To our favorite - only.
Son in law on
his very important
Day.

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THE STANDARD CYCLOPEDIA OF HORTICULTURE

THE MACMILLAN COMPANY
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LXXXI. Ray peach

THE STANDARD CYCLOPEDIA OF HORTICULTURE

A DISCUSSION, FOR THE AMATEUR, AND THE PROFESSIONAL AND COMMERCIAL GROWER, OF THE KINDS, CHARACTERISTICS AND METHODS OF CULTIVATION OF THE SPECIES OF PLANTS GROWN IN THE REGIONS OF THE UNITED STATES AND CANADA FOR ORNAMENT, FOR FANCY, FOR FRUIT AND FOR VEGETABLES; WITH KEYS TO THE NATURAL FAMILIES AND GENERA, DESCRIPTIONS OF THE HORTICULTURAL CAPABILITIES OF THE STATES AND PROVINCES AND DEPENDENT ISLANDS, AND SKETCHES OF EMINENT HORTICULTURISTS

BY

L. H. BAILEY

Illustrated with Colored Plates, Four Thousand Engravings in the Text, and Ninety-six Full-page Cuts

IN THREE VOLUMES

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P

PACHÌRA (native Guiana name). *Bombacàceæ.* A group of tropical American trees of variable size, some of which are known to be deciduous, all with striking showy flowers and exceptionally large fruits.

Calyx almost tubulose, mostly short, truncate; staminal column long, divided at the top into 5 short branches, each of which in its turn ends more or less regularly in 3 bundles of about 15 stamens, with unequal slender filaments: caps. dehiscent, rounded-depressed to elongate-oblong, 5-celled, each cell containing several seeds coated in fleshy tissue. Allied genera are Bombax and Adansonia; the first one differs in having the small seeds imbedded in the woolly inside lining of the caps. (whence their name of silk cotton trees), the latter (the African baobab) in its 5-lobed calyx. In Bombax, the arrangement of the stamens is distinct and their number much greater.—Over 30 species of Pachira have been listed, of which at least 3 belong to Bombax, 4 are synonyms, and among the remainder several are likely to be dropped on one account or another. Botanically speaking, only 7 species are well known, all of which may be distributed into 3 main groups. The fls. may reach 13 in. long with a spread of 9 in. in certain species; the petals are narrow and gracefully recurved in some cases, obovate and somewhat stiff in others. The color varies from a rich pink to white or pale brownish yellow, distinct shades occurring in every species. The digitate foliage also contributes to give the trees their peculiar appearance. As to distribution, *P. aquatica* is found all over Trop. Amer., 3 species are restricted to Cent. Amer., 2 to the W. Indies, and the others are natives of S. Amer. They are easily cult. under glass and prop. either by seeds or cuttings, but, on account of their large size, most species are hardly desirable for conservatories. One species, *P. insignis*, has edible seeds, alike in size and flavor to the chestnut and on which account it is sometimes cult. in Venezuela and some of the Lesser W. Indies. The seeds of *P. macrocarpa* are sometimes used as a cacao substitute; it is probably the xiloxochitl of the Aztecs, being still called by that name (jelinjoche) in Nicoya (Costa Rica).

2694. Pachira macrocarpa.

A. *Caps. globose-depressed, i.e., its diam. greater than its length.* (*Brachycarpæ.*)

insígnis, Savigny (*Carolínea princeps*, Linn. f.). A small tree: lvs. 5–7-foliolate, the lfts. glabrous, subsessile, oblong, 8–24 in. long: fls. 7 in. long, erect; calyx cup-like, short and broad; petals obovate, long-cuneate, crimson or dark purple, covered without with a thick brownish down; staminal tube short, the stamens not reaching the end of the corolla: caps. about 5 in. long by 7 in. diam. Trinidad and Lesser W. Indies; also in Venezuela. J.F. 3:295.

AA. *Caps. ovate-rounded, its diam. more than half the length.* (*Mesocarpæ.*)

B. *Calyx covered with large, crater-like glands: fls. sessile.*

pustulífera, Pittier. A small tree: lvs. 7-foliolate; lfts. briefly petiolulate, obovate, 4½–9 in. long, minutely tomentose beneath: fl. about 7 in. long; calyx stipitate, truncate, pubescent within and irregularly covered with large glands without; petals laciniate, pinkish, yellowish pubescent without; staminal tube short, pubescent, the stamens much shorter than petals: caps. 10 in. long by 8 in. diam. Costa Rica.

BB. *Calyx smooth or with only a few glands at the base: fls. peduncúlate.*

macrocárpa, Schlecht. (*P. fastuòsa*, Decne. *P. longifòlia*, Hort.). Fig. 2694. A small or medium-sized tree: lvs. 5–7-foliolate; lfts. subsessile or briefly petiolulate, oblong or obovate, 2½–8 in. long, glabrous: fls. up to 9 in. long; calyx stipitate, cuplike, smooth or nearly so; petals laciniate or linear, brownish to greenish pubescent without, pink to white or pale yellow within; staminal tube glabrous, the stamens about as long as the petals: caps. ovoid, 9 in. long by 8 in. diam. Cent. Amer., from Mex. to Costa Rica. B.M. 4595. G.C. III. 54: 325. J.F. 2:109, 110.

villósula, Pittier. A tree reaching 90 ft.: lvs. 5–7-foliolate; lfts. petiolulate, obovate or elliptic-lanceolate, 2–7 in. long, villous beneath: fl. up to 10 in. long; calyx funnel-shaped, truncate, ferruginose-pubescent outside; petals laciniate, pubescent on both faces, pinkish

within, rusty colored without; staminal tube long, pubescent, the stamens shorter than the petals: caps. ovoid, 7 in. long by 5 in. diam. Panama.

AAA. *Caps. ovate-elongated, its diam. less than half the length.* (*Dolichocarpæ.*)

B. *Fls. hardly over 4 in. long.*

púlchra, Planch. & Lind. A small tree: lvs. 7-foliolate; lfts. briefly petiolulate, cuneate-oblong or lanceolate, glabrous: fl. about 4 in. long; calyx cup-like, tomentose-pubescent outside; petals linear-oblong, greenish pink within, tomentose and brownish without; staminal tube short, the stamens hardly as long as the petals: caps. not known. Ocaña Mts., Colombia.

BB. *Fls. 10 in. long or more.*

speciòsa, Triana & Planch. A tree about 150 ft. high: lvs. 7-foliolate; lfts. briefly petiolulate, cuneate-oblong, glabrous, 4–8 in. long: fl. about 10 in. long; calyx cuplike, brownish pubescent without; petals oblong, long-attenuated, yellowish white inside, minutely tomentellose outside; staminal tube long, pubescent without, the white stamens nearly as long as the petals: caps. not known. Colombia.

aquática, Aubl. (*P. grandiflòra,* Tussac). A small tree: lvs. 5–7 (9) -foliolate; lfts. subsessile, obovate to elliptic-lanceolate, glabrous, 4–12 in. long: fls. 8½–14 in. long; calyx tubulose-truncate, often warty at the base; petals laciniate, more or less deeply pinkish or purplish; staminal tube long, the red or scarlet filaments about as long as the petals: caps. 7–15 in. long, 3–5 in. diam. Trop. Amer., including W. Indies. G.C. III. 40:308.—*P. aquatica* varies considerably according to the nature of the soil in which it grows and to its environment, and it is not unlikely that most so-called species described in horticultural reviews should be considered as simple varieties of the same. This species is the best known in the genus and its area of distribution is very extensive; its cult. in hothouses has been often attempted and it has lately been intro. in Fla. under the name of *P. insignis. P. stenopetala,* in Gt. 9:302, is probably a cult. form of *P. aquatica.*

P. álba, Walp., is evidently a Bombax. B.M. 4508. Generally speaking, there is a great confusion as to the identification of the several species, most of which are not represented even in the larger herbaria.—*P. minor,* Hemsl., known to us only by a poorly executed plate in B. M. 1412, may be a variety of P. aquatica.

H. Pittier.

PACHÍSTIMA (said to be derived from Greek, *pachys,* thick, and *stigma;* alluding to the slightly thickened stigma). Spelled also *Pachystima* and *Pachystigma. Celastràceæ.* Ornamental woody plants sometimes grown for their evergreen foliage.

Low evergreen shrubs: branchlets somewhat quadrangular, verrucose: lvs. opposite, small, serrulate or entire, short-petioled, with minute deciduous stipules: fls. perfect, small, in few-fld. axillary cymes; calyx-lobes, petals and stamens 4; ovary 2-celled, often only 1 cell developing into a small, oblong, 1-seeded caps.—Two species in the mountains of N. Amer.; allied to Evonymus.

These are low trailing or spreading shrubs with small evergreen foliage and inconspicuous reddish flowers followed by small dull-colored capsules. They are hardy with slight protection in the Arnold Arboretum, Boston, and are handsome dwarf evergreens for rockeries or rocky slopes; *P. Canbyi* forms a dense carpet and may be used as a border plant for evergreen shrubberies. They seem to grow in any well-drained soil. Propagation is by seeds or by layers; also by cuttings of half-ripened wood under glass, and *P. Canbyi* also by division.

myrsinites, Raf. (*Myginda myrtifòlia,* Nutt. *Oreóphila myrtifòlia,* Nutt.). Spreading shrub, to 2 ft.: lvs. broadly elliptic to oblong-obovate, slightly revolute at the margin and serrulate or almost entire, ½–1 in. long: fls. short-stalked, reddish: fr. about ⅓in. long. May–July. Brit. Col. to Calif. and N. Mex.—Resembles the small-lvd. form of *Evonymus radicans,* but of more rigid and stiff growth.

Cánbyi, Gray. Dwarf shrub with trailing and rooting branches, scarcely exceeding 1 ft.: lvs. narrow-oblong, occasionally obovate, revolute and usually serrulate above the middle, ⅓–¾in. long: fl.-stalks filiform, longer than half the lf.; fls. reddish. April, May. Mts. of Va.—This is somewhat similar in habit and foliage to *Evonymus nanus,* but less vigorous and of more even and regular growth. Sometimes called rat-stripper.

Alfred Rehder.

PACHYCÈREUS (Greek, *thick* and *cereus*). *Cactàceæ.* Usually trees, more or less branched, with very definite woody trunks.

Flowers appearing during the day, with rather short tubes; petals short; stamens included; ovary and tube of fl. covered with small bracts bearing wool, hairs, and bristles in their axils: fr. large, burlike; seeds large and black.—The genus consists of 10 species segregated from Cereus. Confined to the drier parts of Mex. Cult. as for Cereus and related groups; see *Succulents.* This genus is closely related to Lemaireocereus, one of the several segregates of Cereus; *C. queretarensis,* Web., is *Lemaireocereus queretarensis,* Brit. & Rose, rather than a Pachycereus (see page 1836, Vol. IV).

2695. Pachycereus Pringlei.

chrysomállus, Brit. & Rose (*Pilocèreus chrysomállus,* Lem.). Tree-like, with erect branches, reaching a height of 30 ft.: ribs in cult. plants 13: areoles with long hairs; radial spines 11–13, the upper ½in. long, the lower twice as long; centrals 4, still longer; all the spines amber-yellow, becoming brown: cephalium terminal or sometimes unilateral, a foot long, woolly and setose. Mex.—The indications are that the plant in cult. under the above name is a true Cephalocereus and not the *Pilocereus chrysomallus* of Lemaire.

Colúmna-Trajàni, Brit. & Rose (*Pilocèreus Colúmna-Trajàni*, Salm-Dyck). TRAJAN'S COLUMN. Treelike, attaining a height of 50 ft. and a diam. of over 2 ft., simple below: areoles large, elliptic; radial spines 10–12, the upper very short, the lower longest, nearly an inch long; centrals 2, the upper an inch long, the lower 4–5 in.: fls. about 2 in. long, scarcely projecting from the unilateral woolly and bristly cephalium. Mex. R.H. 1890, p. 129.—The specific name refers to the famous Trajan's Column.

marginàtus, Brit. & Rose (*Cèreus marginàtus*, DC. *C. gemmàtus*, Zucc.). Simple or branching at apex, 2–3 in. diam., with 5–6 obtuse ribs, which are woolly their whole length: spines short-conical, rigid, 7–9, all nearly alike: fls. brownish purple, about 1½ in. long: fr. globular and spiny. Mex.—Frequently used for hedges in S. Mex. The st. is often covered with a woody crust.

pécten-aboríginum, Brit. & Rose (*Cèreus pécten-aboríginum*, Engelm.). This species is sometimes cult. but does not do well under glass. The large burry frs. used by the Sonoran Indians for hair-brushes are sometimes seen in museums and curio stores.

Prínglei, Brit. & Rose (*Cèreus Prínglei*, Wats.). Fig. 2695. One of the cordon cereuses of N. Mex. Not so tall as *Carnegia gigantea*, ribs, fewer, and fls. scattered. Not in cult. G.F. 2:65 (adapted in Fig. 2695).

J. N. ROSE.

PACHYPHÝTUM (Greek, *thick plant*). *Crassulàceæ*. Succulents, likely to be found in the under-glass collections of amateurs, and out-of-doors far South. See page 870, Volume II.

Caulescent, more or less branched, with very thick lvs. which are often terete: fls. solitary or in secund racemes; calyx deeply lobed, the lobes shorter than the corolla, and appressed to it; corolla 5–7-parted and not at all 5-angled; petals erect below, spreading above; stamens 10, the 5 alternating with the petals free from the corolla, the other 5 borne on the petals each usually with a pair of appendages at the base; scales broad: carpels 5, erect, free to the base.—About 7 species from Mex. Pachyphytum is usually included in Cotyledon but some recent American botanists keep the genus distinct. *P. uniflòrum*, Rose, is a stout species usually woody below with green hardly glaucous terete lvs., appendaged stamens and acute calyx-lobes, said to be cult. in shady courtyards at San Luis Potosi, Mex. *P. bracteòsum*, Klotzsch (*Echevèria bracteòsa*, Lindl..& Paxt.). This species has oblanceolate to spatulate thickish lvs. and a curved, finally erect, secund raceme which is 12–18-fld.: its calyx is deeply campanulate with unequal lobes and a bright red corolla. Mex. B.M. 4951.

PACHYPÒDIUM (Greek, *thick foot*, alluding to the roots). *Apocynàceæ*. About 15 remarkable succulent shrubs and trees of Madagascar, S. Afr. and Trop. Afr., a very few of which are mentioned in horticultural literature. They are grown with succulents, and prop. by cuttings. Frequently the trunk is much swollen: lvs. simple, in spirals; stipules represented by rigid spines; or, according to Stapf, the lvs. suppressed with the exception of a terminal rosette, and the spinous stipules crowded more or less irregularly on the swollen branches: cymes terminal, with few or many sessile or peduncled pink, white or yellow fls.; sepals 5; corolla salver-shaped, constricted at base, or funnelform to campanulate, 5-lobed; anthers conniving into a cone, with appendages longer or shorter than the pollen-bearing part, the structure complex. *P. Geàyi*, Cost. & Bois. Tree, 30 ft. or more, with succulent cactus-like spiny trunk, branching at summit: lvs. in terminal tufts, long and narrow. Madagascar. R.H. 1907, p. 490. *P. namaquànum*, Welw. St. 5–6 ft. high and 9–15 in. diam., fleshy, tapering upward, tubercled and spiny: lvs. obovate-oblong to oblong, crowded in a little crown at the top of the trunk: fls. reddish tinged yellow and green. S. Afr. G.C. III. 46:371, showing the strange plants in the wild. *P. succuléntum*, DC. Tuberous at base, 1–2 ft. high, producing several somewhat branched sts., bearing lvs. scattered on long shoots: lvs. oblong-linear or linear, 1½ in. long, pubescent above; stipules spiny: fls. 1 in. or more across, the oblong lobes white and purple. S. Afr.

L. H. B.

PACHYRHÌZUS (Greek, *thick*, and *root*). *Leguminòsæ*. Climbing herbs bearing large tuberous roots often 6 to 8 feet long and weighing fifty to seventy pounds, which are used for food and as a source of starch.

2696. Pachyrhizus palmatilobus.

Leaves pinnately 3-foliolate; lfts. stipellate, lobed, 3–4 in. wide: racemes with swollen nodes and fascicled pedicels, bracts and bractlets setaceous, caducous; calyx 2-lipped, limb as long as the tube, upper lip emarginate, lower lip deeply 3-lobed; corolla much exserted, petals subequal, keel obtuse; stamens diadelphous; anthers uniform; ovary subsessile, many-ovuled; style long, circinate at the apex, bearded down the inner side below the very oblique stigma: pod large linear, turgid, deeply depressed between the seeds. —A genus of 3 or 4 species distributed throughout the tropics of both hemispheres. Blanco, Flora de Filipinas, describes and figures the roots as turnip-shaped. When young, the roots are palatable.

A. *Lfts. entire.*

eròsus, Urban (*Dòlichos eròsus*, Linn. *D. bulbòsus*, Linn. *P. bulbòsus*, Kurz. *P. angulàtus*, Rich. *Cacàra eròsa*, Kuntze). YAM BEAN. Root tuberous: st. twining, shrubby, hirsute, becoming glabrate with age: lvs. pinnately 3-foliate, often long-petioled; stipules deltoid or ovate-lanceolate, short; terminal lft. long-pedicelled, broadly cuneate at base, deeply or shallowly lobed in the upper half; lateral lfts. oblique, short-pedicelled, stipels subulate: racemes 6–12 in. long, long-peduncled, base often branching, branches ascending; calyx ¼in., as long as the pedicel; corolla reddish, 1 in. or more long: pod 6–9 in. long, ½–⅔in. broad, 8–12-seeded, straight glabrescent. Tropics of both hemispheres. H.I. 19:1842.—Eaten both raw and boiled.

tuberòsus, Spreng. JICAMA. Root tuberous, much larger than the above: st. twining, 10–20 ft. long: lvs. entire or obscurely sinuate: racemes densely fld.: pod 8–12 in. long, ¾–⅞in. broad. Trop. Amer. H.I. 19:1843.—Young pods superior to many cult. beans in the absence of fibrous strings about the sutures of the pods; seeds said to be poisonous. Perhaps only a cult. form of the above species. The root is said to be a great favorite with travelers, as it quenches thirst and is nutritious. They are cut in thin slices and sprinkled with sugar. Two forms are recognized in Mex., one called agua, with a watery juice, and one called leche, with a milky juice. It is said that they

can not be distinguished except by tasting the root. To have good roots, the blossoms and seed-pods must be kept pinched off, for if they are allowed to mature the roots are not good. The roots mature in about 5 months and may be allowed to remain in the ground longer, as they become sweeter as the cold season approaches.

2697. Pachysandra procumbens. (Flowers ×1. Leaves ×½.)

AA. *Lfts. lobed.*

palmatílobus, Benth. & Hook. (*Dòlichos palmatíloba,* Moc. & Sessé). Fig. 2696. St. twining, glabrous or pubescent: lvs. pubescent, often long-petioled, pinnately 3-foliolate, terminal lft. broadly ovate, deeply 3-lobed, with lateral lobes often somewhat 2-lobed, lateral lfts. less deeply 2–4-lobed, lobes ovate, mucronate: fls. purplish, in long-peduncled racemes. Trop. Amer.—Not so common, root smaller and less cult. than the preceding.

P. L. RICKER.

PACHYSÁNDRA (Greek, *thick stamen*). *Buxàceæ.* Perennial herbs or subshrubs of some value as ground-cover in shade for their more or less evergreen leaves.

Stems prostrate or ascending, 6–12 in. high, from rootstocks, scaly below: lvs. alternate, usually coarsely toothed, evergreen or deciduous, 3-nerved: spikes staminate above, with a few pistillate fls. at the base of each; staminate fls. with 4 sepals and stamens and a rudimentary pistil; sepals variable in the pistillate fls.; petals none; pistil 3-celled, 2 ovules in each cell, the 3 styles spreading, filaments thick, exerted, conspicuous, usually white: seeds smooth.—Two species known: of low and dense growth, with very early fls. attractive to bees, and masses of bright green lvs. Easily prop. by division in ordinary soils. Good for rockeries.

In the vicinity of Boston, *P. procumbens* is deciduous, and is desirable only from the feature of its curious flowers borne so extremely early in the spring. The foliage is of a dingy color and deciduous, whereas *P. terminalis* is a true evergreen with thick, glossy foliage forming a dense mat, making a very desirable low-growing cover-plant, succeeding admirably either in full sun or partial shade. The variety *variegata* is a very choice cover plant for ornamental effects. (J. Woodward Manning.)

procúmbens, Michx. MOUNTAIN SPURGE, Fig. 2697. One foot high or less: lvs. ovate to obovate, 2–4 in. long: spikes of white or purplish fls. from the base of the sts. March–May. W. Va. to Fla. B.M. 1964. L.B.C. 10:910. B.R. 33. G.C. III. 55:335.

terminàlis, Sieb. & Zucc. Smaller: lvs. obovate-cuneate: the small spikes of whitish fls. terminal. May. Japan. Var. **variegàta,** Hort., with white variegated lvs., is in the trade.

P. coriàcea, Hook.=Sarcococca pruniformis, Lindl.

J. B. S. NORTON.

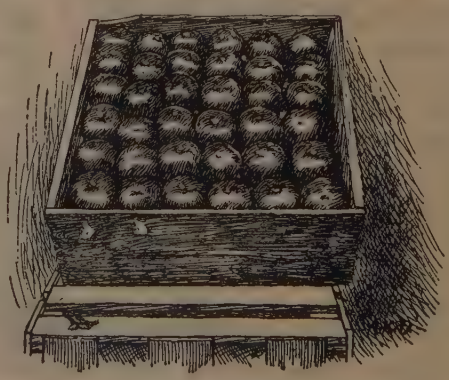
PACHÝSTIMA: *Pachistima.*

PACHÝSTOMA (Greek, meaning *thick mouth,* referring to the thick lip). *Orchidàceæ.* Terrestrial orchids with leafless scapes from underground nodose rhizomes: pseudobulbs producing 1–2 lvs.: sepals and petals similar, the lateral sepals occasionally forming a chin, all upright; labellum 3-lobed, forming a sack with the base of the column; anthers bent over; pollinia 8, lying in pairs and bound into 4 by elastic threads. About 10 species, chiefly E. Indian and Malayan, but 1 from Trop. Afr. *P. Thomsoniàna,* Reichb. f. (*Ancistrochìlus Thomsoniànus,* Rolfe), is the most commonly cult. species. It has large fls. with white sepals and petals, and the lip has green erect side lobes thickly dark purple-spotted and a narrow recurved midlobe which is white nearly covered with deep purple lines. Trop. Afr. B.M. 6471. J.H. III. 51:147. G.C. II. 12:582 (note), 624, 625; 18:501. Gt. 30:1061.—A warmhouse plant. *P. Thomsoniana* is now referred to Ancistrochilus by Rolfe. Ancistrochilus has 2 species and is readily distinguished from Pachystoma by the pollinia being united to a single stipitate appendage as well as by the remarkable lip and spreading segms.

PACHYSTRÒMA (Greek for *thick layer*). *Euphorbiàceæ.* The one species, *P. ilicifòlia,* Muell. Arg., is a shrub or tree of S. Brazil rarely cult. and chiefly in botanical gardens; the oily seed has been used in medicine. Juice milky: lvs. simple, pinnately veined, spinulose dentate: fls. apetalous; sepals valvate or slightly imbricate; stamens 3; styles 3, undivided; ovules 1 in each cell of the ovary. Related to Manihot.

J. B. S. NORTON.

PACKAGES for horticultural produce. The choice of a package and the method of packing horticultural products are very important considerations to every grower who is interested in establishing a reputation for his goods. The commercial value of well-grown produce of choice varieties may be greatly lessened or utterly destroyed if the attempt is made to market it in poor uninviting packages, or if it is poorly packed. Inferior produce or poor varieties are sometimes sold for prices above their real value when packed in an extra attractive way.

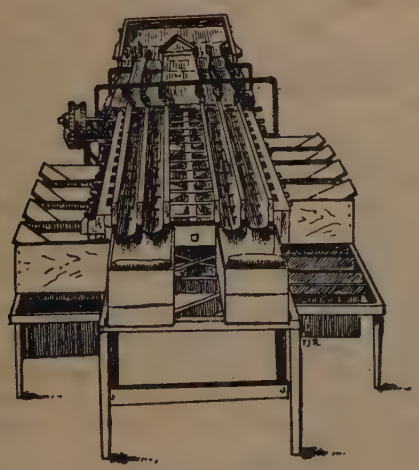


2698. A good pack of apples in a box-tray.

The choice of a marketing package for horticultural products is based largely on customs. These customs have developed gradually along with the growth of the industry in any special region, and when suitable and valuable they persist and become firmly fixed for the

2699. Well-packed and not packed dessert apples.

crop in that section. However, the supply of the raw material and the possibility of securing large quantities of it at a low price are important considerations besides custom. Examples of the custom of adopting a special package in a certain region might be cited, as barrels for apples in the eastern states, boxes in the western states. Peaches are generally packed in flat boxes in the western orchards, and each fruit is wrapped in paper; the same varieties of peaches are marketed from the southern states in six-basket carriers and the fruits are not wrapped, while from Michigan the same variety may be shipped in bushel baskets and from New York orchards in the Delaware type of basket. In general, it would not be advisable to pack any crop in a way that would widely violate the general



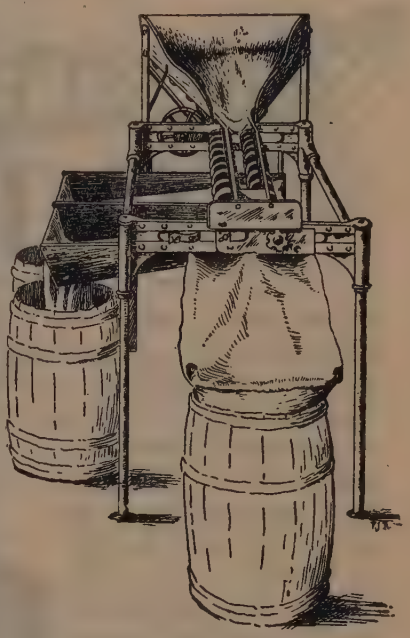
2700. Sizing machine.

custom of the community, unless the grower has a special market to receive his produce prepared in his special way.

The illustrations accompanying this article (Figs. 2698–2718) show some of the diverse forms of packages for fruits and vegetables now in use in North America. The methods of packing cut-flowers are discussed in the article devoted to that subject, pages 922–925, Volume II. The separate fruits may also be consulted under their alphabetic entries.

Apples (Figs. 2698–2704, to show the classes only).

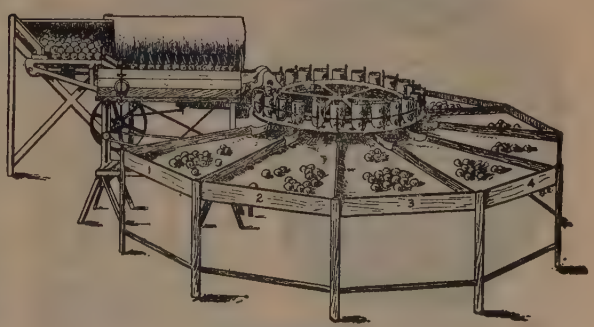
Since the beginnings of commercial apple orcharding, the barrel has been regarded as the standard package for the holding and shipping of apples. The size used has varied at different times and in different sections. The size now specified by the United States Government as standard for apples is, when measured without distention of its parts: Length of stave, 28½ inches; diameter of head, 17⅛ inches; distance between heads, 26 inches; circumference of bulge, 64 inches outside measurement; representing as nearly as possible 7,056 cubic inches. Barrels for apples have been in favor for many years, and promise to remain so, for the reason that they are cheap, easily secured in most regions, can be readily handled and easily and quickly packed, and the trade has become thoroughly accustomed to them.



2701. Machine for sizing fruit

The bushel box has been the standard package for apples in the western United States since apple-production has been of commercial importance in those regions. The box is occasionally used by growers in the eastern apple regions. Formerly its use was always associated with fancy grade high-quality fruit. Western fruits shipped to eastern markets were of this class and always came in boxes. Some eastern growers thought that if even ordinary grades and quality of fruit were packed in bushel boxes, the attractive prices that were secured for western fruit could be secured upon the reputation of the package. The delusion was not long-lived.

As compared with the barrel, the box is a more attractive package, more easily handled, shipped and stored. It is easier to sell from in a store or on a fruit-stand, and when the apples are closely sized, the exact number in every package is known, and they are of



2702. A sizer.

uniform size, and this is of value to dealers and restaurant-keepers.

Boxes cost about one-third as much as barrels, and they hold about one-third as much, but more time is required properly to pack three boxes with apples than to pack one barrel properly. The Government stand-

2703. Another form of sizer.

ard bushel box for apples is 18 by 11½ by 10½ inches, inside measurement. There are various styles, those used in the western states being made with solid ends, and two pieces each for the top and bottom, and one piece for the sides. In the East, where the box is used, panel ends instead of solid pieces are used; otherwise the same as the western style.

Apples are usually packed into barrels in the orchard, but sometimes may be carried to a packing-house or shed. A common way is to empty them from the picking-bag or -basket upon a packing- or sorting-table. From this pile, the "facers" are selected. These are fruits of a uniform size and should be of such a color as will honestly represent the average of the crop. The facers are then laid by hand in the then bottom, but later top, of the barrel. Sometimes two layers are placed in by hand. The barrel is then filled by emptying the apples from a basket that can be lowered into the barrel, or emptied from the apron attached to the lower end of the table. The barrel should be frequently "racked," i. e., given several short, quick, vigorous shakes, to settle the fruit and cause one to roll or slip over the other and thus become firmly lodged. When the barrel is well filled, a layer of apples is placed by hand on top. This operation is known as "tailing," and the cover is pressed into place and held there by driving the hoops down toward the larger part of the barrel, and sometimes by nailing.

2704. A lined picking-basket, for apples, pears and other tree-fruits.

Appliances or machines to size the fruits are used when apples are packed in bushel boxes, and with the recent enactment of laws in several states requiring that the minimum size of the fruits be marked upon the package this becomes necessary when packed in barrels. This sizing may be done by the eye and hand or with the aid of a sizing-board, but for rapid work a machine is necessary. There are a great many kinds, and new styles are manufactured and offered for sale every season. (Figs. 2700–2703.) These machines are shown not necessarily for recommendation but to illustrate some of the types.

2705. Bamboo basket for shipping citrous fruits in the Philippines.

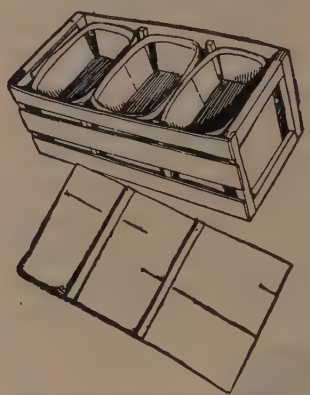
Grading is the operation of selecting the fruits that are similar in appearance and value. No machine can do this; it must be done by hand. Grades are variable, depending upon the general crop of the season, the ideals of the packer, and the governmental requirements. Usually there is a "Fancy," "Grade A," and "Grade B;" or, it is frequently designated as "Fancy," "Standard," and "Choice."

2706. Delaware peach basket.

The art of properly packing the graded and sized apples in the bushel box requires skill and practice. There are well-known standardized ways of doing this work. Details of this operation may be found in Cornell Bulletin No. 298.

Apples are also packed in one-bushel hampers, a commonly used package for summer varieties in the Atlantic Coast states, and also in peck and one-half-bushel market baskets (Fig. 2699), and peck crates.

It is always necessary to exercise the greatest care in the picking of the fruit and in handling it from the tree. A good lined picking-basket, with swing handle, is shown in Fig. 2704.



2707. Six-basket crate. Used for tomatoes and peaches in Georgia and Florida.

Citrous fruits.

Citrous fruits are cut from the trees with shears. Care always should be taken to make a smooth close cut, as any injury to the skin or a long stem that may puncture a fruit that it comes in contact with may lead to serious decay. The picked fruit is placed in a bag, or sack, or basket, and, when filled, this is emptied into a "picking-," "field-," or "lug-" box. It is then hauled to the packing-house, where it is graded by skilled workmen and then carefully sized. The different sizes are packed into standard-size boxes. The orange box, which is made of wood and is 12 by 12 by 26 inches outside measurement, with a partition in the center, may hold from 40 to 400 fruits, but the common sizes are 96, 112, 120, 150, 176, and 200.

Lemons are very carefully graded and sized by hand. A lemon box has outside measurements of 11 by 14½ by 27 inches and holds from 180 to 540 fruits, but the most common and valuable sizes are 300 and 360 fruits.

Pomelos, commonly called grapefruit, are handled in a similar way and packed in the same kind of package as is used for oranges.

In a few cases, half-boxes of all these fruits are packed. All citrous fruits are wrapped in tissue paper.

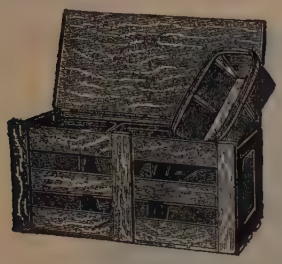
In Fig. 2705 is shown an interesting native basket or hamper in the Philippines. (Wester.)

Cherries.

Cherries are hand-picked from the tree with

2708. Berry crate holding thirty-two boxes.

the whole stems adhering to the fruit, or the stems are cut with shears; rarely, when the fruit is to be canned soon after picking, it is pulled from the stem. In this case it is carried to the canning plant in boxes which are lined with newspapers.



2709. Portable hinged crate

As the fruit is picked, it is placed in baskets or pails and carried to the packing-station, where it is weighed or measured, graded and packed. The packages may be Climax baskets, ten-pound flat boxes, or sixteen-quart crates. The fine varieties of sweet cherries, especially from the western states, are often packed in the ten-pound box. The bottom layer is carefully placed in by hand and enough fruit to make a firm tight pack distributed over the bottom layer, and the cover pressed on.

Grapes.

Grapes are cut from the vines with special grape shears. Fine varieties for fancy market are handled with care, so as not to rub off the bloom. They may be packed in the shipping package in the field, but are usually carried to the packing-house in trays. Some growers prefer to hold them in the packing-house for a day or two, to allow the stems to "wilt," as they can

2710. A vegetable basket.

2711. Bushel basket with cover, useful for vegetables and hard fruits.

then be more easily handled. The packing is usually performed on a table or bench, and from the picking-box or tray into the shipping package.

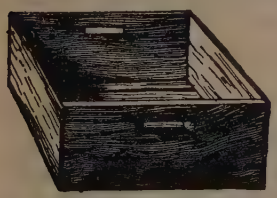
The most common package is a five-, eight- or ten-pound Climax basket with a solid wooden cover. Grapes intended for wine are marketed in peck or half-bushel baskets, and in New York flat trays are commonly used.

Pears.

Pears were formerly packed in a small barrel or keg holding about five pecks, and more recently pear barrels were commonly used. These held about a peck less than the standard apple barrel. The packages now used are the standard barrel and the bushel box, the same as the apple. When the box is used, each fruit is wrapped in paper.

Pineapples.

Pineapples are packed in crates that hold two dozen fruits, and each one is wrapped in paper.



2712. A bushel box. Useful for fruits and vegetables.

Peaches.

Peaches are picked into baskets of various types, the one-half bushel swing-handle type being the most common, and are carried to the packing-house. In some regions the fruits are run over mechanical sizing machines, similar to apples, or sized by hand. They may be packed for shipment into flat twenty-pound wooden boxes, and each fruit wrapped in paper. This is the general custom in the western states. In the eastern states the stovepipe or Delaware basket (Fig. 2706), holding sixteen quarts, is used. There may be a slat cover or netting cover, and a light crate that will hold three of these baskets is sometimes used.

2713. Ventilated barrel.

The six-basket Georgia carrier is a standard peach package (Fig. 2707). It requires special skill to pack fruit into these baskets properly and rapidly. The half-bushel and bushel baskets are also well recognized peach packages. A round stick placed in the center of the package to support the cover insures a minimum amount of bruised fruit.

Plums.

Plums are shipped in a great variety of packages. Fancy grades are wrapped in paper and packed in two-quart baskets and four of these are held in a flat wooden box or crate that weighs about twenty pounds. Large fruit varieties are wrapped in paper and packed in flat twenty-pound boxes the same as peaches. Climax baskets, holding from five to twenty pounds are used, also half-bushel and bushel baskets. Small-fruit varieties, like the Dawson, may be shipped in sixteen-quart cases.

Small-fruits (Figs. 2708, 2709).

The berry-like fruits, as blackberry, currant, dewberry, gooseberry, loganberry, raspberry, and strawberry, are almost universally packed in the sixteen-quart crate. In the past, these fruits, especially the strawberry, have been marketed in a great variety of packages, but in recent years the sixteen-quart crate

2714. A good commercial method of packing cauliflowers for special trade.

has rapidly become the standard and widely recognized package.

This package is also commonly used for the small-fruit plums, especially Damsons, and for cherries, both sweet and sour.

The quart boxes are often taken into the field and "picked into," and then carried to the packing-station and placed in the case; or the fruit pickers use a special picking-basket or -box, and this is delivered to the packing-station and the quart boxes filled there, where

the fruit may be graded and the work of the pickers examined.

Cranberries are picked from the vines by special machines or by hand, and packed in barrels. Occasionally twenty-pound wooden cases are used.

Vegetables (Figs. 2710–2718).

Packages used for the shipment of vegetables are not so evenly standardized as those used for fruits. Custom, however, seems to be of about the same importance, for similar vegetables grown in different regions are packed in different ways.

Asparagus is cut and tied in bunches of various sizes. In a few sections the loose stalks are packed in small boxes or crates, but the usual form is a "bunch," and these bunches are packed in any handy-sized box.

Hamper baskets holding from twenty-eight quarts to one and one-fourth bushels are commonly used for packing beans, corn, cucumbers, lettuce, peas, radishes, spinach, sweet potatoes; but a variety of packages is used for some of these products and for most of them ventilated barrels are used.

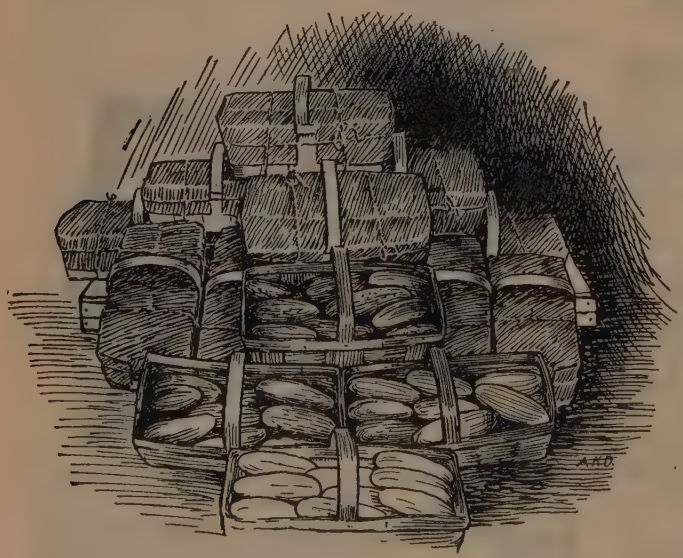
Beets are packed in crates, the same as cabbage.

Brussels sprouts are shipped in quart boxes like small-fruits, and these are placed in cases holding thirty-two, forty-eight or sixty quarts, the forty-eight-quart size being the most common.

Field-grown cauliflower is packed in ventilated barrels; the greenhouse product is packed in small flat boxes or trays that will hold six heads (Fig. 2714).

Packages for shipping celery are of many kinds. Each producing district has its own packages. A common one is a slat crate that varies from 6 by 8 by 24 inches to 10 by 26 by 24 inches. The plants, after being trimmed, are packed upright in these crates, which may or may not be lined with paper. With a fancy product, each bunch is wrapped in paper. A tight flat box, holding twenty-four or more bunches, is frequently used for express shipments.

Cucumbers are packed in baskets (Fig. 2715), hampers, flat boxes, and barrels. Lettuce is packed in barrels,



2715. Basket-packed cucumbers, for a home trade.

hampers, and frequently in crates 16 inches wide, 23 inches long and 8½ inches deep. Such a case will hold two dozen heads of No. 1 or two and one-half dozen heads of No. 2.

Muskmelons are packed in Climax baskets, flat boxes (Fig. 2716), and crates. Sometimes each melon is wrapped in paper. Special retail packages for celery and sweet corn are shown in Figs. 2717 and 2718.

Onions are shipped in bags holding two bushels, in half-barrel hampers, and various other types of packages, and also in bulk.

2716. A twelve-melon package, used for the small dessert varieties.

Potatoes are commonly shipped loose in a box-car. In cold weather, the car must be lined with paper and a heater in each car keeps them warm enough to prevent freezing. In some sections, the practice is to use bags holding about two bushels. Barrels are frequently used. Ventilated barrels are commonly used for sweet potatoes. Special baking potatoes from some regions are wrapped in paper and packed in bushel boxes. Squash is usually packed in ventilated barrels. Sweet potatoes from New Jersey are packed in hamper baskets; those grown in Virginia, in barrels.

Tomatoes are packed in flat boxes, Climax baskets, six-basket Georgia peach-carriers, and hamper baskets. They may or may not be wrapped in paper. For local markets, a great assortment of packages are used, but the peck and half-bushel market basket is the most common.

H. J. Eustace.

PÆDÈRIA (Latin, *pædor*, bad smell, referring to *P. fœtida*). *Rubiàceæ*. Tropical shrubby twiners.

Slender twining plants, fetid when bruised, with terete flexuous branches: lvs. oppsite, rarely in whorls of 3, petioled: fls. small, mostly reddish or whitish, in axillary and terminal dichotomous or trichotomously branching panicled cymes, with or without bractlets; corolla tubular or funnel-shaped; throat glabrous or villous; lobes 4–5, valvate, with crisped margins, often 3-lobed at apex: fr. a small berry. Distinguished from allied genera by the 2-locular ovary and 2 capillary twisted stigmas.—Species about 25, India, Burma, Malay Archipelago, China, Madagascar, Mex. to Brazil. They are little known in cult., the following being a warmhouse climber. It is sometimes known as Chinese fever-plant.

fœtida, Linn. Glabrous or nearly so: lvs. long-petioled, ovate or lanceolate, base acute, rounded or cordate: fls. pink, the cyme branches opposite: fr. broadly elliptic, much compressed: pyrenes black, with a broad pale wing, separating from a filiform carpophore. India, Malaya.—Oliver writes that it is

LXXXII. Peony, Baroness Schroeder.

"usually grown as a stove and greenhouse climber, but it is hardier than is generally supposed. It is rather an attractive-looking but not free-blooming vine. The leaves, or any part of the plant, when bruised emit a most offensive odor. Cuttings should be put in any time after the growths are matured."

P. Wilsonii, Hesse. A strong climber from China, with hairy branches: lvs. long-petiolate, ovate-lanceolate, to 6 in. long: fls. cream-white with a purple-red eye, less than ½in. across, in a cluster somewhat like that of the lilac; corolla-tube ⅔in. long. This species stood two winters at the Arnold Arboretum, Boston, and blossomed, but was finally winter-killed.

L. H. B.

2717. Basket-packed celery, for home trade.

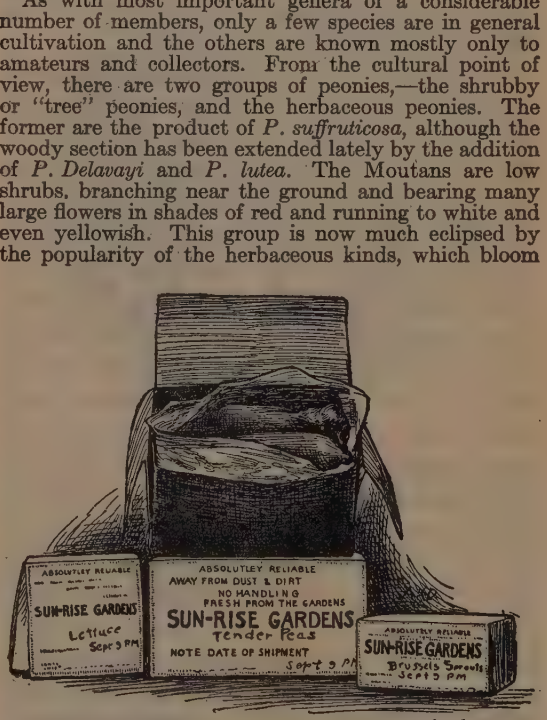
PÆDERÒTA (from *pæderos*, a name applied by the ancients to a species of Acanthus). *Scrophulariàceæ*. Hardy perennial herbs suitable for garden use: low, many-stemmed, puberulent or pilose, with opposite serrate or cut lvs. and dense terminal spikes: fls. short-pedicelled, solitary in the axils of small bracts; calyx 5-parted, the segms. narrow; corolla with a cylindrical tube and a sub-2-lobed limb, the lobes erect or erect-spreading; stamens 2, affixed to the tube: caps. acute, turgid. About 5 species, Eu. and the Orient in the mountains. By some considered a section of Veronica. The following species, which though perennial are usually treated as annuals, require a dry situation and light sandy soil. Prop. by seed. *P. Agèria*, Linn. Plant puberulous, 6–12 in. high: lvs. all acute, the lower ovate, middle ones 1½ in. long, almost 1 in. broad, the upper longer and narrower-lanceolate, cut-serrate: fls. yellow, in short compact spikes; corolla nearly ½in. long with erect segms. May. Eu. *P. Bonaròta*, Linn. Plant pilose, 4–6 in. high: lower lvs. orbiculate; upper lvs. ovate or lanceolate, serrate or cut: fls. blue, in compact globose or oblong spikes which are 1–1½ in. long; corolla ½in. long with somewhat spreading segms. May. Eu.

PÆÒNIA (after the mythical physician Paeon). *Ranunculàceæ*. Peony. Piney. Pæony. Specially attractive and important flower-garden perennials, prized for the showy spring and early summer bloom.

Herbaceous or woody: roots thickened to form upright rootstocks: lvs. large, alternate, pinnately compound or dissected, mostly ternate: fls. terminal and mostly solitary, but sometimes several, a very few species yellow, but mostly red, purple or white; sepals 5, persistent; petals conspicuous, broad, 5–10, but doubling may take place in any species; stamens numerous: carpels 2–5 on a fleshy disk, becoming dehiscent; follicles bearing the indurated more or less conspicuous style; seeds large, fleshy.—Species about 25, Eu. and Asia, and one small-fld. species (*P. Brownii*) in Calif. and northward. Peonies are among the dozen commonest and best hardy herbaceous perennials. By variation and hybridization, the garden forms are now very many. A botanical monograph by E. Huth, is in Engler's Jahrbücher, Vol. 14 (1891). An account by Baker, from which much of the recent botanical characterization is drawn, appears in G.C. II. 21, pp. 732, 779, 828, and Vol. 22, p. 9 (1884). See also R. Lynch, Journ. Roy. Hort. Soc. 12:428 (1890). According to Peter Barr, every species mentioned in Index Kewensis had been intro. to cult. in Eu. except *P. obovata*, a native of Manchuria; this species, once intro. but long ago lost, has very recently been brought again into horticultural notice.

It is customary to divide the genus into two groups, one including the herbaceous species and the other (chiefly *P. suffruticosa* or *P. Moutan*) comprising the woody kinds. This division is not invariable as the plants grow under cultivation, and to the horticulturist who wishes to distinguish the stem-species it is confusing. It may be better from the modern gardener's point of view to make the primary divisions on color of the flowers, into the red-white species and the yellow species. The yellow-flowered species have played a small part in the evolution of the cultivated forms, although *P. lutea* is now beginning to contribute a strain, and other yellow species are very promising. The species are difficult to distinguish, even in unmodified forms, and the garden forms are very puzzling to a systematic botanist. The confusion is increased by the use of Latin names for many of the garden varieties. No two systematists could be expected to agree on the limits and nomenclature of species. The following descriptive account is a compromise arrangement of the species.

As with most important genera of a considerable number of members, only a few species are in general cultivation and the others are known mostly only to amateurs and collectors. From the cultural point of view, there are two groups of peonies,—the shrubby or "tree" peonies, and the herbaceous peonies. The former are the product of *P. suffruticosa*, although the woody section has been extended lately by the addition of *P. Delavayi* and *P. lutea*. The Moutans are low shrubs, branching near the ground and bearing many large flowers in shades of red and running to white and even yellowish. This group is now much eclipsed by the popularity of the herbaceous kinds, which bloom



2718. Paper packages or cartons for sweet corn, and other vegetables supplied direct to consumer.

each year on shoots that arise from the crown, the plant dying completely to the ground on the approach of winter. These garden forms are probably the issue of different species, as *P. officinalis* of Europe and *P. albiflora* of Siberia and the far East. The set derived most directly from the former species are mostly earlier-flowering than those from *P. albiflora*. The botanical parentage of the horticultural herbaceous peonies needs

to be worked out from living material combined with a study of the historical development. It is commonly understood, however, that the present race of herbaceous peonies is mostly the progeny of *P. albiflora*, but many are from *P. officinalis*. The importance of the shrubby or tree peonies is not now great, at least not in this country. The species, *P. suffruticosa* was formerly prized for its bushy habit and wide range of flowers both single and double. The varieties of this species were once commonly propagated by grafting them on the fleshy roots of the herbaceous species. Non-blooming shoots are chosen as cions, and the union is made in late summer, the tuber and its cion then being handled through the winter in a frame, to be ready for planting out in the spring. A yellow-flowered shrub-peony is lately offered by Lemoine (La Lorraine) as a cross between *P. lutea* and *P. suffruticosa*. This bloomed first in 1904; it was awarded a prize in Paris in 1909. The flowers are soft sulfur-yellow with a salmon tinge when opening, becoming lighter when fully open.

2719. One of the modern type of herbaceous peony.

The herbaceous peony has come into great prominence in recent years. In this country, the merits of the plant have been recognized by the organization, in 1903, of the American Peony Society. This Society has now begun the publication of bulletins. It early undertook the study of varieties in a systematic way, coöperating in an extensive test at Cornell University, Ithaca, New York. The test-grounds and the studies corollary to the work, under the leadership of the late Professor John Craig, have yielded four publications: "Peony Check-List," by Coit, 1907; "The Peony," by Coit, Bulletin No. 259, Cornell Agricultural Experiment Station, 1908, in which is given an historical account of the peony, description of the species, and bibliography, as well as cultural advice; "Classification of the Peony" [varieties], by Batchelor, Bulletins Nos. 278 and 306, 1910 and 1911. The reasons for the popularity of the modern race of herbaceous peonies is given by Coit to be the ease with which they are grown, hardiness, permanence in the garden when once established, large size and wide range in color and form of the very showy flowers, fragrance of many of the varieties, freedom from disease and insects, usefulness both for cut-flowers and for landscape effects. As to season of the stem-types, he writes that it is begun, at Ithaca, "about the middle of May by *P. tenuifolia*, and carried along by the well-known old double red peony (*P. officinalis* var. *rubra*). Then come the tree peonies (*P. Moutan* [*P. suffruticosa*]) and, before they are gone, the earlier varieties of the Chinese peonies (*P. albiflora*). Somewhere near July 14, the blooming season closes with the latest varieties of the albiflora group."

The garden herbaceous peonies. (Wm. A. Peterson.)

Herbaceous peonies (Figs. 2719–2722) are among the most hardy, showy, and easily grown of all garden flowers. They stand the severe cold as far north as Duluth without any ground covering. In the southern states their growing season is so extended that they do not develop as fine blooms.

In delicacy of tint and fragrance, the peony more nearly approaches the rose than any other flower. The old-fashioned early red "piny," cultivated since the time of Pliny, is still a favorite in our gardens. Nearly all of the many hundred named varieties grown at present have been obtained by crossing the various forms of *P. albiflora*. Of the great host of double varieties, nearly all have been developed since 1850. The single-flowering sorts are not so popular as the doubles. They do not seem to keep so long when cut, and fade more rapidly when on the plant.

Propagation of herbaceous peonies.

The easiest and most satisfactory method of propagation is by division of the large, thick roots. The roots may be lifted and divided any time from the middle of August until the stalks appear again in the spring. The best time, however, is in early autumn, when the cut surfaces soon callus over and new rootlets form before the frost sets in. Choose a large stool, cut off the leaves and separate into as many divisions as can be made with an eye to each tuber. In digging, care should be taken that all of the tubers are dug up, for if not they may remain dormant a season and then produce a shoot, giving rise to the many stray plants frequently found in old beds. Tubers divided without an eye should also be planted, as they often act in a similar way and make a showing above ground in two years' time. Peonies, like most tuberous plants, when dormant stand considerable exposure and can be shipped long distances with safety.

Grafting is resorted to in herbaceous peonies when new and rare varieties are to be rapidly increased. An eye of the desired sort is inserted into the tuber of some strong-growing variety, from which all the previous eyes have been removed. This operation is usually performed in August. The grafted plants should be placed in frames for the winter and transplanted the next year into nursery rows.

Propagating by seed is somewhat tedious, and is employed only for increasing distinct species and for obtaining new varieties. The seeds should be gathered as soon as ripe and kept damp until sown in November. A mulch the first season will keep the ground moist and prevent weeds from growing. Usually two years are required for the seed to germinate and three more before a well-developed bloom can be expected.

Soils and culture.

Peonies grow in all kinds of soil, but do best in a deep, rich, rather moist loam. A clay subsoil, if well drained, is very beneficial when blooms are desired, but the tubers ramify more in lighter soil if grown for propagating purposes. In preparing the bed, trench the soil thoroughly 2 or more feet deep, working in a great quantity of well-rooted cow-manure, as the plants are gross feeders. The ground should be kept well tilled, and an annual top-dressing put above the plants in November; this should be forked into the earth the next spring. They should have a liberal supply of water at all times, and especially while in bloom. Liquid manure, when applied in the growing season and at a time when the ground is dry, gives good returns, both in the growth of the plant and size of the bloom.

2720. A modern herbaceous peony of good habit.

The eyes should be set 2 inches below the surface. In transplanting, it is a good plan to remove all the old

earth so as to start with fresh unimpoverished soil next to the roots. The flowers produced on small divided plants are likely to be imperfect, but when thoroughly established a plant will continue to bloom if undisturbed for upward of twenty years. During the period of blooming an inconspicuous wire support is desirable, as a heavy rain often beats down the flowers.

The host of ancient and modern varieties available, ranging from purest white to deepest crimson, in such a diversity of form and size, afford great opportunity for the making of extensive color schemes. Peonies do fairly well in partial shade, which prolongs and intensifies the color of the bloom, and therefore may be used to advantage to brighten up somber nooks. The period of blooming for herbaceous peonies ranges from the middle of May through June. They grow 1 to 4 feet high and are therefore suitable for planting in front of shrubbery, along driveways, and are especially pleasing when entering into a distant vista. The richly colored shoots, which find their way up through the soil in the early spring, have considerable value for striking effect. When planted in a border with fall-blooming perennials, such as phlox and funkia, their rich glossy foliage is very effective. The old flowers should be cut off, so that no unnecessary seed follicles will be formed, and thereby exhaust the plant. It is important to remove the faded foliage on all peonies in November so that it may not interfere with the next year's shoots.

Because peony buds admit of being shipped long distances without water, and arrive in good condition, they are now used very extensively on Decoration Day and for June weddings. When cut in tight buds and closely wrapped in paraffin paper, some varieties can be held in cold storage for over a month and then open up very satisfactorily.

For forcing, lift the plants in September and place in a coldframe where they will be accessible when the time for forcing arrives. When brought under glass, a uniform temperature of 55° to 60° should be maintained. By feeding well with liquid manure, strong blooms can be produced in eight weeks. A two years' rest is necessary before the plants are forced again. To secure extra-fine blooms on double-flowering varieties, remove the lateral buds as soon as formed. When the first lateral bud is retained instead of the terminal one, a later period of blooming is secured.

Diseases. (A. C. Beal.)

Among the peony diseases, the most prevalent and destructive is the botrytis blight, which attacks the stems, buds, and leaves. Early in the spring the young stems are attacked at the surface of the ground. The tissue turns black, and later the stems wilt and fall over. Sometimes this trouble is seen as late as the following season. The use of green manure appears to favor the attacks of the disease, and only well-rotted manure or mineral fertilizers should be employed. Later, the young flower-buds are attacked, and these turn black and dry up. This is the so-called "bud-blast." When the buds are not attacked until they are well developed, they turn brown and fail to open. The petals are then found to be a dark brown rotten mass, and this is known as the "bud-rot." In very wet seasons, as high as 80 to 90 per cent of the buds may be thus affected. Even the flowers may be discolored by spots resulting from this fungus. The leaves are usually the last to be attacked, and the symptoms are large irregular spots which become brown and dry.

While control methods have not been devised against this and other peony diseases, it is probable that sanitary measures will prove to be most practicable. The prompt and thorough removal of the wilted stems and rotted buds, together with the complete destruction by fire of all leaves and stems in the fall, will tend to lessen the extent of diseases the following year. For an account of peony diseases by a specialist, see Whetzel "American Florist," April 10, 1915.

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A. *Fls. yellow or orange.*

1. **lûtea,** Franch. (*P. Delavàyi* var. *lùtea*, Finet & Gagnep.). St. woody, short, the plant glabrous: lvs. ternately parted, coriaceous, strongly nerved, glaucous beneath, the segms. obovate-oblong and cut or more

2721. Single peony. (×⅓)

or less lobed above the middle: fls. 2–4 in. across, terminal, golden yellow; outer sepals leaflike and long, the inner ones orbicular and yellowish green; petals 6–10, orbicular, concave, the outer ones irregularly crenate; filaments short, the golden yellow anthers long-linear: carpels 3, turgid, glabrous, the style short and recurved. China. B.M. 7788. Gn. 61, p. 267 (note); 76, p. 416. F.S.R. 1:230. R.H. 1906:14.

Var. **supérba,** Lemoine. Seedling from *P. lutea*, with larger fls. (3–4 in. across) and with carmine base to petals when the plant attains age: lvs. bronze-red during development, but becoming deep green. G.C. III. 44: suppl. July 18 (1908).

2. **Mlokosewítschii,** Lomak. Herbaceous perennial, the sts. stout and glabrous: lvs. 2-ternate, the lfts. or segms. broad-oblong or nearly elliptic, short-pointed or acuminate, 3–4 in. long, dark bluish green above and short-pubescent, pale glaucous beneath, the nerves and margins red: fls. 4–5 in. across, yellow, on glabrous reddish pedicels 4 in. long; sepals unlike, one of them oblong-lanceolate and constricted above the base and the other nearly orbicular; petals about 8, roundish,

concave; stamens very numerous, the filaments twice as long as anthers: carpels 3, oblong, whitish tomentose, the stigmas subsessile and purple. Caucasus; discovered by Mlokosewitsch and only recently intro.; said to be the most handsome of the yellow-fld. species. B.M. 8173. G.C. III. 44, suppl. July 25 (1908). R.H. 1911, pp. 432, 433.

3. **Wittmanniàna,** Stev. Herbaceous perennial, 2–3 ft., green, glabrous and smooth: lvs. 4–8 in. long, 2-ternate; lfts. variable, usually ovate to ovate-cordate and the lateral ones often oblique at base, glabrous above, rather glaucous and lax-hairy beneath: fls. 4 in. across, solitary, pale or whitish, yellow or greenish; sepals irregular, green, concave; petals about 7, broad-elliptic-obovate, membranaceous, concave; stamens with orange-yellow anthers and slender red filaments: carpels 2 or 3, oblong-ovoid, glabrous, the stigmas recurved. Caucasus region. B.M. 6645. B.R. 32:9. R.H. 1906, pp. 348, 349. G. 27:135.—The first intro. of the yellow peonies, although not strongly yellow; intro. to gardens of

2722. Pæonia albiflora.

Royal Hort. Society (England) in 1842. Light and not pronounced in color, and apparently not of great promise.

AA. *Fls. white, in shades of red or purple (exceptions sometimes in No. 11).*

B. *Petals scarcely longer than the sepals.*

4. **Brôwnii,** Douglas (*P. californica,* Torr. & Gray). Low and somewhat fleshy, about 1 ft.: lvs. glaucous or pale, lobes obovate to nearly linear: fls. dull brownish red; petals 5 or 6, thickish, little if any longer than the concave sepals; outer sepals often leaflike and compound; fl.-sts. reclining or recurved; disk many-lobed: follicles 4–5, nearly straight, glabrous, the fr. finally resting on the ground from the bending over of the st.; seeds oblong. Early spring or summer. Calif. to Wash. and northward, and in Nev. and Utah. B.R. 25:30.

BB. *Petals much exceeding the sepals.*

C. *Disk expanded and involving or enveloping the carpels: plants woody.*

5. **suffruticôsa,** Andr. (*P. Moutan,* Sims. *P. arbòrea,* Donn). Tree Peony. St. 3–6 ft. or even higher much branched, distinctly shrubby: lvs. glabrous; lfts. more often entire at the base of the plant than above: fls. large, various in color, as rose, red, to white: follicles numerous, very hairy, rather small. May, June. N. W. China.—Long cult. in the Orient, where varieties are numbered by the hundreds. The following varietal names have been transferred from combination with *P. Moutan,* now making new combinations: Var. **rùbroplèna,** Bailey. Rose-colored, almost single. Var. **rôseosupérba,** Bailey. Fls. much more doubled. Gn. 31:76 (as Reine Elizabeth). F.S. 14:1395, 1396 (as Triomphe de Grand). Var. **vittàta,** Bailey. Fls. single white, rose and flesh-color, striped, fragrant. F.S. 7:747. Var. **papaveràcea,** Bailey. Petals thin and poppy-like, white, with red at center of fl. B.M. 2175. L.B.C. 6:547. Gn. 38: 370; 52:325, and pp. 324, 325. Var. **Bánksii,** Bailey. Fls. much doubled, rose-colored, and large. B.M. 1154. Var. **Hùmei,** Bailey. Fls. semi-double, whitish or blush with darker center. B.R. 379. Var. **rôsea,** Bailey. Fls. bright rose-colored, fragrant, more or less double. L.B.C. 11:1035.

6. **Delavàyi,** Franch. Woody or subshrubby, branching, glabrous, 3 ft., more or less stoloniferous: lvs. ternate, somewhat glaucous beneath, 1 ft. long; segms. lanceolate or ovate-lanceolate, 2–4 in. long, cuneate, decurrent and confluent at base: fls. small (about 2 in. across), dark purple or velvety crimson; petals suborbicular, 5–9, remarkable for their firm substance; stamens yellow: carpels 5, glabrous, spreading. July. China, at high altitudes. Var. **angustíloba,** Rehd. & Wils., has more finely divided lvs., the lfts. being narrow-lanceolate. G.C. III. 53:403 (as *P. Delavayi*).—In Ireland *P. Delavayi* is said to be cut to the ground sometimes by the winter but it throws up new shoots in spring. Somewhat like *P. lutea* except in color of fls.

CC. *Disk little if at all expanded and not enveloping base of carpels: plants herbaceous.*

D. *Blooms several on one st.*

7. **Veìtchii,** Lynch. Herbaceous, 2 ft., with 6 or 7 lvs. on st.: lvs. shining, light green, with many (about 15) very acute lance-oblong segms. which are about ½in. broad; petiole of lowest lf. about 4–8 in. long: fls. several on the st. rather than solitary, nearly 4 in. across, often nodding and sometimes becoming flat, purplish crimson. W. China. G.C. III. 46:2. Gn. 73, p. 539. R.H. 1914, pp. 196, 197.—A recently described species; a compact, attractive plant.

DD. *Blooms mostly solitary or single on each st. (partial exception in No. 8 and others under cult.).*

E. *Lfts. all entire, sometimes confluent at base.*

8. **albiflòra,** Pallas (*P. edùlis,* Salisb.). Fig. 2722. Root of fusiform parts or tubers: st. 2–3 ft., often branching and bearing from 2–5 fls.: lower lvs. biternate; parts petiolulate or the lateral ones sessile, the lfts. (secondary lfts.) 3–4 in. long, oblong, lanceolate or elliptic, veining red: peduncle long, often with a large entire or lobed bract; outer sepals large, leaflike; petals large, various in color, usually white or pink, 8 or more; stamens golden yellow: follicles 3–5, ovoid, recurved-spreading, with spiral or reflexed stigmas. June. Siberia, China, Japan. B.M. 1756. F.S. 8:812. Gn. 30:588 (var. *Adrian);* 50, p. 170; 51:448. J.H. III. 58:493. Gt. 7: 362 (forms). A.G. 23:643; 25:203.

Var. **Reevesiàna,** Loud. (*P. Reèvesii,* Hort.). A double form, with deep red petals. P.M. 1:197.

Var. **sinénsis,** Steud. (*P. chinénsis,* Vilm.). A tall Chinese variety, with large, double, crimson fls. One of the commonest forms in gardens. B.M. 1768.

Var. **festìva,** Planch. Fls. double, white, with a few marks of carmine in the center. F.S. 8:790–91.

Var. **Whítleyi,** Hort. (not var. *Whitleyi,* Anders., which has double pinkish fls.). Fls. single, large, white. Gn. 36:8; 63, p. 352.

9. **obovàta,** Maxim. (*P. oreogèton,* S. Moore). Root or rhizome of elongated cylindrical tubers: st. 2 ft. high:

lower lvs. twice ternate; lfts. membranaceous, broadly ovate or obovate, more or less pubescent, especially beneath, the central one stalked: fls. not fragrant, 4–5 in. across, white according to G.C. III. 57:290 (usually described as red-purple); petals about 6, obovate, concave, very obtuse; sepals white or pale rose: carpels recurved, the seeds blue-black and berry-like. June. Siberia, N. China, Japan.

10. **coriàcea,** Boiss. Allied to *P. albiflora:* glabrous, the st. nearly simple and reddish: lvs. coriaceous, glaucous beneath, the lower ones biternate; lfts. very broad: fls. bright crimson: carpels 2–3, deflexed, glabrous; seeds dark purple. June. Spain, N. Afr.

11. **corállina,** Retz. Tall, from carrot-form roots: lower lvs. biternate or rarely triternate; lfts. ovate or obovate, glabrous, or pubescent beneath: fls. purple or rarely whitish or even yellowish: carpels about 5, spreading or recurved, densely tomentose when young but glabrous at maturity; seeds round, reddish to dark blue and becoming black. April, May. S. Eu.

2723. Pæonia tenuifolia. (×½)

12. **Cambessedèsii,** Willk. Like *P. corallina,* but that species has glaucous-green never purple lvs. and hairy carpels: herbaceous perennial, about 1½ ft., simple, erect and glabrous: lvs. ternately pinnatisect, with ovate-lanceolate or oblong acute entire glabrous segms. that are deep green above and purple beneath: fls. deep rose-pink, solitary, erect, 3½ in. across, the petals 5–10, broadly obovate and crenulate; stamens many, with purple filaments and yellow anthers: carpels 5–7, erect, glabrous and shining, purple. Balearic Isls., Corsica. B.M. 8161.

EE. *Lfts. more or less lobed.*

F. *Lvs. and st. glabrous throughout.*

13. **tenuifòlia,** Linn. Fig. 2723. Root or rhizome creeping, tuberous: st. 1–1½ ft. high, 1-fld., densely leafy up to the fl.: lvs. ternate, glabrous, cut into numerous segms. often less than 1 line broad: fl. erect; petals dark crimson, elliptic-cuneate, 1–1½ in. long; anthers shorter than the filaments; stigma red, spirally recurved: follicles 2–3, about ½in. long. June. Caucasus region. B.M. 926. A.G. 17:658. Var. **flòre-plèno,** Hort. (Fig. 2723). Fls. double, crimson. F.S. 4:308. Var. **hýbrida,** Hort. Fls. of a rich crimson color: lvs. very pretty.

14. **anómala,** Linn. Root tuberous: st. 2–3 ft., 1-fld., glabrous: lvs. biternate, glabrous beneath, cut into numerous, confluent lanceolate long-acute segms.: fl. bright crimson, very large; outer sepals often produced into compound leafy points; petals obovate to oblong: follicles 3–5, ovoid, arcuate, tomentose or glabrous. June, July. Eu. and Asia. B.M. 1754. Gn. 67, p. 375.

Var. **insígnis,** Lynch. The variety most cult.: st. 1½–2 ft. high: lvs. about 10, the lower ones very large, gradually reducing to the fl.: carpels with red pubescence.

Var. **intermèdia,** C. A. Mey. Lvs. deeply lobed: fls. rosy crimson.

15. **officinàlis,** Linn. (*P. fúlgida,* Sabine). Fig. 2724. St. stout, 2–3 ft. high, 1-headed: lvs. dark above, pale beneath, the lowest more divided than the others, having 15–20 oblong-lanceolate lfts., 1 in. or more broad: outer sepals leaflike; petals dark crimson, 1½–2 in. broad, obovate; stigmas crimson, recurved: follicles 2–3, becoming 1 in. long. May, June. Eu. One of the old forms in gardens. B.M. 1784. Gn. 53, p. 233.—By some combined with *P. peregrina.*

Var. **álbo-plèna,** Hort. Fls. double, white tinged with red. Gn. 19:14. Garden forms are given trade names, as: *anemonæflòra,* crimson, globular fls., with a mass of twisted crimson stamens, edged with yellow. A.G. 17:663. Gn. 31:512; *blánda,* pale pink; *lobàta* lvs. distinctly lobed: fls. cerise-salmon, a very unusual color. Gn. 79, p. 351; *ròsea,* rich deep rose; *Sàbini,* rich deep crimson petals and yellow stamens. L.B.C. 11:1075.

2724. Pæonia officinalis. (×⅓)

Var. **festìva,** Tausch. Fls. white, with red centers. Native of Eu.

FF. *Lvs. and st. pubescent, at least in the upper part.*

16. **peregrìna,** Mill. Sts. about 1½–2 ft. high: lvs. 5–6 on a st., deep green and glabrous above, pale green and pilose beneath; otherwise the lvs. and fls. are much like those of *P. officinalis.* Eu.—Two garden forms with double fls. are: *amaranthéscens sphérica,* and *pulchérrima plèna,* the latter differing from the former in the purple shade of crimson fls. This species-name is used by Huth to cover a number of the forms that by others are regarded as tenable species.

17. **paradóxa,** G. Anders. Plant one of the dwarfest: lvs. in a dense tuft; lfts. 3-lobed and incised: fls. purple-red: carpels pressed closely together. S. Eu.—Differs from *P. peregrina* by smaller ovate and more glaucous lvs., lfts. more divided and crowded. Var. **fimbriàta,** Hort. Double purple fls., with projecting purple stamens; very pretty, but not much cult. in Amer. The species is sometimes referred to *P. peregrina.*

18. **arietîna,** G. Anders. St. 2–3 ft. high, hairy toward the top: lvs. 5–6 on a st., rather glaucous and pubescent beneath; segms. oblong to oblong-lanceolate, strongly confluent, decurrent: fls. always solitary, dark red, large: follicles 3–4, densely tomentose, ovoid, spreading widely, becoming 1 in. long, strongly arched; stigma recurved. S. Eu. B.R. 819 (as *P. cretica*).—There are a number of horticultural varieties, under vernacular names. *Ándersonii,* bright rose; *Báxteri,* crimson; *crètica,* blush-pink. The species is by some combined with *P. peregrina.*

19. **decòra,** G. Anders. Tubers oblong: sts. 2–3 ft. high: lvs. horizontal, diminishing to the top; lfts. oblong-obtuse: fls. rather small, deep purple; petals few, small, narrow, peduncle long: follicles hairy, large, spreading from the base when mature. S. Eu. Var. **álba,** Hort., has satiny white fls., slightly tinted pink. Gn. 72, p. 291.

Var. **Pállasii,** G. Anders. Lvs. narrow-oblong: fls. rich crimson. G. 29:225.

Var. **elàtior**, G. Anders. Lvs. broadly oblong: fls. rich crimson, very large: receptacle with few processes, and a connection between the carpels at their base of similar surface and appearance to that of the carpels.

P. Bròteri, Boiss. & Reut. (P. corallina var. Broteri, Huth). Fls. red, varying to white: carpels densely white-tomentose: allied to P. officinalis and P. corallina in lvs. and habit.—*P. córsica*, Sieber. Much like P. coriacea.—*P. Emòdi*, Wall. Closely related to and sometimes regarded as a synonym of P. anomala. B.M. 5719. Gn. 45:70.—*P. hùmilis*, Retz. (P. peregrina var. humilis, Huth). Rather low: fls. bright red: carpels glabrous or very nearly so. B.M. 1422.—*P. microcárpa*, Boiss. & Reut. Allied to the preceding and referred to it by Huth, but dwarfer. Var. Jonathan Gibson is a garden form, with very downy lvs.—*P. móllis*, G. Anders. Low, about 1 ft., with 1 fl. to the st.: lvs. dull green above, glaucous and pubescent beneath, with many oblong-lanceolate segms.: fls. deep red and subsessile: carpels 2–3, pilose, erect-curved. A doubtful species allied to P. anomala. L.B.C. 13:1263.—*P. pùbens*, Sims. Allied to P. officinalis probably: lvs. hairy below, margins red.—*P. Rússii*, Biv. (P. corallina var. Russii, Huth). Allied to P. corallina, but with the lvs. decidedly hairy below.—*P. sessiliflòra*, Sims. Nearly related to P. mollis; very low: fls. subsessile, white.—*P. triternàta*, Pallas (P. corallina var. Pallasii, Huth). Differs from P. corallina in its rounded lvs., green st., and rose or whitish fls. B.M. 1441 (P. daurica).

K. C. DAVIS.
L. H. B.†

PAINTED CUP: *Castilleja.*

PAINTED LEAF: *Euphorbia heterophylla.*

PALAFÓXIA HOOKERIÀNA: *Polyopteris.*

PALAQUÌUM: *Isonandra.*

PALAÙA (after Anton Palau y Verdera, professor of botany at Madrid the latter half of the eighteenth century). Also written *Palava*, under which name it appears in lists. *Malvàceæ*. Flower-garden herbs.

Annual or perennial, tomentose or somewhat glabrous: lvs. usually lobed, dissected or sinuate: bractlets 0: fls. purple or purplish, axillary, peduncled, solitary; calyx 5-cut; stamens in a column which is much divided at the top; ovary many-celled; style stigmatose at the apex: carpels crowded without order.—Species 9 in 1908, as accepted by Ulbrich in Engler's Jahrb. 42; Peru and Chile.

dissécta, Benth. (*P. flexuòsa*, Mast.). Slender annual, branched from roots: sts. 8–12 in. long, ascending, flexuous above: lf.-stalks 1–2 in. long; blades 1–2 in. long and broad, triangular in outline, pinnatifid, the segms. lobed; lobes obtuse: fls. many, well separated from the foliage, about 1 in. across, lilac with whitish center, the stamens rose-purple and arranged in 5 longitudinal series; styles 25–30. Peru. B.M. 5768. H.F. II. 12:43.

L. H. B.

PALÀVA: *Palaua.*

PALISÒTA (named in honor of A. M. F. J. Palisot de Beauvois, 1752–1820, French administrator, traveler and botanist). *Commelinàceæ*. Perennial herbs, sometimes grown as pot or tub specimens under glass, as in palm houses, for the foliage.

Stem or caudex either long or very short, simple or nearly so, with the lvs. crowded at the top or base: lvs. long, parallel-veined, hairy when young and the margins with reddish or grayish hairs: fls. mostly white or purplish or rose, in many small cymes which are arranged in a dense or elongated panicle on mostly 1 peduncle that is terminal or essentially so; sepals and petals 3, the latter obovate; stamens 3, perfect, and 2 or 3 bearded staminodes; ovary 3-celled, with 1–several ovules in each: fr. a colored fleshy or succulent indehiscent berry.—Species about 15, in Trop. Afr. Little known in cult. outside of collections. The lvs. are often banded or striped, and the colored hairs make them conspicuous. For cult., see *Commelina*, p. 835.

P. Âlbertii, Gentil. Sub-caulescent: much like P. Elizabethæ, but lvs. not variegated and petioles without marginal hairs, also stronger-growing: lvs. very dark green, grayish hairy beneath, to 3 ft. long and 4–10 in. wide, long-attenuate to petiole, the latter widely channeled. Habitat not given.—*P. Bárteri*, Hook. f. Sts. 1–5 in. long, with lvs. near the base (i. e., practically radical), the young parts shaggy hairy: lvs. to 2 ft. long by about 4 in. wide, obovate-lanceolate, abruptly contracted into a tip 1 in. long, at maturity with densely hairy margins but otherwise often nearly glabrous: infl. about 2 in. long (or longer in cult.), very many-fld.; fls. pale purplish. Upper Guinea. B.M. 5318.—*P. bicolor*, Mast., imperfectly known, has oblong-obovate lvs. about 1 ft. long, with a broad band in center of greenish yellow, the margins brown-hairy and fleshy petiole with broad purplish band. Upper Guinea.—*P. Elizabethæ*, Gentil (P. Pynaertii var. Elizabethæ, Hort.). Caulescent: lvs. long-acuminate, obovate-lanceolate, marked with greenish yellow variegation along the median line, 2–3 ft. long and 4–10 in. wide, long-attenuated to petiole, the latter thick and several inches long, broadly canaliculate with rufescent hairs on the margin. Habitat not given. G.C. III. 48:423. Gt. 64, p. 49.—*P. Pynaèrtii*, Wildem. The plant in cult. seems to be the variegated-lvd. form and which is probably the same as P. Elizabethæ, although the latter is said to differ in general form of growth and to have longer lvs. and with widely channeled petiole. Trop. Afr. R.B. 35:376 (as fol. var.).—*P. Schweinfurthii*, Clarke. St. 3–7 in. long and ½in. diam., with 2 or 3 lvs. at the nodes: lvs. to 2 ft. or somewhat more and 8 in. broad, elliptic, short-acuminate at either end, densely hairy on margin but more or less glabrate otherwise: infl. 4–7 in. long, cylindric and very dense, containing several hundred fls. Trop. Afr., widely spread. G.W. 8, p. 553.—*P. thyrsiflòra*, Benth. Shaggy-hairy on young parts, the sts. to 15 ft. long: lvs. very large, lance-obovate or oblong-elliptic, the margins densely hairy: fls. white, in a loose panicle often 2 in. wide and 10 in. long; ovary glabrous: berry ¼in. or more diam., blue. Upper and Lower Guinea. The Dichorisandra thysiana, Hort. (G.C. III. 28:392. R.B. 28:133), is probably this plant. It is described as a "plant of striking habit, and bold ascending foliage:" from Hort. Linden.

L. H. B.

PALIÙRUS (ancient Greek name). *Rhamnàceæ*. Ornamental woody plants sometimes grown for their attractive foliage and curiously shaped fruits.

Trees or shrubs: stipules usually changed into spines: lvs. alternate, 3-nerved, entire or serrate: fls. small, perfect, in axillary or sometimes terminal cymes; petals 5, 2-lobed; stamens 5: fr. woody, 3-celled, depressed subglobose, with a broad orbicular horizontal wing; cells 1-seeded.—Six species from S. Eu. to Tonkin, China, and Japan.

These are spiny trees or shrubs sometimes procumbent with two-ranked generally ovate medium-sized leaves and small greenish yellow flowers in axillary clusters followed by orbicular broadly winged, curiously shaped fruits resembling a head with a broad-brimmed hat. The one species cultivated in this country is not reliably hardy north of Washington, D. C.; in Massachusetts it is killed every winter almost to the ground even with protection, and the young shoots flower but bear no fruit. It is not very ornamental, but the dark green foliage is pretty and the curious fruits are interesting. It thrives in any well-drained soil and prefers a sunny and warm position. Propagation is by seeds stratified or sown in autumn and by layers or root-cuttings.

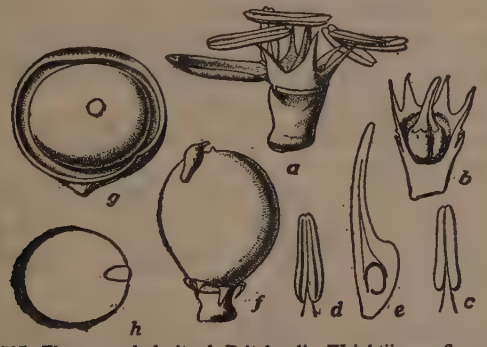
Spìna-Chrísti, Mill. (*P. austràlis*, Gaertn. *P. aculeàtus*, Lam. *Zizyphus Paliùrus*, Willd. *Rhámnus Paliùrus*, Linn.). JERUSALEM THORN. CHRIST'S THORN. Spreading, spiny shrub or small tree to 20 ft., sometimes procumbent: branches brown: 1 of the 2 spines at the base of the petioles straight, the other hooked and recurved: lvs. rather slender-petioled, ovate, usually unequal at the rounded base, obtuse, minutely serrulate, glabrous, dark green above, pale or grayish beneath, ¾–1½ in. long: fls. in axillary short-peduncled cymes: fr. brownish yellow, about ¾–1 in. across, glabrous. June, July. S. Eu. to Himalayas and N. China. B.M. 1893; 2535 (as *P. virgatus*.) G.C. III. 50:377.—This plant is supposed to have furnished the crown of thorns which was placed on the head of Christ before his crucifixion; others think *Zizyphus Spina-Christi* to be the shrub the crown was made of. These two shrubs resemble each other closely, but the branches are whitish and the frs. berry-like in Zizyphus; the shape of the spines is exactly the same in both species.

P. orientàlis, Hemsl. Tree, to 30 ft.: sometimes unarmed: lvs. 2–4 in. long, glabrous: fr. 1–1½ in. across, glabrous, purplish. China. This but recently intro. species is perhaps the most ornamental of the genus; it has not proved hardy at the Arnold Arboretum.—*P. ramosissimus*, Poir. (P. Aubletia, Rœm. & Schult.). Shrub similar to P. Spina-Christi, but with both spines straight, with larger lvs. pubescent beneath, and smaller tomentose frs. with narrow wing. China, Japan.

ALFRED REHDER.

PALM. Palms are amongst the most striking plants in tropical floras. The tall mostly straight unbranched trunks surmounted by a spreading canopy of huge pinnate or digitate leaves distinguish them from nearly all other forms of vegetation. They are widely spread in warm regions, being most abundant in America and Asia and few in Africa. They are particularly conspicuous in the Pacific Islands. Although the palms are such bold and interesting plants, the species are imperfectly understood. This is due to the great difficulty of making herbarium specimens, to the fact that the greater number of botanists are residents of regions in which palms do not grow, and to the differences of opinion as to the relative importance of the various botanical characters. Many of the palms have been named first from cultivated specimens, and often before the flowers and fruits are known. When the specimens finally come to fruit, the names are usually shifted, causing much confusion. The proper generic position of a palm may be unknown for several years after it becomes popular in the horticultural trade. Consider the changes in nomenclature which have occurred in palms that have been referred to the genera Areca and Kentia.

The species of palms are not very numerous as compared with orchids, composites and grasses. They probably do not greatly exceed 1,200, as at present known, although more than that number have been described. Bentham & Hooker accept 132 genera, and Drude, in Engler & Prantl's "Pflanzenfamilien," accept 128 genera. Most of the genera are small, and many of them are monotypic. The largest genera are Calamus, with about 200 species, all Old World, mostly Asian; Geonoma, with about 100 species, all American; Bactris, about 100, American; Chamædorea, with about 60, all American; Licuala, with 30, ranging from eastern Asia to Australia; Desmoncus, about 25, American; Cocos, 30, all confined to America but the coconut, which is now cosmopolitan; Pinanga, with about 25 species, of the oriental tropics; Areca, nearly two dozen, oriental. Many of the species, particularly in the small genera, are restricted to very small geographical regions, often to one island or to a group of islands. The palms represent an old type of vegetation, and they are now, probably, on the decline, as measured



2725. Flower and fruit of Pritchardia Wrightii.—*a*, flower in anthesis, with one segment remaining attached to corolla-tube; *b*, flower in lengthwise section, segments and anthers wanting; *c*, anther, dorsal view; *d*, anther, ventral view; *e*, lengthwise section of carpel; *f*, young fruit, with remains of sterile carpel at apex; *g*, section of kernel, showing entire seed inside; *h*, section of seed along line of raphe.

in geological epochs.—Perhaps the most complete account of the botany of certain groups of palms is by O. Beccari in such works as: "The species of Calamus," "Le Palme Americane della tribu della Corypheæ," "Notes on Philippine Palms," and many smaller papers. O. F. Cook has also written extensively of the American species.

General characteristics.

The members of this family are essentially tropical in habitat, are highly ornamental in appearance, and many of them also of very great economic value, their fruits, stems and leaves not only entering largely into the manufactured products of both Europe and America

2726. Flowers and fruit of Thrinax Wendlandiana.—*a*, top part of flowering branchlet; *b*, flower; *c*, fruiting perianth, seen from above, from which the fruit has been taken; *d*, fruit; *e*, longitudinal section of seed, through embryo.

but also providing both food and shelter for thousands of the inhabitants of tropical countries. One notable characteristic of palms in general is their unbranched stems, the exceptions to this rule being very few and mostly limited to the members of one genus, Hyphæne, of which the doum palm of Egypt, *H. thebaica*, is the best example. While these unbranched stems form a prominent feature in connection with this order of plants, yet great variations are found in size and habit, some of them towering up like a slender marble shaft to a height of more than 100 feet and then terminating in a crown of magnificent plume-like leaves, while others may reach a height of only 3 to 4 feet when fully developed, and some species are permanently stemless. In some examples the stems are so long and slender that a scandent habit is the result; these rope-like stems of the rattan palms in particular are described as wandering through the tops of some of the great trees of the Malayan Peninsula to a length of several hundred feet, —reported as long as 1,700 feet, but report unreliable.

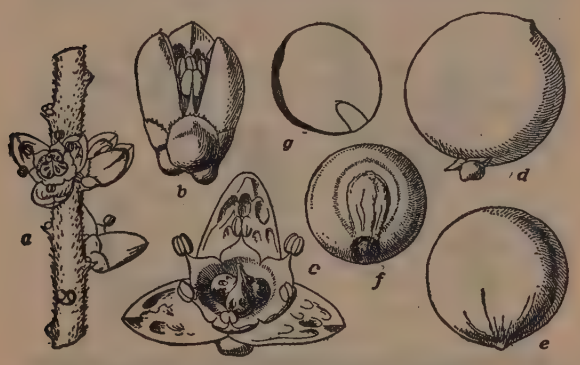
The foliage of the palms is of two chief kinds, the fan-veined leaves, in which the venation radiates from a common center, and the feather-veined, in which the veins run out from the sides of a long midrib, the leaf being frequently divided into long narrow segments. Of the first group, the common fan palm, *Livistona chinensis*, is a good example, while the date palm, *Phœnix dactylifera*, and also the coconut, *Cocos nucifera*, are common examples of the feather-veined class. There are also minor characteristics of foliage that mark many of the genera, some having pinnate leaves with erose tips, a few having bipinnate leaves (as *Caryota urens*), others with flabellate leaves having erose segments, and many with the segments of the leaves bifid or split at the tips.

The flowers of palms in general are not specially attractive either in size or coloring, many of them being greenish white or yellow, and some orange or red; but these flowers are produced in prodigious quantities by some of the species, perhaps the most prolific in this respect being the talipot palm (*Corypha umbraculifera*), which throws up a branching inflorescence to a height of 30 feet above the foliage, such an inflorescence having been estimated to include fully 60,000,000 flowers! This, of course, applies only to wild specimens.

The seeds of palms are also found in many sizes and various shapes, ranging from the size of a pea in some of the Thrinax to the unwieldy fruit of the double coco-

nut, *Lodoicea maldivica*, which will sometimes weigh forty pounds each and require several years to reach maturity.

As a rule, the members of any single genus of palms are found in one hemisphere, either the eastern or western as the case may be, probably the greater number of species being of Asiatic and American origin, rather than African. An apparent exception is found to this system of hemispheric distribution in the case of the coconut, this plant being so very widely distributed throughout the tropical world that its original habitat is still in doubt. On the other hand, some species are known to be very local in their natural state, in proof of which the howeas may be cited; this genus has been found only within the circumscribed area of Lord Howe's Island, which, from a comparative point of view, may be termed merely a fragment of land (probably of volcanic origin), a mere dot on the broad bosom of the South Pacific.



2727. Flowers and fruits of Accelorhaphe Wrightii.—*a*, part of flowering branchlet; *b*, unopened flower; *c*, flower full open; *d*, fruit; *e*, kernel of fruit; *f*, seed as shown on the raphal side; *g*, lengthwise section through embryo.

Few palms are found within the limits of the United States as natives, the most common being the well-known palmetto, *Sabal Palmetto*, a member of the fan-leaved section, to which many of the American palms belong. But while the species of palms native in the United States are limited in numbers, yet there is at least one unique species in the group in the form of *Pseudophœnix Sargentii*, a monotypic palm, that is known to exist in a wild state only on certain of the Florida Keys, and in limited numbers even there, and recently in Cuba and Santo Domingo.

Europe is even less favored as to native palms, there being but one species known there in that condition, *Chamærops humilis*, also a fan-leaved species and comparatively hardy, being capable of enduring moderate frosts.

The palm tree of the Bible is doubtless the date palm, *Phœnix dactylifera*, which is found in large numbers throughout Syria to this day; and in fact the small grove of dates within easy reach of the Syrian householder forms one of his most valuable assets, for it provides food not only for his family, but frequently for his horses or camels also.

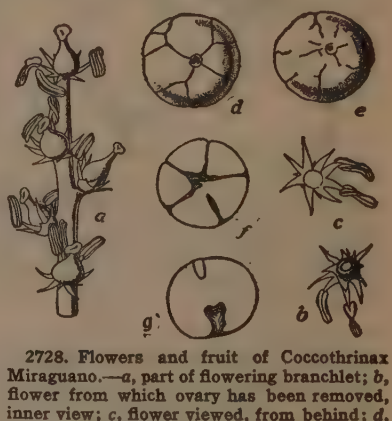
The act of producing flowers does not necessarily terminate the life of a palm, though in some instances such an effect may be produced by this cause; but a singular habit has been noted in regard to the flowering of the fish-tail palm, *Caryota urens*, which when it reaches maturity begins to throw out a flower-spike from the top of the stem, this being followed by successive spikes of flowers, and ultimate bunches of seeds from the top of the plant downward, the flower-spikes appearing at the joints of the stem, and when this process of flowering has proceeded down to the ground, or until the vitality of the plant has been exhausted, death ensues.

There are also a number of species of palms that develop a soboliferous habit, throwing up a number of shoots from the base of the plant, *Rhapis flabelliformis*, sometimes known as the ground rattan, being a good example of this class, among which the widely grown and elegant *Chrysalidocarpus lutescens* is also found, together with the geonomas, some of the phœnix and various other genera. Many of the palms are unisexual, but there are also many others in which both male and female flowers are produced on the same spadix, in some examples the males being grouped together near the ends of the branches of the inflorescence and the females nearer to the main stem, while in others a female is placed between two males, thus arranging the flowers in threes.

Cross-pollination of palms by artificial means has probably been seldom practised, there being few cultivated collections in which the opportunity for such an operation has presented itself; but it seems highly probable that such cross-fertilization has been accidentally effected among wild plants, for in large lots of seedlings intermediate forms are frequently seen, this peculiarity having been noted among howea seedlings, where forms intermediate between *H. Belmoreana* and *H. Forsteriana* are found, and sometimes seedlings that seem to combine the characteristics of *H. Belmoreana* and those of its near relative *Hedyscepe Canterburyana*. Similar variations from a given type have also been noted among the phœnix, several so-called species being most likely merely varieties.

Many palms are armed with stout thorns or prickles, not only the stems but also the leaves and even the fruits in some species being thus guarded, these prickles being usually very hard and tough. In some cases, notably *Acanthorhiza aculeata*, the prickles around the stem are often branched, and are decidedly unpleasant to come in contact with. In the case of Desmoncus, this being the western representative of the rattan palms, the tip of the midrib of the leaf is continued in the form of a hooked spine, and helps to support the plant in its scandent career. The sharp spines of certain palms are used for poisoned arrows by some of the South American tribes, these arrows being projected through a blow-pipe formed from a section of the hollow stem of another palm. Among the species of Phœnix, it is often found that several of the leaflets nearest to the base of the leaf are developed as spines, these thorny leaflets becoming stiff and hard, and capable of making a very sore wound.

The very great economical value of many of the palms can only be touched upon within the limits of the present article, the uses to which not only the fruits but also the stems and leaves are put by the natives of many tropical countries being enough of themselves to fill volumes. One prominent example of this great utility is the Palmyra palm, of which a Hindoo poet enumerated over 800 different uses. Other notable examples include



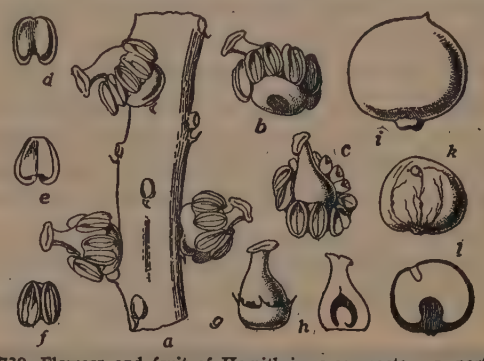
2728. Flowers and fruit of Coccothrinax Miraguano.—*a*, part of flowering branchlet; *b*, flower from which ovary has been removed, inner view; *c*, flower viewed, from behind; *d*, seed, with hilum in center; *e*, seed, upper surface; *f*, seed in transverse section; *g*, lengthwise section of seed, through embryo.

the coconut palm, the fruits of which are imported by hundreds of tons every year, and in addition to providing a valuable food, either fresh or in a desiccated condition, also produce that very valuable fiber from which cordage, matting and a great variety of goods are manufactured; also the Phœnix family, which produces the dates of commerce in apparently endless supply, and the date sugar of Bengal, this being contributed by *Phœnix sylvestris*, while the stems of date palms are often used in house-building in the East. Another very valuable palm product is found in palm oil, this being largely derived from the fruits of *Elæis guineensis*, the oil being expressed from the ripe fruits in much the same manner that olive oil is manufactured. The rattan of commerce is chiefly composed of the flexible stems of various calami, the plentiful supply of this material being sufficiently attested by the great variety of articles manufactured therefrom. Various palms have been mentioned under the name of "wine palm," but it seems likely that some species of Raphia are most used for liquors, some portions of these palms giving a large amount of sap when tapped, and as the juice is rich in sugar, the sap soon ferments and may become strongly alcoholic. The best sago is produced from the pith of Metroxylon or Sagus, the trees being cut down and split into segments for the removal of the pith, the latter being then prepared in a rough granulated form for export. Sago is also procured from Caryota and some other genera, but the product is not equal to that of Metroxylon. The so-called whale-bone brooms frequently used in stables and for street-cleaning are mostly made from Piassaba (or Piaçaba) fiber, this being gathered from around the base of plants of attaleas, mostly *A. funifera*. The attaleas also produce large seeds or nuts, those of *A. funifera* being known as coquilla-nuts, and very largely used for ornamental purposes, being very hard and capable of receiving a fine polish. Many small articles are manufactured from vegetable ivory, this being secured from the nuts of *Phytelephas macrocarpa*, a singular palm from South America, bearing a large fruit in which are contained from six to nine of the ivory-nuts, the plant itself having a short and sometimes creeping stem from which proceeds a noble head of pinnate fronds that are frequently 15 to 20 feet in length. The seeds of *Areca Catechu*, after preparation with lime and the leaves of the pepper-plant, become the betel-nut of the East Indies, so much used by the natives of that portion of the world as a mild stimulant. The cabbage palm of the West Indies is *Oreodoxa oleracea*, the smooth and straight stems of which are frequently 80 to 100 feet high, and the removal of the "cabbage," so-called, means the destruction of such a tree, for the portion eaten is composed of the central bud in which the young leaves are compactly gathered together.

2729. Flowers and fruit of Copernicia Curtissii.—*a*, summit of flowering branch; *b*, single flower; *c*, flower in longitudinal section; *d*, fruit; *e*, seed, from the raphal side; *f*, seed, side view; *g*, seed in longitudinal section through embryo.

Botanical structure.

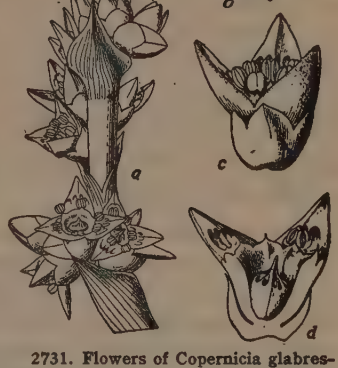
As the trunk of the palm rises, the leaves underneath the crown die and fall. Usually the old petioles, or their bases, remain for some time, forming a shaggy capital to the column; this is well marked in the large or cabbage palmetto of the South. The palms are mostly trees, and sometimes rise to the height of nearly 200 feet, but some are climbing and others are low shrubs. Some palms are only a foot or two tall at maturity, as Malortiea. In some species the stems are prickly. Usually they make very straight comely boles, but a few species produce branches above.



2730. Flowers and fruit of Hemithrinax compacta.—*a*, part of flowering branchlet; *b*, *c*, flowers in anthesis; *d*, *e*, anthers, from dorsal side; *f*, anther from inner side; *g*, flower with anthers removed; *h*, lengthwise section of ovary; *i*, fruit; *k*, seed; *l*, lengthwise section of seed, showing embryo.

The inflorescence of palms usually arises underneath or in the crown, from the axils of the leaves. The clusters are really spadices, although often branched, and are covered in the bud by a dry spathe composed of one or several leaves or parts. The remains of these spathes are well shown in Fig. 2538 (page 2298). In the upper cluster on the left, the spathe is arching over the fruits. The blossoms are relatively small, and usually dull colored and not showy, but in some species the spadix is scarlet or yellow and often very gracefully branched. The spathes are sometimes immense woody coverings, like troughs or bowls.

The flowers of palms are not greatly differentiated or specialized. The essential structure may be understood by comparing the details in Figs. 2725 to 2731, which are adapted from Beccari's account of palms indigenous to Cuba in Pomona College Journal of Economic Botany, February, 1913. Of most palms, the flowers are small or minute, quite regular, and they may be either hermaphrodite, monœcious, or dicœcious. Often the whole flower is nearly woody, even the perianth-parts being hard and scarcely resembling petals. In most species there are two series of perianth-parts: three distinct imbricated sepals inclosing three distinct or partially united petals. Many modifications of this arrangement are known, however, as in the case of cer-



2731. Flowers of Copernicia glabrescens.—*a*, summit of flowering branch; *b*, top view of open flower; *c*, flower, side view; *d*, flower in lengthwise section.

tain species of Thrinax where the perianth is reduced and deformed, and of Nenga where the sepals are longer than the petals. There are nearly always six stamens, both in the pistillate and staminate flowers, and except in certain species of Oreodoxa (Roystonea) they are always included. They are often in two series, one opposite the sepals, the other opposite the petals, always free, and nearly always inserted on the short perianth-tube. The anthers are linear, oblong or arrow-shaped, two-celled, the pollen usually ellipsoid or nearly round, very rarely minutely spiny. The ovary is free, ovoid or oblong or globose, and often found in a rudimentary form even in staminate flowers, but sometimes lacking in the latter. There are mostly three cells, but four and even up to seven cells are known in rare cases. The ovule in each cell is solitary and almost always erect.

Great variety characterizes palm fruits. Some are dry and hard almost stone-like fruits, others are fleshy and even drupe-like. In many species there is a hard fibrous coating to the fruit, as in the case of the coco-

2732. A palm-house.

nut. In other species the seed is free, but often it adheres to the inner coat of the fruit; it nearly always contains a copious albumen.

The individual flowers and fruits of palms are borne on a large inflorescence (spadix) which may or may not be inclosed in a sheath-like structure (spathe). The form and branching of this spadix varies much. One character that seems to hold is that of the branching, in one group of genera the spadix being either simple or imperfectly branched, if compound then paniculate, such as is found in Geonoma, Euterpe, and allied genera; and in others the spadix is always pinnately branched, the ultimate branches distichous if greater ramification is present.

Horticultural importance, and culture.

Palms have been favorite greenhouse subjects from the period of the first development of the glass plant-house. The stereotyped form of conservatory is a broad or nearly square structure, with narrow benches around the sides over the heating-pipes and a palm-bed in the center. In these conservatories a variety of palms will succeed, requiring neither a very high temperature nor much direct sunlight. (Fig. 2732.) In fact, palms usually succeed best under shaded roofs. The palms are most satisfactory in their young state, before the trunks become very prominent, and before the crowns reach the glass. The larger number in houses have pinnate or pinnatisect leaves, and these species are usually the more graceful in habit, although the fan palms are also much prized. Small palms are now in great demand for room and table decoration, and a few species are grown in enormous quantities for this trade. They are sold when small. They usually perish before they are large enough to be cumbersome. Among the most popular of these palms are *Chrysalidocarpus lutescens, Howea Belmoreana* and *H. Forsteriana, Cocos Weddelliana, Livistona chinensis,* and possibly one or two species of Phœnix.

Some palms endure considerable frost without injury. Of such are the sabals and the palmettoes of the southern states. The saw palmetto (*Serenoa serrulata*) and the blue palmetto (*Rhapidophyllum Hystrix*) occur as far north as South Carolina. In Asia, Nannorhops occurs naturally as far north as 34° and grows in the mountains of Afghanistan where snow falls, and in Europe. Chamærops (the only palm indigenous to Europe) reaches 44°.

The genera chiefly known to horticulturists are the following:

Tribe Arecæ. *Lvs. pinnatisect, the lfts. free or joined so as to form a plaited limb, the sides in vernation reduplicate: fls. monœcious or diœcious: seeds umbilicate, with ventral raphe and dorsal embryo.*

Areca, Pinanga, Kentia, Hydriastele, Kentiopsis, Hedyscepe, Nenga, Archontophœnix, Rhopalostylis, Dictyosperma, Ptychosperma, Cyrtostachys, Drymophlœus, Cyphophœnix, Clinostigma, Cyphosperma, Euterpe, Acanthophœnix, Oreodoxa, Acrista, Bacularia, Linospadix, Howea, Ceroxylon, Verschaffeltia, Dypsis, Chamædorea, Hyophorbe, Roscheria, Geonoma, Calyptrogyne, Bentinckia, Wallichia, Didymosperma, Arenga, Caryota, Phytelephas, Pseudophœnix, Œnocarpus.

Tribe Phœniceæ. *Lvs. pinnatisect, segms. acuminate and with induplicate sides in vernation: spadices interfoliar, the spathe solitary: fls. diœcious: carpels 3, only 1 maturing, the stigma terminal; seed strongly ventrally sulcate, the embryo usually dorsal.*

Phœnix.

Tribe Coryphæ. *Lvs. fan-shaped, wedge-shaped or orbicular, plaited, more or less cut, the lobes with induplicate sides: spadices interfoliar, the spathes many: fls. usually perfect; ovary entire or 3-lobed or sometimes the 1–3 carpels distinct, the ovule erect; pericarp usually smooth; seeds with ventral raphe and small hilum.*

Corypha, Sabal, Washingtonia, Chamærops, Rhapidophyllum, Acanthorhiza, Brahea, Erythea, Pritchardia, Licuala, Livistona, Trachycarpus, Rhapis, Thrinax, Nannorhops, Serenoa, Copernicia, Teysmannia, Trithrinax, Coccothrinax.

Tribe Lepidocaryeæ. *Lvs. pinnatisect or fan-shaped, the segms. with reduplicate sides in vernation: spadices terminal or axillary, the spathes numerous: fls. polygamo-monœcious; ovary entire, more or less 3-loculed: fr. clothed with reflexed, shining, imbricate, appressed scales; seed with dorsal raphe and ventral embryo.*

Calamus, Ceratolobus, Raphia.

Tribe Borasseæ. *Lvs. orbicular, the segms. fan-shaped and the sides induplicate: spadices interfoliar, the spathes many and sheathing: fls. diœcious, the male minute and sunk in cavities on the spadix, the female very large, ovary entire, 3-loculed, the ovule ascending: fr. various.*

Borassus, Lodoicea, Latania, Hyphæne.

TRIBE COCOINEÆ. *Lvs. pinnatisect, the lfts. with reduplicate sides: spadices interfoliar, unisexual or androgynous, the spathes 2 or more: inferior fls. often in 3's, the middle one female; ovary 1–7-loculed: fr. large, drupe-like, 1–7-loculed, the stigma terminal, the endocarp or shell hard and woody and provided with 3–7 pores.*

Bactris, Astrocaryum, Acrocomia, Martinezia, Elæis, Diplothemium, Cocos, Maximiliana, Scheelea, Attalea, Jubæa, Desmoncus.

2733. Germination of Chrysalidocarpus lutescens.

There is very little accessible monographic literature on the palms. Martius' "Historia Naturalis Palmarum," Munich, three volumes, 1823 to 1850, is a standard work. Kerchove de Denterghem's "Les Palmiers," Paris, 1878, is an important work. A popular running account of palms and the various kinds, by William Watson, will be found in the following places in Gardeners' Chronicle: 1884 (volume 22), pages 426, 522, 595, 728, 748; 1885 (volume 23), pages 338, 410, 439; 1885 (volume 24), pages 362, 394, 586, 748; 1886 (volume 25), pages 75, 139, 557; 1886 (volume 26) pages 491, 652; 1887 (volume 2, series 3) pages 156, 304; 1891 (volume 9), pages 234, 298, 671; 1893 (volume 13), pages 260, 332.

2734. Germination of Livistona.

Palm-culture, for decorative purposes in the United States, has made its greatest progress within the past twenty-five years, and now seems to be a well-established business, with the prospect of a steady increase as the adaptability of these plants becomes better understood. A great area of glass is now in use for palm-culture alone, the middle states being the center of this industry, though large numbers are also grown in a few southern states; and owing to a favorable climate and gradually improving business methods, it seems probable that American growers will soon be able to compete with their more experienced brethren of Europe in this class of plants.

The species most used in commercial horticulture in the United States are contained in a very short list, the greater quantity being confined to five species, namely, *Livistona chinensis*, *Howea Belmoreana*, *Howea Forsteriana*, *Chrysalidocarpus lutescens*, and *Cocos Weddelliana*, while less quantities of *Caryota urens*, several species of Phœnix, *P. canariensis* being very largely planted outdoors in the South and on portions of the Pacific coast, *Seaforthia elegans* and some others of the Ptychosperma group, and some few livistonas cover the extent of the catalogue for many growers.

Of these, the seeds are imported in most cases, and on the quality of these seeds the success of the grower depends, so far as getting up a stock is concerned. Most of these species germinate readily in a warm greenhouse, providing the seeds are fresh, the slowest of the common commercial palms being the howeas. In small quantities these seeds are usually sown in about 6-inch pots, the pots being well drained and nearly filled with light soil, then the seeds sown thickly and covered with ½ inch of soil, watered thoroughly and placed where they may receive the benefit of some bottom heat; and at no time should they be allowed to become very dry. The period required for germination varies greatly with different species, *Livistona chinensis* germinating in two or three weeks if fresh, and being ready for potting in about two months, while seeds of some of the attaleas have been known to remain in the earth for fully three years before starting.

The seedlings of many species are very much alike, the seed-leaf in many instances being a long narrow simple leaflet, this description often applying equally to the seedlings of both fan-leaved and pinnate-leaved species; and from this fact it is somewhat difficult to recognize a species while in the juvenile form. Figs. 2733–2736 show stages in the germination of common palms. Special cultural notes for particular species of palms will be found throughout the Cyclopedia, but at this time a few general remarks regarding treatment of palms as a whole may be admissible. It has already been noted that palms in general are tropical in nature, and while there are a number of species that are found at considerable elevations, where the nights are decidedly cool, yet in a young state the same species may make more progress in a night temperature of 60° F.; and with this in view, a minimum temperature during the winter of 56° to 60° is safest for young and growing palms, while an advance of 15° to 20° during the day will not hurt them.

2735. Germination of Cocos Weddelliana.

An abundance of water is required, for many palms grow on the banks of rivers or in swampy ground; and even those found on high and rocky ground send their roots down to such a depth as to find a liberal water-supply.

Rotted sod is the basis for the best soil for palms, and a fair proportion of stable manure is a safe fertilizer, such a soil being mixed with various proportions of peat or sand, to make it lighter and more open for some delicate species.

Insects are frequently troublesome if allowed to gain headway, various scale insects doing the greatest damage, while red-spiders and thrips may become established unless forcible syringing is persisted in. The most successful practice requires close observation on the part of the grower, and the prompt removal of all insects. Many other pests are also known and in the report of the Missouri Botanical Garden for 1898, Trelease gives an account of many of these. Busch in a report on investigation of diseases of the coconut palm in United States Department of Agriculture Bulletin of Entomology II. 38, 1902, gives an account of a disease that threatened the coconut industry in Trop. America.

Summer care of palms.

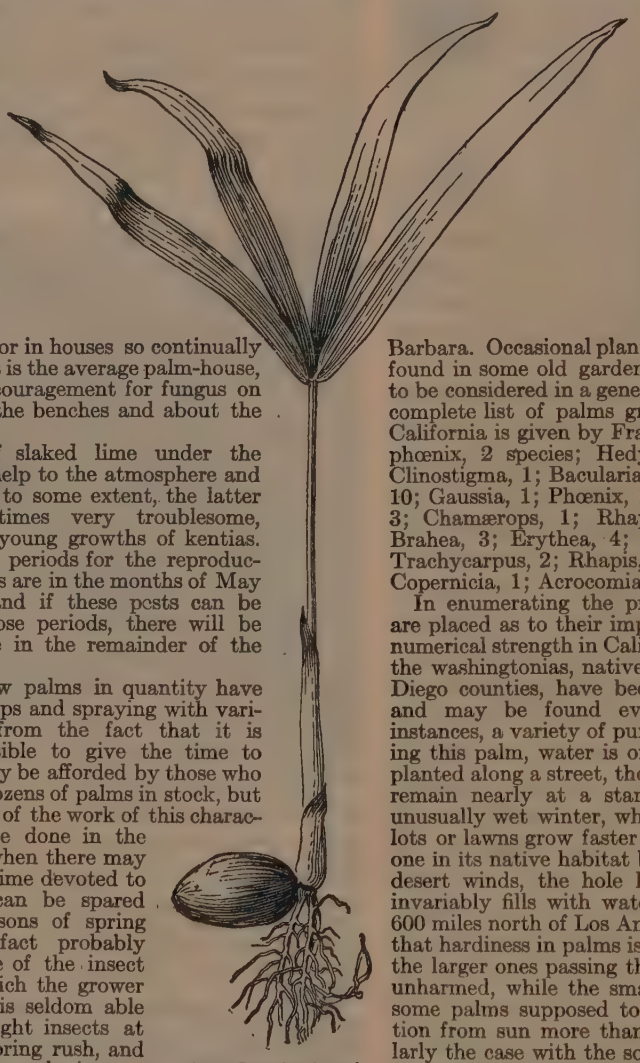
Some shading throughout the summer is best, the foliage grown under glass being more tender than that

naturally produced outdoors. Repotting should be done during the spring and summer months, preferably, there being comparatively little root-action on the part of most palms between November 1 and March 1. Give only moderate-sized shifts, that is, use pots only 1 or 2 inches larger, and always ram the soil firmly.

Florists especially must understand the summer treatment of decorative palms. The usual weather of midsummer, which includes not only high temperature, but also fairly high humidity, is a help for the grower of palms, for such conditions do much to promote the growth of the stock, provided that watering, syringing, and proper attention to ventilation be given. A little ventilation at night, in addition to fairly liberal airing during the day, tends to prevent an over-accumulation of moisture on the foliage, and also has an influence toward the prevention of fungoid growths on or about the plants, for in houses so continually warm and moist as is the average palm-house, there is much encouragement for fungus on the woodwork of the benches and about the plants.

A sprinkling of slaked lime under the benches is also a help to the atmosphere and discourages snails to some extent, the latter pest being sometimes very troublesome, especially on the young growths of kentias. Two of the worst periods for the reproduction of scale insects are in the months of May and September, and if these pests can be kept down at those periods, there will be much less trouble in the remainder of the year.

Those who grow palms in quantity have to depend upon dips and spraying with various insecticides, from the fact that it is practically impossible to give the time to each plant that may be afforded by those who carry only a few dozens of palms in stock, but in either case most of the work of this character is likely to be done in the summer months, when there may be a little more time devoted to such work than can be spared in the busier seasons of spring and fall. This fact probably accounts for some of the insect tribulations to which the grower is exposed, as he is seldom able to find time to fight insects at the time of the spring rush, and by this means new colonies are distributed before the danger is appreciated.



2736. Germination of Howea Belmoreana.

Kentias and cocos are undoubtedly the palms for the million at this stage of the florists' art in America, and the necessities of these admirable plants are well understood. Seaforthias and ptychospermas were rather more common to the trade fifteen to twenty years ago than they are now, and were used for decorative work before the kentias absorbed so much attention. Instead of using seaforthias for decorating, persons are adding them to the outdoor garden in those parts of the South where palms add so greatly to the permanent effect in the outdoor planting.

The common *Phœnix canariensis* and other strong-growing members of that subfamily are also frequently in demand for outdoor use, while the dwarf date, *Phœnix Roebelenii*, continues to be in demand for house decoration, under which condition it is eminently satisfactory; it has found further usefulness even in small sizes, in being used to some extent for the centers of fern-pans. *Livistona rotundifolia* is one of the most charming of dwarf palms, but is easily spoiled by insects, requiring constant vigilance on that account, while a comparatively high temperature and moist atmosphere are also essential to its welfare.

W. H. Taplin.
L. H. B.
N. Taylor.†

Palms in California.

Palms grown in the open in California gardens do not exceed about twenty-six genera, and numbering about eighty species. In this account may be found the species growing in the gardens of Los Angeles and vicinity, and throughout southern California in limited numbers from San Diego to Santa Barbara. Occasional plants of species not mentioned are found in some old gardens, but are not so plentiful as to be considered in a general list of the hardy palms. A complete list of palms grown somewhere in southern California is given by Franceschi as follows: Archontophœnix, 2 species; Hedyscepe, 1; Rhopalostylis, 2; Clinostigma, 1; Bacularia, 1; Howea, 2; Chamædorea, 10; Gaussia, 1; Phœnix, 10; Sabal, 10; Washingtonia, 3; Chamærops, 1; Rhapidophyllum, 1; Serenoa, 2; Brahea, 3; Erythea, 4; Pritchardia, 2; Livistona, 6; Trachycarpus, 2; Rhapis, 2; Thrinax, 2; Trithrinax, 2; Copernicia, 1; Acrocomia, 1; Cocos, 10; Jubæa, 1.

In enumerating the prevailing garden palms, they are placed as to their importance, or rather as to their numerical strength in California. The native fan-palms, the washingtonias, natives of San Bernardino and San Diego counties, have been most extensively planted, and may be found everywhere, serving, in some instances, a variety of purposes. (Fig. 2737.) In growing this palm, water is of the first importance. When planted along a street, those adjoining vacant lots often remain nearly at a standstill, except in case of an unusually wet winter, while those along the cultivated lots or lawns grow faster than any other palm. When one in its native habitat blows over by the force of the desert winds, the hole left by the roots and stump invariably fills with water. Washingtonias are hardy 600 miles north of Los Angeles. It may be well to state that hardiness in palms is principally a question of size, the larger ones passing through the most severe winter unharmed, while the small ones may perish. So, also, some palms supposed to be very tender need protection from sun more than from frost. This is particularly the case with the so-called kentias and rhapis. A certain howea (or *Kentia Forsteriana*) is protected only by a large overhanging branch of a sycamore, which is of course leafless in cold weather, yet it has reached a height of 12 feet, with a diameter at base of 12 inches, and it has never been injured by frost, yet water hydrants 10 feet away have been frozen so hard as to burst them. In Los Angeles is a kentia 15 feet high, growing on the north side of a house, protected from sun alone, being 20 feet from the building, where for several winters the ground nearby has frozen to the depth of 1 inch. This is in the bottom-lands, the coldest part of the city.

Phœnix dactylifera, although not so ornamental as others of the genus, was extensively planted in early

days and is one of the hardiest of palms (Fig. 2738). The most popular palm for the masses, who look for grace and beauty combined with cheapness, is *Phœnix canariensis*. More of these are planted at present than of any other three species. In Los Angeles and

2737. A sentinel palm.—Washingtonia filifera, San Jacinto Mountains, California.

vicinity they may be counted by tens of thousands. Like these two for hardiness is *P. reclinata;* and all may be seen growing north of San Francisco some 200 miles. All the genus is hardy in southern California. *Trachycarpus excelsus* and *Chamærops humilis*, the latter varying greatly in appearance, will grow as far north as any palms and are popular everywhere. The former in thirty years will grow to the height of 25 feet, while the latter will make 8 to 10 feet of trunk in the same time. *Livistona australis* and *L. chinensis* are both popular, though not hardy outside the southern part of the state, and the latter must be shaded from noonday sun. *Erythea armata* and *E. edulis* (often known as braheas) grow around San Francisco Bay luxuriantly. The dwarf sections of Cocos, represented chiefly by the one known in the trade as *Cocos australis*, is hardy even farther north than the erytheas, and are by far the most ornamental palms to be found in that section. Other cocos in southern California are *C. flexuosa*, *C. plumosa*, *C. coronata*, *C. Romanzoffiana*, and many others. Any cocos will grow here in protected places except *C. Weddelliana*. Palms of the *Cocos flexuosa-plumosa-Romanzoffiana* type are the most graceful grown, and at present very extensively planted in the southern citrous belt, sometimes for street or sidewalk trees. It is also one of the fastest growers, and will reach 20 feet in fifteen years, with ordinary care. *Archontophœnix Alexandræ* and *A. Cunninghamii*, the most elegant of our palms after the *Cocos plumosa* type, are not quite so hardy but will thrive from Santa Barbara southward, in warm locations. The same exposures, with shade during the hottest part of the day, will do for *Hedyscepe Canterburyana* and *Howea Forsteriana* and *H. Belmoreana;* also *Rhopalostylis Baueri* and *R. sapida*. The four species of sabals seem to thrive and seed well in this section, though *S. Palmetto* and *S. Blackburnianum* grow much faster than the others. *Rhapidophyllum Hystrix* is perfectly hardy, but on account of its dwarf habit is not so extensively planted as its merits deserve. *Rhapis flabelliformis* and *R. humilis* need protection from sun alone, though there is a rhapis growing for ten years without protection from either sun or frost, and in the coldest section of Los Angeles, but its color is not all that could be desired. Chamædoreas are planted only where they can be protected from both frost and sun, though they thrive better under such circumstances than they do under glass. In such situations they are just the plant for the purpose, as they do not grow away from the protecting tree as do sun- and light-loving palms, but remain erect. *Brahea dulcis* may occasionally be seen, but grows too slowly to be popular. One of the grandest and hardiest palms, one that deserves for many reasons to be more extensively planted, is *Jubæa spectabilis*. There are a few specimens 20 feet in height with a bole 4 feet in diameter.

List of California palms. (Wright.)

The following list of palms for southern California has been compiled from many years of observation by J. Harrison Wright. While not entirely complete as regards the newest and untried introductions, it covers all the hardier species and it is made with special reference to the effects of the severe frosts of January, 1913.

I. Hardy Palms.

Withstand a minimum temperature of 18° to 20° F. with little or no injury.

Chamærops humilis (in a dozen varieties).
Cocos Alphonsii.
Cocos Bonnetii.
Cocos campestris.
Cocos eriospatha.
Cocos flexuosa (of Hort.).
Cocos Gaertneri.
Cocos Yatay.
Erythea armata.
Erythea edulis.
Jubæa spectabilis.
Phœnix canariensis.
Phœnix dactylifera.
Phœnix reclinata.
Phœnix sylvestris.
Sabal Adansonii.
Sabal Blackburniana.
Sabal mexicana.
Sabal Palmetto.
Sabal princeps.
Serenoa serrulata.
Trachycarpus excelsa.
Trachycarpus Martiana.
Washingtonia gracilis.
Washingtonia robusta.
Washingtonia Sonoræ.

2738. Date palms at Old Town, San Diego.

The following require protection from sun in the interior valleys:

Livistona australis.	Rhapidophyllum Hystrix.
Livistona chinensis.	Rhapis flabelliformis.
Phœnix Rœbelenii.	Rhapis humilis.

The above are rather generally found and to them may be added the following, equally hardy but not yet in general cultivation:

Brahea calcarea.	Cocos australis (true).
Brahea Pimo.	Cocos Datil.
Cocos Arechavaletaña.	

Above are tall-growing Cocos of the plumosa type but hardy.

Cocos odorata.	Nannorhops Ritchiana.
Cocos pulposa.	Trachycarpus cæspitosa.
Erythea Brandegei.	Trithrinax braziliensis.
Erythea elegans.	Trithrinax campestris.

All the above can be grown wherever oranges are planted, and in addition the following are at home on the hill section of Los Angeles, in the frost-free foothills and sheltered coastal valleys like Santa Barbara and the Montecito.

II. Tender Palms.

Chamædorea desmoncoides.	Livistona Mariæ.
Chamædorea elegans.	Phœnix rupicola.
Cocos botryophora.	Pritchardia Gaudichaudii.
Cocos plumosa.	Pritchardia pacifica.
Cocos Mariæ-Reginæ.	Ptychosperma Alexandræ.
Cocos Romanzoffiana.	Ptychosperma Cunninghamiana (Seaforthia).
Howea Belmoreana.	
Howea Forsteriana.	Rhopalostylis Baueri.
Livistona Jenkinsoniana.	Rhopalostylis sapida.

The following have been recently introduced, but are not thoroughly tested:

Ceroxylon andicolum.	Livistona decipiens.
Copernicia australis.	Sabal Uresana.
Juania australis.	Sabal Exul.

[*Juània austràlis*, Drude, representing a monotypic genus in the Island Juan Fernandez (and for the first word of which it is named), is an unarmed palm with pinnatisect terminal lvs. allied to Ceroxylon: lf.-segms. long and narrow, acuminate, whitish beneath, thickened on the margins: fr. globular, size of a cherry.]

Ernest Braunton.

Hardy palms in Florida.

A large proportion of the various species of palms tried by the writer in Florida have succeeded from moderately to exceedingly well. Close to 200 species belonging to some 60 genera have been in cultivation and of these more than 150 are surviving. The state itself is rich in palms for a region lying wholly outside the tropics, there being not less than fifteen native and one naturalized species, the latter the common coconut, found within its borders. A few of these, such as *Sabal Palmetto*, *Serenoa serrulata* and Rhapidophyllum among native forms, and one or two species of Trachycarpus, one or two of the dates, *Jubæa spectabilis* and Washingtonia should be fairly hardy, especially along the coastal region, throughout most of the northern part of the state.

Most of the palms which do well in this state succeed on ordinary pine land, but their growth would be improved if a liberal amount of muck or leaf-mold was incorporated with the soil, and a heavy mulch is always beneficial. Of course in poor soils a good fertilizer is necessary and it is an excellent plan to apply one rich in potash in the fall in order to harden up the growth for winter.

Nearly all the palms must be propagated from seed; only a few are cespitose, such as chrysalidocarpus, rhapis, most of the phœnix and chamædoreas, and these can often be propagated from suckers. When these are thrown out above the ground it is best to make an incision at their bases and set a flower-pot underneath, mounding up with earth around the sucker, when it will generally throw out roots into the pot, after which it may be severed and the whole removed.

The entire state is subject to "northers" during which the wind blows from the northwest, and cold weather and frost may occur in any part of the state. A large part of the palms which can be grown in Florida are tropical and if their seeds when in the ground are subjected to such a degree of cold they are almost sure to perish. If one is propagating any considerable number of palms, it will pay to have a frame covered with a sash or sashes. This can be sunk in the ground if necessary; the seeds should be planted in good soil, and during cold nights the whole may be heavily covered with fertilizer sacks. It should have a southern exposure and be well protected from the wind. In the southern part of the state such a pit, if covered early and thoroughly on cold nights, will generally answer all purposes, but if one could have a small glass house with

2739. A digitate-leaved palm, one of the best palms for small conservatories—Rhapis flabelliformis.

a bench along one side it would be better. The space in front and below it could be closed up and under the shelf a small kerosene stove or lamp could be kept going during cold nights. This would furnish bottom heat for the seeds planted on the bench and thus insure their germination.

Fairly good-sized palms are best for planting in the open ground, say from 4- or 5-inch pots. Water well and mulch, then shelter by setting palmetto leaves around the plant so as to shade it. In case of danger of frost, mound up around the stem to above the growing point with dry soil and if the leaves are frozen the plant will not be seriously injured.

The following notes are drawn from experience in the cultivation of these palms in central and southern Florida.

Acœlorraphe Wrightii grows in marl land on the southern shore of the mainland of Florida. It forms very dense, attractive clumps 30 feet or more across.

Acrocomia. Rapid growers, and *A. Totai* is hardy in the southern half of Florida. It will not grow in dry or poor soils, but thrives in rich moist lands. Like most palms, this species is very responsive to an application of commercial fertilizer—from a pound to ten pounds according to the size of the plant. *A. media*, from Porto Rico, is an exceptionally vigorous grower.

Archontophœnix. The two species, *A. Cunninghamii* and *A. Alexandræ*, which are such favorites in the North, are among the best palms in Florida, and will, without doubt, becomes favorites in the lower third of the state. They succeed well in shade or sunshine, on pine or hammock land, and are fairly rapid growers, the former being somewhat the stronger plant.

Areca glandiformis is a superb, rapid-growing palm which grows well in pine land; *A. triandra* is an elegant species, which should probably be grown in the shade, and the same may be said of *A. Alicæ*. All are tropical.

Arenga saccharifera is a noble palm and does well in pine land.

Attalea. Prefers rich soil and if well grown makes magnificent specimens. *A. Cohune* succeeds well in southern Florida, and also *A. gomphococca*.

Bactris. None of the species thrives in southern Florida.

Caryota. Several species are cultivated in lower Florida. Sometimes the specimens do well; at other times they fail. When in bloom they are among the most striking of palms. The ends of the leaflets are subject to a blight which decidedly injures the growth of many specimens.

Chamædorea. Lovely, often cespitose palms with reed-like stems. They are probably all tender, and do well in southern Florida in sheltered, more or less shaded places.

Chamærops. All of these do well in southern Florida and would doubtless prove hardy throughout a large part of the state. They are slow growers, especially until they attain to considerable size. *C. humilis* thrives best on high dry soils. The flowers, resembling a flat yellow fringe from a distance, appear in March, and exhale a very strong, aromatic perfume. All produce numerous suckers which should not be removed. Planted in small groups 10 to 15 feet apart, they soon form very beautiful specimens which look best in the foreground of magnolias or other taller palms. Each plant should receive a mulch of stable manure in March or April, and some good commercial fertilizers during the rainy season.

Chrysalidocarpus lutescens is a well-known palm in the North, and in southern Florida it forms large clumps 20 or 25 feet high.

Coccothrinax jucunda and *C. Garberi* are elegant, low-growing palms from the extreme southern part of Florida and are as easily grown as the species of Thrinax.

Cocos. All species of Cocos do well in southern Florida except *C. insignis* and *C. Weddelliana*. The common coconut, *C. nucifera*, save that it sometimes is injured by frost, does as well as in many parts of the tropics and it is grown more than all other palms put together. It ripens nuts and is becoming naturalized in Dade and Monroe counties. *C. plumosa* and the species of its section are beautiful, rapid growers and all the australis section succeed admirably. The various species are sometimes attacked by what is apparently a fungous disease appearing as brown streaks in the young leaves. The only remedy is to pull the leaves apart and cut out the injured young leaf back as near the growing bud as possible. This may have to be repeated once or twice. This same disease attacks the royal palms, which may be treated in the same way. All the species do well on high pine land, if well fertilized and watered during long dry spells. The tall-growing, slender-stemmed species like *C. plumosa*, *C. flexuosa*, *C. Romanzoffiana* and *C. coronata* are hardy as far north as central Florida. The species and varieties of the australis group—*C. australis*, *C. eriospatha*, *C. Datil*, *C. Gaertneri*, *C. Yatay*—are better adapted to high pine land than most palms. They soon form beautiful specimens, flower regularly when only a few years old, and bear large bunches of edible fruit, sometimes as large as a big cherry or small plum. The fertilizers to be used for these palms should be equally rich in ammonia, phosphoric acid and potash. This should be applied in the months of December, January, and February. All the old dry leaves, spathes and fruit-stems should be removed at the end of September.

Copernicia. A fine group of fan-leaved palms which is abundantly developed in Cuba.

Corypha. None of the species seems to thrive in Florida.

Dæmonorops. Tender, and easily killed during cold spells in lower Florida.

Dictyosperma. Two species are grown in southern Florida, *D. rubra* and *D. alba*. Both are fine palms and when established are strong growers and soon make bold and beautiful specimens. They are hardier than some of the tropical species.

Elæis, the oil-palm of tropical Africa, is grown to some extent in lower Florida and it has produced perfect seeds. It seems to be a rank feeder and if planted in pine land should be well fertilized.

Erythea edulis and *E. armata* should be hardy throughout the southern half of Florida.

Gaussia princeps grows abundantly on limestone cliffs in the mountains of Cuba, and promises to do well also in southern Florida.

Geonoma. Species of this genus are doing moderately well in southern Florida planted in a shaded situation in the edge of the hammock.

Hedyscepe Canterburyana is doing excellently in southern Florida and should be hardy throughout the greater part of the state.

Howea. These palms do not seem to do well in Florida, although they should be hardy over the southern half of the state.

Hydriastele Wendlandiana is a handsome, rapid-growing palm which promises well when planted in partial shade in fairly good pine land. As it is a native of Queensland it is, no doubt, tender.

Hyophorbe amaricaulis and *H. Verschaffeltii* are strikingly ornamental, richly colored palms which are doing fairly well in lower Florida. Both have bottle-shaped caudices.

Hyphæne Schatan has been introduced into southern Florida and does well in pine land, although very tender. It has massive leaves with spiny-edged petioles.

Jubæa. The species grow very slowly. *J. spectabilis* should be hardy throughout Florida.

Latania. The latanias are among our noblest and most beautiful palms; *L. Loddigesii* is very robust and *L. Commersonii*, although not so strong a grower, is very fine. They will grow in salty soil and stand salt air well, but are tender.

Licuala. Tropical palms from the Orient which do not do well in southern Florida. *L. grandis* and one or two others have succeeded for a short time, but soon die.

Livistona. Most of the species do well in southern Florida. *L. chinensis* and *L. australis* will probably prove hardy as far north as latitude 27°. They require rich moist soil. *L. rotundifolia*, *L. altissima*, *L. Hoogendorpii*, *L. subglobosa* and *L. Jenkinsiana* are fine tropical species.

Martinezia caryotæfolia is cultivated in southern Florida and seems to do best in a sheltered and partly shaded situation.

Nipa. This grows successfully in brackish marshes in southern Florida, although often destroyed by land crabs.

Oreodoxa. The species of this genus are unsurpassed for majesty and grace by anything in the vegetable kingdom. The common royal palm, *O. regia*, grows in the greatest abundance almost everywhere throughout the island of Cuba and is universally respected and loved by the natives. It is generally a rather slender tree, rarely over 70 feet high and, as a rule, has a swelling somewhere along the stem. O. F. Cook considers that the species growing in the extreme lower end of this state is distinct and has named it *Roystonea floridana*. It grows to a height of 100 feet or more, the stem is not often swollen and the seeds are smaller than those of Cuban trees. Both flourish on rich or moist soil over the lower third of the state. *O. Boringuena* is a stouter species which will probably do well where the Cuban species will, while *O. oleracea* is a lofty growing species that is much tenderer. They generally do not succeed well on pine land but will do fairly well if abundantly mulched and treated with muck, especially if they are irrigated.

Phœnix. All species and varieties of the date palm grow exceedingly well in Florida, and all the smaller kinds growing in tufts fruit abundantly, as do also the hybrids between *P. dactylifera* and *P. sylvestris*. They flourish equally well on pine, hammock or swamp land, even in brackish marshes. *P. dactylifera*, *P. canariensis* and *P. sylvestris* are hardy in northern Florida. Hybrids between these three are numerous. The tufted kinds like *P. reclinata*, *P. paludosa*, *P. farinifera* and their varieties form magnificent specimens of medium size when well cared for. *P. humilis* and *P. Roebelenii* grow best in rich moist somewhat shaded soil. For the large-growing species like *P. canariensis* and *P. sylvestris*, and for all the large-growing palmettos (sabals) it is necessary to make special preparations before setting them out on high pine land. Dig a hole 6 feet deep and 6 feet wide. Old tin cans, bones, rotten oak wood should be placed at the bottom, then stable manure mixed with clay should follow. The upper 2 feet of the hole should be filled in with surface soil mixed with well-rotted manure. Three- or 4-foot specimens should be set out in such places. They will grow very fast and will form beautiful specimens within a few years. On low moist soils and in hammock woods, such preparations are not so necessary. But wherever planted, all palms need two good applications of fertilizer each year. A good plan is to mulch the plants in April and May with stable manure. This should be dug in around the plants in October, and a good application of commercial fertilizer rich in potash should follow immediately. Potash serves to harden the plants and makes them more resistant to cold.

Phytelephas macrocarpa succeeds well in southern Florida.

Pritchardia. A few species of magnificent fan-leaved palms from the South Seas, all of which are excessively tender in Florida. They can be grown in the more tropical parts of the state in sheltered places but are liable to have their leaves disfigured by frost.

Pseudophœnix Sargentii has been found rather abundantly on Elliott's Key, one of the northernmost of the lower chain. It is cultivated somewhat in southern Florida and when young is rather attractive but when old it has exceedingly dark foliage and is rather stiff and formal.

Ptychosperma Macarthuri is an elegant tufted palm which succeeds finely in southern Florida. It should have partial shade and shelter and if well fertilized it soon becomes a most attractive object.

Rhapidophyllum. This beautiful little palm is a native of northern and central Florida where it grows on low shaded ground. The low stems are covered with a very thick spongy mass of a peat-like substance. It is easily removed and thrives in any soil, even on high pine land. It does not need much water or fertilizer.

Rhapis. Slender, tufted, low-growing palms which are hardy in Florida and require moist soil and a shady place. *R. humilis* is the most elegant species, growing in dense clumps about 7 feet high. *R. flabelliformis* is more inclined to spread.

Roscheria. Young plants of *R. melanochætes* do well in southern Florida, in sheltered situations.

Sabal. In good rich moist soil all the sabals grow well and soon form fine specimens. Such soils need no special care before planting, but good applications of fertilizers are necessary, if fine-looking and thrifty specimens are desired. All do well, however, on high dry pine land soils if well watered and fertilized. If not well taken care of they are exceedingly slow growers. *S. Blackburnianum* has immense leaves, while those of the somewhat glaucous-colored *S. mauritiæforme* are scarcely of less size. *S. mexicanum* resembles the native *S. Palmetto*. There are a number of distinct varieties, such as *S. havanensis* and *S. princeps*. The species which do not form a trunk, like *S. Adansonii*, are only desirable for large palm collections.

Serenoa. Common on high pine lands as well as in rich hammocks. It grows in dense clumps and when given an opportunity to grow makes a very ornamental plant.

Stevensonia grandifolia is a magnificent palm but seems to be excessively tender in Florida. Perhaps it would succeed with protection until it attained considerable size.

Thrinax. The species of this fine genus do remarkably well in all kinds of situations and soils. They are all tropical and the beauty of the leaves is destroyed by frost. *T. Wendlandiana, T. floridana, T. microcarpa* and *T. keyensis* are natives of the extreme southern end of the state and are all fine. *T. barbadensis* and *T. Morrisii* are elegant species, the latter being dwarf. The magnificent leaves of *T. altissima* are liable to be injured by winds if planted in an exposed place.

Trachycarpus. These palms do not seem to thrive well in Florida, although a few specimens of *T. excelsus* in the central part of the state are doing well.

Verschaffeltia also does not thrive in Florida.

Wallichia caryotoides thrives in shady positions in southern Florida.

Washingtonia. Three distinct species are grown in Florida. *W. robusta* is one of our finest palms, growing rapidly and vigorously in pine land and it is used to some extent for planting along streets and roads. *W. filifera* is not so handsome a tree or so rapid a grower as *W. robusta* but it is doing well. *W. Sonoræ* promises well here. Everywhere in Florida where the soil is moist, the washingtonias grow to perfection. They will not thrive on high dry ground. They will occasionally require good applications of fertilizers.

CHAS. T. SIMPSON.
H. NEHRLING.

PALMERÉLLA (Dr. Edward Palmer, American botanical collector, discoverer of the original species). *Campanulàceæ.* A genus of two or three species, with small blue fls. like those of a lobelia. The genus differs from Lobelia in the adnation of the stamens, as well as in the entire or closed corolla-tube, at least its upper part, but which soon splits from the base upward for a good distance, and before withering the lower part of the corolla is much disposed to separate into five claws (liberating also the lower part of the filaments); filaments adnate to the corolla-tube to near the throat and then monadelphous and adnate on one side or the other, or free: nectary an imperfect tubular cavity in the throat of the corolla.—Herbs of S. Calif. and Mex., very little known horticulturally.

débilis, Gray. Slender glabrous branching perennial herb, 2 ft. high, very leafy: lvs. alternate, linear-lanceolate, entire, sessile, 2–3 in. long; floral ones gradually reduced to bracts: raceme lax, few-fld.; corolla-tube whitish, 9 lines long, lobes light blue, 2 of them smaller than the others, the larger ones 3–4 lines long. S. Calif. and Low. Calif. Var. **serràta,** Gray, was offered in 1881 but it is probably not in cult.: infl. and corolla-tube somewhat puberulent: lvs. (except the upper ones) sharp-serrate, the lowest spatulate and obovate. S. Calif.

L. H. B.

PALMETTO: *Sabal.*

PALMS, POPULAR NAMES OF: Alexandra P., *Archontophœnix Alexandræ.* **Assai P.,** *Euterpe edulis.* **Betel-nut P.,** *Areca Catechu.* **Blue P.,** *Erythea armata.* **Blue Palmetto,** *Rhapidophyllum.* **Bourbon P.,** *Latania.* **Broom P.,** *Attalea funifera* and *Thrinax argentea.* **Cabbage P.,** *Euterpe oleracea.* **Club P.,** *Cordyline.* **Coconut P.,** *Cocos nucifera;* **Double Coconut** or **Sea Coconut P.,** *Lodoicea.* **Coquito P.,** *Jubæa spectabilis.* **Corojo P.,** *Acrocomia sclerocarpa.* **Curly P.,** *Howea Belmoreana.* **Date P.,** *Phœnix dactylifera.* **European P.,** *Chamærops humilis.* **Fan P.,** any species with fan-shaped, rather than pinnate lvs. **Fern P.,** *Cycas.* **Fish-tail P.,** *Caryota urens.* **Flat P.,** *Howea Forsteriana.* **Guadeloupe P.,** *Erythea edulis.* **Gru-gru P.,** *Astrocaryum vulgare* and *Acrocomia sclerocarpa.* **Hemp P.,** *Chamærops excelsa.* **Ivory-nut P.,** *Phytelephas macrocarpa.* **Needle P.,** *Rhapidophyllum.* **Nikau P.,** *Rhopalostylis.* **Nipa P.,** *Nipa.* **Norfolk Island P.,** *Rhopalostylis Baueri.* **Oil P.,** *Elæis guineensis;* also *Cocos butyracea,* etc. **Palmetto P.,** *Sabal, Serenoa.* **Panama-hat P.,** *Carludovica palmata.* **Para P.,** *Euterpe edulis.* **Raffia P.,** *Raphia.* **Royal P.,** *Oreodoxa regia.* **Sago P.,** various species of *Metroxylon* and *Cycas.* **Savanah P.,** *Sabal mauritiæformis.* **Saw P.,** or **Palmetto,** *Serenoa.* **Talipot P.,** *Corypha umbraculifera.* **Thatch P.,** *Sabal Blackburniana; Howea Forsteriana.* **Toddy P.,** *Caryota urens.* **Umbrella P.,** *Hedyscepe Canterburyana.* **Walking-stick P.,** *Bacularia monostachya.* **Wax P.,** *Ceroxylon.* **Wine P.** of E. Indies, *Caryota urens, Phœnix sylvestris* and *Borassus flabelliformis;* of New Granada, *Cocos butyracea.*

PALUMBÌNA (said to be from *palumbes,* wood-pigeon; from a supposed resemblance of the fls.). *Orchidàceæ.* A monotypic genus greatly resembling Oncidium, with which it was formerly united. It differs principally in having the lateral sepals entirely united, forming a single segm. resembling the dorsal sepal in shape and size, the labellum scarcely larger than the petals and resembling them in shape.

cándida, Reichb. f. The only species is a small plant with narrow, compressed pseudobulbs, each with a single slender lf., 6–12 in. long: fls. few, small, white, in a slender racème; sepals, petals and labellum oblong, acute, differing but little in size and shape. Guatemala. B.M. 5546. G.C. 1865:793; II. 20:233 (as *Oncidium candidum*).—May be easily grown in a temperate house. Blooms in summer, the fls. lasting a long time.

HEINRICH HASSELBRING.

PAMBÙRUS (from the Singhalese name *Pamburu*). *Rutàceæ,* tribe *Citreæ.* Small trees distantly related to Citrus but bearing frs. filled with gum: young branches often angled; older ones rounded, spines solitary or paired in the axils of the lvs.: lvs. simple, thick, gray-green: fls. 4–5-parted (usually 4) with 8–10 stamens; pistil supported on a subcylindric disk.—Only one species is known.

missiònis, Swingle (*Limònia missiònis,* Wall. ex Wight. *Atalántia missiònis,* Oliver). Lvs. simple, elliptic-oblong, short-petioled, showing veins only very obscurely, wrinkling at the margins on drying: fls. in axillary racemes, shorter than the lvs.; filaments slender, anthers linear-oblong, disk long and slender; ovary 4–5-celled, with 2 ovules in each cell: fr. 1 in. diam., filled with a mucilaginous fluid. Ill. Wight, Ill. Ind. Bot. v. 3, pl. 33. Swingle, Journ. Wash. Acad. 6:336.—This tree occurs in India and Ceylon in sandy soil near the seacoast. It should be tested as a stock for Citrus. The wood is light-colored, but when variegated is used for furniture.

WALTER T. SWINGLE.

PAMPAS-GRASS (*Cortaderia argentea,* which see. Vol. II, p. 856.). A showy tall perennial subtropical grass grown for its whitish fluffy plumes of inflorescence; native in Argentina and southern Brazil.

The growing of pampas plumes for profit in California has been undertaken for over forty years. Pampas-grass was introduced into the United States about 1848. In the northern states it is frequently planted on the lawn in summer, and upon the approach of cold weather transferred in a tub to a cellar for winter protection. In California, a hill will sometimes attain a height of 20 feet, a diameter as great, and a weight of 2,000 pounds. Such plants would be very inconvenient for our northern friends to handle in the cellar.

Plants are easily produced from seed, but as the sex and variety are very uncertain, stock is usually increased by dividing the female plants, the plumes of which are much more beautiful than those of the male. The growing of pampas-grass in North America on a commercial scale dates from 1874, when the difference in sex was discovered. In 1872 the writer sowed seed which in two years gave several hundred plume-bearing plants. Even then the variations in color and fineness were very marked. In 1874, it was found that by pulling the immature plumes from the sheaths and exposing them to the hot sun, the male plumes would hang heavily like oats, while the female plumes would become fluffy, and light and airy. In November, 1874, samples of the female plumes were sent to Peter Henderson & Co., New York. Three hundred were ordered at once, and the following day instructions were received to double the order and send by express. This was the first lot of good plume

LXXXIII. An avenue of palms in southern Florida.—Oreodoxa regia.

ever sent east from California, and was the beginning of the present pampas industry. The writer's plantation was increased each year until 1889, when it comprised about 5,000 hills. There were a number of other extensive plantations in the neighborhood of Santa Barbara. The crop of 1889 was estimated at 1,000,000 plumes. The demand has been good, but the prices have never been so high as at the beginning of the industry. The first prices were $200 for 1,000 plumes. The decrease in price was gradual until 1886, when sales were slow at $30 for 1,000 plumes. Some of the growers did not harvest their crops that year, and destroyed their plants. In the fall of 1887 plumes were in demand at $40 the 1,000, and in 1888 they were scarce at $50 and $60 the 1,000. The following spring there was an increase in acreage. Since then the industry has had its ups and downs, and the price has ruled low for several years, the present prices being $9 to $10 for first-class, and $5 to $6 for second size.

Pampas-grass should be put on the best valley land, and set 10 by 16 feet apart. Before planting, the ground should be deeply plowed and put in first-class condition. In selecting stock, divide only female plants that produce the finest white plumes. Young hills produce the best plants. From old hills the best plants are obtained around the outside, those in the center of the stool being mostly worthless unless planted in large clumps. Some plumes will be produced the first year after planting. They will not be first-class, but are worth saving. The second year, if well grown, they should produce 80 to 150 plumes to the hill. Not all plantations will yield this much. The third and fourth years there will not be much change in the yield. As a plant gets older the plumes are larger but the yield is less. After 8 to 10 years a quantity of dead matter will have accumulated, and the hills should be trimmed or burned.

The appearance of the plumes is a signal for great activity among those who have large fields. The grass should be so trimmed early in September, before the plumes appear, that each hill will be easy of access. Young plants ripen their plumes two or three weeks earlier than old ones, and some varieties are earlier than others. It requires exercise of judgment to pick the plumes at the proper time. They are generally ready when they are exposed from the husk a few inches and have a fluffy look. It is well to try a few at this stage, and if they cure well at the stem end when dry they are all right, but if they do not become fluffy at the stem end they have been picked too young. If the plume looks dark and seedy at the top when cured, it was too old when picked. Some varieties, especially those producing very long plumes, should be allowed to remain somewhat longer on the plant than those of the short-plumed varieties. By trying a few of each variety, the time of ripening can soon be ascertained. Some varieties are pulled from the husk in the field; others have to be hauled to husking benches, where the husk or sheath is removed. Some planters husk them like corn: others use a knife set in such a way as to split the husk without injuring the plume. When the husk has been split, a quick jerk or strike on the table will extract the plume. The plumes are then taken to the drying ground and evenly spread in long rows. This ground should be made smooth and free from any trash that is liable to adhere to the plumes. Clean stubble ground is the best. The plumes are left on the ground three days and two nights to cure, and are turned and shaken once each day. They are next packed away as broadly and smoothly as possible on shelves in a dry building, where they should lie ten days or two weeks, or until the stems are thoroughly dried, at which time they are ready for market. They are packed in two grades: the first class, having plumes 26 inches long and over, clear of stem (sometimes as long as 45 inches), is packed in cases that hold three-quarters of a ton and contain 3,000 plumes; second-class stock is packed in cases of the same size, the plumes being 17 to 26 inches long clear of stem, and 6,000 in each case. If shipping by express, the writer uses bales of about 2,000 plumes, covered with canvas or burlap and some light strips of wood at the corners. If the plumes are packed smoothly and evenly they will withstand heavy pressure. Careful all-round cultivation is necessary to produce good plumes.

The best market at present is London, the next Hamburg. Berlin, Denmark, New York and Philadelphia take a few. Pampas plumes are colored in London. In America the pure white plumes give the best satisfaction.

JOSEPH SEXTON.

PÀNAX (old Greek name, meaning *all healing* or a panacea). *Araliàceæ*. A genus of seven or eight species of hardy perennials none of which is of cultural importance except *P. quinquefolium*, Linn., the GINSENG, which see (Vol. III). They have aromatic roots, digitately compound leaves and greenish white flowers in a terminal umbel. They are all natives of the North Temperate Zone, mostly in Asia and North American. For an account of the tender plants heretofore included in this genus, see *Polyscias*.

The genus as now defined is distinguished by the thickish roots or tubers from which arise erect simple short sts. bearing 1 whorl of 3 digitate lvs. which have 3 or 5 lfts.: umbels terminal and solitary, simple, bearing small white or greenish polygamous fls.; calyx obscurely 5-toothed; petals 5, spreading; stamens 5, alternating with petals; styles 2 or 3: fr. a 2- or 3-seeded little drupe. Two species are native in the eastern U. S. and Canada. *P. quinquefòlium*, Linn. (*Ginseng quinquefòlium*, Wood. *Aràlia quinquefòlia*, Decne. & Planch.).

2740. Panax trifolium.

GINSENG, growing in rich woods Que. to Minn. and south to Ala.: about 1 ft. high from a more or less branching thick root: lfts. usually 5, stalked, the basal pair much smaller than the others, all ovate or obovate, dentate, acuminate: peduncle an inch or two long, bearing a 6–20-fld. umbel; styles usually 2: fr. bright red. *P. trifòlium*, Linn. (*Ginseng trifòlium*, Wood. *Aràlia trifòlia*, Decne. & Planch.), GROUND-NUT (Fig. 2740), native in moist mostly low or flat woods, Nova Scotia to Iowa and Ga.: delicate little plant about 6 in. high, with a deep globular blackish tuber or root about ½in. diam.: lfts. mostly 3, sessile, oval to oblanceolate, obtuse, serrate: peduncles an inch or two long, bearing a few whitish often monœcious fls.; styles usually 3: fr. 3-angled or 2-sided, yellowish. An attractive but not showy early spring bloomer, suitable for colonizing in moist shady places.

L. H. B.

PANCRÀTIUM (Greek, *all-powerful;* referring to supposed medicinal value). *Amaryllidàceæ*. Attractive summer- and winter-flowering bulbs, bloomed inside or some of them grown outside in mild climates with protection.

Very like Hymenocallis, being the Old World representatives of this group, differing botanically in having many superposed ovules in each cell rather than (as in

Hymenocallis) 2 basal collateral ovules. Bulb tunicated: lvs. linear to lorate, mostly appearing with the fls., the latter in an umbel terminating an erect solid mostly stout scape or peduncle and white or greenish; perianth funnel-shaped, with a long tube, the segms. equal, short and spreading or ascending; stamens inserted at the throat of the perianth and joined by a web or cup: fr. a loculicidally 3-valved caps. with

2741. Pancratium: types of three sections.

At the right, the short perianth-tube and small staminal cup of *P. illyricum*. At the left, the relatively short tube and large cup of *P. maritimum*. At the top, the long tube and small cup of *P. verecundum*, to which *P. tortuosum* is very closely allied. (From B.M. and B.R.)

angled black seeds.—Species 14 or more in the Medit. region, eastward to India and southward in Afr. Pancratiums and hymenocallis, sometimes called spider-lilies or spirit-lilies, form a beautiful group of bulbs, hardy or tender, some blooming in winter, others in summer, and all characterized by the beautiful floral structure known as a staminal cup. This cup is white and has the texture of petals. It is fringed or toothed in a great variety of ways. The filaments growing out of the cup are long or short. The perianth-segms. are usually long, slender, and gracefully recurved.

The species of pancratium, coming as they do from Africa, southern Asia, and southern Europe, in most cases need a high temperature while in growth and a period of rest after flowering. The "rest" is secured by placing them in a house where there is plenty of ventilation and a cooler temperature. Gradually withhold water, giving only just sufficient to keep in a life-like state. The bulbs should be kept in this semi-dry state through the winter. After the middle of January, they may be repotted or have a top-dressing. For a compost, use a good strong loamy soil four parts, well-decayed cow-manure one part. When the roots get well through this compost, liquid manure will be useful once a week. Those bulbs that do not need repotting may have some of the old compost removed, but care must be taken not to injure any of the roots. They may now be placed in a house with a night temperature of 60°. As growth progresses, the temperature may be increased at night to 65° or 70° and at day, with sun, from 80° to 85°. Keep well up to the glass so their growth will be as stocky as possible. In their growing season, they will consume large quantities of water, and they should never become entirely dry at the roots. Give plenty of syringing in bright weather, and ventilate so as to keep temperature right. When they show flower, they may be given a drier and more airy house. For a winter temperature, 50° to 55° will be high enough, with about 10° increase with sunshine.—Pancratiums can be increased by offsets and seed. The offsets may be separated from the parent plant and placed rather close in pans in a light mixture of equal parts of leaf-mold, peat, and sand, given good drainage. When they have made a few roots, they may be potted up into small pots and grown on. When sowing seed, prepare some pans by giving plenty of drainage and filling with a mixture of leaf-mold, peat, and sand, screening some of it fine for the top. Sprinkle the seed all over the surface and cover with the fine mixture, press firmly and give ordinary stove temperature. Maintain an even moisture with these pans. When they start to come up, place well up to the glass. When large enough, prick out into other pans or flats, using a heavier compost. Pot off when larger and grow without rest through the winter. In the spring they will require 5- or 6-inch pots. Their management from this on will be that already mentioned. Give light fumigations often in order to keep down aphids and thrips. Scale and mealy-bug, which often get into the axils of the leaves, can be removed by the use of a soft brush. (J. J. M. Farrell.)

A. *Perianth-tube 3–6 in. long.*

B. *Segms. more than 2 in. long.*

tortuòsum, Herb. Bulb globose, 2 in. or less diam., with long cylindrical neck: lvs. 6–12, linear, spirally twisted, 1 ft. or less long, with the fls., the latter 2–4 in an umbel: perianth-tube 5–6 in. long, the segms. linear and ascending, greenish; staminal cup over 1 in. long, distinctly toothed between the short free tips of the filaments. Autumn and winter. Arabia and Egypt.

BB. *Segms. 1½ in. long.*

verecúndum, Ait. Fig. 2741. Bulb globose, 2 in. diam., with long cylindrical neck: lvs. 6–10, sword-shaped, appearing with the fls.: peduncle compressed, 1 ft. long; fls. 2–6, white, with greenish tube, fragrant; tube 3–4 in. long; segms. linear; staminal cup or corona 1 in. or less long, bifid between the free filaments. India. B.R. 413.

AA. *Perianth-tube 1–3 in. long.*

B. *Staminal cup small, 3–4 lines long.*

illýricum, Linn. Fig. 2741. Bulb very large: lvs. 5–6, strap-shaped, glaucous, 1½–2 in. wide, appearing with the fls.: scape 1 ft. or more long; fls. white, 6–12 in a centripetal umbel; perianth-tube 1 in. long, green; segms. 1½ in. long; staminal cup with long narrow, 2-cut teeth; free portion of filaments 6–9 lines long: seeds not compressed. Summer. Corsica, Sardinia, Malta, S. Italy. B.M. 718. Gn. 48, p. 246.—Hardiest, commonest and perhaps the best.

BB. *Staminal cup large, 1 in. long.*

marítimum, Linn. Figs. 2741 and 1936, Vol. III. Bulb globose, 2–3 in. diam. and with a neck: lvs. 5–6, linear, glaucous, persistent, becoming 2–2½ ft. long: fls. white, very fragrant, 5–10 in an umbel on a compressed scape or peduncle; perianth-tube 2–3 in. long; segms. linear, 1½ in. long, ascending; staminal cup very prominent, the teeth short, triangular and regular; free part of filaments 3 lines long. Spain to Syria. B.R. 161.

P. Amáncæs, Ker=Hymenocallis Amancæs (see suppl. list, p. 1627).—*P. amœnum*, Andr.=H. ovata.—*P. calathinum*, Ker=H. calathina.—*P. caribæum*, Linn.=H. caribæa.—*P. coronàrium*, Le

Conte=H. occidentalis.—*P. fràgrans*, Salisb.=H. ovata, but P. fragrans, Willd.=H. caribæa.—*P. galvestonénse*, Hort., presumably =H. galvestonensis.—*P. Hárrisii*, Hort., is presumably H. Harrisiana.—*P. littorâle*, Jacq.=H. littoralis.—*P. mexicânum*=H. rotata probably.—*P. ovâtum*, Mill.=H. ovata.—*P. rotâtum*, Ker=H. rotata.—*P. undulâtum*, HBK.=H. undulata.

WILHELM MILLER.
L. H. B.†

PANDÀNUS (Latinized form of a Malayan name). *Pandanàceæ*. SCREW-PINE. Tropical plants often attaining the size of trees, and remarkable for their stilt-like aërial roots, and the perfect spiral arrangement of their long sword-shaped leaves. They are planted in tropical and subtropical regions, and are also grown as pot and tub specimens for greenhouse, residence, veranda and lawn decoration, where their stiff clustered foliage gives them a formal decorative character.

The family Pandanaceæ comprises 3 genera (Warburg, in Engler's Das Pflanzenreich, IV:9 [hft. 3] 1900): Sararanga, with 2 species, in the S. Sea Isls. and Philippines; Freycinetia, more than 100 species, from Ceylon to Philippines, Austral., New Zeal., and Hawaii; Pandanus, with probably 250 species now described, in Trop. Afr., India, Austral., islands of the Indian Ocean and the Pacific. Pandanus comprises small trees or shrubs, erect or rarely prostrate, usually forked, the trunk annular, often producing aërial roots: lvs. linear and acute, commonly sharp-dentate or prickly on margin and midrib, the base usually vaginate but not petioled: fls. diœcious, in axillary or terminal spadices, the male spadices branched, the female always terminal and racemose or solitary, the leafy spadix-bracts usually colored; perianth none; stamens many in male fls., the filaments free or connate; staminodes in female fls. small or none, the ovary free or joined to those of adjacent fls.; ovule solitary and erect: fr. a syncarpium of free or connate angular woody or fleshy drupes, sometimes large (1 ft. long) and cone-like.—The screw-pines are characteristic plants in many tropical regions, with long ringed trunks, bracing roots, and crowns of dracena-like foliage. The lvs. of some species are used in manufacture of bagging and in other ways, and of some kinds the frs. are eaten. Some of them have very fragrant fls., and of others the frs. or other parts are fetid. Two species are important in cult., *P. Veitchii* and *P. utilis*, the former variegated, the latter not. (See Figs. 2742–2744.) Young plants of these are amongst the most popular foliage plants for home decoration. They are especially suited for fern-pans and table-decoration. They are grown to a very large extent by wholesale florists and palm specialists.

2742. Pandanus Veitchii.

Every conservatory has them, and occasionally *P. utilis* is grown to a considerable age and height for the sake of a perfect specimen of the spiral habit of growth on a large scale. (See Fig. 2743.) Some of the species have red- or purple-tinted lvs., but these appear not to have become popular. In the tropics, *P. utilis* is as valuable to the natives as many palms. The frs. are edible, and the roots furnish fiber for ropes, baskets, mats and hats, as do also the lvs. which are used in

2743. Pandanus utilis. A young screw-pine just beginning to show the spiral character.

making paper and nets. The numbers of species in commercial cult. are very few, although many names occur in horticultural literature. Without fls. and frs., it is difficult to know what species are actually in cult., or how accurate may be the popular descriptions and illustrations. For the same reason it is impossible to construct an accurate botanical key that will be of practical use to the gardener. Some of the good garden kinds are unplaced botanically, particularly the variegated or striped-lvd. kinds, which are sterile or the fructification insufficiently studied.

Pandanuses are among the best decorative plants and they are not difficult to manage when grown under favorable conditions. They are usually at home in palm-houses, and some of the species may be treated as semi-aquatics in victoria tanks. As a rule, they thrive in much heat and with plenty of water. From the latter part of January on, these plants become active in growth. It is at this time that one must make the atmosphere of the house more congenial in the way of supplying abundance of atmospheric moisture. To supply this condition, damp down the benches, paths and under the benches two or three times a day in bright weather. Before they have made too much headway any necessary repotting should be done, such as renewing with new compost or shifting into larger pots. A good compost to use is fibrous loam four parts, well-decayed manure and leaf-mold one part each, with enough sand added to give it a porous texture. See that the pots have plenty of drainage and pot firm enough to get the new compost well around the roots. In February and on, as the days become longer and the sun more powerful, they will require more water at the roots, with frequent syringings. The temperature may be increased from 60° to 65° at night, and in late spring and summer they will need a night temperature of 70° with a rise of 10° to 15° in bright weather. During summer when the sun is powerful, they will need a little shade, but only enough to hold them in good color as they like plenty of diffused sunlight at this

period. In autumn, winter and spring, they like plenty of sunshine. When autumn comes, do less watering and syringing, as root-action is becoming less active. To keep them in good health, it is very important to use great care in watering them in the winter months, as any unskilful or careless watering will surely cause ruin. Also give ventilation strict attention at all times. —Most of the species of pandanus can be increased from suckers, that are more or less produced from the main stem. These may be taken off and a few of the bottom leaves removed, and placed singly in small pots, using a mixture of loam, peat, and sand in equal parts. Plunge in a warm propagating-bed where they may have a brisk bottom heat. The best time to increase this stock is after January. Some species are grown from seed. Seeds may be sown whenever they can be secured fresh, which is usually in the spring. Sow the seed in pans in a mixture of loam, peat, and sand in equal parts. Cover and press firmly. Keep moist, but not in a soaked condition. It will aid the germination to soak the seed twenty-four hours in tepid water. Give plenty of heat and keep shaded and they will germinate without much trouble. When large enough, pot off and keep on shifting and grow under the above cultural directions and they will form good stocky plants. (J. J. M. Farrell).

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A. *Foliage striped or marked with white or yellow.*

1. **Veitchii,** Hort. Fig. 2742. Lvs. 2 ft. long, broader than in the common *P. utilis*, somewhat recurved, spiny-toothed, dark green in the center, margined with broad bands of white or silvery white, the apex long-acuminate. Polynesia; intro. by Veitch in 1868. A.F. 4:570. F. 1871, p. 177. Gn. 2, p. 501. G. 9:176; 23:565. G.L. 26:177. Gn.W. 23, suppl. May 12. G.W. 2, p. 389; 5, p. 391; 11, p. 241; 12, p. 414.—Perhaps a form of *P. tectorius*.

2744. Pandanus utilis. Young plant of a narrow-leaved graceful form.

2. **variegàtus,** Miq. St. branched, emitting roots: lvs. narrow-lanceolate, very narrowly attenuate or even filiform above, pale green, striped or variegated with white or pale green or the younger ones all white, the prickles or spines whitish and purplish. Polynesia. —Probably plants cult. as *P. javanicus* and *P. Candelabrum* var. *variegatus* belong here.

3. **Bâptistii,** Hort. A leafy short-stemmed plant: lvs. narrow, nearly 1 in. wide, curved, unarmed, long-acuminate, longitudinally lined or striped with whitish or yellowish. S. Seas, probably in New Britain Isls. R.H. 1913, p. 141. G.W. 14, p. 422. Gn.W. 9:581.—Said to be a rapid grower.

4. **Sânderi,** Hort. Habit tufted, the st. being short: lvs. 30 in. long, with minute marginal spines, not unlike those of *P. Veitchii* but of denser habit, and differing much in the variegation, which in this case is golden yellow, and in place of being confined to the margin, or nearly so, it is distributed in narrow bands of yellow and green in alternation throughout the length of its lf. Timor, Malay Archipelago. G.C. III. 23:249. R.H. 1898, p. 230. G. 21:606. Gn.W. 25:123. G.W. 11, p. 242. R.B. 24, p. 180. G.M. 41:686. A.G. 19:455; 22:189. A.F. 16:887. F.E. 13:111.—Said to be a rapid grower.

AA. *Foliage green, or at least not variegated or striped.*

B. *Spines on lf.-margins relatively small or short (sometimes wanting).*

5. **pacíficus,** Hort. Lvs. broad and dark green, shining, abruptly narrowed to a tail-like apex, the margins with small fine spines. Pacific Isls. G.W. 11, p. 243; 15, p. 597.—Apparently not placed botanically, but said to be distinct and a very useful plant.

6. **tectòrius,** Soland. (*P. odoratíssimus*, Linn. f. *P. odoràtus*, Salisb. *P. odorífer*, O. Kuntze). Height 20 and more ft., much branched, the trunk commonly flexuose and supported by aërial roots: lvs. light green, 3–5 ft. long, linear-lanceolate, abruptly produced into a long point, glaucous; spines short, white. S. Asia, islands of Indian and Pacific oceans, Austral., Philippines. G.C. III. 17:14; 32:194, 195.—A scent which is much esteemed in Java is said to be obtained from the male fls. A variable species to which many names belong, as *P. javánicus*, Hort., *P. spiràlis*, R. Br., *P. Blancòi*, Kunth, *P. leucacánthus*, Hort., and *P. Bòryi*, *P. Chamissònis*, *P. Douglasii*, *P. Línnæi*, *P. Lourèiri*, *P. Ménziesii*, *P. Rheèdii*, *P. Rúmphii*, Gaud. Var. **lævis,** Warb. (*P. lævis*, Kunth. *P. moschàtus*, Miq.), has somewhat glaucous and unarmed lvs. 6 ft. or more long, with a very long-acuminate apex. Var. **Samâk,** Warb. (*P. Samák*, Hassk.), has narrow subulate-acuminate lvs., with margins and keel bearing slender whitish spines. *P. tectorius* is common in the Philippines near the sea and along tidal streams, and horticultural varieties are cult. in Manila.

7. **Fórsteri,** Moore and Muell. (*P. Fosteriànus*, Hort. *P. Moòrei*, F. Muell.). Habit of *P. tectorius:* tall, to 30 ft., branched at top, with aërial roots: lvs. to 3 ft. long and 2 in. or more wide, short-appressed-spinulose. Lord Howe's Isl.

8. **ùtilis,** Bory (*P. distichus*, Hort. *P. flabellifórmis*, Carr. *P. mauritiànus*, Hort. *P. sativus*, Thouars). Figs. 2743–2745. The best-known species: attains 60 ft. in Madagascar, where it is native: branching: lvs. glaucous, erect, 1–2¾ ft. long, 3 in. wide, spines red. I.H. 7:265. B.M. 5014 (as *P. Candelabrum*). R.H. 1866: 270. A.F. 4:571. F.E. 15:592. G.W. 15, p. 597.—Cult. in tropics; lvs. used in making of bags, baskets,

mats, and other articles. Juvenile specimens with curving lvs. 1½ ft. or less long, may be known as *P. elegantissimus* or by other names.

9. **heterocárpus,** Balf. f. (*P. ornàtus*, Bull). Branching tree, to 20 ft., with slender trunk, very numerous roots and spreading branches: lvs. lanceolate-acuminate, dilated and clasping at the base, erect-spreading, leathery, strict, greenish, often somewhat glaucous at the base, rather flat margin covered with small red,

2745. Pandanus utilis. An old screw-pine in the tropics.
(Adapted from "The Garden")

slightly incurved spines; lower midrib furnished from the middle with distant spines of the same character. Mascarene Isls. I.H. 19:97.

10. **pygmæus,** Thouars. Low spreading shrub, not over 2 ft. high in the center, but sending out from the base numerous horizontal, rooting, annulated branches: lvs. about 1–1½ ft. long, spirally arranged in 3's, linear-subulate, with a clasping base; margins and keels fringed with small fuscous spines. Madagascar. B.M. 4736.—Said sometimes to be cult. as *P. graminifolius*.

11. **graminifòlius,** Kurz. Lvs. 12–18 in. long by 3–4 lines wide, glaucous beneath: marginal and carinal spines minute, straight. Burma, and the true species perhaps not cult.; see No. 10. *P. graminifolius* of the trade has never been carefully distinguished from *P. pygmæus*, and, according to Nicholson the garden plant under this name is a species of Freycinetia. F.R. 2:388, where Taplin says it has a tufted much-branched habit, dark green lvs. about ½in. wide, not so stiff as most species; spines short, whitish. Gn.W. 20:446. G.W. 11, p. 245.

12. **furcàtus,** Roxbg. (*P. hórridus*, Blume. *P. spinifrúctus*, Dennst. *P. urophýllus*, Hance). Tree, attaining 30–40 ft., branched, with aërial roots at base: lvs very long, attaining 6–9 ft., about 3 in. wide, somewhat glaucous beneath, the margins and keel with distantly thick spines; apex long-acuminate. India. R.H. 1879:290; 1881, pp. 174, 175.

13. **caricòsus,** Kurz. Low, cespitose: lvs. 5–8 ft. by about 2 in., glaucous beneath; margins and dorsal costæ densely spinulose-serrate, the spines very small and acute. Java. R.H. 1878, p. 405.

BB. *Spines disagreeably long.*

14. **refléxus,** C. Koch. Tree, about 15 ft., branched, the trunk 3–6 ft. tall: lvs. reflexed, acute, 5–6 ft. long, dark green, shining; spines long, whitish, those on the midrib of the lower side reversed. E. African Isls. F.R. 2:387. G.W. 11, p. 245.

15. **Vandermèeschii,** Balf. f. Tree, to 20 ft., much branched: lvs. stiff, suberect, 2½–3 ft. long, 1½–2 in. broad, very glaucous; margins red and thickened; spines strong, red; midrib red, prominent, spiny. Mauritius. G.C. III. 18:237.

P. amaryllifòlius, Roxbg. Plant small and diffuse, supported by aërial roots: lvs. linear, somewhat 3-nerved, the apex somewhat dilated, little spinose-serrate. Probably Malayan. C.L.A. 19:131. G.W. 11, p. 243.—*P. Butàyei*, Wildem. Lvs. rather broad, robust, with sharp claw-like prickles on margins and keel, said to be a beautiful decorative plant. Congo.—*P. Candelàbrum*, Beauv. Candelabrum Tree. Chandelier Tree. Tree, attaining 30 ft., the lower branches horizontal and upper erect: lvs. 3 ft. by 2 in., dark green and glaucous, strongly toothed; spines brown. Trop. Afr. B.M. 5014, under this name is P. utilis.—Not advertised in Amer., but for the popular variegated form, see No. 2.—*P. Houllètii*, Carr. Height 7–8 ft. in the wild, simple, with aërial roots: lvs. many, the blades linear and gradually acuminate-pointed, sometimes 8 ft. long and 4 in. broad, with small curved brown or purplish spines, surface dark green, tinged copper-red, or young ones purple. Singapore. B.M. 8197. R.H. 1868, p. 210.—*P. luzonénsis*, Merrill. Probably the species reported in S. Fla. as P. luzonicus: tree, 25 ft., with erect trunk much branched above: lvs. to 6 ft. long and about 1 in. wide, long- and narrow-acuminate, the margins strongly antrorsely toothed, and with stout curved spines. Philippines.—*P. nítidus*, Kurz=P. stenophyllus.—*P. stenophýllus*, Kurz. Shrub, 6–8 ft., with many prop-roots: lvs. 2–3 ft. or more long, 1 in. wide, shining, the margin and keel remotely pale, spinulose-serrate. Java. G.W. 11, p. 242.—*P. Wavriniànus*, Hort. Lvs. narrow, strap-shaped, recurved, dark olive-green, with irregular awl-shaped teeth. Habitat unrecorded. L. H. B.†

PANDÒREA (*Pandora*, Greek mythological name). *Bignoniàceæ*. Ornamental woody vines grown for their beautiful flowers and also for their handsome foliage.

Evergreen shrubs, climbing without tendrils or roots: lvs. opposite, odd-pinnate; lfts. entire or serrate: fls. in axillary or terminal few- or many-fld. panicles; calyx small, campanulate, 5-toothed; corolla funnelform-campanulate, with imbricate lobes; stamens included, with spreading superposed anther-cells; disk thick, ring-like; ovary linear, the seeds in many series: pod oblong, with thick not keeled valves; seeds broadly elliptic, winged.—Five species from Austral. to Malay Archipelago and in S. Afr. Formerly usually included under Tecoma.

The pandoreas are vigorous-growing vines or lianas with handsome evergreen foliage and beautiful white or pink rather large flowers. They can be grown outdoors only in the southern states and in California and stand few degrees of frost; in the North they are sometimes a cultivated in the greenhouse. They require rich soil and sunny position. Propagation is by seeds and by greenwood cuttings under glass. See also *Bignonia* for culture.

The wonga-wonga vine, *P. australis*, is rather difficult to grow on high pine-land, as it needs a soil rich in humus. In rich soil, however, and liberally fertilized, it is a rampant grower with beautiful dark green glossy foliage. The flowers are interesting but comparatively small, and not showy. However, the species is worth cultivating for foliage alone. It must be well taken care of and well watered during the dry spring months or it will dwindle away in a very short time.

P. Ricasoliana, from Natal and Caffraria, demands a very rich soil and a heavy mulch of stable manure. Its leaves easily drop from the woody branches after a cold night, and 6° or 7° of frost kill the plant down to the ground. For this reason the vine should be banked with dry sand every fall and if killed down to the banking it must be cut off immediately or the entire plant will be lost. Plants raised from seed received under the name of *Tecoma Ricasoliana*, from Italy, are much hardier and more floriferous than those obtained from seed imported from South Africa, but the flowers of both are exactly alike. In order to flower profusely,

this species must be planted in the full sun. It usually requires a few years before it starts into a vigorous growth, and it rarely flowers before its fifth year or before it has attained considerable size. In Florida, *P. Ricasoliana* should be planted on tall stumps, or on arbors and sheds by itself, never mingled with other species. (H. Nehrling.)

A. *Fls. white: lfts. 3–9.*

austrālis, Spach (*Bignònia Pandòræ,* Sims. *Técoma austrālis,* R. Br.). Wonga-Wonga Vine. Evergreen high-climbing shrub: lvs. odd-pinnate; lfts. 3–9, elliptic-ovate to ovate-lanceolate, acuminate but bluntly pointed, entire or sometimes coarsely crenate, shining above, glabrous, 1–2½ in. long: panicles many-fld.; corolla funnelform-campanulate, with 5-lobed spreading limb, yellowish white, spotted violet in the throat, ¾in. long: fr. oblong, pointed, 2–3 in. long. Spring. Austral. B.M. 865. Gn. 27, p. 94. Var. **ròsea,** Hort. Fls. light rose-colored. —"Young plants and particularly seedlings have the lvs. very finely cut, nearly of the appearance of a fern and are in this stage sometimes known as *Tecoma filicifolia* or *Campsidium filicifolium;* when getting older they change entirely."—Franceschi.

jasminoìdes, Schumann (*Técoma jasminoìdes,* Lindl. *Bignònia jasminoìdes,* Hort.). Bower Plant of Australia. Evergreen climbing shrub: lvs. odd-pinnate; lfts. 5–9, almost sessile, ovate to lanceolate, acuminate, but bluntly pointed, entire, glabrous, 1–2 in. long: panicles rather few-fld.; corolla funnelform-campanulate, the large spreading 5-lobed limb with crenate lobes, white, sometimes suffused with pink, usually rosy pink in the throat, 1½–2 in. long; calyx small, 5-lobed. Aug.–Oct. B.R. 2002. B.M. 4004. P.M. 6:199. R.H. 1895, p. 109. Var. **álba,** Hort., has larger white fls.

2746. Panicum virgatum.

AA. *Fls. pink: lfts. 7–11.*

Ricasoliàna, Baill. (*Técoma Mackénii,* W. Wats. *Técoma Ricasoliàna,* Tanfani). Evergreen climbing shrub: lvs. odd-pinnate; lfts. 7–11, short-stalked, elliptic-ovate, acute or acuminate, serrate, dark green above, pale beneath, glabrous, about 1 in. long: fls. in loose, terminal panicles; corolla funnelform-campanulate, with spreading 5-lobed limb, light pink, striped red, glabrous inside and outside, 2 in. long; calyx 5-toothed: fr. linear, terete, 10–12 in. long. S. Afr. G.W. 2:343, 346. J.H.S. 39, p. 12, fig. 15.

Brȳcei, Rehd. (*Técoma Brȳcei,* N. E. Br. *Técoma Regìnæ Sàbæ,* Franceschi). Evergreen climbing shrub: lfts. 9–11, stalked, lanceolate, acuminate, entire, glabrous, 1–2 in. long: fls. in large terminal panicles, slender-pedicelled; calyx glandular; corolla funnelform campanulate, abruptly contracted at the base, light pink, netted with crimson, yellow in throat, tube 1¼ in. long, hairy inside, limb spreading, about 2 in. across. Oct.–March. Rhodesia. G.C. III. 39:344.

Alfred Rehder.

PANICULÀRIA: *Glyceria.*

PÁNICUM (old Latin name of Italian millet, *Setaria italica*). *Gramineæ.* Annual or perennial grasses with usually flat blades and paniculate inflorescence.

Spikelets with 1 terminal perfect floret and below this a second floret which may be staminate, neutral or reduced to the sterile lemma; fertile lemma characterized by being of a much firmer texture.—An immense genus of grasses scattered over the world, especially in the tropics. Several hundred species have been described, while conservative authorities place the number at about 300. Their importance as forage grasses is very insignificant when the number of species is taken into consideration. This is largely from the fact that the species, as a rule, are not gregarious, and to the fact that they are not well represented in the meadows and prairies of temperate and northern regions. Guinea-grass and para-grass are, however, important forage grasses of the warmer regions.

A. *Plant annual.*

capillàre, Linn. Old Witch-Grass. A common native annual grass and weed, has been recommended for cult. on account of its ornamental purple panicle, which is ample and loose, the spikelets being borne on slender hair-like pedicels. R.H. 1890, p. 525; 1896, p. 572. Dept. Agric., Div. Agrost. Bull. 17:54.

miliàceum, Linn. True Millet. Broom-corn Millet. Hog Millet. A tall annual (3–4 ft.), with soft lvs., grown for fodder, but not in common use in this country: spikelets large, in a rather compact drooping panicle. Dept. Agric., Div. Agrost., Bull. 20:37.—Cult. from prehistoric times. Grown somewhat extensively in China and Japan, and S. E. Russia. Native country unknown, but probably E. Indies. More fully discussed in Dept. Agric., Farmers' Bull. No. 101. What is usually grown in the U. S. under the name of millet is *Setaria italica* and its varieties.

texànum, Buckl. Colorado-Grass. Texas Millet. Commonly decumbent at base and rooting at the lower joints: culms stout, 2–6 ft.: foliage softly hairy: panicle narrow, the large, pointed, hairy spikelets somewhat crowded: seed cross-wrinkled. Dept. Agric., Div. Agrost., Bull. 7:50.—The common name refers to the Colorado River of Texas where the species is native. Sparingly cult. in the southern states.

AA. *Plant perennial.*

B. *Blades long and narrow, not plicate.*

virgàtum, Linn. Fig. 2746. An upright grass with stiff culms, 2–6 ft. high, and with stout scaly rootstocks: spikelets in loose, compound panicles, usually more or less purplish, sharp-pointed; first glume half as long as spikelets, 5–7-nerved, second glume and sterile lemma of about equal length, 5–7-nerved. Native throughout U. S. except in the extreme W. R.H. 1890, p. 525; 1896, p. 572. Gn. 14, p. 215; 29, p. 235; 37, p. 245. G. 10:103. Dept. Agric., Div. Agrost. Bull. 7:60. A hardy perennial used for ornamental purposes.

máximum, Jacq. Guinea-Grass. Four to 8 ft., or sometimes taller, forming dense tufts: culms robust: nodes hairy: sheaths more or less hirsute; blades 20–30 in. long: panicle 1–2 ft. long, the long stiff branches arranged in whorls; spikelets short-pedicelled, smooth,

rather glossy, the seed minutely cross-wrinkled. Native of Afr., early intro. into the W. Indies and Trop. Amer. —Cult. for forage in the Gulf States.

barbinòde, Trin. (*P. mólle* of authors, not Swartz). PARÀ-GRASS. Strongly stoloniferous, as much as 20 ft. long: culms decumbent, rooting at the joints, 6–10 ft. high, robust: sheaths more or less hairy, the blades smooth, 6–20 in. long: panicles 8–15 in. long, consisting of numerous ascending racemes with rather crowded spikelets.—Intro. from Brazil. *P. numidiànum,* Lam., is a closely related species of the E. Indies, sometimes confused with true para-grass.

BB. *Blades an inch or more broad, plicate: panicle narrow, the spikelets interspersed with bristles.*

sulcàtum, Aubl. A tall perennial, 4–6 ft., native of Trop. Amer.: lvs. large, 1 in. or more broad, somewhat hairy, conspicuously plicate: panicle narrow, about 1 ft. long, with many ascending branches, bearing short-pedicelled spikelets throughout their length, and also scattered bristles; spikelets pointed; lower glume half, second glume two-thirds the length of the sterile lemma and fertile floret, all strongly nerved.—This and the next species belong to the section Ptychophyllum, which is better referred to Setaria.

palmifòlium, Willd. (*P. plicàtum* of authors, not Lam.). PALM-GRASS. Fig. 2747. Resembles the preceding, but lvs. broader and nearly smooth, the panicle larger and more bristly: spikelets similar. G. 3:101. Gn. 12, p. 517; 31, p. 487; 37, p. 245. R.H. 1862, p. 290. —A variegated form is figured in F.S. 17:1743–44 under the name *P. foliis niveo-vittatis.* Cult. in the S. for ornament. Native of E. Indies. Woolson, of Passaic, N. J., says it grows 4–6 ft. high in the hardy border and makes a fine, stately grass; useful for winter bouquets. This grass is known in the trade as *P. plicatum* or less commonly as *P. excurrens,* but the real *P. plicatum,* Lam., through an allied species, is a smaller, narrower-lvd. plant of no particular beauty and unknown in cult. The true *P. excurrens*=*P. plicatum,* Lam.

P. qtrosanguíneum of lists is apparently Pennisetum Ruppellii.—*P. Crus-gálli*=Echinochloa.—*P. frumentàceum*=Echinochloa.—*P. germánicum*=Setaria.—*P. variegàtum*=Oplismenus Burmannii.

A. S. HITCHCOCK.

2747. Panicum palmifolium.

PANÍSEA (Greek, *entirely like,* referring to the fact that the labellum is like the other floral parts). *Orchidàceæ.* Epiphytic herbs, densely cespitose: sepals and petals somewhat similar, narrow, free; labellum narrow, with a long sigmoid-flexuous claw; column slender, broad-winged above; pollinia 4, almost without appendages.—About 4 species in the Himalayas and Assam. *P. tricallòsa,* Rolfe, having pale translucent yellowish green fls.; with 3 yellow calli on the disk tipped with brown, has been grown in botanic gardens. Assam.

PANSY. A favorite garden perennial, commonly grown as an annual; prized for the beauty and individuality of its flowers. The pansy is everywhere a familiar flower. There is much character in it. The flower is often likened to a face. It appeals to personal feeling. In fact, the word pansy is only a corruption of the French *pensee,* meaning thought. The old folk-name, heartsease, is also associated with the familiar place which the plant has occupied; it signifies remembrance. The pansy is one of the oldest of garden flowers. Parkinson mentions it as a flower-garden subject in 1629. When critical study began to be given to the kinds of plants, the pansy was so distinct from wild species that its specific indentity could not be determined with precision, and, in fact, this is the case to the present day. It is generally considered, however, that it has descended from *Viola tricolor* (see *Viola*), a small perennial violet native to the cooler parts of Europe. In its nearly normal or unimproved forms, *Viola tricolor* is now grown in gardens. (Fig. 2748.) It is a most interesting plant, because handsome-flowered and variable. The flowers of this violet usually have three colors or shades, mostly blue, whitish and yellow, but in the different varieties one of the colors strongly predominates. A form with very small and inconspicuous flowers (var. *arvensis*) has run wild in many parts of the country.

Pansies are perennial, but they are grown practically as winter or spring annuals. Commercial growers sow the seeds in fall, and sell great quantities of the seedling plants before winter sets in. These plants are flowered in frames or cold greenhouses, or they are planted in the open for spring bloom. Plants are also started indoors in late winter for spring bloom. Pansies delight in cool, moist weather; hence the American summer is not to their liking, and they often perish. A new stock of plants is started every year.

The modern improved pansies run in strains or families rather than in definite varieties. These strains are maintained at a high grade by the best cultivation and the closest attention to selection. The seed of the best strains is necessarily expensive, for it represents much human care. The stock usually runs down quickly in other hands. It should be renewed from the seed-breeder each year if the best results are to be maintained. These fancy and high-bred strains require extra care in the growing. Most of the best strains are of European origin. They are usually known by the name of the breeder. The chief points of merit in the high-bred pansy are size of flower, brilliancy of coloring, arrangement of colors. The flowers may be self-colored (of only one color) or parti-colored. The parti-colored flowers are of three general types: two banner petals and three central petals of different colors; petals all margined with lighter color; petals all striped. There are all grades of intermediate differences. The colors which are now found in pansies are pure white, purple-black, pure yellow, different shades of blue, purple, violet, red-purple. Pansy flowers are now grown 3 inches across. (Fig. 2749.)

With the above account may be compared Gerard's description of pansies in 1587. He pictures the hearts-ease or *Viola tricolor* with small violet-like flowers, the petals standing apart from each other. The "upright heartsease," or *Viola assurgens tricolor,* is represented as a stouter and more erect plant, with rounder but scarcely larger flowers. These are described as follows:

"The Hearts-ease or Pansie hath many round leaves at the first comming up; afterward they grow somewhat longer, sleightly cut about the edges, trailing or creeping upon the ground: the stalks are weake and tender, whereupon grow floures in form & figure like the Violet, and for the most part of the same bignesse, of three sundry colours, whereof it tooke the syrname *Tricolor*, that is to say, purple, yellow, and white or blew; by reason of the beauty and braverie of which colours they are very pleasing to the eye, for smel they have little or none at all. The seed is contained in little knaps of the bignesse of a Tare, which come forth after the floures be fallen, and do open of themselves when the seed is ripe. The root is nothing else but as it were a bundle of threddy strings.

2748. Viola tricolor. Nearly or quite the original form of pansy.

"The upright Pansie bringeth forth long leaves deeply cut in the edges, sharp-pointed, of a bleake or pale green colour, set upon slender upright stalks, cornered, jointed, or kneed a foot high or higher; whereupon grow very faire floures of three colours, viz., of purple, blew, and yellow, in shape like the common Hearts-ease, but greater and fairer; which colours are so excellently and orderly placed, that they bring great delight to the beholders, though they have little or no smell at all: for oftentimes it hapneth that the uppermost floures are differing from those that grow upon the middle of the plant, and those vary from the lowermost, as Nature list to dally with things of such beauty."

L. H. B.

Cultivation of pansies.

There are few plants more popular than the pansy. Every year the demand for the plants is greater. This flower has been cultivated for so long that its source is a matter of uncertainty. As seen at the present day, it is an artificial production, differing considerably from any known wild plant.

Pansies were probably first improved from the original type in Great Britain, where the cool and moist climate is well adapted to their cultivation, and new varieties gradually appeared with larger flowers, of varied colors. For many years, England and Scotland bore the reputation of growing the best pansies. About forty years ago, three French specialists, Bugnot of St. Brieuc, and Cassier and Trimardeau of Paris, made immense strides in developing the pansy, and their productions were a revelation to the horticultural world. Such sizes and colors were previously thought impossible. Trimardeau developed a new race with immense flowers and very hardy constitution. His strain, crossed with those of Cassier and Bugnot, has given a pansy which is superseding the older English varieties. At the present day, Germany and France lead in introducing new varieties.

It is customary at the present day to make a careful selection of seedlings for new varieties, also to propagate by the means of cuttings. The specialists are devoting much time to the improvement of the various types and strains. The flowers are being steadily improved in all points by which pansies are judged,—size, color, substance and form. Nearly all of the beautiful colors are to be found among the giant types, and the care that is being taken in the selection of colors makes it reasonably sure that, when the choicest seed is obtained, a large percentage of the plants will come true to color. The season of blossoming has been extended, the new early-flowering strains blooming five or six weeks earlier in the spring than the old varieties.

There are many beautiful varieties of pansies and it is difficult to make a selection, but the most popular for both amateur and commercial growers are the giant flowers of the Trimardeau type, the Cassier superb strain of blotched pansies, and the Bugnots. One of the newer strains is the "Masterpiece," a very large flower with curled or ruffled petals, which are so undulated and curled that many of its blossoms appear to be double. The new upright giant five-blotched pansy called the "Princess" by Ernest Benary is entirely distinct from all other pansy strains in its great compactness, its upright growth and its hardiness. Two other types which should be mentioned are the "Orchid Flowered," whose delicate orchid colors do not exist in any other strain; and the "New Early Flowering Giant" pansy, which blossoms in early March.

It is conceded by European pansy specialists who have visited the United States that the American pansy seed planted on the American soil, will produce larger and finer flowers than the foreign-grown seed of the same strain planted on the same soil.

Pansies degenerate very quickly; therefore it is very important to procure fresh seed every year from a specialist.

The four characteristics of the pansy required by the four leading pansy-growing people are as follows:

Germany: Color, substance, form, size.
Great Britain: Form, color, substance, size.
France: Substance, size, color, form.
America: Size, color, substance, form.

The success of growing a crop of pansies depends largely on having good fresh seed and on how the seedbed is treated the first six to twelve days; for if pansy seed becomes dry after once sprouting, it is dead; and if kept too close, it will damp-off.

A coldframe is a good place in which to sow the seeds if the boards are not full of fungus; or a box 9

2749. Modern pansies. (Nearly ½ natural size)

inches to a foot high might be made on fresh ground that is a little sandy and was well manured for a previous crop; dig and make the soil fine and water it well before sowing the seeds. Sow in drills 3 inches apart and $\frac{1}{16}$ inch deep. One ounce of seed will sow about 300 to 350 feet of drill, or 90 feet if sown broadcast. Cover the seed $\frac{1}{16}$ inch deep with fresh sand or sandy soil, pat down or roll well and give a light watering. The surface should be dusted with sulfur or grape dust to keep the damping-off fungus from starting. Cover with boards, leaving space for ventilation; or they can be covered with moss, hay, or straw, being sure to remove the covering as soon as the seed is sprouted. Pansy seed will not sprout well if kept above 75°. After sprouting and until they have the second leaves, it is a good plan to cover them with the thinnest muslin, tacked on frames. Sashes may be used if well shaded and well ventilated.

To secure the best results, pansy seed should be sown from July 10 to August 25. If plants for cut-flowers are wanted, sow the seed the first part of July. The best plants for wintering over in the field for spring sales are from seeds sown from July 10 to 20 in the northeastern states. Five or six weeks after sowing the seeds, the plants are usually large enough to be transplanted in the field, in good rich ground. The soil can hardly be made too rich, and should be in raised beds so the water will not stand on them in the winter. Plant 7 or 8 inches apart each way. If a coldframe is used, from 50 to 250 plants can be set under a 3- by 6-foot sash. If pansy plants are transplanted the first time into the place where they are wanted to grow, they will have larger flowers; for every time the roots of a pansy are disturbed, the flowers will be smaller. Just enough mulch should be applied to hide the plants from view after the ground is frozen. This mulch is taken off as soon as the frost is out of the ground in the spring.

There are from 25,000 to 28,000 seeds in one ounce of pansy seed. Growers usually allow one ounce of seed for 4,000 plants. With good fresh seed and great care, 7,000 to 8,000 plants should be obtained from one ounce of seed. For commercial purposes, pansy seed should be planted in July and August, but at this time of the year, it is too hot for the seeds to grow well. Seeds planted in the fall or early spring will give double the number of plants and require less care.

If pansies for winter blooming are desired, transplant as soon as the plants are large enough to the beds or benches in the greenhouses. They will need about the same temperature as for violets, 40° to 45° at night, and 60° in the daytime in bright weather.

Pansies are now being grown very extensively for cut-flowers in this country.

If wanted for exhibition purposes, keep the pansy plants in a low temperature till January; some freezing, even, will benefit them. Start them slowly into growth at a temperature between 30° to 40° at night, as a higher temperature will diminish the size of the flowers. A weak solution of guano or hen-manure once every two weeks will help them wonderfully. During growth and bloom, maintain a rather low, even temperature, without actual freezing, carefully avoiding extremes in temperature.

In favored localities pansies designed for early spring bloom receive no glass protection during winter, the plants from the August sowing being transplanted in the fall from the seed-bed directly into their permanent quarters. Good pansies can be grown out-of-doors without glass protection as far north as Nova Scotia. Generally, however, it is much better to winter pansies in a coldframe, especially the finer strains. Pansies in bloom should be partially shaded from the hot midday sun, particularly the fancy-colored strains, the petals of which are more delicate in texture.

CHARLES FROST.†

PAPÀVER (old Latin name, from the Greek, of dubious derivation). *Papaveràceæ*. POPPY. Well-known flower-garden plants, of brilliant but short-lived bloom.

Herbs or rarely subshrubs, annual, biennial and perennial, with milky juice, bristly or smooth and often glaucous: lvs. usually lobed or dissected in a pinnate way: peduncles long, single-fld., the bud usually nodding: fls. red, violet, yellôw and white; sepals 2; petals usually 1; stamens numerous: ovary and caps. globose, obovate or top-shaped, dehiscing under the vertex by transverse pores between the placentæ, the openings very small and valve-like; this vertex or flattened sometimes conical top or cap represents the combined radiate stigmas; placentæ 4–20, projecting into the center.—Species more than 100, largely in the Medit. region, and the Armenian-Persian region and somewhat eastward, with one in the southern hemisphere; Fedde accepted 99 species in 1909 in Engler's Das Pflanzenreich, hft. 40 (iv:104) together with many botanical varieties and hybrids. Two or three species are indigenous in W. N. Amer. Opium is made from the milky juice of *P. somniferum*, which oozes from shallow cuts made in the young capsules. The seeds have no narcotic properties and are sold for bird food under the name of "maw seed." They also produce a valuable oil.

2750. Shirley poppy.—One of the forms of Papaver Rhœas.

Poppies rank among the most popular flowers in cultivation. From their astonishing range of color, and from the formidable list of names given below, one might suppose their botany to be very complicated. It is, however, easy to understand, although the variation in some of the species is very great. There are only four species commonly cultivated and these are all remarkably distinct. They are (1) the opium poppy, (2) the corn poppy, (3) the Iceland poppy, and (4) the oriental poppy.

1. The opium poppy, *P. somniferum*, is one of the commonest and the most variable. It is annual, of tall stately habit, and recognized at once by the glaucous hue of its foliage. The flowers are the largest of any of the annual species, but unfortunately they are useless as cut-flowers because they drop their petals so quickly.

2. The corn poppy of Europe, *P. Rhœas*, is also an annual, but a dwarfer plant, with green hairy finely

cut foliage and smaller flowers. It is brilliant in the fields of Europe, and it has run wild in this country. The Shirley poppies are the best strain of this species; in gardens the flowers last longer than the common *P. Rhœas* and the plants are neater when out of bloom.

3. The Iceland poppy, *P. nudicaule*, is the glory of the arctic regions. It ranges over an immense territory and varies remarkably both in the wild and the garden. Orange, red, and white are the chief colors, besides shades of yellow, but the flowers never attain the brilliant scarlet of the corn poppy. Although the Iceland poppy is perennial, it is short-lived, and is commonly treated as an annual or as a short-lived perennial. It is known for the satiny texture and crimpled character of its petals. The flowers are excellent for cutting, especially if the young flowers are chosen and cut in the early morning, a principle which applies to many flowers often supposed to be useless for home decoration.

4. The oriental poppy, *P. orientale*, is a longer-lived perennial, and although it has the largest flowers of any species in the genus it has nothing like the fame of the opium poppy. However, it has the double advantage of being easily propagated by either seed or division, and it has a considerable range of color, which is said to be largely due to crosses with *P. bracteatum*. The latter differs in having large bracts below the flower.

The other species of poppy are for the fancier. The alpine poppy, *P. alpinum*, was considered by Linnæus to be a distinct species from the Iceland poppy. However, gradations occur between the typical form of *P. nudicaule* of the arctic regions and the poppy found in the Alps. The former has a yellow flower, while the common alpine poppy is white. The alpine poppy is by some regarded as an extreme form of *P. nudicaule*, characterized by a dwarfer habit and more finely divided foliage. For horticultural purposes *P. nudicaule* and *P. alpinum* should be considered to be distinct species, as many botanists indeed consider them to be. The Iceland poppy can be easily grown in the border, while the alpine poppy demands rock-garden treatment. The former does best in a moderately rich and light loam, while the latter does better in a rather poor soil. Both need full exposure to the sun, and *P. alpinum* probably needs better drainage. See No. 20, p. 2459.

The Shirley poppies are now the prevailing forms of *P. Rhœas*. The following history of the remarkable race is given by the Rev. W. Wilks in "The Garden," 57, page 385: "In 1880 I noticed in a waste corner of my garden abutting on the fields a patch of the common wild field poppy (*Papaver Rhœas*), one solitary flower of which had a very narrow edge of white. This one flower I marked and saved the seed of it alone. Next year, out of perhaps two hundred plants I had four or five on which all the flowers were edged. The best of these were marked and the seed saved, and so for several years, the flowers all the while getting a larger infusion of white to tone down the red until they arrived at quite pale pink and one plant absolutely pure white. I then set myself to change the black central portions of the flowers from black to yellow or white, and having at last fixed a strain with petals varying in color from the brightest scarlet to pure white, with all shades of pink between and all varieties of flakes and edged flowers also, but all having yellow or white stamens, anthers and pollen, and a white base." . . . Mr. Wilks then distributed it freely to all. "My ideal," he continues, "is to get a yellow *P. Rhœas*, and I have already obtained many distinct shades of salmon. The Shirley poppies have thus been obtained simply by selection and elimination. . . . Let it be noticed that true Shirley poppies (1) are single, (2) always have a white base with (3) yellow or white stamens, anthers and pollen, (4) never have the smallest particle of black about them. Double poppies and poppies with black centers may be greatly admired by some, but they are not Shirley poppies. It is rather interesting to reflect that the gardens of the whole world—rich man's and poor man's alike—are today furnished with poppies which are the direct descendants of one single capsule of seed raised in the garden of the Shirley Vicarage so lately as August, 1880."

Hybrids between different species of Papaver are described in the monographs, but they do not appear to have given leading forms for cultivation. Hybrids have been produced between the annual and perennial species. Between the different garden varieties, crossing probably goes on continuously, and new strains are constantly arising.

For garden purposes most poppies are to be treated as annuals for best results, with the exception of *P. orientale* and *P. bracteatum*, which the gardener thinks of as one group. The oriental poppy is, in fact, the only common long-lived perennial poppy. The Iceland poppy may live for several years, but after the third year it usually degenerates. It blooms the first year from seed and the best results are usually secured the second year. The cultivation of poppies is very simple, except of course in the case of alpine species, for which special conditions must be provided. Seeds usually germinate readily, but as the young plants of the annual kinds do not transplant well, the seeds should be sown where the plants are to remain. In the Shirley and similar poppies, the plants may be thinned to stand 4 to 6 inches apart. For especially large and fine blooms, the plants should be given at least twice more room. A succession in sowings will provide a greatly extended season of bloom; removing the seed-pods will also extend the blooming-time. Open warm soil in a sunny exposure is preferred for poppies.

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A. *Plant prickly: caps. glabrous.*

1. **aculeàtum,** Thunb. (*P. gariépinum*, Burch. *P. hórridum*, DC.). Annual, 1–4 ft. high, the st. nearly simple: st. branched, densely covered with spreading, rigid, unequal bristles: lvs. green, sinuately pinnatifid, the laciniations spine-tipped: fls. scarcely 2 in. across; petals scarlet-orange, unspotted: caps. glabrous, oblong-obovate. S. Afr., Austral. B.M. 3623.—The only poppy known to inhabit the southern hemisphere. Annual in S. Afr., but said to be biennial in northern botanic gardens.

AA. *Plant pilose or setulose (not prickly), sometimes glabrous.*

B. *Species usually annual or biennial (Nos. 1–12).*

C. *Herbage setulose (or perhaps glabrous in No. 2 and in forms of No. 4) green or glaucous: foliage always incised or pinnatifid, the st.-lvs. not clasping.*

D. *St. elongated and leafy.*

E. *Caps. usually glabrous.*

F. *Shape of caps. club-shaped to top-shaped.*

2. **californicum,** Gray. Annual, sparsely pilose-pubescent to glabrous, 1–2 ft. high: lvs. pinnately parted or

divided into toothed or 3-lobed or entire segms.: fls. 2 in. across; petals brick-red, with a green spot at the base bordered with rose-red: caps. between club- and top-shaped, flat on top, the disk 6–11-nerved. Santa Inez Mountains and southward in Calif.; also Mt. Tamalpais (near San Francisco).

FF. *Shape of caps. mostly obovate or oblong.*

3. **arenàrium,** Bieb. Annual, 12–20 in. high, from a perpendicular root, erect, sparingly beset with bristles which are spreading on the st. and appressed on the foliage: lvs. twice pinnatisect into minute linear or linear-oblong segms.: bud obovoid or narrow-obovoid: fls. purple, with a dark spot at the base of each petal; filaments not dilated: caps. obovate to oblong or top-shaped, with a convex disk; stigmatic rays 7–9. Sandy places in Caucasus and Caspian region.

4. **dùbium,** Linn. Erect usually robust annual, hirsute, 1–2 ft. high, branched, few-fld.: lvs. glaucescent, more or less appressed setulose or often nearly glabrous above, the lower ones pinnatifid or nearly so with the segms. pinnately cut and lobes ovate or roundish or sometimes much narrower; st.-lvs. usually pinnatifid with narrow acute lobes: peduncle long; fls. pale rose, vermilion or seldom white, mostly darker in center; petals suborbicular, nearly 1 in. long; anthers violet and filaments red: caps. glabrous, obovate-oblong or oblong-clavate. Eu., N. Afr.; run wild in parts of N. Amer. Very variable, and probably little known in gardens. Var. **lævigàtum,** Elk. (*P. lævigàtum,* Bieb.). Glabrous or with a few small bristles: fls. purple, usually spotted; petals small, obovate: caps. narrowly top-shaped or club-shaped; stigmatic rays 8–10. Medit. to extratropical Himalaya.—It is doubtful whether the plant sold under this name is true, for in G.C. III. 5:21 it is shown with large, roundish, overlapping petals.

FFF. *Shape of caps. globose.*

5. **Rhœas,** Linn. Corn Poppy. Fig. 2750. Hispid annual, or rarely glabrescent, erect and branching, 1 to about 3 ft.: lvs. coarsely toothed (rarely nearly entire) to more or less pinnatifid, lanceolate in outline: bud oblong-ovoid, roundish at apex: petals orbicular or nearly so, entire or sometimes crenate or incised, cinnabar-red, deep purple to scarlet, white and variously marginate, sometimes dark-spotted, the fls. 2 in. or more across; stigmatic disk usually 10-radiate, but varying from 5–18. Eu. and Asia; run wild in N. Amer. Abundant in fields in Eu. Gn. 30, p. 297.—An immensely variable species, from 25–30 botanical varieties and subvarieties being recognized; and the cultural variations are numberless. In cult. every shade known to the opium poppy has been reproduced in the corn poppy, but the fls. are always smaller. In the wild it varies greatly, the foliage once or twice pinnately parted, the bristles many or few, appressed or spreading, the fls. spotted or not. Up to 1886 the French poppies were considered the best strain. Since then the strain or race known as Shirley poppies has surpassed all others. This strain was developed by the Rev. W. Wilks, secretary of the Royal Horticultural Society. (See p. 2456.) Var. **ranunculiflòrum,** Hort., is a strain with double fls. in various colors, self and variegated, with the petals entire, rounded and somewhat reflexed. Var. **japónicum,** Hort., is a strain intro. about 1893 from Japanese gardens, and said to have smaller and fuller fls. than ordinary and of more varied shades. They are called Japanese or Japanese pompons. Rhœas was the name used by the ancient Greeks and Romans for the corn poppy.

Var. **umbròsum,** Mott. (*P. umbròsum,* Hort.), has petals of a darker red than the typical *P. Rhœas,* and blackish spots. It was intro. by Vilmorin about 1891, and was considered a marked gain in productiveness. The habit is dwarf, compact, much branched. Soon after a double form was distributed. Mottet considers it a form of *P. Rhœas,* but some botanists consider it a form of *P. commutatum,* a species apparently not otherwise in garden cult. *P. umbrosum* was found growing wild in Attica.

Var. **Hoòkeri,** W. Miller (*P. Hoòkeri,* Baker). A puzzling plant found in gardens of India, and of unknown parentage. It is nearest to *P. Rhœas,* and "differs in its great size, for it forms a bushy herb 4 ft. high and upward, and in the great number of the stigmatic rays, which are 12–20, i. e., nearly double those of *P. Rhœas;* the fls., caps. and seeds also are much larger and the stigma broader in proportion." The fls. attain 3½ in. diam., and vary from pale rose to bright crimson, with a white or black spot at the base. B.M. 6729. Gn. 29, p. 139. G.C. II. 25:9.—Said to revert occasionally to *P. Rhœas.*

The flower-garden forms of *P. Rhœas* give remarkable color effects. Probably no plant so quickly and cheaply satisfies one's love of color.

2751. Poppies in the year 1613. Five flowers from "Hortus Eystettensis" (redrawn and reduced, indicating the antiquity of some of the main types that are popular today). P. somniferum.

The season of bloom, which is mostly July in the N., is rather short, but it may be considerably extended by successional sowings and by not allowing the plants to seed. Begin to sow as early

as the land can be put in condition. Cover lightly, or the germination may be unsatisfactory. Thin to 6–12 in. apart. Self-sown seeds give earlier-blooming plants.

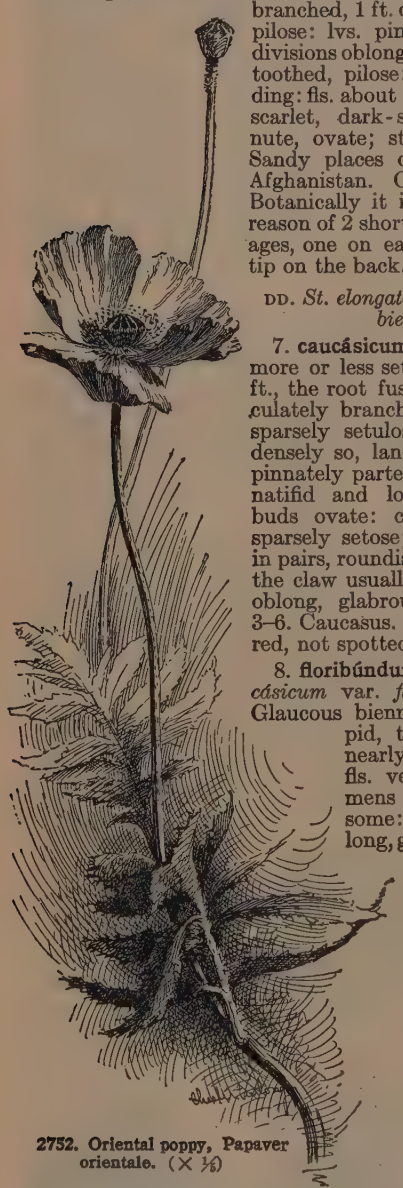
EE. *Caps. more or less setulose.*

6. pavonìnum, Fisch. & Mey. (*P. pavònium,* Stschegl.). PEACOCK POPPY. Annual, more or less branched, 1 ft. or less high, hispid-pilose: lvs. pinnately parted, the divisions oblong-linear and incised-toothed, pilose: bud ovoid, nodding: fls. about 1 in. across; petals scarlet, dark-spotted: caps. minute, ovate; stigmatic rays 4–7. Sandy places of Turkestan and Afghanistan. G.C. II. 26:329.—Botanically it is very distinct by reason of 2 short horn-like appendages, one on each sepal near the tip on the back.

DD. *St. elongated, sparsely leafy: biennial.*

7. caucásicum, Bieb. Biennial, more or less setose, glaucous, 1–2 ft., the root fusiform, erect, paniculately branched: lvs. glaucous, sparsely setulose or the petiole densely so, lanceolate in outline, pinnately parted, the segms. pinnatifid and lobes ovate-oblong: buds ovate: calyx glabrous or sparsely setose; petals somewhat in pairs, roundish, pale scarlet and the claw usually yellowish: caps. oblong, glabrous; stigmatic rays 3–6. Caucasus. B.M. 1675 (brick-red, not spotted).

8. floribúndum, Desf. (*P. caucásicum* var. *floribúndum,* Elk.). Glaucous biennial, yellowish, hispid, the segms. of lvs. nearly entire or dentate: fls. vermilion, the stamens ochroleucus, handsome: caps. mostly oblong, glabrous. Caucasus region. B.R. 134.



2752. Oriental poppy, Papaver orientale. (× ⅙)

9. pérsicum, Lindl. Biennial, setose-hispid, 1–2 ft., paniculately branched, st. pyramidate: lvs. glaucous, oblong-lanceolate in outline, pinnately parted, the segms. oblong-lanceolate and entire or dentate: buds oblong; calyx setose; petals overlapping at the margin, deep red or brick-red, green-spotted at base: caps. large and broad, densely hispid; stigmatic rays 5–6. Persia. B.R. 1570 (petals brick-red, with or without a white spot at the base).—This has been, and may still be, confused in the trade with *P. caucasicum.*

CC. *Herbage mostly glabrous (or very sparingly setulose), glaucous, the st.-lvs. clasping and nearly entire or incised-dentate.*

10. somnìferum, Linn. (*P. opiìferum,* Forsk. *P. nìgrum,* Crantz). OPIUM POPPY. Fig. 2751. Robust, glaucous and glabrous annual, 3–4 ft. high, with fls. 4–5 in. across, much larger than those of any annual kind: lvs. oblong, unequally toothed at the base; st.-lvs. cordate at the base, sinuate-repand to dentate-serrate, very glaucous, clasping: fl.-bud ovoid-oblong, somewhat obtuse at apex, glabrous; petals orbiculate, entire, undulate or cut, from white through pink and red to purple, but not yellow or blue: caps. globose, glabrous, with a flat 8–12-lobed disk. Greece, Orient. Gn. 9, p. 197; 59, p. 127. Gt. 40, p. 609; 44, p. 593. R.H. 1893, p. 349. S.H. 2:272. G. 3:125 (as var. *nigrum*).—Sparingly run wild in N. Amer. Very variable in color of seeds, characters of caps., and form and color of petals. Var. **álbum,** DC. (*P. officinàle,* Gmel.), has fls. and seeds white: caps. ovate-globose.

Among the double horticultural forms of *P. somniferum* are two main strains or types, the carnation-fld. and the peony-fld. (the latter *P. pæoniæflòrum,* Hort.). The former has fringed petals; the latter not. Both include a wide range of color, and even a yellow form has been advertised, but this form is of doubtful authenticity. *P. Murséllii* is another strain of double fringed kinds, of which Mikado is a favorite. *P. fimbriàtum* is another trade name for double fringed varieties. *P. cardinàle* is the French name of another strain of double fringed fls. Chinese poppies are a double-fld. race intro. from Chinese gardens early in 1890, and comprising dwarfer strains than previously known. R.H. 1893, p. 349. An exceptionally interesting monstrosity has occurred in which there are no petals, and the stamens are supposed to be transformed into pistils which actually ripen seed. It was figured as long ago as 1851 in F.S. 6, p. 242, and again in R.H. 1893, p. 349. It seems to be no longer advertised, but it was considered to be constant.

Among the single varieties, Danebrog is one of the most striking and popular. The white spots at the base of the petals form a cross. This variety is also known as Danish Cross, Danish Flag and Victorian Cross. Of the pure white kinds, Flag of Truce and The Bride are favorites. Mephisto is scarlet, spotted black. About a dozen other varieties are advertised by name.

11. setígerum, DC. (*P. somníferum* var. *setígerum,* Elk.). Differs from *P. somniferum* in having deeply incised lvs. and 7–8 stigma-lobes, the petals violet, the plant more setulose in parts: stigma-lobes 7–8.—*P. setigerum* is apparently no longer advertised, but according to Nicholson numerous fine strains have originated from it. It is usually considered a hairy form of *P. somniferum.* It is a violet-fld. plant native to the Medit. region.

12. glaûcum, Boiss. & Hausskn. (*P. somníferum* var. *glaùcum,* O. Kuntze). TULIP POPPY. Annual (sometimes perennial?), glaucous and glabrous except a few small, appressed bristles along the peduncles, branched at the base: st.-lvs. broadly cordate at the base, pinnately lobed or parted; the lobes triangular, dentate; the teeth obtuse, callous, muticous: bud ovoid, somewhat attenuate at top; petals large, scarlet, spotted at the base: caps. ovate, stalked; stigmatic rays about 12. Syria to Persia. Gt. 40, p. 608, repeated in G.C. III. 10:527, R.B. 20, p. 58, S.H. 2:467 and V. 15:37. R.H. 1892, p. 463; 1893, p. 350.—The plant sold under this name reminds one immediately of a tulip because of the color and texture of the fls., but especially because of its cuplike shape. The 2 inner petals are smaller, erect, and make a loose cup. The plants grow about 12–18 in. high and produce 50–60 large fls.

BB. *Species perennial.*

C. *Sts. elongated, more or less leafy: caps. glabrous.*

D. *Branching dichotomous or corymbose.*

E. *Fls. racemose.*

13. pilòsum, Sibth. & Smith (*P. olýmpicum,* Sibth. & Smith). Perennial: sts. tall and pilose, freely branched: lvs. covered with velvety, appressed hairs;

st.-lvs. clasping, broadly oblong, lobed and serrate; radical lvs. oblong, long-petioled: fls. 2 in. across, brick-red and showy, corymbose-racemose; petals roundish, repand: caps. glabrous, oblong-club-shaped; stigmatic rays 6–7. Rocky alpine heights of Mt. Olympus in Bithynia. B.M. 4749. Gt. 1:322. Gn. 41, p. 277; 42, p. 585.

EE. *Fls. solitary, or in 2's or 3's.*

14. **atlánticum,** Ball (*P. rupífragum* var. *atlánticum,* Ball). Perennial: hoary and everywhere covered with copious spreading hairs except the glabrous caps.: height 1–2 ft., from a thick woody root, the sts. scape-like: lvs. oblanceolate, coarsely and irregularly crenate-serrate or pinnatifid, the segms. entire or crenate-serrate; st.-lvs. smaller and sessile: bud broadly ovate, hispid, nodding: fls. 2–3 in. across; petals orange-red or scarlet; stigmatic rays 6–8: caps. club-shaped. Morocco, 6,000–7,000 ft. B.M. 7107.

15. **rupífragum,** Boiss. & Reut. Perennial, cespitose and many stemmed: lvs. mostly radical, oblong-lanceolate in outline, pinnatisect with rounded sinuses, the segms. irregularly oblong or lanceolate and dentate or nearly entire, glabrous or pilose on the nerves, but the scape-like sts. sparsely hispid; st.-lvs. smaller and narrower: bud broadly ovoid, glabrous, nodding: fls. 5–6 in. diam., pale red: caps. oblong-clavate, glabrous, the disk 8-rayed. Spain. Gt. 2, p. 66.

DD. *Branching slight, the sts. mostly peduncle-like although bearing lvs.*

16. **orientàle,** Linn. ORIENTAL POPPY. Figs. 2752, 2753. Plants grow 3–4 ft. high, perennial, stiff-hairy, and bear fls. sometimes 6 in. or more across: lvs. hispid, pinnately parted; lobes oblong-lanceolate, the upper lobes coarsely serrate and the lower incise-dentate: petals sometimes 6, obovate, narrowed below, scarlet with blackish base: caps. obovate, with a flat disk; stigmatic rays 13–15. Medit. region to Persia. B.M. 57. Gn. 24, p. 459; 42:584. Gn. M. 5:16. V. 12:33.—A popular perennial, now in many forms. The petals are originally apparently scarlet with a black spot. It was not until late in the 80's of the past century that this species made a decided break in color. A considerable class of hybrids with *P. bracteatum* has arisen which extends the color range through several shades of red to orange, salmon, and pale pink. Some are unspotted, some are adapted to cutting, and doubling has made some progress. Among the Latin names of varieties belonging to this class are **grandiflòrum, hýbridum, immaculàtum, nànum, splèndens, Pàrkmanii, plènum, semi-plènum,** and **Sintenísii.** Several have received common or personal names. Possibly some of these names belong rather with *P. bracteatum.*—Oriental poppies are better divided after blooming, in late July, or Aug., when they are dormant; but the roots should not be disturbed if the best bloom is expected the following season. They always grow in the autumn, and these divided plants would start away and make good growth. If divided in spring, they would not recover in time to bloom. Any extra-good variety may be increased largely by cutting the roots into short pieces. This also is best accomplished in summer. No plant is more brilliant in late spring or early summer than the oriental poppy, with its large fls., silken petals and flaming colors, although its season of bloom is short.

17. **bracteàtum,** Lindl. (*P. orientàle* var. *bracteàtum,* Ledeb.). Differs from the preceding in having large leafy bracts below the fl.: perennial, erect, setose: radical lvs. pinnate-parted, the upper ones incised, segms. lanceolate or oblong: petals sometimes 6, obovate attenuate to base, blood-red and not spotted or the claw dark violet: stigmatic disk 16–18-radiate. Medit. region to Persia. B.R. 658. G.C. 1860:647.—A variety with petals more or less united into one was mentioned in 1862–5 in F.S. 15, p. 186.

CC. *Sts. very short, so that the plant is practically acaulescent, the fls. solitary on scapes.*

D. *Scapes very short, usually not exceeding 4 in. but sometimes twice that height.*

18. **pyrenàicum,** Kern. Low and cespitose perennial, nearly stemless: lvs. green, all radical and petiolate, appressed pilose or setose (sometimes nearly glabrous), pinnately parted, the segms. ovate, ovate-lanceolate, entire, or seldom pinnatifid: scapes 1 or several, usually 2–4 in. high in the wild but sometimes twice that height, the bud ovoid, pilose, nodding: fl. yellow to orange; petals round-obovate, more or less erose, nearly 1 in. or less long: caps. oblong or obovoid, strongly ribbed. Pyrenees, Alps, Apennines.

19. **alpìnum,** Linn. ALPINE POPPY. Low and cespitose perennial, nearly stemless: lvs. glaucous, all radical and petiolate, glabrous or nearly so, 2–3-pinnately parted, the ultimate segms. linear or linear-lanceolate:

2753. Papaver orientale, the most popular perennial poppy.

scapes single or several, the bud ovoid or round-obovoid, usually pilose, nodding; fls. white, fragrant; petals round-obovate, erose, nearly 1 in. long or less: caps. oblong to obovate, strongly ribbed. Alps, Apennines.—The following garden varieties have been offered as of this species, but some of them are probably *P. pyrenaicum:* **albiflòrum, álbum, aurantìacum, flaviflòrum, flàvum, ròseum** and **rùbrum.** *P. lùteum,* Hort., belongs here, but *P. luteum* of the botanists is the Welsh poppy, *Meconopsis cambrica.*

DD. *Scapes longer, particularly in cult.*

20. **nudicaùle,** Linn. ICELAND POPPY. Fig. 2754. Mostly a yellow-fld. arctic perennial, more robust than the two preceding, cespitose, nearly stemless: lvs. all radical and petiolate, somewhat glaucous, glabrous or hairy, pinnatifid, the segms. oblong and entire or lobed: scapes single or several, usually 1 ft. high, the bud ovoid or nearly globose, pilose, usually nodding; fls. 1–2 in. diam., sweet-scented; petals obovate and sinuate, white with yellow base or yellow with greenish base, the 2 inner ones smaller: caps. oblong or obovate-glo-

bose, hispid or rarely glabrous. Arctic regions. E. and W. hemispheres.—The species runs into very many botanical forms. In America a form or similar species is found as far south as S. Colo. Gn. 26:380; 24, p. 342; 28, p. 58; 42, p. 584; 79, p. 42. G. 6:321; 7:66. V. 13:297. B.M. 1633; 3035, and R.H. 1890:60 (*P. croceum*). F. S. 10:1017 (as var. *croceum*). The following varieties are in the trade: **álbum, aurantîacum, coccíneum, cròceum, striàtum,** and **sulphùreum.** Double forms in the various colors are advertised. Older names which are likely to appear are vars. **lùteum, puníceum,** and **rùbro-aurantîacum.** B.M. 2344. The name "nudicaule" refers to the lack of lvs. on the scape, which distinguishes this and the alpine poppy from the common corn poppy of Eu. *P. greenlándicum*, Hort., is possibly a catalogue name for *P. nudicaule*. The Iceland poppy is a favorite for spring bloom. It is a hardy perennial, but blooms the first year from seed. It has neat evergreen foliage on the ground.

2754. Iceland poppy, Papaver nudicaule. (×⅓)

The colors have been much varied in the cult. sorts, so that the gardener has choices in pure white, bright yellows, orange, and orange-scarlet. If the seed-pods are continuously removed, the plant will bloom throughout most of the summer. The fls. are very useful for cutting.

P. Heldreichii, Hort.=P. Schinzianum, below.—*P. heterophýllum*, Greene=Meconopsis heterophylla.—*P. Hópkinsii*, Hort. Apparently perennial, and described as a particularly good poppy of medium height with deep scarlet fls. on slender graceful sts. Offered abroad.—*P. Monètii*, Hort. Spontaneous hybrid between P. glaucum and P. Rhœas.—*P. pilòse-bracteàtum* is a garden hybrid, as indicated in the name.—*P. Schinziànum*, Fedde. Probably a garden hybrid between P. rupifragrum and a species allied to P. lateritium, and which has been cult. as P. Heldreichii: fls. brick-red; petals suborbicular-obovate, to 1¼ in. long: caps. obovoid-clavate.

WILHELM MILLER.
L. H. B.†

PAPÀYA (Fig. 2755). The papaya (*Carica Papaya*) is a well-known edible fruit which has spread from its original home in America throughout the tropical world, and is a favorite fruit in many regions. In Hawaii it is said to rank next to the banana in popularity; in nearly all parts of tropical America it is one of the commonest fruits, while early in the seventeenth century it became known in the Orient and is now grown in India, Ceylon, the Malay Archipelago, and many other regions, as well as in tropical Africa and Australia. The name papaya is considered a corruption of the Carib ababai, which in one form or another has been carried around the world; papaia, papeya and papia are some of the various adaptations which are in use. The English name papaw (or pawpaw) is probably derived from the same source, and is widely used; in the United States it has the disadvantage of confusing this fruit with *Asimina triloba*, which is well known in the central and southeastern states under the same name. The Portuguese name, current in Brazil, is mamão (the tree mamoeiro), a word probably referring to the mammiform apex of the fruit; in the French colonies it is called papaye (the plant papayer); in German colonies papaja and papajabaum, or melonenbaum. Several other names are used in tropical America, notably fruta de bomba in Cuba, lechosa in Porto Rico, melon zapote in parts of Mexico, and tree melon in English-speaking countries.

The papaya—a giant herbaceous plant rather than a tree—grows to a height of 25 or 30 feet, and is often likened to a palm in general appearance, though there is, of course, no botanical relationship. The trunk is commonly unbranched, bearing toward its apex large soft deeply-lobed leaves sometimes 2 feet across, upon stiff hollow petioles 2 feet or more in length. The wood is fleshy, the bark smooth, grayish brown, marked by prominent leaf-scars.

The plant is normally dicœcious, and produces its flowers in the uppermost leaf-axils, the staminate ones sessile on pendent racemes 3 feet or more in length, the pistillate ones subsessile and usually solitary or in few-flowered corymbs. The staminate flowers are funnel-shaped, about an inch long, whitish, the corolla five-lobed, with ten stamens in the throat; the pistillate flowers are considerably larger, with five fleshy petals connate toward the base, a large cylindrical or globose superior ovary, and five sessile fan-shaped stigmas.

Beside the typical dicœcious form, in which male and female flowers are confined to separate plants, it is not unusual to find various other distributions of the sexes; these have been studied in Hawaii by Higgins and Holt, who describe (Hawaii Agricultural Experiment Station, Bulletin No. 32) a number of different forms, such as the occurrence of staminate flowers with more or less rudimentary stigmas and ovaries which sometimes give rise to small fruits; a hermaphrodite form, which regularly produces perfect flowers and good fruits; and various other combinations of staminate, pistillate and hermaphrodite flowers on the same and different plants. It will thus be seen that the distribution of the sexes in the papaya is very irregular; it has been reported by some authorities, indeed, that severe pruning or injury to the tree sometimes results in a change of sex, but this has been observed only on staminate trees of the dicœcious type.

Aside from these variations in the distribution of the

sexes, there are marked differences in the size, shape and quality of the fruits produced by different seedlings of the typical dicecious form, and the papayas of certain regions in the tropics are uniformly superior to those of other regions. In Bahia, Brazil, there are two distinct types, one with small nearly spherical fruits not over 6 inches in diameter, and a very superior type called "mamão da India" which produces fruits 18 inches long, cylindrical in form, and of excellent flavor. With the recent discovery of a method of grafting the papaya, which is fully described under Carica (page 663; cf. also Circ. No. 119, Bur. Pl. Ind., U. S. Dept. Agric. 1913), the propagation of superior seedlings has been made possible. In addition, much can be done to improve the quality of the fruit through the selection of seed, but the number of males which arise is usually much greater than is necessary to furnish pollen for the female trees. Through vegetative propagation, it is possible to eliminate all unnecessary males and propagate only a sufficient number to furnish the required pollen—not more than one in ten.

The fruit is commonly spherical or cylindrical in form, round or obscurely five-angled in transverse section, from 3 up to 20 or more inches in length, sometimes weighing twenty pounds or over. In general character it strongly resembles a melon; the skin is thin, smooth on the exterior, orange-yellow to deep orange in color, while the flesh, which is concolorous with the skin, is from 1 to 2 inches thick, and incloses a large sometimes five-angled cavity, to the walls of which are attached the numerous round wrinkled and blackish seeds, the size of small peas, inclosed by a thin gelatinous aril.

The flavor is rather sweet, with a slight musky twang which is sometimes objectionable to the novice, and which varies greatly in amount; the best types are of a bland agreeable taste which is almost sure to be relished, and which makes the papaya one of the most popular breakfast fruits in many tropical countries. In Brazil the flavor is thought to be improved if the fruit is lightly scored when taken from the tree, and then allowed to stand for a day so that the milky juice may run out. While most commonly used, perhaps, as a breakfast fruit, like the muskmelon in northern countries, the papaya can be prepared in numerous ways. In Brazil it is served as a dessert, sliced, with the addition of a little sugar and whipped cream. As a salad, in combination with lettuce, it is excellent. As a crystallized fruit it is good, but it has not very much character. When green it is sometimes boiled and served as a vegetable, much as summer squash is in the North. It can also be made into pickles, preserves, jellies, pies, and sherbets. When used as a breakfast fruit it is cut in halves longitudinally, and after the seeds are removed, served with the addition of lemon juice, salt and pepper, or sugar, according to taste.

In the tropics, papayas are in season during a large part of the year, and the yield is enormous, single trees bearing in the course of their lifetime a hundred or more of their immense fruits. In Florida the season extends from December to June, with occasional fruits ripening at other times. While considered a rather difficult fruit to ship, especially when fully ripe, papayas have been sent from Hawaii to San Francisco and marketed in the cities of the Pacific coast. According to Higgins and Holt, the best method of shipment is to wrap the fruits separately in paper, then encase them in cylinders of corrugated strawboard, and pack them in single-tier crates. They should be picked when they show the first signs of ripeness. Refrigeration during the voyage is important.

The fruit of the papaya, as well as all other parts of the plant, contains a milky juice in which an active principle known as papain is present. This enzyme, which was first separated by Peckholt, greatly resembles animal pepsin in its digestive action, and in recent years has become an article of commerce. Aside from its value as a remedy in dyspepsia and kindred ailments, it has very recently been utilized for the clarification of beer. Its digestive action has long been recognized in the tropics, as evidenced by the common practice of the natives, who rub the juice over meat to make it tender, or wrap a fowl in papaya leaves and let it stand overnight before cooking it.

2755. Fruit of papaya. (×⅓)

The papaya succeeds best in regions with a warm climate and rich loamy but well-drained soil. In south Florida it appears to prefer the richer hammock soils to those of pinelands, but may be very successfully grown on the latter with proper fertilizing. On the Florida Keys, the plant has become thoroughly naturalized, and springs up wherever a clearing is made, the seeds being scattered by birds and other agencies. It withstands but little frost, although it is occasionally possible to fruit it toward the northern part of the state when a mild winter allows it to reach its second summer without injury. In California, the papaya has never been very successful, probably because the nights are too cool to mature the fruit perfectly. It has been noticed in the tropics that fruit ripened in cool weather is poor and somewhat squash-like in flavor. The best locations in southern California are the protected foothill regions, where the ground is sloping and the soil well drained, and where the heat during the summer months is more intense than on the seacoast. An old tree at Hollywood, Los Angeles, bore fruit for several years, but finally succumbed to the cold rains of winter, which often cause the plants to rot off at the base, especially if the drainage is the least bit defective.

In Hawaii the papaya is said to succeed on almost any soil, provided it is well drained. As soon as the plants are well started they like plenty of moisture, and are rank feeders. On the shallow soils of south Florida, organic nitrogen should be abundantly supplied.

The papaya is easily grown from seed, which in Florida should be planted as early as possible,—preferably in January,—in order to have the plants in fruit by the following winter. If seeds are washed and dried after removal from the fruit, and stored in glass bottles, they will retain their viability for several years. A light sandy loam is a good medium for germination, and the seeds should be sown rather thickly about ½ inch deep. They may be potted off when they have made their third leaves, and from pots later set out in the ground. As the stems of young plants are very succulent, care should be taken to avoid damping-off.

For a permanent orchard, the plants should be set not less than 10 feet apart. The papaya is short-lived, and will not usually remain in profitable bearing more than two to four years. That it is of extremely simple culture is proved by the ease with which it becomes naturalized in tropical regions, and the thriftiness of the wild plants.

Two pests have become sufficiently troublesome in south Florida to require attention, one of which, the papaya fruit-fly (*Toxotrypana curvicauda*), threatened at one time to become serious (Cf. Journ. Agr. Research, ii. 447–453, Knab & Yothers). This insect occurs in several parts of tropical America; the female inserts her eggs into the immature papaya by means of a long ovipositor, and the larvæ first feed in the central seed-mass, but later work into the flesh of the fruit, frequently rendering it unfit for human consumption. The only means of control which have been suggested are the destruction of wild plants and infested fruits, and the production of varieties of the papaya with very thick flesh, so that the female will be unable to reach the seed cavity with her ovipositor;—the young larvæ are unable to live in the flesh. A fungous disease, known as papaya leaf-spot (*Pucciniopsis caricæ*) frequently attacks the foliage during the winter season, forming small black masses on the under surfaces of the leaves. It is not very destructive, and easily controlled by spraying with bordeaux mixture. F. W. Popenoe.

PAPÈDA (Malayan name). *Rutàceæ*, tribe *Citreæ*. Under this name Hasskarl in 1842 created a new genus to include a form closely related to if not identical with *Citrus Hystrix*, DC. A number of species of Citrus closely related to *C. Hystrix* have been reported from the Indo-Malayan and western Polynesian regions. As these species are for the most part only imperfectly described, it is doubtful whether they are valid species or forms of one polymorphic species. This group of forms may constitute a subgenus under Citrus, distinguished by having very large broad-winged petioles sometimes equaling or even exceeding in area the lamina, small fls. with free stamens, rough frs. with sour and acrid pulp composed of very short pulp-vesicles, containing oil in the center. *Citrus* (*Papèda*) *Hystrix*, DC., probably includes *Papèda Rumphii*, Hassk. The forms of this subgenus are sometimes used in the Philippines as stocks on which to graft the commonly cult. species of Citrus. The frs. are not edible but are used by the natives of the Malayan and Polynesian islands in lieu of soap for washing the hair.

Walter T. Swingle.

PAPER PLANT: *Cyperus Papyrus* and *Papyrus antiquorum*.

PAPHÍNIA (Paphos, city of Cyprus, sacred to Venus). *Orchidàceæ*. A rare and pretty genus of orchids, having the habit of small lycastes.

Flowers curiously shaped, borne on pendent scapes which are mostly 2-fld.; sepals and petals similar, spreading; mentum obsolete, labellum uppermost in the fl. They may be easily grown with lycastes, and should be planted in fibrous peat and moss. During the growing period they require a liberal supply of water.

cristàta, Lindl. (*Lycáste cristàta*, Nichols.). Pseudobulbs ovate, 1–3-lvd.: lvs. lanceolate, 4–6 in. long: scapes pendent, 1–2-fld.; sepals and petals lanceolate, acuminate, spreading, the latter a little smaller; all streaked above and transversely banded below with deep crimson or chocolate-brown markings on a whitish ground; labellum much smaller, chocolate-purple; the 2 lateral lobes oblong, pointed, half spreading, separated from the middle lobe by a deep constriction; middle lobe triangular-rhomboid, with an erect crest and clavate glands on the disk, and bordered in front by a fringe of clavate hairs. June–Aug. Trinidad. B.M. 4836. B.R. 1811 (as *Maxillaria cristata*). Gn. 78, p. 33.

rugòsa, Reichb. f. Pseudobulbs small, rounded: lvs. small, linear, acuminate: fls. waxy, creamy white, covered with red spots, which run together in blotches. Colombia.

grandiflòra, Rodrig. (*P. grándis*, Reichb. f.). Fls. chocolate-brown, striated on the lower half of the sepals and petals with greenish yellow and cream-color, margins cream; labellum dark purple at the base, with an oblong, cream-colored middle lobe, and a pair of small lobes on each side. Brazil. G.C. III. 14:561.—A curious orchid.

P. Lawrenciàna=Lycaste Lawrenciana(?).

Heinrich Hasselbring.

PAPHIOPÈDILUM (from Paphos, *Paphinia* see, and Latin for *sandal*). *Orchidàceæ*. Terrestrial or epiphytic orchids grown in a warm greenhouse; comprises the glasshouse cypripediums.

Rhizome somewhat creeping: lvs. coriaceous, keeled below, sulcate above, conduplicate in vernation, green or tesselated: fls. showy; sepals 3, the dorsal erect, showy, the lateral united; petals spreading or pendulous; lip saccate, the margin of the orifice not inflexed; column short; ovary 1-celled, with parietal placentæ.—About 50 species in Trop. Asia, Malay Archipelago, Philippines. Differ from Cypripedium chiefly in having the lvs. conduplicate in the bud instead of convolute and in having a deciduous perigonium instead of withering and persistent. Cf. Pfitzer, Pflanzenreich, hft. 12.

Cultivation of paphiopedilums. (Alfred J. Loveless.)

Paphiopedilums generally are of easy culture, and may be grown in one house by devoting the cool end to *P. insigne* and its hybrids, and the selenipedium group. The plants should never be allowed to become dry, as they are making active growth most of the time. Light spraying should be frequent in bright weather, and an application of very weak liquid manure occasionally will be found of great assistance in keeping the plants healthy. Ventilation regulated according to external conditions is essential at all times to maintain atmospheric action.

During the winter months the thermometer should register from 55° to 60° F. by night, and about 65° F. by day, with sun heat a few degrees higher doing no harm. On the approach of spring the temperature should be slightly advanced to prepare the plants for summer heat, and accordingly decreased on the approach of fall. A light shading will be necessary at all times, to prevent excessive heat and sunburn, with heavier shading toward midsummer by the addition of bamboo shades, these to be removed in autumn, and dispensed with during the winter.

The greater part of the species grow best in pots, in a compost composed of two parts peat-fiber, one part turfy loam, one part chopped living sphagnum, one-third of the pot room being devoted to clean drainage. The compost should be pressed in rather firmly around the roots, finishing off about ½ inch below the rim of the pot. A sharp lookout should be kept for thrip, and clean pots, with frequent sponging of the foliage, is essential to the good health of the plants. *P. insigne* and kindred species should have one part chopped sod added to the above mixture (see note on culture in Veitch's "Orchid Manual" 2:34). *P. villosum* and *P. Exul* sometimes suffer under pot culture from fungi, which attack the base of the plant in sultry summer weather. Basket culture will obviate this, as it allows a better circulation of air through the compost. *P. Lowei*, *P. Parishii*, *P. philippinense* and allied species, together with *Selenipedium caudatum*, are truly epiphytic and preferably should be grown in baskets. By this method the roots are better preserved and less liable to decay during the winter season.

The concolor section requires a warm moist location with free access to the air. The species should be grown in rather small pots, with at least half the space devoted to drainage of broken charcoal or other free material. The potting compost should consist of equal parts chopped sod, peat-fiber and living sphagnum. Limestone is often recommended as essential in the culture of this section, but, the conditions being equal, it gives no beneficial results (Orchid Review 4:45; Veitch's Manual 2:19, 20).

LXXXIV. A plantation of papaya in the Hawaiian Islands.

The deciduous tropical species require similar treatment to the evergreen kinds. They have a long dormant period during which they should be rested in a temperature of 50° F., with sufficient water to keep the compost moist until growth starts, when they must be returned to their proper department and enjoy a liberal supply of water until after the flowering season, when they must be ripened off and the water supply gradually withheld.

The hardy species (true cypripediums) do better planted out in the open ground or in rockeries, where they should be so situated as to have good drainage and shade. The soil must be free and porous and consist of three parts chopped turf and equal parts of peat and sphagnum. They require a liberal supply of water and frequent syringing over the foliage while growing, but the supply should be gradually reduced after the flowering period until only enough water is given to keep the soil moist. During the winter the plants should be protected with leaves or pine boughs. *Cypripedium reginæ* and *C. pubescens* grow well under pot culture. A 7- to 10-inch pot will hold eight or a dozen crowns, which should be planted 2 inches below the surface. Two inches of drainage are sufficient. The pots should be filled with soil (firmly pressed in) to ½ inch below the rim. After a thorough watering they should be stored in a coldframe and protected with leaves and boughs. About the middle of February they may be removed to a coolhouse, where they should remain for a week, and then be placed in the cool end of the cypripedium house, where they should be watered sparingly until growth-action starts. These plants make strong growths under this treatment, and the flowers are a decided improvement over those produced outside. See *Cypripedium* and *Phragmopedilum*.

All paphiopedilums are propagated by division, but many beautiful hybrids have been added to the list, since the raising from seed has been better understood.

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GENERAL KEY TO SECTIONS.

A. *Petals broadly elliptic or almost orbicular.* SECTION I. Species 1–4.
AA. *Petals elongated.*
B. *Pouch of lip not eared: lvs. green, strap-shaped.* SECTION II. Species 5–10.
BB. *Pouch of lip eared: lvs. various.* SECTION III. Species 11–42.

SECTION I.

A. *Fls. bell-shaped.*
B. *Lip shorter than the petals*..... 1. **bellatulum**
BB. *Lip as long as the petals*..... 2. **Godefroyæ**
AA. *Fls. spreading.*
B. *Scape shorter than lvs*..... 3. **concolor**
BB. *Scape longer than lvs*..... 4. **niveum**

1. **bellâtulum,** Pfitz. (*Cypripèdium bellátulum*, Reichb. f.). Lvs. oblong-elliptic, up to 10 in. long and 3½ in. broad, the upper surface deep green mottled with paler green, the lower surface dull purple: scape shorter than lvs., 1-fld., purple, pubescent; fls. pale yellow or white, spotted with brown-purple; dorsal sepal orbicular, concave, ciliolate; petals broadly oval; lip with fewer and smaller spots than the sepals and petals. Summer. Shan States, China. G.C. III. 21:321. J.H. III. 30:513; 43:49. A.F. 6:557; 13:77, 622; 14:675. Gng. 7:129. G. 34:399. G.M. 55:593. O. 1912, p. 19. L. 4:149. C.O. 9. Var. **álbum,** Rolfe. Fls. white, the lvs. not colored beneath. C.O. 9*a*. Var. **Chòtekæ,** Hort. The larger fls. with larger spots. L. 665. Var. **egrègium,** Hort. Sepal short, 3-lobed, the spots light purple. Var. **luteo-purpùreum,** Pfitz. Fls. pale yellow, purple-spotted. Other minor varieties are: *biflòrum, giganteum, gránde, grandiflòrum, lineàtum, Lòwii, màjus, ròseum, supérbum.*

2. **Gódefroyæ,** Pfitz. (*Cypripèdium Gódefroyæ*, Rolfe. *C. cóncolor Gódefroyæ*, Hemsl.). Lvs. up to 6 in. long and 1¼ in. wide, deep green, marbled and spotted with paler green on the upper surface, the lower surface spotted with brown-purple: scape shorter than lvs., pubescent, green, purple-spotted, 1- or 2-fld.; fls. white or pale yellow, lightly pubescent, spotted magenta; dorsal sepal nearly orbicular; petals oblong-elliptic, deflexed; lip with the spots very small. Summer. Cochin-China. B.M. 6876. G.W. 14, p. 367. G.Z. 31:169. Gn. 25, p. 396. G.C. II. 23:49. Var. **Làingii,** Pfitz. Fls. smaller, white with purple dots. Var. **leucochìlum,** Pfitz. Fls. white, the sepals and petals purple-spotted. Var. **Màriæ,** Pfitz. Fls. large, the white petals with black-purple spots. Other minor varieties are: *amplìatum, hemi-xanthìnum, Smithiæ, striàtum, supérbum, viridifòlium.*

3. **cóncolor,** Pfitz. (*Cypripèdium cóncolor*, Batem.). Lvs. up to 6 in. long and 1½ in. wide, oblong-oval, deep

green, mottled above with grayish green, below spotted with deep crimson: scape shorter than lvs., 1- or 2-fld.; fls. pale yellow, dotted with purple; sepals and petals ciliolate; dorsal sepal nearly orbicular; petals broadly oblong-elliptic, deflexed; lip small, nearly cylindric, somewhat laterally compressed. Autumn. Moulmein. B.M. 5513. G.C. 1865:626; II. 19:19; III. 9:501. I.H. 12:444. F.S. 22:2321. G.Z. 30:97. Var. **chlorophýllum,** Pfitz. Lvs. concolored, not mottled: fls. with numerous dots. Var. **longipétalum,** Pfitz. Petals obovate, narrower than and almost twice as long as sepals. Var. **Requièri,** Pfitz. Larger, with sepals violet-spotted externally. Var. **sulphurìnum,** Pfitz. Fls. sulfur-colored: lvs. green. Var. **tonkinénse,** Pfitz. (*C. tonkinénse,* Godefr.). Sepals and petals larger. L. 77.

4. **níveum,** Pfitz. (*Cypripèdium níveum,* Reichb. f.). Lvs. up to 6 in. long and 1½ in. broad, dull dark green above, spotted gray-green, lurid purple beneath: scape equaling or longer than lvs., 1- or 2-fld.; fls. white; sepals and petals ciliolate; dorsal sepal orbicular, concave, reddish purple on the back; purple-dotted in front toward the base; petals broadly oblong or nearly orbicular, a little deflexed; lip shorter than sepals and petals. Spring. Loncavi and Tambilan Isls. B.M. 5922. G.Z. 19:17. J.H. III. 45:559. Var. **álbum,** Pfitz. Fls. pure white. Var. **punctàtum,** Pfitz. Base of petals densely violet-dotted. Var. **reticulàtum,** Pfitz. Petals purple-reticulated at the apex, the nerves purple-spotted. Other minor varieties are: *punctatíssimum, Requièri, ròseum.*

SECTION II.

A. *Sepals with simple nerves, no cross-nerves.*
- B. *Length of petals flat, ciliate* ..... 5. **Rothschildianum**
- BB. *Length of petals twisted, the margins with hair-bearing warts.*
  - C. *Length of petals 6 in. or less.*
    - D. *Staminodium pointed in front.*
      - E. *Point a long beak* ..... 6. **glanduliferum**
      - EE. *Point short* ..... 7. **præstans**
    - DD. *Staminodium notched in front* ... 8. **philippinense**
  - CC. *Length of petals over 1 ft.* ..... 9. **Sanderianum**

AA. *Sepals with the nerves united by slender cross-nerves, hence reticulated* ..... 10. **Stonei**

5. **Rothschildiànum,** Pfitz. (*Cypripèdium Rothschildiànum,* Reichb. f. *C. neo-guineénse,* Lind.). Fig. 2756. Lvs. up to 2 ft. long and 3 in. wide, glossy green: scape erect, a little exceeding the lvs., violet, minutely pubescent, the bract yellowish green, ciliate, lined with black-purple; fls. about 5 in. in long diam.; dorsal sepal ovate, acute, ciliolate, about 15-nerved, yellow, lined with black-purple; petals about 5 in. long, twice larger than sepals, linear, 7-nerved, undulate, pale green, purple-spotted; lip about as long as sepals, lateral somewhat compressed, dull purple, the apex yellow. Winter. Borneo and Sumatra. R. 2:61. B.M. 7102. V.O. 4:45. G.F. 6:145. A.G. 21:91. G.C. III. 27:137. Gt. 51, pp. 486, 487. J.H. III. 60:3. R.B. 24:221. Var. **Elliottiànum,** Pfitz. (*Cypripèdium Elliottiànum,* O'Brien). Fls. ivory-white, red-lined; petals shorter; staminodium acutely 2-toothed at apex. Philippines. L. 4:186. J.H. III. 32:55. A.F. 6:557; 7:855. Var. **platytænium,** Hort. Sepals and petals longer and broader than in the type. L. 623.

6. **glanduliferum,** Pfitz. (*Cypripèdium glanduliferum,* Blume. *C. præstans,* Veitch, not Reichb. f.). Lvs. strap-shaped, up to 8 in. long and nearly 1 in. wide: scape dull purple, 1-fld., scarcely exceeding lvs., or several-fld. and exceeding the lvs.; fls. green and rose; dorsal sepal narrowly ovate, acute, about 13-nerved, nearly 1½ in. long; petals about 2¼ in. long, deflexed, lanceolate and long-attenuate from a rhomboid base, twisted, the undulate margins with hair-bearing warts; lip about equaling the petals, the broad claw about half the length of lip, the basal lobes very narrow, involute, the sac very short and confined to apex of lip. Summer. New Guinea.

7. **præstans,** Pfitz. (*Cypripèdium præstans,* Reichb. f. *C. glanduliferum,* Veitch, not Blume). Lvs. strap-shaped, up to 1 ft. long and 2¼ in. wide: scape about equaling lvs., black-purple, pubescent, several-fld.; dorsal sepal oblong, acute, about 15-nerved, whitish, purple-lined, yellowish on back, about 2 in. long; petals yellow, about 5 in. long, twisted, cuneate-elliptic and long-attenuate from a narrow base, the undulate margins with hair-bearing warts; lip a little longer than the sepals, shining, yellow suffused red, the sac laterally compressed conic. Aug. New Guinea. L. 3:102. I.H. 34:26. Var. **Kimballiànum,** Hort. (*Cypripèdium præstans* var. *Kimballiànum,* Hort.). Lines on the sepals broader; petals broader at base, densely red-lined, the warts larger; lip white, rose-suffused. New Guinea. L. 249.

8. **philippinénse,** Pfitz. (*Cypripèdium philippinénse,* Reichb. f. *C. lævigàtum,* Batem.). Lvs. oblong-ligulate, up to 1 ft. long, glossy: scape up to 1½ ft. tall, 3–5-fld.; fls. 3 in. largest diam.; dorsal sepal broadly ovate, acute, whitish, striped purple-brown; petals linear, twisted, 5–6 in. long, ciliate, with small hair-bearing basal warts, yellowish at base, passing into dull purple, the apex pale green; lip buff-yellow, lined faintly with brown. April and May. Philippines. B.M. 5508. G.C. 1865:914. F.M. 298. B.H. 1867:6. F.S. 17:1760, 1761. G.F. 3:309. Var. **platytænium,** Desb. Petals a little longer and twice broader than in type. Var. **Cannærtiànum,** Pfitz. (*Cypripèdium Cannærtiànum,* Lind. *C. Roebbelénii* var. *Cannærtiànum,* Pucci). Lateral sepals not united as in type.

2756. Paphiopedilum Rothschildianum. (×¼)

9. **Sanderiànum,** Pfitz. (*Cypripèdium Sanderiànum,* Reichb. f.). Lvs. up to 1 ft. long: scape barely as long as lvs., purple, pubescent, several-fld.; fls. about 4 in. largest diam.; dorsal sepals broadly lanceolate, concave, acute, ciliolate, pale yellowish green with broad brown lines, pubescent on back; petals linear, twisted, 1½ ft. long or more, ciliate at the broader base, pale yellow margined with brown-purple at base, above this spotted with brown-purple, the remainder, the greater part, dull purple barred or spotted here and there with pale

yellow; lip brown-purple above, pale yellow beneath. Feb.–May. Malay Archipelago. G.C. III. 19:329. Gt. 43, p. 520. R. 1:3.

10. **Stŏnei,** Pfitz. (*Cypripèdium Stŏnei*, Hook.). Lvs. up to 1½ ft. long: scape up to 2 ft. tall, greenish purple, pubescent, 3–5-fld.; fls. about 4 in. greatest diam.; dorsal sepal cordate, acuminate, white, with usually 2 or 3 dark crimson streaks; petals 5–6 in. long, linear, twisted, sparsely ciliate at base, the lower two-thirds pale tawny yellow, crimson-spotted, the remainder crimson; lip dull rose, veined and reticulated with crimson, the narrow infolded lobes whitish; staminodium fringed except in front. Autumn. Borneo. B.M. 5349. I.H. 10:355. F.S. 17:1792, 1793. L. 6:281. Var. **acrosèpalum,** Reichb. f. Dorsal sepal narrower than in type, the lateral sepals free. Var. **Cannærtiànum,** Hort. Dorsal sepal white; petals longer than in the type, creamy white with a central line of chocolate spots. Var. **platytænium,** Reichb. f. Fls. larger, the petals much broader, white, spotted with yellow and purple, the apex carmine. G.C. 1867:1118. F.M. 1880:414.

SECTION III.

A. *Scape several-fld.*
B. *Fls. all appearing at same time: lvs. nearly erect.*
C. *Petals with hairy warts, narrow, pendent, much twisted* ..... 11. **Parishii**
CC. *Petals without warts, dilated at apex, divaricate.*
D. *Staminodium cordate, with a tooth in the sinus; apex of petals 4 times broader than lower half* ..... 12. **Lowei**
DD. *Staminodium oval, 2-lobed; petals but little broader at apex* ..... 13. **Haynaldi-anum**
BB. *Fls. appearing in succession: lvs. recurved.*
C. *Lvs. green, more or less netted.*
D. *Pouch long and narrow* ..... 14. **Victoria-Mariæ**
DD. *Pouch short and broad* ..... 15. **Chamberlainianum**
CC. *Lvs. glaucous, not netted* ..... 16. **glaucophyllum**
AA. *Scape 1-, very rarely 2-, fld.*
B. *Lvs. not netted or reticulated: sepals always netted.*
C. *Staminodium not lunate.*
D. *The staminodium with 3 protuberances* ..... 17. **hirsutissimum**
DD. *The staminodium with 1 protuberance.*
E. *Margins of staminodium flat; petals flat or but slightly undulate on margins.*
F *Petals dilated; staminodium obcordate.*
G. *Ovary white-villous; petals much dilated, the upper part almost orbicular* ..... 18. **villosum**
GG. *Ovary purple hairy.*
H. *Staminodium pilose above.*
I. *Dorsal sepal much larger than lower sepals* ..... 19. **insigne**
II. *Dorsal sepal about as long as lower sepals* ..... 20. **exul**
HH. *Staminodium glabrous* ..... 21. **Charlesworthii**
FF. *Petals elliptic; staminodium cordate* ..... 22. **Druryi**
EE. *Margin, the posterior, of staminodium revolute; petals strongly undulate on margin* ..... 23. **Spicerianum**
CC. *Staminodium lunate* ..... 24. **Fairieanum**
BB. *Lvs. netted or reticulated.*
C. *Petals manifestly dilated above.*
D. *Staminodium umbonate* ..... 25. **Appletonianum**

DD. *Staminodium not umbonate.*
E. *Lvs. pale beneath, shorter than scape.*
F. *Sepals not reticulated,*
G. *Petals, the upper margin with warts; staminodium nearly rhomboid* ..... 26. **Bullenianum**
GG. *Petals without warts.* ..... 27. **Volonteanum**
FF. *Sepals manifestly reticulated* ..... 28. **Hookeræ**
EE. *Lvs. violet-marbled beneath, about as long as scape* ..... 29. **venustum**
CC. *Petals not or but little dilated above.*
D. *Margin of petals naked or ciliate, but without spots or warts.*
E. *Sepal-nerves numerous, close.*
F. *Front of lunate staminodium 2-lobed.*
G. *Petals with upper margin naked* ..... 30. **tonsum**
GG. *Petals ciliate on both margins.*
H. *Dorsal sepal obtuse* ..... 31. **Mastersianum**
HH. *Dorsal sepal acute or acuminate.*
I. *Sinus of staminodium not 3-toothed; dorsal sepal ovate, acute.* 32. **virens**
II. *Sinus of staminodium 3-toothed; dorsal sepal nearly orbicular, long-acuminate* ..... 33. **javanicum**
FF. *Front of staminodium not 2-lobed, nearly orbicular.* 34. **Dayanum**
EE. *Sepal-nerves few, distant* ..... 35. **purpuratum**
DD. *Margin of petals with spots or warts bearing tufts of hairs.*
E. *Petals somewhat falcate or deflexed, their upper surface marked with numerous spots or warts.*
F. *Margin of petals with numerous approximate warts or spots.*
G. *Lip longer than the petals, obliquely descending* ..... 36. **Curtisii**
GG. *Lip equaling or shorter than the petals, directly descending.*
H. *Claw of the lip less than half as long as the sac* ..... 37. **ciliolare**
HH. *Claw of the lip half as long as the sac* ..... 38. **superbiens**
FF. *Margin of petals with few large warts* ..... 39. **Argus**
EE. *Petals sigmoid, or curved in two directions, their upper surface spotless or with few spots.*
F. *Upper margin of petals only with warts.*
G. *Lower sepal elliptic-ovate, obtuse; lobes of lip with small warts* ..... 40. **barbatum**
GG. *Lower sepal narrowly ovate, acute; lobes of lip with large warts* ..... 41. **callosum**
FF. *Upper and lower margins of petals with warts* ..... 42. **Lawrenceanum**

11. **Párishii,** Pfitz. (*Cypripèdium Párishii*, Reichb. f.). Lvs. oblong-ligulate, up to 16 in. long and 2½ in. wide, bright green: scape 4–8-fld., pale green, downy; fls. about 3 in. across; dorsal sepal oblong-elliptic, pale yellow, green-veined, the upper part bent forward, the basal lateral margins revolute; petals twisted, linear, 4–6 in. long, pendulous, the basal part green, with few blackish dots, the upper half blackish purple, pale-margined; lip deep green, often stained brown-purple;

staminodium pale yellow, green-mottled, obovate-oblong. Autumn. Moulmein. B.M. 5791. Gt. 47, p. 25. I.H. 22:214.

12. **Lòwei,** Pfitz. (*Cypripèdium Lòwei,* Lindl.). Lvs. ligulate, up to 15 in. long: scape much exceeding lvs., nodding, 3–6-fld.; fls. 3–4 in. diam.; dorsal sepal oval, acute, yellowish green, veined with purplish brown at base, pubescent at the back; petals spatulate, twisted, about 3 in. long, deflexed, the basal part yellow, black-spotted, the upper part violet-purple; lip brown, paler beneath; staminodium obcordate, the border with purple hairs, a small erect hairy horn at the base. April and May. Borneo. F.S. 4:375. A.F. 11:1349. R.H. 1857, p. 402; 1883, p. 352; 1885, p. 473. Var. **crucifórme,** Hall. (*Cypripèdium crucifórme,* Zoll. & Morr.). More slender, with narrower paler lvs. which are often obscurely marbled. W. Java.

13. **Haynaldiànum,** Pfitz. (*Cypripèdium Haynaldiànum,* Reichb. f.). Lvs. up to 16 in. long and 2 in. broad: scape much exceeding lvs., long-hairy, 4–6-fld.; fls. 4 in. greatest diam.; dorsal sepal oval, obtuse, whitish tinted with rose above, the lower half with revolute margins pale yellowish green, with large brown spots; petals spatulate-linear, 3–4 in. long, twisted and recurved above, ciliate, yellowish green below with large brown spots, the upper half pale dull purple; lip pale green, tinged with dull purple; staminodium oblong, 2-lobed in front. Jan.–May. Philippine Isls. B.M. 6296.

14. **Victòria-Màriæ,** Rolfe (*Cypripèdium Victòria-Màriæ,* Rolfe). Lvs. broadly linear-oblong, paler beneath: scape several-fld., much exceeding lvs., brown, pubescent; fls. about 4 in. greatest diam.; dorsal sepal nearly orbicular, concave, the margin reflexed, white-ciliate; petals about 1¼ in. long, spreading, linear-lanceolate, twisted, white-ciliate, green, red-margined; lip about as long as petals, purple, green-margined; staminodium rhomboid-ovate. Sumatra. B.M. 7573.

15. **Chamberlainiànum,** Pfitz. (*Cypripèdium Chamberlainiànum,* O'Brien). Lvs. up to 1 ft. long and 1½ in. wide, narrowly white-margined: scape much exceeding lvs., several-fld., grayish brown, densely pilose, nodding; fls. about 4 in. greatest diam.; dorsal sepal almost orbicular, emarginate, the basal margin reflexed, white-ciliate, green, suffused with brown at base, the curved nerves brown; petals about 1¼ in. long, linear, spreading, twisted, long-ciliate, green, marked with small purple spots in lines along the nerves; lip about as long as sepals, pale green, with many violet dots. Sumatra. B.M. 7578. R.H. 1892, pp. 104, 105. G.F. 5:413. Gn.W. 8:641. G.W. 6, p. 471. R.B. 26:253.

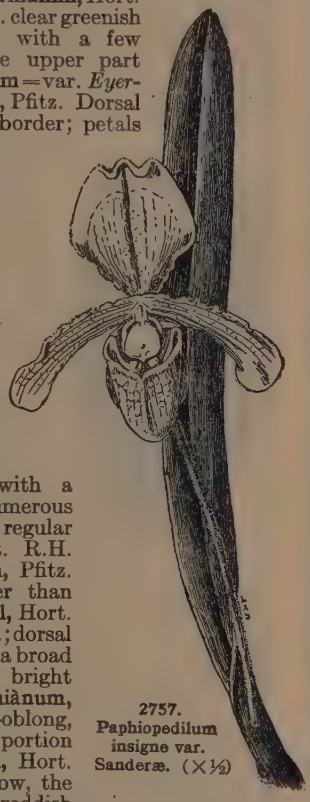
16. **glaucophýllum,** J. J. Smith. Lvs. glaucous, broadly strap-shaped: scape many-fld.; dorsal sepal orbicular-ovate; petals linear, twisted, ciliate, red-dotted; lip large, violet; staminodium large, ovate, black-violet. Java. B.M. 8084.

17. **hirsutíssimum,** Pfitz. (*Cypripèdium hirsutíssimum,* Lindl.). Lvs. narrowly strap-shaped, up to 6 in. long and ¾in. wide, indistinctly marbled: scape shorter than the lvs., black-purple, hirsute, 1-fld.; fls. 4–5 in. greatest diam.; dorsal sepal nearly orbicular, the base and central part marked with blackish purple, often confluent dots, the remainder green; petals about 3 in. long, broadly spatulate, spreading, somewhat twisted, the margin undulate, the base marked with deep purple on a green ground and studded with many black hairs, the upper bright violet-purple; lip dull green, purple-stained and with minute blackish warts; staminodium almost square, with 3 protuberances and 2 white eyes. March–May. Assam. B.M. 4990. J.H. III. 52:513. R.H. 1859, pp. 182, 183. I.H. 4, p. 67 (note). F.S. 14:1430.

18. **villòsum,** Pfitz. (*Cypripèdium villòsum,* Lindl.). Lvs. up to 18 in. long and 1½ in. broad, grass-green, with the lower surface paler and purple-spotted toward the base: scape nearly as long as lvs., 1-fld., hairy; fls. 5–6 in. greatest diam., glossy, the sepals and petals ciliate; dorsal sepal broadly oval, green, the base and center marked with brown-purple, the margin with a narrow white band, the basal margins revolute; petals about 3 in. long, strongly dilated above, yellow-brown, undulate, purple-hairy at the base, the midvein brown-purple; lip brownish yellow, the broad infolded lobes tawny yellow; staminodium tawny yellow, oblong-cordate. Jan., Feb. Moulmein. I.H. 4:126. A.F. 6:555. Gn. 65, p. 435. Var. **Bóxallii,** Veitch (*Cypripèdium Bóxallii,* Reichb. f. *P. Bóxallii,* Pfitz.). Dorsal sepal narrower at base, the central part marked with numerous, often confluent, black spots, the marginal band broader. Moulmein. I.H. 26:345. G.W. 5, p. 545. Gng. 15:306. Other varieties are: var **álbo-marginàtum,** Pfitz., the white margin of dorsal sepal broader; var. **atràtum,** Pfitz. (also known as var. *Bóxallii atràtum*), has the dorsal sepal strongly marked with black spots and the white border broad, the petals yellow-brown above, spotted below, and yellow-margined (R. II. 1:8); var. **aùreum,** Pfitz., dorsal sepal lemon-yellow, strongly black-spotted, the petals above red-lined; var. **canariénse,** Pfitz., fls. with a general yellow tinge; var. **gigantèum,** Pfitz., in color much like var. *aureum,* the petals and dorsal sepals larger; var. **Górtonii,** Pfitz., dorsal sepal with a narrow purple band, bright emerald, the petals pale rose-purple narrowly bordered with greenish black; var. **Líndenii,** Pfitz., fls. larger and more brilliant; var. **Measuresiànum,** Pfitz., in color resembling var. *atratum,* the dorsal sepal yellowish green with a purple base, the lip pale cream; var. **Moënsii,** Pfitz., dorsal sepal black for two-thirds its height, then olive-green bordered with pale cream, the petals reticulated, the staminodium large, the protuberance amethyst.

19. **insígne,** Pfitz. (*Cypripèdium insígne,* Wall.). Lvs. linear, up to 1 ft. long and ¾in. broad, pale green: scape usually shorter than lvs., 1-, rarely 2-fld., densely purple-pubescent; fls. 4–5 in. greatest diam., glossy; dorsal sepal broadly oval, with margins somewhat revolute, the base and central portion apple-green, marked with numerous brown-purple spots along the green veins, the upper part white; petals linear-oblong, spreading, undulate, pale yellow-green veined brown-purple; lip yellowish green, brown-shaded; staminodium nearly quadrate, pubescent, the tubercle orange-yellow. Winter. Nepal to Assam. B.M. 3412. G.C. III. 18:763. A.F. 7:633. F.E. 9:327. Gng. 1:243. A.G. 16:73; 19:825. J.H. III. 42:47. C.L.A. 11:43. Gn. 65, p. 101; 72, p. 40.—Extremely variable in coloration, the following being some of the prominent varieties. Var. **álbens,** Pfitz. Fls. soft greenish yellow, with the dorsal sepal pure white in upper half. Var. **álbo-marginàtum,** Pfitz. Fls. yellowish; dorsal sepal white-bordered on entire margin, the light-colored spots only on the green portion. Nepal. Var. **Amesiànum,** Pfitz. Fls. rather large, not spotted, resembling those of var. *Maulei;* dorsal sepal with a broad white margin, the green part suffused with brown. Var. **amœnum,** Pfitz. Dorsal sepal olive-green, marked with large brown spots, and widely bordered with white, with violet spots in the lower part of the border; petals olive-green, suffused with brown; lip clear maroon-brown. Khasia. Var. **apiculàtum,** Hort. Var. **Arnoldiànum,** Pfitz. Fls. larger than in var. *Maulei;* dorsal sepal greenish yellow, broadly white-margined, the spots confined to the green part. G.F. 7:425. A.F. 6:115. Var. **aùreum,** Pfitz. Dorsal sepal yellow below; petals and lip clear yellow-brown. Var. **Breevesiànum,** Hort. Dorsal sepal oblong, the lower two-thirds yellowish green, with brown dots in regular lines, the remainder white; petals reddish brown. Var. **Bròwnii,** Pfitz. Fls. large, pale green; dorsal sepal strongly marked with large pustules, each with a white dent at the apex; petals spotted. A.F. 7:65. Var. **brugénse,** Hort. Var. **Chântinii,** Pfitz. One of the best

varieties; dorsal sepal large, olive-green below heavily spotted with brown, the upper part only white with a few large mauve spots; lip mahogany, polished. Nepal. R.H. 1878:130. G. 25:60. Var. **citrìnum,** Pfitz. Fls. clear citron-yellow, except dorsal sepal, which is clear green at base, bordered with white and some clear mauve spots. Var. **corrugàtum,** Pfitz. Lip corrugated. Var. **Colsoniànum,** Pfitz. Fl. large, with a broad dorsal sepal. Var. **Cowperiànum.** Fls. greenish yellow; dorsal sepal like that of var. *albo-marginatum,* spotted at base; petals larger; lip large. Var. **Cuhingiànum,** Pfitz. Fls. large, clear green; dorsal sepal broad, the upper part white, with numerous clear violet spots. Var. **Dormaniànum,** Hort. Var. **Dorothy.** Fls. yellow, in form like those of var. *Chantinii.* Var. **Dowminiànum,** Hort. Var. **Érnestii,** Pfitz. In form and color resembling var. *Sanderæ,* but the spots on dorsal sepal more distinctly defined. Var. **Èyermannii,** Hort. Resembles var. *Sanderæ:* fls. clear greenish yellow, the dorsal sepal with a few indistinct small spots, the upper part white. Var. **Eyermanniânum**=var. *Eyermannii.* Var. **Fórstermanii,** Pfitz. Dorsal sepal with a broad white border; petals distinctly brown-veined. Nepal. Var. **fuscàtum,** Pfitz. R.B. 20:25. Var. **Gilmoreànum,** Pfitz. Fls. large, resembling those of var. *Chantinii;* dorsal sepal very broad, bordered white, with large brown spots in the center and smaller ones toward the border. Var. **grácile,** Pfitz. Dorsal sepal narrow, yellowish green, irregularly brown-spotted, white border broad. Var. **Gravesiànum,** Pfitz. Fls. on a long peduncle; dorsal sepal with a broad white border and numerous brown spots arranged in regular lines. Var. **guttàtum,** Hort. R.H. 1851:201. Var. **Halliànum,** Pfitz. Sepals longer and broader than usual. Var. **Harefield Hall,** Hort. A fine variety, with large fls.; dorsal sepal large and round, with a broad white margin and large bright brown spots. Var. **Horsmaniànum,** Pfitz. Dorsal sepal cuneate-oblong, with the entire upper portion white. Var. **Hurrelliànum,** Hort. Dorsal sepal greenish yellow, the basal half suffused with reddish brown, the apex white. Var. **illústre,** Pfitz. Fls. yellowish, the sepals and petals spotted. Var. **Kimballiânum,** Pfitz. Sepal more than 3 times longer than broad, flat, yellowish green, the spots running in lines into the white border; petals strongly veined. Khasia. Var. **Lágeræ,** Hort. Dorsal sepal with a dark brown center, slightly suffused at edges with greenish yellow, with 4 or 5 pink marks, the whole margined with pure white. Var. **Laura Kimball,** Hort. Fls. resembling those of var. *Sanderæ,* but of a chamois-yellow, with a few brown hairs at the base of the petals. Var. **longisépalum,** Pfitz. Dorsal sepal very long and narrow, appearing narrower on account of its reflexed margins, pale green slightly tinted and veined brown at base, spotless, with a small white apex. Var. **Lûcianii,** Pfitz. Fls. bright yellow, tinted green, dorsal sepal clear green at base, with only 2 or 3 large dots of bronzy yellow, white border very broad. Var. **lûteo-álbum,** Hort. Upper two-thirds of dorsal sepal pure white, remainder yellowish green with few spots. Var. **Lutchwychenànum,** Pfitz. Dorsal sepal narrower basal margins wavy, the upper white passing into pale yellow, spots hardly visible. Var. **Macfárlanei,** Pfitz. Fls. clear yellow; dorsal sepal with a broad white border, but without the usual pustules. Var. **Mandevilleànum,** Pfitz. Resembles var. *albo-marginatum:* petals with numerous spots in regular lines. Var. **Maûlei,** Pfitz. Dorsal sepal with the white predominant, extending to the base on either side of the green center, the upper spots violet-purple, the others larger and brownish. Nepal. G.W. 6, p. 470. Var. **máximum,** Pfitz. Dorsal sepal deep green, large. Var. **montànum,** Pfitz. Dorsal sepal with a narrow yellow line, the lower three-fourths of a golden yellow, with a brownish tinge due to the large spots; petals yellow, striated with brown-red. Var. **Mooreànum,** Pfitz. Fls. pale yellow, petals pale greenish yellow; dorsal sepal broad-ovate, with a broad white margin; central spots largest, smaller toward the margin; petals brown-veined. Nepal. Var. **Nílsonii,** Pfitz. Lip small, round. Var. **punctatíssimum,** Hort. Dorsal sepal entirely covered with brown spots except a narrow white margin. Var. **Sánderæ,** Pfitz. Fig. 2757. Lvs. and scape pale: dorsal sepal primrose-yellow with a few minute reddish brown dots, the upper part white; petals yellow; lip waxy yellow. Gng. 7:196. A.G. 21:329. Gt. 56:1559. Var. **Sanderiànum,** Pfitz. Fls. yellowish green, reticulated with darker green nerves, the dorsal sepal with a broad white border. Var. **Studbyànum,** Hort. Var. **supérbiens,** Hort. Var. **sylheténse,** Pfitz. Dorsal sepal with large dark spots somewhat confluent in lines along the middle.



2757. Paphiopedilum insigne var. Sanderæ. (×½)

20. **exúl,** Pfitz. (*Cypripèdium exúl,* O'Brien). Lvs. up to 8 in. long and nearly 1 in. broad, narrowly strap-shaped, lightly marbled, very narrowly white-margined: scape longer than lvs., green, purple-hairy, 1-fld.; fls. about 3 in. greatest diam.; dorsal sepal broadly ovate, obtuse, reticulate-veined, yellowish green with a white margin, brown-spotted; petals longer than the sepals, oblong, a little dilated toward the apex, ciliate, yellow sparsely spotted and lined with brown; lip marked like petals. Siam. C.O. pl. 13. B.M. 7510.

21. **Chárlesworthii,** Pfitz. (*Cypripèdium Chárlesworthii,* Rolfe). Lvs. spotted, up to 10 in. long and 1 in. broad: scape 1-fld., about as long as lvs., purple-spotted, pubescent; fls. about 3 in. greatest diam.; dorsal sepal broadly ovate, large, about 2½ in. long, obtuse, nearly flat, white, mottled and suffused with pale carmine or purple-rose; petals horizontally spreading, a little shorter than sepal, oblong, obtuse, long-hairy at base on inner surface, sparsely ciliate, yellowish green, striated or reticulated with brown. Autumn. Bengal. B.M. 7416. R.B. 20:241. Gn. 47:252. A.F. 13:430. J.H. III. 45:469. O.R. 1:335. L. 10:443. A.G. 25:561.—Variable. The following varieties are known: Var. **conchiflòrum,** Pfitz. Dorsal sepal concave. Var. **Càshawæ,** Pfitz. (*Cypripèdium Càshawæ,* O'Brien) Has the fleshy lvs. glaucous beneath, the fls. larger. Var. **Desmetiànum,** Pfitz. Dorsal sepal with the rose-veined white center surrounded by a band of rose-magenta, and with a white border. Var. **Duvivieriànum,** Pfitz. Dorsal sepal orbicular, nearly 3 in. diam., pure white at the base, the radiating nerves of a rose-lilac, the mahogany petals tessellated with amber, the staminodium white with a chrome-yellow umbo. Var. **magníficum,** Pfitz. Fls. very large and brilliantly colored. Var. **marginàtum,** Pfitz. Dorsal sepal is white with the base and border rose. Var. **unícolor,** Pfitz. Lip the same color as sepals and petals.

22. **Drùryi,** Pfitz. (*Cypripèdium Drùrii,* Bedd.). Lvs. ligulate, up to 8 in. long and 1¼ in. wide, lightly marbled: scape longer than lvs., purple-hairy, 1-fld.; fls. about 3 in. greatest diam.; dorsal sepal about 1¼ in. long, rhombic-ovate, obtuse, nearly flat, glandular-black-hairy on the back, white-ciliate, yellowish green or citron-color, marked black-purple in center; petals

longer than sepals, narrowly elliptic, obtuse, somewhat falcate, pubescent on back, the face manifestly hairy at base, golden yellow, purple-lined down middle and brown-dotted at the base; lip about as long as petals, yellow. May, June. Travancore. I. H. 24:265. A.F. 6:555. F.M. 1880:425. L. 6. O. 1914, p. 139.

23. **Spiceriànum,** Pfitz. (*Cypripèdium Spiceriànum,* Reichb. f.). Lvs. up to 1 ft. long, and 2 in. broad, broadly linear-lanceolate, pale beneath: scape about as long as lvs., glabrous, black-purple, 1-fld.; fls. about 3 in. greatest diam.; dorsal sepal transversely elliptic when spread out, about 1½ in. long, deeply sulcate, the margins strongly retroflexed, giving the sepal the appearance of a spathe, white, a crimson-purple band down the center, and a large green basal blotch speckled with red; petals a little longer than sepal, spreading, deflexed, somewhat falcate, oblong, strongly undulate at margin, pilose at base on inner surface, green, dotted and suffused with brown; lip longer than sepal, the claw green, the pouch violet, pale-green-margined. Oct.–Dec. Assam. B.M. 6490. I.H. 30:473. Gn. 48, p. 304. A.G. 11:159. A.F. 3:226. Gng. 1:242. F.E. 9:329. G.W. 14, p. 73. J.H. III. 44:27.—Quite variable. Among others, are the following varieties: Var. **albovíride,** Pfitz. Differs in absence of median color of the dorsal sepal. Var. **grandiflòrum,** Hort. Fls. larger than usual. Var. **leodiénse,** Pfitz. Dorsal sepal for upper three-fourths pure white, with tender green at base, the petals green at the very undulate margins, with the center brownish green, the lip bronzy green. Var. **magníficum,** Pfitz. Lower sepal pure white. Var. **Mercatelliànum,** Pfitz. Fls. yellowish white marked with purple, green absent. Var. **nànum,** Pfitz. Dorsal sepal without green basal spot. Var. **nigréscens,** Pfitz. Fls. smaller, lip blackish brown. Var. **rubéscens,** Pfitz. Dorsal sepal pure white on back, strongly tinted with violet-red on face and marked down the center with a purple band, the petals bronzy green, marked with brown dots.

24. **Fairieànum,** Pfitz. (*Cypripèdium Fairieànum,* Lindl.). Lvs. up to 6 in. long and 1 in. broad, strap-shaped, light green, paler beneath: scape much exceeding lvs., green, hairy, 1-fld.; fls. about 3 in. greatest diam.; dorsal sepal nearly orbicular, about 1½ in. long, the basal margin somewhat reflexed and undulate, reticulated at the recurved apex, ciliate, pubescent on back, greenish white, striated and reticulated with violet; petals lanceolate, undulate on the ciliate margin, green, striated with violet; lip a little shorter than the sepal, white at base, green at apex. Autumn. Bhotan. G.C. III. 38:168. J.H. III. 51:321. Gn.M. 3:63. B.M. 5024. F.S. 12:1244. O. 1915, p. 15.

25. **Appletoniànum,** Rolfe (*Cypripèdium Appletoniànum,* Gower. *C. Bulleniànum Appletoniànum,* Rolfe). Lvs. ligulate, indistinctly tessellated: scape much exceeding lvs., slender, velutinous, 1-fld.; fls. about 4 in. greatest diam.; dorsal sepal ovate, shortly acuminate, the margin at apex involute, the basal margin revolute, yellowish green, brown-striated; petals half longer than sepal, horizontally spreading, somewhat rhombic-dilated above, glabrous, the margins at base undulate, the upper margin usually with a few warts, the lower part green, purple-dotted, the upper part rose; lip green, marked with purple. Siam. O.R. 4:17. C.O. 22. Var. **Poyntziànum,** Pfitz. (*Cypripèdium Poyntziànum,* O'Brien). Petals pale green, the apex lilac; lip whitish, rose at base, purple-spotted within. Siam.

26. **Bulleniànum,** Pfitz. (*Cypripèdium Bulleniànum,* Reichb. f. *C. Hoòkeræ Bulleniànum,* Veitch). Lvs. up to 8 in. long, about 1 in. wide, tessellated: scape much exceeding lvs., 1-fld., hirsute; fls. about 3½ in. greatest diam.; dorsal sepal ovate, acuminate, the basal margins reflexed, about 1¼ in. long, olive-green, shaded with brown; petals deflexed, dilated from a narrowly oblong base, obtuse at apex, ciliate, the upper margin with hairless violet-brown warts, olive-green at base, rose-violet above; lip green, marked with greenish brown, longer than sepals but shorter than petals, the inflexed lobes with warts. March and April. Borneo. Var. **anophthálmum,** Reichb f. Petals not spotted; lip green. Var. **oculàtum,** Reichb. f. Claw of the lip ochre-color, brown-spotted; lip red-brown, bordered with green.

27. **Volonteànum,** Pfitz. (*Cypripèdium Volonteànum,* Sand. *C. Hoòkeræ Volonteànum,* Rolfe. *P. Hoòkeræ Volonteànum,* Kerch.). Fig. 2758. Lvs. up to 8 in. long, 2 in. broad, obscurely tessellated above, paler beneath: scape much exceeding lvs., 1-fld., pale brown with white hairs; fls. about 4 in. greatest diam.; dorsal sepal ovate, long-acuminate, ciliate, the basal margins reflexed, yellowish green; petals nearly twice as long as sepals, deflexed, the narrow base undulate, spatulate and somewhat falcate, long-acuminate at apex, minutely toothed, at the base long-ciliate and barbed, green, rose at apex, upper margin with black spots; lip pale green, suffused rose. June, July. Borneo. Var. **gigantèum,** Pfitz. A robust form. Var. **Lòwei,** Pfitz. Darker.

28. **Hoòkeræ,** Pfitz. (*Cypripèdium Hoòkeræ.* Reichb. f. *C. barbàtum Hoòkeræ,* Hort.). Lvs. up to 6 in. long, and 2 in. wide, dark green, tessellated: scape 1-fld., much exceeding lvs., purple, pilose; fls. about 4 in. greatest diam.; dorsal sepal ovate, acuminate, pubescent on back, ciliate, yellowish white, marked centrally with green; petals depressed, spatulate, ciliate, the undulate basal part green with blackish spots, the margin purple, the apex purple; lip pale green, suffused with rose, the infolded lobes yellowish brown, purple-spotted. May and June. Borneo. B.M. 5362. F.S. 15:1565.—The following varieties are known: *cæruléscens, lùteum, màjus, Measuresiànum,* and *supérbiens.*

2758. Paphiopedilum Volonteanum. (×⅓)

29. **venùstum,** Pfitz. (*Cypripèdium venùstum,* Wall.). Lvs. up to 6 in. long and 1½ in. wide, above dark green blotched with pale grayish green, beneath strongly violet-mottled: scape about as long as lvs., 1-fld., purple, pubescent; fls. about 3 in. greatest diam.; dorsal sepal broadly ovate, acute, white, veined green; petals somewhat spatulate, spreading, ciliate, longer than sepals, barbed at base, the basal part green with blackish warts, the upper portion brownish dull purple; lip pale yellowish green, rose-tinged, reticulated with green, the infolded lobes yellow. Jan.–March. N. India. B.M. 2129. B.R. 788. Var. **Measuresiànum,** Pfitz. Fls. white and green, without the brown or red tinge. Var. **pardìnum,** Pfitz. (*Cypripèdium pardìnum,* Reichb. f. *P. pardìnum,* Pfitz.). Warts extending over whole upper surface of the petals which are yellow, suffused with copper-color; inflexed lobes of lip with large conic warts. F.M. 51. Var. **spectâbile,** Pfitz. Scape shorter than in the type, the petals strongly colored with mahogany at the apex, the middle area brownish, irregularly black-spotted, the lip large, bronzy green, reticulated with clear green.

30. **tónsum,** Pfitz. (*Cypripèdium tónsum,* Reichb. f.). Lvs. up to 8 in. long and 2 in. wide, tessellated, usually beneath toward the base with purple: scape longer than lvs., 1-fld., reddish brown, shortly pilose; fls. 4–5 in. greatest diam., shining; dorsal sepal broadly ovate, acute, ciliolate, white, green-veined, or the alternate shorter veins sometimes purplish; petals somewhat spatulate, pale green, sometimes stained with dull purple, green-veined, marked with a few black spots;

lip dull green, tinged crimson and brown, the infolded lobes broad, warty. Autumn. Mountains of Sumatra. C.O. Cypripedium 6. The following varieties are known: *cùpreum; supérbiens*, with the dorsal sepal white at the extremity marked with clear brown; and *supérbum*.

31. **Mastersiànum,** Pfitz. (*Cypripèdium Mastersiànum*, Reichb. f.). Lvs. up to 10 in. long and 2 in. broad, deep green, tessellated: scape longer than lvs., 1-fld., brown-purple-long-hirsute; fls. 3–4 in. greatest diam.; dorsal sepal nearly orbicular, ciliolate, bright green, the border yellowish white, green-veined; petals horizontal, ciliate, obtuse, brownish red, the base paler with numerous blackish purple small warts on the upper margin and midvein; lip pale reddish brown, the infolded lobes spotted dull purple on a greenish brown ground. Spring. Amboina. G.C. III. 15:593; 25:274. B. M. 7629. O. 1910, p. 88.

32. **vìrens,** Pfitz. (*Cypripèdium vìrens*, Reichb. f. *C. javánicum vìrens*, Veitch. *P. javánicum vìrens*, Kerch.). Lvs. up to 6 in. long and 2 in. wide, obscurely tessellated above: scape somewhat exceeding lvs., brown, shortly pilose, 1-fld.; fls. 3–4 in. greatest diam.; dorsal sepal ovate, acute, ciliolate, the margin reflexed at base, about 1½ in. long, pale green, striated darker green; petals divaricately spreading, longer than dorsal sepal, obtuse, green at base with scattered small, black warts, the apex pale purple; lip about as long as sepal, green suffused with rose, the inflexed lobes with numerous contiguous small warts. N. Borneo.

33. **javánicum,** Pfitz. (*Cypripèdium javánicum*, Reinw.). Lvs. up to 7 in. long and 2 in. wide, distinctly tessellated above, pale green beneath: scape longer than lvs., pubescent, 1-fld.; fls. 3–4 in. greatest diam.; dorsal sepal nearly orbicular, long-acuminate, ciliolate, margin reflexed below, pale green, striated darker green; petals somewhat deflexed and falcate, oblong, obtuse, ciliolate, green, the inner surface with brown small warts; lip green, the inflexed lobes minutely warty. Java. F.S. 7:703. Var. **màjus,** Du Buyss. Fls. larger and greener. Var. **mìnus,** Pfitz. Fls. smaller. Var. **supérbum,** Hort.

34. **Dayànum,** Pfitz. (*Cypripèdium Dayànum*, Reichb. f. *C. spectábile Dayànum*, Lindl. *C. supérbiens Dayànum*, Reichb. f.). Lvs. up to 7 in. long and 2 in. wide, distinctly tessellated: scape much longer than lvs., purple, pilose, 1-fld.; fls. 4–6 in. greatest diam.; dorsal sepal broadly ovate, acuminate, ciliolate, white, green-veined; petals ligulate, somewhat deflexed, long-ciliate with black hairs, greenish brown at base, rose-purple above; lip brownish purple, green-veined, the infolded lobes with numerous small purple warts. May, June. Borneo. F.S. 15:1527. Var. **Ernestiànum,** Pfitz. Petals crimson-veined at base, the apex white and ciliate with purple hairs. Var. **Pétri,** Pfitz. (*Cypripèdium Pétri*, Reichb. f.). Dorsal sepal long-triangular acute, the petals somewhat broadened above, the lip more conical. Var. **Smithiànum,** Pfitz. Var. **spléndens,** Pfitz. Fls. more brilliant in color. Var. **supérbum,** Pfitz., has the petals maroon in the center, lined with green, the lip maroon veined with greenish brown.

35. **purpuràtum,** Pfitz. (*Cypripèdium purpuràtum*, Lindl. *P. sínicum*, Hance). Lvs. up to 5 in. long and 1½ in. wide, distinctly tessellated, paler beneath: scape longer than lvs., 1-fld., purple, hirsute; fls. 3–3½ in. greatest diam.; dorsal sepal nearly orbicular, abruptly acute, folded at the middle, the basal margins revolute, white with a greenish central stain, purple-veined, ciliolate; petals spreading, undulate, narrowly elliptic, somewhat falcate, ciliate with mixed longer and shorter hairs, purplish crimson, with purple or green veins, numerous small blackish warts at base; lip brownish purple, deeper veined and reticulated, infolded purple lobes with numerous warts. Autumn. Hong-Kong. B.M. 4901. F.S. 11:1158. C.O. Cypripedium 12. Vars. *Kimballiànum* and *Seègeri* are known.

36. **Cùrtisii,** Pfitz. (*Cypripèdium Cùrtisii*, Reichb. f.). Lvs. up to 8 in. long, tessellated above: scape longer than lvs., 1-fld., pubescent; fls. 3–4 in. diam., the segms. ciliolate; dorsal sepal broadly ovate, acuminate, grass-green, white-margined, the numerous green veins purple toward the base; petals ligulate, deflexed, the tips recurved, the margin with black hairs and warts, pale purple, white along the midvein, uniformly purple-spotted, green-veined; lip helmet-shaped, brownish purple, the infolded narrow purple lobes with darker warts. May, June. Sumatra. A.F. 6:557. Gng. 1:41. L. 3:140. Var. **amœnum,** Pfitz. Dorsal sepal brown at base with a broad white margin; petals green toward apex. Var. **pállidum,** Pfitz. Fls. more delicately colored; petals almost white at apex, strongly dotted with clear purple; lip pale greenish, lightly tinted pale brown-purple.

37. **ciliolàre,** Pfitz. (*Cypripèdium ciliolàre*, Reichb. f.). Lvs. obtuse, oblong-elliptic, 6–8 in. long, tessellated: scape longer than lvs., 1-fld., hirsute, black-brown; fls. 4 in. greatest diam.; dorsal sepal broadly ovate, acuminate, ciliolate, white, purple at the base, green-veined, or the lateral veins sometimes purple; petals deflexed, recurved, ciliate with long black hairs, green toward base with numerous blackish warts, pale purple at apex; lip manifest, helmet-shaped, dull brownish purple, the pale yellow-green infolded lobes with purple warts. April–July. Malay Archipelago and Philippines. I.H. 31:530. G.C. III. 21:348. Var. **Miteauànum,** Pfitz. Dorsal sepal nearly triangular, reddish crimson at base and strongly black-nerved, the border white, lightly tinted rose; petals crimson at base, dotted with blackish brown. L. 3:146. Other varieties are: *Elmireànum, grandiflòrum, magníficum, máximum, spléndens*, and *spléndidum*.

38. **supérbiens,** Pfitz. (*Cypripèdium supérbiens*, Reichb. f. *C. barbàtum* var. *Veìtchii*, Linn. *C. barbàtum* var. *supérbiens*, Morr. *C. Veitchiànum*, Hort.). Lvs. up to 8 in. long and 2½ in. broad, oblong-elliptic, tessellated: scape longer than lvs., brown, white-pilose, 1-fld.; fls. about 4 in. greatest diam., the segms. ciliate; dorsal sepal broadly ovate, acute, white, green-striped; petals deflexed, ligulate, white, green-veined, with numerous blackish warts, the marginal ones larger; lip somewhat helmet-shaped, brownish purple, pale green below, the infolded lobes crimson and warty. May–July. Malay Peninsula. I.H. 12:429. F.S. 19:1996. A.F. 7:707. R.H. 1871, p. 596. J.H. III. 50:3. F.W. 1872: 33.—Vars. *Démidoffii* and *Líndenii* are known.

39. **Árgus,** Pfitz. (*Cypripèdium Árgus*, Reichb. f. *C. barbàtum* var. *Árgus*, Hort. *C. Pitcheriànum*, Manda). Lvs. acute, up to 8 in. long and 1½ in. wide, tessellated: scape longer than lvs., brown-hairy, 1- or rarely 2-fld.; fls. 2½–3 in. greatest diam.; dorsal sepal broadly ovate, acute, ciliolate, white, the base rarely spotted blackish purple, green-veined, or the longer veins sometimes purple; petals undulate, ligulate, deflexed, acute, ciliate, white, the veins pale green, the upper third pale purple, the inner surface with blackish warts; lip dull brownish purple, pale greenish brown beneath, the narrow infolded lobes pale purple, deeper spotted. March, April. Luzon. B.M. 6175. F.M. 1876:220. B.H. 32:241. R. 2:83. C.O. 5. A.F. 3:179. Var. **Boddærtii,** Pfitz. Petals narrower and more strongly deflexed. Var. **Líndenii,** Pfitz. Colors brighter; dorsal sepal larger. Var. **Moènsii,** Pfitz. (*Cypripèdium Moensiànum*, Hort.). Dorsal sepal very large, pointed, white, green-lined; petals broader, white, green-lined, strongly spotted with blackish crimson, the spots confluent in transverse masses; lip greenish yellow below, maroon above. L. 3:129. Var. **nígricans,** Pfitz. Spots congested and confluent. Var. **nìgro-maculàtum,** Pfitz. Dorsal sepal white, lightly tinted rose, dotted reddish brown at base; petals green at base, strongly black-spotted; lip maroon above, olive below. Var. **supérbum,**

Pfitz. Dorsal sepal round, lightly acuminate, white, strongly veined with shining green, the border here and there spotted with reddish purple; petals white at base, green-lined, and almost entirely black-spotted; lip reticulated. Other varieties known are: *biflòrum, gigantèum, grandiflòrum, Mantínii, Morreniànum, multicolor, nìgrum, purpuràtum,* and *tigrìnum.*

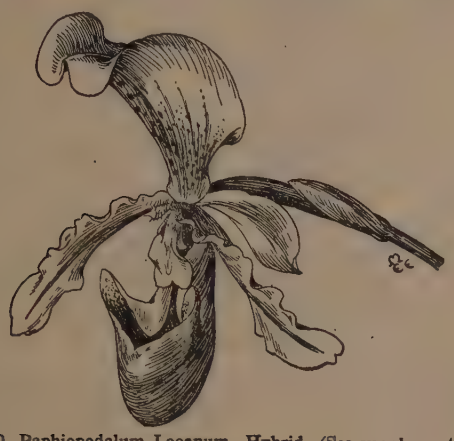
40. **barbàtum,** Pfitz. (*Cypripèdium barbàtum,* Lindl. *C. purpuràtum,* Wight). Lvs. acute, up to 6 in. long, tessellated: scape longer than lvs., black-purple, pubescent, 1- or rarely 2-fld.; fls. 2½–3 in. greatest diam.; dorsal sepal nearly orbicular, pointed, folded at the midvein, white, more or less purple-stained, green at base, the veins prominent, deep purple, the central green at base; petals spreading, somewhat deflexed, oblong-linear, ciliate, the upper margin with small blackish warts, the base brownish green, the apex purple; lip helmet-shaped, deep brownish purple, paler below, the infolded purple lobes deeper-spotted. June, July. Malay Peninsula. B. M. 4234. B.R. 27, p. 53 (desc.). F. S. 3:190. B.H. 33:7. V. O. 4:12. Var. **biflòrum,** Pfitz. Scape 2-fld. Var. **cæruléscens,** Pfitz. Dorsal sepal white and green in about equal proportions, the nerves dark green and crimson; petals olive-green, whitish rose at the apex with a few black dots; lip maroon. Var. **Crôssii,** Pfitz. (*Cypripèdium Crôssii,* Hort. *C. barbàtum* var. *Warneriànum,* Warn.). Dorsal sepal large, nearly round, the upper half pure white, the center green, striped deep maroon and tinted rose-purple between the nerves; petals strongly reflexed, rose-violet toward the apex which terminates with a white spot; lip clear maroon. B.H. 15:227. Var. **grandiflòrum,** Pfitz. Dorsal sepal very large, the apex pure white, lined and veined with rose-purple at base; petals olive-green above, black-spotted, rose-magenta below toward the apex; lip large, deep purple-maroon. Var. **Héndersonii,** Pfitz. Dorsal sepal has a broad white border, the center shaded with violet, and the base lined with tender green; petals undulate, reflexed, the upper surface olive-green, the lower surface light rose heavily shaded green, the extremity with a white point; lip deep maroon. Var. **illústre,** Pfitz. Dorsal sepal round, acuminate, white, green-lined at base, banded with blackish purple, and broadly white-bordered; petals brownish green above, rose-salmon, below; lip very large, blackish brown. Var. **màjus,** Pfitz. Resembles var. *grandiflorum,* but is more robust and has larger fls. of richer color. Var. **nànum,** Pfitz. Dorsal sepal small, only about 1 in. long; petals somewhat falcate, about 1¼ in. long, with 2–4 warts. Var. **nigrìtum,** Pfitz. (*Cypripèdium nigrìtum,* Reichb. f.). Dorsal sepal oblong, acute; petals narrower. Perhaps a natural hybrid. Borneo. Var. **nìgrum, Pfitz.** Dorsal sepal very large, oval, strongly lined with deep crimson and shaded violet-purple, the center greenish white, the border broad white; petals bronzy black above; lip blackish brown. A.F. 36:1184. Gng. 20:34. Var. **O'Brìenii,** Pfitz. Dorsal sepal small, less than 1 in. long; petals falcate, with 6–8 warts. Var. **òrbum,** Pfitz. (*Cypripèdium òrbum,* Reichb. f.). Fls. paler than in the type. Var. **porphŷreum,** Pfitz. Dorsal sepal very broad, round, reticulated, reddish violet on a white ground, the border pure white; petals olive-green above, rose-violet below; lip very large, blackish brown. Var. **pulchérrimum,** Pfitz. Perhaps a natural hybrid between *P. Hookeræ* and *P. hirsutissimum.* Var. **supérbum,** Pfitz. Dorsal sepal orbicular, very flat, striped with very deep crimson and black-veined; petals reddish wine-color above, and olive-brown below with a central black band. Var. **Wârneri,** Pfitz. Dorsal sepal very broad, nearly orbicular, white, strongly lined with dark green, stained with red-magenta, with a broad white border; petals shining dark green above; lip deep maroon. Other varieties known are: *gigantèum, grácile, mosàicum, nóbile, pictum, plumòsum, purpùreum.*

2759. Paphiopedilum Lathamianum. Hybrid. (See supplementary list.) (×⅓)

41. **callòsum,** Pfitz. (*Cypripèdium callòsum,* Reichb. f.). Lvs. acute, up to 10 in. long; tessellated: scape longer than lvs., brownish purple, 1-, or sometimes 2-fld.; fls. 4 in. greatest diam.; dorsal sepal broadly ovate, cordate, white, veins green at base, deep purple above, alternately longer and shorter; petals spreading, ligulate, pale green, tinted pale rose at apex, with 4 or 5 blackish warts on upper margin; lip helmet-shaped, brownish purple, the infolded lobes purple-spotted. Feb., March. Siam. R.H. 1888:252. L. 2:73. C.O. Cypripedium 7. Var. **gigantèum,** Pfitz. Dorsal sepal broad, white, shaded with emerald-green lined with deep green. Var. **Rossiànum,** Pfitz. Petals longer, narrower, and strongly falcate. Var. **Sánderæ,** Pfitz. Fls. white, the dorsal sepal green-veined. C.O. Cypripedium 15*a*. Var. **Schmidtiànum,** Pfitz. (*Cypripèdium Schmidtiànum,* Kranzl.). Petals at base deflexed; lobes of the lip inflexed, thickened, subacute at apex; staminodium less angled, nearly orbicular. Var. **sublæve,** Pfitz. Petals without warts or hairs on the surface. Var. **viridiflòrum,** Pfitz. Dorsal sepal and petals greenish white, veined with deep gray.

42. **Lawrenceànum,** Pfitz. (*Cypripèdium Lawrenceànum,* Reichb. f.). Lvs. up to 10 in. long, 2½ in. broad, tessellated: scape longer than lvs., brownish purple, pubescent, 1-, or rarely 2-fld.; fls. 4–5 in. greatest diam.; dorsal sepal nearly orbicular, white, the veins alternately longer and shorter, deep purple, the central ones usually green at base; petals spreading, ciliate, ligulate, green, the tips purple, each margin with 5–10 blackish warts; lip dull purple, brown-tinged above, green beneath. April–July. B.M. 6432. I.H. 30:478. F.S. 23:2372. G.C. III. 21:291. G.Z. 24., p. 1. J.H. III. 51:51; 63:545. Var. **Abbottiànum,** Pfitz. Fls. large, the dorsal sepal with veins deep crimson. Var. **atropurpùreum,** Hort. Same as following. Var. **atrorùbrum,** Pfitz. Fls. richly colored, especially the dorsal sepal. Var. **biflòrum,** Pfitz. Scape 2-fld., the lower fl. is normal, while the dorsal sepal of the upper fl. is reflexed. Var. **coloràtum,** Pfitz. Dorsal sepal subacute, internerves pale violet, warts of the petals numerous. Var. **expánsum,** Pfitz. Dorsal sepal much larger than in the type; petals larger. Var. **Grenièri,** Pfitz. Dorsal sepal very broad, round, emerald-green at base, with numerous deep blackish purple veins above, the ground-color white, shaded rosy magenta, the border white; petals emerald-green above, greenish white beneath, lined with rose; lip well developed, reddish maroon above, greenish yellow below. Var. **Hyeànum,** Pfitz. Dorsal sepal white, green-veined; petals horizontal, very long, white, green-dotted; lip olive. G.C. III. 21:37. Var. **magnìficum,** Pfitz. Dorsal sepal deep

green at base, with a broad white border, lined with blackish purple at center. Var. **Moènsii,** Pfitz. Dorsal sepal broad, strongly lined with blackish purple and carmine, the border pure white; petals sea-green; lip brownish maroon with a white terminal spot. Var. **pleioleûcum,** Pfitz. Dorsal sepal white above, the



2760. Paphiopedalum Leeanum. Hybrid. (See supplementary list). (×⅗)

green veins short. Var. **stenósemum,** Pfitz. Dorsal sepal much narrower than in type, elliptic. Other varieties known are: *aurículum, gigantèum, gránde, Lindenii, marmoràtum, nìgrum, pìctum, Pitcherìànum, purpuráscens,ròseum, supérbum, viréscens.*

The following list contains some of the hybrids. Many others are grown by fanciers but cannɔt be mentioned here. For catalogues of hybrids, see G.C. III. 17:199, A.G. 16:118, and the "Orchid Stud-book," by Rolfe & Hurst. *P. Acis*=P. Lawrenceanum×P. insigne Maulei.—*P. Acme*=P. nitens×P. Bessie K. Pitcher.—*P. Actæus*=P. insigne×P. Leeanum.—*P. Actæus Bianca*=P. insigne Sanderæ×P. Leeanum Prospero. G.C. III. 44:261.—*P. Actæus langleyénse*=P. insigne Sanderæ×P. Leeanum giganteum. G.C. III. 41:12.—*P. Adrastus*=P. Leeanum×P. Boxallii.—*P. Albertiànum*=P. insigne×P. Spicerianum.—*P. Albert Truffaut*=P. Harrisianum×P. Spicerianum.—*P. Alcibiades magníficum*=P. Leeanum×P. Schlesingerianum. G.M. 49:55.—*P. Alcibiades supérbum*=P. Leeanum giganteum×P. Mons. de Curte.—*P. Alcides*=P. insigne×P. hirsutissimum.—*P. Alector*=P. barbatum Crossii×P. Spicerianum.—*P. Alfred Hollington*=P. ciliolare×P. philippinense.—*P. Alice*=P. Spicerianum×P. Stonei.—*P. Allaniànum*=P. Spicerianum×P. Curtisii.—*P. Almum*=P. barbatum×P. Lawrenceanum.—*P. Alson*=P. insigne×P. Druryi.—*P. Amandum*=P. insigne×P. venustum.—*P. Amesiànum*=P. villosum×P. venustum.—*P. Aphrodite*=P. Lawrenceanum×P. niveum.—*P. apiculàtum*=P. barbatum×P. Boxallii.—*P. Arnoldiæ*=P. bellatulum×P. superciliare. G. 31:165.—*P. Artemis*=P. Dayanum×P. Swanianum.—*P. Arthuriànum*=P. insigne×P. Fairieanum. A.F. 6:557.—*P. Arthuriànum pulchéllum*=P. insigne Chantinii×P. Fairieanum.—*P. Ashburtoniæ*=P. barbatum×P. insigne. I.H. 35:61.—*P. Ashburtoniæ calospilum*=P. barbatum×P. insigne.—*P. Ashburtoniæ expánsum*=preceding.—*P. Ashworthiæ*=P. insigne×P. Spicerianum. J.H. III. 55:481.—*P. Aspasia*=P. Selligerum×P. tonsum.—*P. Astræa*=P. philippinense×P. Spicerianum.—*P. augùstum*=P. Haynaldianum×P. villosum.—*P. aùreum*=P. nitens×P. Spicerianum.—*P. aùreum Hyeànum*=preceding. G. 28:171.—*P. aùreum virginàle*=same. J.H. III. 62:71.—*P. aurôreum*=P. Lawrenceanum×P. venustum.—*P. Ballantinei*=P. purpuratum×P. Fairieanum.—*P. barbàto-Mástersii.*—*P. Baron Schrohder*=P. Fairieanum×P. œnanthum.—*P. Bárteti*=P. barbatum×P. insigne Chantinii.—*P. Beatrice*=P. Boxallii×P. Lowii.—*P. Beckmanii*=P. bellatulum×P. Boxallii.—*P. Berggreniànum*=P. Harrisianum×P. insigne.—*P. Bessie K. Pitcher*=P. Leeanum×P. villosum.—*P. Bragaiànum*=P. Boxallii×P. hirsutissimum.—*P. Brídgei*=P. Argus×P. Godseffianum. G.M. 52:184. J.H. III. 58:229.—*P. Bryanii*=P. philippinense×P. tonsum.—*P. Buchaniànum*=P. Druryi×P. Spicerianum.—*P. calánthum*=P. barbatum×P. Lowii.—*P. caligàre*=P. venustum×P. Dayanum.—*P. cállo-Rothschildiànum*=P. callosum×P. Rothschildianum.—*P. Calypso*=P. Boxallii×P. Spicerianum.—*P. Cánhamii*=P. villosum×P. superbiens.—*P. Carnusiànum*=P. Haynaldianum×P. Spicerianum.—*P. Ceres*=P. Spicerianum×P. hirsutissimum.—*P. chelsiénse*=P. Lowii×P. barbatum.—*P. chloroneùrum*=P. Harrisianum×P. venustum.—*P. Cleopatra*=P. œnanthum×P. Hookeræ.—*P Clinkaberriànum*=P. philippinense×P. Curtisii.—*P. Clothilde Moens*=P. Leeanum×P. Haynaldianum.—*P. Còlmanii nìgrum*=P. Harrisianum×P. javanicum.—*P. concínnum*=P. Harrisianum×P. purpuratum.—*P. conspícuum*=P. Harrisianum×P. villosum.—*P. Constançe*=P. Curtisii×P. Stonei.—*P. Cooksoniànum*=P. Almum.—*P. Creon*=P. Harrisianum×P. œnanthum.—*P. Crethus*=P. Spicerianum×P. Argus.—*P. Crossiànum*=P. insigne×P. venustum.—*P. Crossiànum pállidum*=P. insigne×P. venustum pardinum.—*P. Crossiànum Tautziànum*=preceding.—*P. Cybele*=P. Lawrenceanum×P. Druryi.—*P. Daùthieri*=P. barbatum×P. villosum.—*P. Doodmaniànum*=P. Chamberlainianum×P. Spicerianum.—*P. Dibdin*=P. Boxallii×P. Argus.—*P. dilèctum*=P. Boxallii×P. hirsutissimum.—*P. díscolor*=P. venustum×P. Harrisianum.—*P. Donatiànum*=P. 'insigne×P. Harrisianum.—*P. Doncasteriànum*=P. hirsutissimum×P. callosum.—*P. Doris*=P. venustum×P. Stonei.—*P. Druryo-Hoòkeræ*=P. Druryi×P. Hookeræ.—*P. Duchess of Sutherland*=P. Rothschildianum×P. Youngianum.—*P. eboràcum*=P. insigne×P. nitens. J.H. III. 53:589.—*P. Edithæ*=P. bellatulum×P. Charlesworthii.—*P. Eismanniànum*=P. Boxallii×P. Harrisianum.—*P. Electra*=P. Harrisianum×P. insigne.—*P. enfieldénse*=P. Lawrenceanum×P. Hookeræ.—*P. Ephialtes*=P. insigne Chantinii×P. aureorum.—*P. Euryades éxcellens*=P. Boxallii×P. Leeanum. G.M. 47:255.—*P. Euryale*=P. Lawrenceanum×P. superbiens.—*P. Euryandrum*=P. barbatum×P. Stonei. G.Z. 24, p. 241.—*P. Eurylochus*=P. ciliolare×P. hirsutissimum.—*P. Evelyn Ames*=P. Calypso Oakwood×P. Leeanum giganteum.—*P. Excelsior*=P. Rothschildianum×P. Harrisianum.—*P. Fairy Queen*=P. Curtisii×P. Druryi.—*P. Finetiànum*=P. philippinense×P. ciliolare.—*P. Fitchiànum*=P. Bullenianum×P. venustum.—*P. Fletcheriànum*=P. Godefroyæ×P. Mabeliæ. G.C. III. 40:254. J.H. III. 53:339.—*P. Fòwleri*=P. callosum×P. Rothschildianum.—*P. Fràseri*=P. barbatum×P. hirsutissimum.—*P. Frau Ida Brandt*=P. Io×P. Youngianum.—*P. Galatea*=P. Harrisianum×P. insigne Maulei.—*P. Galatea màjus*=P. Harrisianum×P. insigne. J.H. III. 46:47.—*P. Garret A. Hobart*=P. Lathamianum×P. insigne Chantinii.—*P. Gaudiànum*=P. Curtisii×P. Harrisianum.—*P. gemmíferum*=P. Hookeræ×P. purpureum.—*P. Germinyànum*=P. villosum×P. hirsutissimum.—*P. Gigas*=P. Harrisianum×P. Lawrenceanum.—*P. Godseffiànum*=P. Boxallii×P. hirsutissimum.—*P. Goweriànum formòsum*=preceding. G.M. 43:78.—*P. gránde*=P. Lawrenceanum×P. villosum.—*P. gránde atràtum*=preceding.—*P. Gratrixiànum*=P. bellatulum×P. enfieldense. G.C. III. 37:77.—*P. Grávesiæ*=P. Argus×P. niveum.—*P. Greyànum*=P. Druryi×P. ciliolare.—*P. Harlequin.*—*P. Harrisiànum*=P. barbatum×P. villosum. F.S. 22:2289, 2290. R.B. 22, p. 148. A.F. 6:557.—*P. Harrisiànum Daùthieri*=P. Dauthieri.—*P. Harrisiànum lineàtum*=P. barbatum×P. Boxallii.—*P. Harrisiànum Pitcheriànum.*—*P. Harrisiànum supérbum*=P. barbatum×P. villosum.—*P. Harveyànum*=P. Leeanum×P. Stonei.—*P. Hephæstus*=P. barbatum×P. Lawrenceanum.—*P. Hera Mrs. Tautz*=P. nitens×P. Spicerianum.—*P. Hindeànum*=P. Godefroyæ×P. insigne. G.C. III. 33:53.—*P. Hinkiànum*=P. Godefroyæ×P. insigne.—*P. Hóbsonii*=P. Lawrenceanum×P. philippinense. A.F. 14:1094. Gng. 7:242.—*P. Holbrook Gaskell*=P. Leeanum×P. Charlesworthii.—*P. Honoriæ*=P. Druryi×P. Godefroyæ.—*P. Horniànum*=P. Spicerianum×P. superbiens.—*P. Hurrelliànum*=P. Argus×P. Curtisii.—*P. hýbridum*=P. villosum×P. barbatum.—*P. Ianthe*=P. Harrisianum×P. venustum.—*P. íngens*=P. insigne×P. Rothschildianum.—*P. Ino*=P. Haynaldianum×P. Canhamii.—*P. intermèdium*=P. hybridum.—*P. Io*=P. Lawrenceanum×P. Argus.—*P. James Garfield*=P. regale×P. tonsum.—*P. James K. Polk*=P. Chamberlainianum×P. nitens.—*P. javánico-Spiceriànum*=P. lutescens.—*P. javánico-supérbiens*=P. superbiens×P. virens.—*P. Joseph Donat*=P. Ashburtoniæ×P. Spicerianum.—*P. Josephiànum*=P. Druryi×P. Sementa. A.F. 7:707.—*P. Juno*=P. callosum×P. Fairieanum.—*P. Kimballiànum*=P. Rothschildianum×P. Dayanum.—*P. Krameriànum*=P. œnanthum×P. villosum.—*P. Krishna*=P. insigne×P. tonsum.—*P. Láforxadei*=P. barbatum×P. insigne Chantinii.—*P. Lanieriànum.*—*P. Lathamiànum* (Fig. 2759)=P. Spicerianum×P. villosum. O. 1910, p. 88.—*P. Leander*=P. Leeanum×P. villosum.—*P. Lebaudyànum*=P. Haynaldianum×P. philippinense. A.G. 23:387.—*P. Ledoùxiæ*=P. callosum×P. Harrisianum.—*P. Leeànum* (Fig. 2760)=P. insigne×P. Spicerianum. Gng. 10:53. G. 25:112. F.R. 11:363. A.F. 16:1730; 35:108.—*P. Leeànum aùreum.*—*P. Leeànum burfordiénse.*—*P. Leeànum Clinkaberryànum.* G.M. 52:1008.—*P. Leeànum gigantèum*=P. insigne×P. Spicerianum. A.F. 9:765. J.H. III. 64:29.—*P. Leeànum grandiflòrum.*—*P. Leeànum lutéscens.*—*P. Leeànum Masereelianum*=P. insigne Chantinii×P. Spicerianum. I. H. 36:77. A.F. 6:555. A.G. 12:65.—*P. Leeànum nigréscens.*—*P. Leeànum pulchéllum.*—*P. Leeànum supérbum* is a good form raised by Veitch.—*P. Lloyd magníficum*=P. bellatulum×P. Swanianum.

2761. Paphiopedilum Niobe. Hybrid. (See supplementary list.) (×⅓)

—*P. Lobengula*=P. Boxallii×P. Harrisianum.—*P. Loewegrenià-num*=P. Spicerianum×P. Io.—*P. Lord Derby*=P. Rothschild-ianum×P. superbiens.—*P. lùcidum*=P. Lowii×P. villosum.—*P. lùridum*=P. Lawrenceanum×P. villosum.—*P. lùridum purpùreum.* —*P. lutéscens*=P. Spicerianum×P. javanicum.—*P. lùteum*=P. Fairieanum×P. Spicerianum. G.C. III. 49:402.—*P. Lynchiànum* =P. Spicerianum×P. Selligerum.—*P. Macfárlanei*=P. callosum× P. Spicerianum.—*P. macrópterum*=P. Lowii×P. superbiens.—*P. Mâhleræ*=P. Lawrenceanum×P. Rothschildianum.—*P. Mángoldii.* —*P. marmorophýllum*=P. Hookeræ×P. barbatum.—*P. Marshal-liànum*=P. venustum×P. concolor.—*P. Masereeliànum*=P. Leeanum.—*P. Massaiànum*=P. superciliare×P. Rothschildianum.—*P. Maùdiæ*=P. Lawrenceanum Hyeanum×P. callosum Sanderæ. A.G. 25:211. G. 33:737.—*P. Maùdiæ magnìficum*=preceding. G.C. III. 30:129.—*P. Máynardii*=P. purpuratum×P. Spicerianum.—*P. Measuresiànum*=P. villosum×P. venustum. Gn.W. 4:73.—*P. Measuresiànum pavoninum*=P. Boxallii×P. venustum.—*P. Melan-thus*=P. Hookeræ×P. Stonei.—*P. Memoria-Moensii*=P. Harrisia-num×P. Spicerianum.—*P. microchìlum*=P. Druryi×P. niveum. G.Z. 28, p. 267.—*P. Minos*=P. Arthurianum×P. Spicerianum.—*P. Mlle. Madeline Gayot*=P. Dayanum×P. insigne Chantinii.—*P. Mme. Barbey*=P. Lawrenceanum×P. tonsum.—*Mme. Cappe*=P. Harrisianum×P. Spicerianum.—*P. Mórganiæ*=P. superbiens×P. Stonei. I.H. 34:5. G.C. III. 41:66. J.H. III. 50:49.—*P. Mór-tenii*=P. Chamberlainianum×P. Leeanum. G.M. 47:103.—*P. Mrs. Canham*=P. superbiens×P. villosum.—*P. Mrs. G. D. Ower*=P. superciliare×P. villosum.—*P. Mulus*=P. hirsutissimum×P. Lawrenceanum.—*P. Niobe* (Fig. 2761)=P. Spicerianum×P. Fairieanum.—*P. nitens*=P. villosum×P. insigne Maulei.—*P. nitens Gravesiànum.*—*P. nitens Sallièri*=P. insigne×P. villosum. —*P. nitens Sallièri Hyeànum*=P. insigne×P. villosum.—*P. nitens Schlesingeriànum*=P. Boxallii×P. insigne.—*P. nitens Mons de Cùrte*=P. Boxallii×P. insigne Chantinii.—*P. Numa*=P. Lawrenceanum×P. Stonei.—*P. Oakes Ames*=P. ciliolare×P. Rothschildianum.—*P. obscùrum*=P. barbatum×P. insigne.—*P. œnánthum*=P. Harrisianum×P. insigne.—*P. œnánthum supérbum*= P. Harrisianum×P. insigne Maulei.—*P. Olivia*=P. tonsum×P. niveum.—*P. Orester*=P. Harrisianum×P. insigne.—*P. Orion*=P. concolor×P. insigne.—*P. Orphanum*=P. barbatum×P. Druryi.—*P. Osbornei*=P. Harrisianum superbum×P. Spicerianum.—*P. Page-ànum*=P. superbiens×P. Hookeræ.—*P. pállens*=P. Spicerianum× P. Dayanum.—*P. Pâtersonii*=P. Lowii×P. Dayanum.—*P. pa-voninum*=P. Boxallii×P. venustum. A.F. 7:707.—*P. Pelias*=P. Haynaldianum×P. insigne.—*P. pellùcidum*=P. Dayanum×P. insigne.—*P. Pelops*=P. Niobe×P. Sementa.—*P. picturàtum*=P. Spicerianum×P. superbiens.—*P. Pitcherianum*=P. Harrisianum superbum×P. Spicerianum.—*P. Pitcherianum Williamsii*=P. Harrisianum×P. Spicerianum.—*P. Pleistochlòrum*=P. barbatum × P. virens.—*P. Pleuroneùron*=P. venustum×P. villosum.—*P. Plumerum*=P. Harrisianum×P. venustum.—*P. polìtum*=P. bar-tum×P. venustum.—*P. Pollettiànum*=P. callophyllum×P. œnan-thum superbum.—*P. polystigmáticum*=P. Spicerianum×P. venus-tum.—*P. Premier*=P. Cymatodes×P. Rothschildianum.—*P. Pre-wéttii*=P. Harrisianum×P. Lawrenceanum.—*P. Priapus*=P. phil-ippinense×P. villosum.—*P. Princess*=P. Coffinetii×P. Fairiea-num.—*P. punctàtum*=P. Boxallii×P. Leeanum. Gt. 51:1503.—*P. radiòsum*=P. Lawrenceanum×P. Spicerianum.—*P. Rapparti-ànum*=P. Charlesworthii×P. Lathamianum. G.M. 46:723.—*P. regàle*=P. insigne Maulei×P. purpuratum.—*P. Reginaldiànum*= P. insigne×P. siamense.—*P. Robinsoniànum*=P. Lawrenceanum× P. superbiens.—*P. Rólfei*=P. bellatulum×P. Rothschildianum. R.H. 1911:254.—*P. Rólfei supérbum*=preceding. G.C. III. 36:399. Gn.W. 21:1041.—*P. Roséttii*=P. insigne Sanderianum×P. Mau-diæ.—*P. Rothschildiano-Bòxallii*=P. Rothschildianum×P. Boxal-lii.—*P. Rothschildiano-Lawrenceànum*=P. Rothschildianum×P. Lawrenceanum.—*P. Rothschildiano-supérbiens*=P. Rothschildia-num×P. superbiens.—*P. Rothschildiano-tónsum*=P. Rothschildia-num×P. tonsum.—*P. Rowallianum*=P. villosum×P. venustum.— *P. rubéscens*=P. Boxallii×P. œnanthum.—*P. Sallièri*=P. insigne ×P. villosum.—*P. Sallièri aùreum.*—*P. Sallièri Hyeanum*=P. insigne×P. villosum—*P. Sallièri nigro-maculàtum.*—*P. Sallièri pic-tum.*—*P. Sallièri platypétalum.*—*P. Sanactæus etoniénse*=P. Actæus langleyense×P. insigne Harefield Hall.—*P. Sanderiano-Cùrtisii.* G.C. III. 27:75.—*P. Sanderiano-supérbiens.* J.H. III. 54:251.—*P. Sappho*=P. barbatum×P. Lowii.—*P. Savageànum*=P. Harrisia-num×P. Spicerianum.—*P. Schlesingeriànum*=P. Boxallii×P. in-signe.—*P. Schroèderæ*=P. Fairieanum×P. œnanthum. Gn.W. 7: 201.—*P. Selligerum*=P. barbatum×P. philippinense. G.Z. 22, p. 193.—*P. Selligerum màjus*=preceding. Gng. 11:1349. 18:370. A.F. 35:108.—*P. Selligerum porphyreum*=same.—*P. Seegeriànum*=P. Harrisianum×P. Spicerianum.—*P. Shillianum*=P. Gowerianum ×P. Rothschildianum. Gn.W. 16:57.—*P. siaménse*=P. Apple-tonianum×P. callosum.—*P. sibyrolénse*=P. Boxallii×P. insigne. —*P. Siebertiànum*=P. Dayanum×P. insigne.—*P. Spiceroniveum*=P. Spicerianum×P. niveum.—*P. superciliàre*=P. bar-batum×P. superbiens.—*P. Susan Ames*=P. Leeanum×P. nitens. —*P. Svend Brun*=P. Curtisii×P. Lowii.—*P. Swaniànum*=P. bar-batum×P. Dayanum.—*P. Swinburnei*=P. Argus×P. insigne Maulei.—*P. Swinburnei magnìficum*=preceding.—*P. Tautziànum nigricans*=P. barbatum×P. niveum. Gn. 71, p. 89. J.H. III. 54:179.—*P. T. B. Haywood*=P. Druryi×P. superbiens.—*P. tessellàtum*=P. barbatum×P. concolor. A.F. 7:707.—*P. tessel-làtum porphyreum*=preceding.—*P. tessellàtum rùbens*=P. barbatum ×P. concolor. G.C. III. 39:19.—*P. Thalia Mrs. Francis Wellesley* =P. insigne×P. Schroederæ.—*P. Thayeriànum*=P. Boxallii×P. Lawrenceanum.—*P. Thetis*=P. barbatum×P. venustum.—*P. Thibautiànum*=P. Harrisianum×P. insigne Maulei.—*P. Thómp-sonii*=P. Spicerianum×P. villosum.—*P. Thórntonii*=P. insigne× ×P. superbiens.—*P. Thórntonii Blòmbergii*=preceding.—*P. Tityus* =P. œnanthum×P. Spicerianum.—*P. tonso-Arthuriànum*=P. ton-sum×P. Arthurianum.—*P. tonso-Charlesworthii*=P. tonsum×P. Charlesworthii.—*P. tonso-purpuràtum*=P. tonsum×P. purpura-tum.—*P. tonso-Sánderæ*=P. tonsum×P. insigne Sanderæ.—*P. tonso-villòsum*=P. tonsum×P. villosum.—*P. Tracyànum*=P. au-reum×P. Leeanum. G.M. 52:260. Gn.W. 22:159.—*P. Transvaal* =P. Chamberlainianum×P. Rothschildianum.—*P. triùmphans*= P. nitens×P. œnanthum. G.M. 48:742.—*P. triùmphans magnífi-cum*=preceding. G.M. 47:794.—*P. Troilus*=P. insigne×P. nitens. —*P. Turpe*=P. barbatum×P. Argus.—*P. T. W. Bond*=P. hirsu-tissimum×P. Swanianum.—*P. Umlauftiànum*=P. insigne×P. Lawrenceanum.—*P. Van Houtteànum*=P. barbatum×P. villosum. —*P. Vernixium*=P. Argus×P. villosum.—*P. Vexillàrium*=P. barbatum×P. Fairieanum.—*P. Wallæriànum*=P. Harrisianum×P. villosum.—*P. westfieldénse*=P. Leeanum×P. Pollettia-num. Gn.W. 22:69.—*P. Wiganiànum*=P. Ashburtonæ×P. Harrisianum.—*P. William McKinley.*—*P. Williamsiànum*=P. Harrisi-anum×P. venustum.—*P. Winniànum*=P. Druryi×P. villosum.— *P. W. R. Lee*=P. Rothschildianum×P. superbiens.—*P. W. W. Lunt*—P. Boxallii×P. insigne.—*P. Youngiànum*=P. philippinense ×P. superbiens.—*P. Youngiànum supérbum*=preceding. G. 28: 67. G.C. III. 40:439.—*P. Zampa*=P. hirsutissimum×P. Leeanum —Other names may be expected in the trade.

GEORGE V. NASH.

PAPÝRUS (an ancient name, coming through the Greek, and from which comes indirectly the word *paper*). *Cyperàceæ*. A group of aquatic or subaquatic very ornamental plants, now considered to represent one polymorphous species; by modern authors they are placed in the genus Cyperus (which see, page 941, Volume II).

The paper-reed, *Cypèrus Papỳrus*, Linn. (*Papỳrus antiquòrum*, Link. *P. sícula*, Parl. *Cypèrus syrìacus*, Parl.),

2762. Papyrus antiquorum.

Fig. 2762, is of the Nile region and widespread in Trop. Afr., also of Sicily. It is a glabrous perennial with a woody rhizome, reaching 10–15 ft. in height in favorable regions, the tall sts. solitary or very few from each root and varying from nearly terete to acutely 3-angled: lvs. all radical (only sheaths produced on the flowering culm), long and sedge-like: umbel compound on the top of the high culm, the primary rays many and 6–20 in. long, drooping; spikelets 1×1½ in., with

many spreading spikelets; wings of rachilla lanceolate, yellow, falling early with the glumes; stamens 3, the anthers joined by a crested connective: nut or fr. ellipsoidal, 3-cornered, gray. Var. *antiquòrum*, Clarke (*P. antiquòrum*, Willd. *P. mossambicénsis*, Parl. *Cypèrus Papyrus*, Linn., in part), has spikelets more or less deciduous above the 2 lowest or empty glumes, the wings of the rachilla obtuse and tardily falling, the connective not crested. This variety occurs in Trop. and N. Afr. and in Palestine.

The papyrus is popular about large tanks or aquaria in greenhouses, and is often bedded out about ponds in summer. Far South it may stand in the open. It is much used in California for adornment of lawns, doing well even with a moderate supply of water. The fluffy heads make attractive house decoration. The papyri of the ancient Egyptians were made of strips taken from the culm or stem, from base to apex, between the cortex and the core, being laid side by side and beaten and pressed together to form a continuous surface.

The paper-reed is known best to horticulture as a tender decorative plant, almost solely as an aquatic. It stands by itself, unequaled and unrivaled as such. It has tall dark green stems 10 or more feet high, depending on mode of culture, surmounted with an umbel of threadlike leaves or filaments, subdivided, and forming a most graceful and ornamental object. It is at home on the margin of a natural pond, or it may be planted in a tub or box of rich soil and placed in the artificial pond, but should be only slightly submerged. The plant should not be subjected to a spray from a fountain jet, as the weight of water will bend and break the stems. They may also be planted in groups similar to cannas, but should receive copious supplies of water, otherwise they will be dwarf and stunted. Propagation is effected by seed. Sow and treat seedlings similar to *Cyperus alternifolius*, the common umbrella plant. Sow in early autumn or spring; seedlings will make good plants the same season. Winter the medium-sized plants in a cool greenhouse with all light and air possible, else the plants become drawn and weak and crippled with aphis. Large plants may be divided in spring. (William Tricker.)

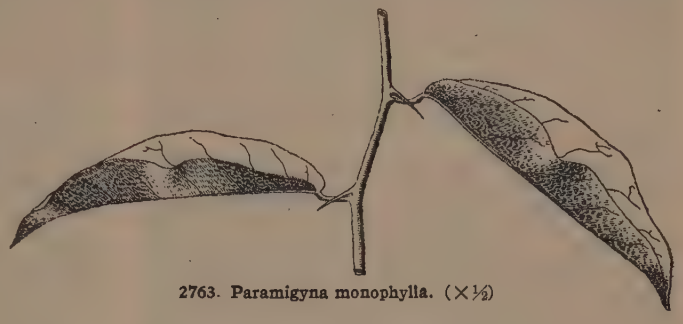
L. H. B.

PARACHUTE FLOWER: *Ceropegia Sandersonii.*

PARADÌSEA (said to be from Paradise, of which this plant is supposed to be a fit inhabitant). Often written *Paradisia*. *Liliàceæ*. St. Bruno's Lily. Hardy herbaceous perennial, a single species, with small white flowers, native in the Pyrenees, Apennines, Alps, and Juras.

St. Bruno's lily and St. Bernard's lily are advertised in catalogues of hardy herbaceous plants as *Anthericum Liliastrum* and *Anthericum Liliago*, but the former should be called *Paradisea Liliastrum;* the latter is St. Bernard's lily. Both have white fls., borne in early summer on scapes a foot or more high. The fls. of both are tipped green outside. The lvs. are linear, all radical, and a foot or so long. Both plants are natives of Cent. Eu., and by their popular names recall the life-saving monks of the Alps. It is no wonder, then, that they are often confused, although they belong to different subtribes. The Paradisea has larger fls., which are funnel-shaped rather than rotate, but the fundamental differences upon which Paradisea is made a separate genus lie in the stamens. In Paradisea (according to Bentham & Hooker) the anthers are attached at the middle of the back and are versatile; in Anthericum the anthers are attached at their base and are erect; moreover, the stamens of Paradisea are hypogynous; of Anthericum, perigynous. Following are some of the other differences as given by Baker in Journ. Linn. Soc. 15:286, 287, 301 (1877):

Liliástrum, Bertol. (*Anthéricum Liliástrum*, Linn. *Czáckia Liliástrum*, Andrz.), has 6–8 lvs.: scape 12–24 in. high; raceme 2–10-fld.; bracts lanceolate; perianth 18–21 lines long; style 15–18 lines long; ovary and caps.



2763. Paramigyna monophylla. (×½)

oblong.—*Anthericum Liliago*, Linn., has 12–20 lvs.: scape 6–15 in. high; raceme (sometimes panicled) 10–20-fld.; bracts linear; perianth 6–9 lines long; style 5–6 lines long; ovary and caps. globose. Some of the above characters may not hold for cult. plants.

Var. **màjor,** Hort., is much larger and a better form than the type, growing 2–3 ft. high and bearing more and larger fls. Gn. 9:12 (as *Anthericum Liliastrum* var.) has fls. 2 in. long and 2½ in. across. Var. *gigantèum*, Hort., is probably the same. *P. Liliastrum* and its varieties are plants of secondary importance in the hardy border; they are of simple cult.; prop. by division, or by seeds sown as soon as ripe.

Wilhelm Miller.
L. H. B.†

PARADISE FLOWER: *Strelitzia Reginæ.*

PARAMÍGYNA (from the Greek *to mix with*). *Rutàceæ*, tribe *Citreæ*. Evergreen climbing shrubs native to India and distantly related to the orange, but having fruits filled with gum.

Leaves alternate, unifoliolate, articulated with the long petiole; spines recurved: fls. solitary or in clusters in the axils of the lvs., large, white, 4–5-merous with 8–10 free stamens; ovary 3–5-celled with 1–2 ovules in each cell: fr. globose or elliptical, gummy, with a lemon-like peel.—Several species are known. The following is being tested as a stock by the U. S. Dept. of Agric.

monophýlla, Wight. Fig. 2763. An evergreen climbing shrub related to Citrus: lvs. simple, alternate; spines recurved: fls. large, white, 4–5-merous, with free stamens: the young lvs. are pendent, the twigs, spines, petioles and leaves are all more or less hairy. Talbot, For. Fl. Bombay, p. 200, fig. 122. Wight, Ill. Ind. Bot., pl. 42.

Several other species occur in the Indo-Malayan region; two have recently been described from the Philippines: *P. longipedunculàta*, Merrill, a scandent shrub, closely related to P. monophylla, from which it differs in its longer peduncles and several other characters; *P. mindanaénsis*, Merrill, a nearly glabrous scandent shrub, with shining lvs. and glabrous fr., usually curved.

Walter T. Swingle.

PARA-NUT: *Bertholletia.*

PARASITE. A parasitic plant or animal is one which fastens itself upon another living thing, penetrating the tissues of the host or organism attacked, thus usually deriving some or all of its nutriment therefrom. Parasitic plants are numerous, but the larger part of them are to be found among the fungi and the bacteria. These two classes of organisms are the chief causes of plant diseases,—such as rusts, smuts, mildews, and blights. It is with such parasites as these that plant pathology is primarily concerned, and path-

ologists estimate that in the United States alone the annual losses to crops from parasitic fungi and bacteria amount to not less than $600,000,000. Parasitic fungi commonly grow within the tissues of the host plant, reaching the surface only when forming certain types of spores, or propagative bodies. Parasites invariably cause some disturbance of the normal development of the tissues. Notwithstanding this fact, it can be said that there are beneficial parasites, such as the bacteria producing the nodules, or tubercles, on the roots of legumes; and these nodules are important because of the fixation therein of atmospheric nitrogen, which ultimately becomes a source of nitrogen supply for the legume host.

There are also parasites among flowering plants. Of these, two principal classes may be noted: (1) those green in color, or chlorophyl-containing, such as the mistletoe and the bastard toad-flax; and (2) those practically devoid of chlorophyl, such as the dodder and the broom-rape. The members of the first class are commonly supposed to be active photosynthetically, that is, they are able to manufacture their own carbonaceous food-supply from carbon dioxide and water, while members of the second class must receive all or nearly all similar foods through the host plant. Plants living upon dead organic substance are termed saprophytes (which see). There are all gradations between parasites and saprophytes, especially among the fungi. Some are parasitic during their more active vegetative growth, and then continue their development saprophytically. Again, there are many fungi which, while generally parasitic, may be grown in the laboratory upon a variety of culture media, or cooked plant products. Finally, there are those which ordinarily live saprophytically in the soil, but under certain conditions are able to induce disease epidemics.

B. M. Duggar.

PARATRÒPIA (Greek, *turned away*, probably with reference to the twining habit). *Araliàceæ*. Twining trees or shrubs similar to Aralia, with compound lvs.: infl. paniculate or racemose. The genus is now included in Schefflera by most authorities. *P. Steltzneriàna*, Barb.-Rodr. The plant intro. into Calif. under this name grows up to 24 ft. high, evergreen: if. palmately 6-foliate; lfts. leathery, oblong, short deltoid acuminate, petioles articulate at the petiole.

PARDÁNTHUS: *Belamcanda.*

PARIETÀRIA (from *parietarius*, belonging to walls, referring to its habitat). *Urticàceæ*. Annual or perennial herbs widely scattered in the temperate zones, scarce in the tropics. Fls. polygamous, cymose or glomerate at the axils; perianth of the hermaphrodite and male fls. deeply 4-lobed, rarely 3-lobed; lobes valvate; of the female fl. distinctly tubulous at the base, lobes shorter; stamens 4, rarely 3; ovary free within the perianth; stigma penicillate, short or linear: achene included in the persistent perianth. Ten or more species. **P. arbòrea,** Ait., an erect shrub, with lvs. perfectly white underneath, has been offered in trade-lists. This belongs in the genus Gesnouinia, differing from Parietaria in being small trees with the involucre subtending 3-fld. glomerate-panicled branches: fls. monœcious, the central pistillate, with the achene included in the tube of the involucre. Gesnouinia contains 2 species belonging to the Canary Isls.

PÁRIS (the berry of the plant is compared to the apple of discord, while the four leaves surrounding it are likened to Paris and the three envious goddesses, Juno, Minerva, and Venus. Others think the name is derived from *par*, equal, referring to the agreement in number between leaves and floral parts, and this is probably the correct derivation). *Liliàceæ*. Herb-Paris. Love-Apple. Hardy small herbs.

Differs from Trillium in having its floral parts in 4's instead of 3's. There are about 6 species altogether, and in some of them the floral parts are in higher numbers than four. They resemble trilliums in being small hardy rhizomatous plants, found in mountainous countries of the North Temperate Zone, and even in the arctic regions; also they have a single whorl of lvs. at the top of the scape and a single fl., but in Paris the outer perianth-segms. are more herbaceous and calyx-like, while the inner ones are much narrower and less showy, being mere strips of petal, or even entirely absent.

quadrifòlia, Linn. Herb-Paris. True-Love. Four-leaved Grass. Height 9–12 in.: lvs. all cauline, netted-veined (exceptional among monocotyledons): peduncle rising 1–2 in. above lvs.: perianth-segms. yellowish green, the 4 inner ones rather more yellow: berry bluish black. The dominant European type, scattered over Eu. and Siberia from the Arctic Circle to the Medit., in woods and shady places, but usually local. Gn. 31, p. 165.—Fls. in spring or early summer. Rarely the lvs. and floral parts are in 5's. Wilhelm Miller.

PARÍTIUM: *Hibiscus elatus* and *H. tiliaceus.*

PARK: *Landscape Gardening*, page 1801.

PÁRKIA (named after Mungo Park, born in 1771). *Leguminòsæ*. Tall unarmed trees: lvs. evenly bipinnate; lfts. very numerous, small: fls. in dense, long-peduncled, obovoid heads; calyx tubular, shortly 5-cleft; corolla tubular, somewhat cleft; stamens 10; ovary stalked: pod large, flat, strap-shaped, coriaceous.—About 10 species, tropics of both hemispheres. *P. timoriàna*, Merr. Cupang. A very large tree, up to 115 ft. high, with vase-shaped, wide-spreading crown: lvs. fernlike, with very small lfts.: fls. small, white and yellow, in dense pear-shaped panicles: pods pendulous, flattened, black, 18 in. long. Timor and Philippines. Intro. in U. S. by Dept. of Agric. and offered for distribution.

PARKINSÒNIA (John Parkinson, 1567–1629, London apothecary, author of the delightful "Paradisus Terrestris" and "Theatrum Botanicum"). *Leguminòsæ*. Tropical trees or shrubs, with a thin smooth bark and armed with simple or three-forked spines.

Leaves alternate or fascicled, bipinnate, with 1–4 pairs of pinnæ; the common petiole short, often obsolete or spinescent; stipules minute or none: fls. yellow or whitish, on slender pedicels in short, loose axillary or terminal racemes; calyx 5-parted, produced at base and jointed upon the pedicel; petals 5, clawed, the upper one within and broader than the rest, somewhat cordate, the claw pubescent and nectariferous on the inner side; stamens 10, free, the upper one gibbous outside; ovary several-ovuled, shortly stipitate: pod compressed, leathery, 2-valved, linear to linear-oblong, more or less twisted, tapering at both ends; seeds compressed, albuminous, with a crusty brown testa.—Five species. The dominant type, both in the wild and in cult., is *P. aculeata*, the Jerusalem thorn, which is probably a native of Amer., but is naturalized or cult. in all tropical countries. One species is S. African, one is S. American, and the remainder belong to the region between Texas and S. Calif. *P. aculeata* is a thorny evergreen tree with feathery drooping branches and handsome yellow fls.; it is admirable for hedges, thrives in the driest places and can endure some cold. It has been cult. in European conservatories, being usually raised from imported seeds, but it is of difficult cult. *P. Torreyana*, though generally destitute of lvs., is known in N. Mex. as "palo verde," from the bright green color of the branches. It stands drought even better than *P. aculeata*. These plants belong to the same tribe with such fine northern trees as Gleditsia

and Gymnocladus and such southern kinds as Cæsalpinia, Poinciana, and Colvillea. They are little known horticulturally.

AA. *Lfts. numerous; rachis flat, long.*

aculeàta, Linn. JERUSALEM THORN. Small glabrous tree, up to 10 ft. tall, the slender zigzag branches often pendulous: lvs. 8–16 in. long, with spiny petioles ½–1 in. long; lfts. numerous, very small, distant, linear to linear-oblanceolate, ½–4 in. long, inequilateral, on slender petioles; rachis winged, ½–1½ ft. long: racemes slender, axillary, 3–6 in. long; fls. fragrant, pendulous; calyx glabrous, tube very short, lobes oblong, reflexed, exceeding the tube; petals yellow, ⅜–⅝ in. long, blades suborbicular or oval, longer than the claws; stamens and ovary pubescent: pods narrow, 2–4 in. long, constricted between the seeds; seeds oblong. Probably Trop. Amer. S.S. 3:131.

AA. *Lfts. few; rachis terete.*

Torreyàna, Wats. Small tree, 18–25 ft. tall, with light green, smooth bark: young branches and lvs. sparingly pubescent: lfts. 2 or 3 pairs, oblong, obtuse, narrowed toward the scarcely oblique base, glaucous, about ¼in. long: racemes terminal with rather long pedicels, jointed near the middle, but joint not evident until in fr.; petals bright yellow, a prominent gland on the upper one: pod acute, more or less constricted between the very thick ventral suture. Valley of the Colo. and eastward through W. Texas.—Usually naked in the S.W. as the lvs. are early deciduous.

P. L. RICKER.

PARMENTIÈRA (named after Ant. Aug. Parmentier, who intro. potato-cult. into France). *Bignoniàceæ.* Shrubs or small trees with spirally placed fls. in 3's: fls. from the old wood on rather long peduncles, almost regular; calyx spathe-like, splitting up one side; corolla campanulate-funnelform, little crooked, limb sub-2-labiate, posterior 2-parted, anterior 3-parted, lobes all broadly spreading; stamens 4, scarcely exserted; ovary sessile, 2-loculate, many-seeded: fr. elongate-cylindrical or oblong: lvs. alternate or subopposite, 3-foliate or some simple, common petiole often broad. Species 2, from Mex. and Panama. **P. cerífera,** Seem., from Panama, called "palo de vela," or candle-tree, from its long cylindrical frs. which are smooth and white like candles, has been offered in the trade.

PARNÁSSIA (after Mt. Parnassus). *Saxifragàceæ.* GRASS OF PARNASSUS. Low-growing moisture-loving hardy perennial herbs of tufted habit, sometimes transferred to gardens.

Glabrous, from short rootstocks, mostly with scape-like sts.: lvs. simple and entire, mostly radical (or basal) and petiolate, 1 on the st. sessile and mostly small: fls. usually 1, white or yellow; calyx 5-parted; petals 5, withering, but deciduous; fertile stamens 5, alternating with the petals; staminodia present or represented by glands; ovary 1-celled; style very short or none; stigmas usually 4; ovules many: caps. 1-celled, with 4 placentæ projecting within, 4-valved (sometimes 3-valved).—In wet or moist places in temperate and subarctic regions in the northern hemisphere, about 25 species. They are suitable for shady positions along the water's edge, and are prop. by seeds or division. They commonly grow about 6 in. high, but attain 2 ft. They bloom from June to Sept.; the petals are conspicuously veined with green lines. The plant which Dioscorides called "grass of Parnassus" is *P. palustris,* the only species common in Eu. This is perhaps the best one for cult., but they are all much alike in horticultural value. Parnassias prefer a peaty soil, but such is not necessary. The species are usually tenacious of life and are good perennials. The N. Carolinian species are hardy N.

A. *Petals not clawed.*

B. *Rudimentary stamens 9–20 at the base of each petal.*

C. *Scape-lf. more or less clasping.*

palústris, Linn. GRASS OF PARNASSUS. Rootstock short and erect: lvs. ovate, usually cordate at the base; scape-lf. ovate or cordate, at or below the middle of st.: fls. ½–1 in. across; rudimentary stamens 9–15 scales at the base of each petal. Eu., Asia., N. Amer., south to Mich. and Wyo. Gn. 41, p. 500; 78, p. 450. G.L. 26:365. A.G. 13:696.

CC. *Scape-lf. not clasping.*

califórnica, Greene (*P. palústris* var. *califórnica,* Gray). Height 1–2 ft.: lvs. ovate or ovate-oblong, cuneate at base, 1–2 in. long; scape-lf. very small, and borne above the middle: fls. 1½ in. across; rudimentary stamens about 20 at the base of each petal. Calif.

BB. *Rudimentary stamens 3–5 at the base of each petal.*

caroliniàna, Michx. Rootstock erect, very short: height 8–16 in.: lvs. ovate, broadly oval or orbicular, more or less cordate at the base; scape-lf. borne below the middle: fls. ¾–1½ in. across; rudimentary stamens usually 3 in each set. Swamps and low meadows, New Bruns. to Man., south to Va. B.M. 1459.

AA. *Petals clawed.*

B. *Rudimentary stamens usually 3 at the base of each petal.*

asarifòlia, Vent. Rootstock erect, short and thick: height 10–16 in.: lvs. orbicular, kidney-shaped at the base, often 2–3 in. wide; scape-lf. clasping, borne at about the middle: petals entire. Wet places in high mountains of Va. and N. C. B.B. 2:184.

BB. *Rudimentary stamens 5–9 at the base of each petal.*

fimbriàta, König. Rootstock ascending, short: height 1 ft. or less: lvs. kidney-shaped to cordate-ovate; scape-lf. cordate, more or less clasping, at or above the middle: petals fringed below the middle. Colo. to Calif. and north in Alberta and to Alaska.

P. nubícola, Wall. The largest and coarsest of all the species, and lacks the delicate beauty and white petals of P. palustris: lvs. elliptic-ovate; scape-lf. borne below the middle: petals shorter than in the other kinds as compared with calyx-lobes; rudimentary filaments 3, not topped by anthers. Himalayas. B.M. 6609.

WILHELM MILLER.
L. H. B.†

PAROCHÈTUS (Greek, *beside,* and *ditch* or *canal*). *Leguminòsæ.* A half-hardy perennial trailer, with foliage like the shamrock, but with each of the 3 lfts. marked at the base with a handsome brown crescent; the pea-shaped fls. have a cobalt-blue standard and pink wings. It is desirable for hanging-baskets, pots and rockeries, and is said to bloom the year round. Parochetus is a genus of one species. It is allied to the clovers, sweet clover, medick, and rest-harrow, and differs from them in having a more acute keel, a 2-valved pod, and the lfts. not stalked. It is a native of Trop. Asia and E. Afr., ascending the Himalayas from 4,000–13,000 ft. If seeds could be secured from the greatest altitude the plants might be hardy in the N. This plant was formerly offered by A. Blanc, of Philadelphia, under the name of shamrock-pea, or blue oxalis. It has recently been distributed by the U. S. Dept. of Agric. in an effort to give this attractive plant a place in American horticulture.

commùnis, Hamilt. SHAMROCK-PEA. BLUE OXALIS. Height 2–3 in.: rhizome thread-like, wide-creeping: petiole 2 in. long; lfts. obovate, emarginate, glabrous or slightly pubescent: peduncles 1–2-fld.; fls. ½–¾in. across, axillary: pod straight, glabrous, linear, ¾–1 in. long. F.S. 15:1575.

P. L. RICKER.†

PARONÝCHIA (old Greek name used by Dioscorides, meaning whitlow-wort, or a cure for whitlow, a disease of the fingers or toes). *Caryophyllàceæ;* by some sep-

arated in *Illecebràceæ*. WHITLOW-WORT. Annual and perennial little herbs, without showy flowers, adaptable to rock-gardens and borders.

Plant tufted, low, with minute clustered fls. and silvery stipules; erect or diffuse, often dichotomously branching: lvs. opposite, broad or narrow, entire, the margins flat or very rarely recurved; stipules prominent, scarious, shining: fls. minute, without petals, axillary or rarely in terminal cymes, usually hidden among the stipules; sepals 5, awned; stamens 5; staminodia 5 (sometimes wanting), bristle-like or reduced to teeth; style 2-cleft: fr. an urticle inclosed in the calyx.—Species about 50, largely in the Medit. region, but widely distributed; several are native in the U. S. A very few are cult. in the hardy border. The two European species here given do not appear in the leading catalogues, domestic or foreign, but *P. serpyllifolia* is said to be much used for carpet-bedding abroad. *P. argentea* furnishes the Algerian tea. Allied to Herniaria, which see for generic differences. The species described below are perennials. They are of simple cult.; prop. by seed and division.

A. *Lvs. narrow, linear or awl-shaped.*

argyrócoma, Nutt. (*Anýchia argyrócoma,* Michx.). Erect or ascending perennial, 3–8 in. high, making broad tufts or mats, clothed with silvery appressed scale-like hairs: lvs. linear; stipules silvery white, scarious, entire, usually shorter than the lvs.: fls. in forking cymes; bracts large, silvery, membranous; staminodia minute. Rocky places. Maine and N. H. to Ga. and Tenn.—Also called silver chickweed, silverhead, and silver whitlow-wort. The northern form is sometimes separated as var. **albimontàna,** Fern., differing from the type (which occurs from Va. south) in having branches mostly floriferous rather than most of them sterile, lvs. glabrate and with involute margins, and calyx-awns subulate and glabrescent.—*P. argyrocoma* is not difficult of cult. and is prized for rockeries, its silvery tufted appearance lending a distinct charm to the collection for this purpose. Prop. by seeds and division.

dichótoma, Nutt. Woody at the base, glabrous or nearly so, tufted, 4–14 in. tall: stipules entire, often 5–6 lines long, tapering into a slender awn: fls. in forking cymes; awns of the calyx-segms. divergent; staminodia of minute bristles. Dry soil, Md. and N. C. to Ark. and Texas.

AA. *Lvs. rather broad, obovate or nearly so.*

argéntea, Lam. Prostrate diffuse perennial, with long branches: lvs. ovate to oblong or lanceolate, acute: fls. lateral and terminal, dense, intermixed with lvs.; bracts ovate, acute, much longer than the fl.; calyx-lobes semi-scarious, hooded, mucronate on the back near the apex. Common in dry places, Medit. region.—Foliage nearly glabrous.

serpyllifòlia, DC. Prostrate creeping perennial: lvs. obovate, flat, rather fleshy: fls. terminal; calyx-lobes blunt. Arid parts of S. and E. Eu.—Foliage ciliate at the margin. A disputed plant. Probably a form of *P. capitata,* Lam.

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PAROSÈLA. By some used instead of *Dalea,* p. 960.

PARRÒTIA (after F. W. Parrot, a German naturalist and traveler, afterward professor of medicine at Dorpat; 1792–1841). *Hamamelidàceæ.* Ornamental woody plants grown chiefly for their handsome foliage and also for their early appearing flowers.

Deciduous shrubs or small trees: lvs. alternate, short-petioled, crenate, with large caducous stipules: fls. small, in dense heads surrounded by an involucre of several bracts; petals wanting; calyx 5–7-lobed, embracing the pubescent ovary about half; stamens 5–15; styles 2: caps. 2-celled, with 2 beaks, dehiscent between the beaks, with 1 oblong shining seed in each cell.—Two species in Persia and the Himalayas.

The parrotias are spreading shrubs or small trees with medium-sized orbicular to obovate-oblong leaves, small flowers in dense heads appearing before the leaves, and with fruit similar to those of the witch-hazel. The Persian species is hardy as far north as Massachusetts. Its chief beauty consists in the brilliant autumnal tints of the foliage, which changes to golden yellow, orange, and scarlet and remains a long time on the branches. The early appearing flowers with the purple pendulous stamens, are also attractive. The Himalayan species is more tender and its foliage turns only to pale yellow, but the flowers are somewhat more showy from their rather large white bracts. The parrotias grow in any well-drained soil and like a sheltered position. The wood is very close-grained, hard and strong, and therefore *P. persica* bears the name, "ironwood." The tough pliable branches of the Himalayan species are extensively used for basket-work and are also twisted into thick ropes used for the construction of twig-bridges over the great rivers of its native country. Propagation is by seeds and layers and also by greenwood cuttings under glass.

pérsica, C. A. Mey. Shrub or small tree, to 15 ft., with spreading branches: lvs. oval to obovate-oblong, obtuse, coarsely and crenately dentate above the middle, dark green above, pubescent beneath when young, 3–4 in. long: bracts of fl.-heads covered with dark brown tomentum; stamens 5–7, pendulous, with linear-oblong, purple anthers: fr. with recurved beaks. N. Persia. B.M. 5744.

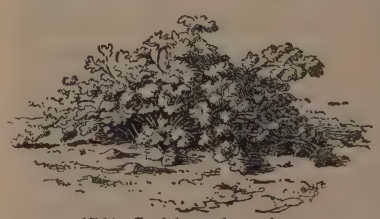
Jacquemontiàna, Decne (*Fothergílla involucràta,* Falc. *Parrotiópsis involucràta,* Schneid.). Spreading shrub or small tree, to 20 ft.: lvs. orbicular, crenately toothed, stellate-pubescent on both sides, 2–4 in. long: heads many-fld., with spreading white bracts sprinkled with a purplish scurf on the back; stamens about 15, erect, with yellow, oval-oblong anthers. Himalayas. B.M. 7501.

ALFRED REHDER.

PARROT'S BILL: *Clianthus.*

PARROT'S FEATHER: *Myriophyllum.*

PÁRRYA (Capt. W. E. Parry, Arctic explorer). *Crucíferæ.* Four or 5 N. American and a few Asiatic low perennial herbs, with thick caudices, scape-like peduncles, narrow lvs. and mostly racemose rose-colored or purplish showy fls.; sepals oblong and erect, the lateral ones gibbous at base; petals broad, clawed: pod broad and flat, mostly elliptic, with orbicular seeds. The parryas are alpine or boreal often arctic plants, and some of them will no doubt prove useful for the alpine garden. So far they are practically unknown in American gardens. The most likely species to be used in rock-gardening is **P. Ménziesii,** Greene (*Cheiránthus Ménziesii,* Benth. & Hook.). It has a leafy scape 3–8 in. high, with a raceme of many fls., the petals nearly ½in. long and bright purple: lvs. spatulate or oblanceolate, entire, densely tomentose. N. Calif., north to the Lower Columbia River. L. H. B.



2764. Curl-leaved parsley.

PARSLEY (*Petroselinum hortense,* which see). Fig. 2764. A leaf vegetable, used for garnishing and flavoring.

While indispensable in the market-garden, parsley is not usually found in the home-gardens in this country.

The addition of a bit of parsley foliage, finely chopped, heightens the flavor of soups, fish, and the like. The principal use of this vegetable, however, is for garnishing meats and fish and other dishes, and for this purpose it seems to be the vegetable *par excellence*, equally desirable in the home as on the hotel table.

A very few plants of parsley will suffice for the home-garden, and any spot of good soil will do for starting them from seed. Sow as early in spring as practicable, either in an early hotbed or coldframe, or in open ground. Parsley seed germinates somewhat slowly, and the plants are feeble at first. In open ground, early sowing aids the plants to get ahead of the weeds. In larger patches the rows should be a foot apart, and seed sown rather thinly in shallow drills. Thin the plants to stand 4 to 8 inches apart, and cultivate same as carrots. Gather the leaves as needed. For use in winter and early spring, start plants in open ground in early fall, and on the approach of cold weather set them in a corner of the greenhouse bench, or in a box or keg filled with rich loam placed in a light kitchen or cellar window. Old roots, if still vigorous, may be lifted in autumn and treated the same as seedlings. Parsley will stand considerable frost. Although biennial or perennial, a new stock should be started every year. The plants usually bear better if the leaves are removed a few at a time rather than to have the entire crown cut at once.

When the plant is a year old (sooner or later), it throws up seed-stalks, and produces seed in abundance, even under glass protection. By keeping the seed-stalks closely cut out, the season of leaf-yield may be prolonged for a time. Seed is easily gathered and cleaned.

The varietal differences lie chiefly in the foliage, which in some sorts is rather coarse, as in the Plain or Common, or more finely divided, as in the Curled, Double Curled, Moss Curled, and Fern-leaved.

T. Greiner.
L. H. B.†

PARSNIP (*Pastinaca sativa*, which see). Fig. 2765. A favorite vegetable, cultivated for its edible root, which is used mostly in winter and spring.

The average home-gardener thinks much of quick results. The drawback to parsnip-growing, in his estimation, is the length of time the crop requires for its development. When seed is sown, in early spring, the harvest seems a long way off. To offset this disadvantage, however, parsnips become available as green material when other things fresh from the garden are very scarce or entirely absent, that is, in open spells in winter, and in the very early days of spring. A crop of good straight roots may not be so easily produced as a crop of smooth carrots, but when once grown it does not burden one with much responsibility in regard to storage or keeping, which is an important point in its favor. The roots may be left in the ground where they grew or stored in moss or sand in the cellar. The winter freezing in the ground does not injure them; in fact, some growers suppose that it improves the quality. This ability to withstand the winter makes them valuable also as food for cattle, sheep, hogs and poultry in the early spring, in case the table or market should not call for them at that time. If dug in autumn, they may be stored in a cool, moist cellar (or buried) as other roots are kept.

The best soil for parsnips is a clean rich loam, which offers no obstruction to the uniform expansion of the roots. Straight deep roots must have a deep soil. Prepare it the same as for beets or carrots, or for any other garden crop. The seed should be strictly fresh, as it soon loses its vitality. Seeds germinate rather slowly and therefore the ground should be clear of roots and seeds of weeds, otherwise the young plants may be smothered. Sow in early spring, preferably with a garden seed-drill, ½ to 1 inch deep, in rows 15 to 20 inches apart in the garden, and somewhat farther in field culture, in the place where the plants are to stand. Be prompt in thinning the young seedlings to 6 to 12 inches apart in the row; at the same time pull up or cut out all weeds. The free use of the hand wheel-hoe will keep the patch clean until the entire surface of the ground is covered with foliage, thus preventing further growth of weeds. Tillage may then cease.

Seed is easily grown. Plant the roots in spring in any good soil, and gather the seed-heads in summer when most of the seeds in them are mature. Dry them on sheets, and then thrash or strip.

The varieties of parsnip are few in number. For shallow, stony or otherwise unfavorable soils the best varieties are the Round or Early Short Round; for better soils the Half-Long, Student, or Hollow Crown; and for deep clean soils the Long Smooth.

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2765. Parsnip.

PARSÓNSIA (after John Parsons, a Scotch naturalist). *Apocynàceæ*. Twining shrubs with opposite lvs.: calyx 5-parted, glandular or naked, or with 5 scales; corolla salver-shaped, tube short; lobes overlapping to the right; stamens inserted in the tube, filaments often twisted, anthers conniving over and adhering to the stigma, cells spurred and empty below; disk of 5 lobes or scales; ovary 2-celled, cells many-ovuled.—About 20 species in Trop. Asia, Austral., and New Zeal. The genus as here defined is that of Robert Brown; some recent authors have revived the older genus of the same name of Patrick Browne, making it supplant the usual species of Cuphea (p. 913). *P. Páddisonii*, R. T. Baker, is reported as under cult. It is a woody climber with glabrous sts., attaining a height of about 15 ft., and with stalked obovate-lanceolate lvs. This species produces tubers the size of beet-root, which are used as food by colonists as well as natives of New S. Wales. R.H. 1901:322 (note).

PARTHÈNIUM (ancient name transferred to this plant). *Compósitæ*. About a dozen perennial or annual, mostly canescent or pubescent, rather coarse herbs or shrubs of the western hemisphere, only rarely taken to gardens and apparently not domesticated. The heads are only inconspicuously rayed and not specially showy, the ray-florets about 5. *P. integrifòlium*, Linn., the American Feverfew, or Prairie Dock, has been offered as an ornamental hardy herbaceous perennial, but the plant is desirable only for foliage effects; and the fls. are not attractive. It is pictured in B.B. 3:411 and described in American manuals; it grows on dry soils from Minn. to Ga.: stout, to 4 ft., from a tuberous rootstock: lvs. ovate or ovate-oblong: heads many in a dense corymb, the rays whitish. The so-called "guayule rubber" of Mex., *P. argentàtum*, Gray, the difficulty of growing which has caused much discussion, is reported as being under cult. in Mexico City by M. Calvino. It is unknown in horticulture.

PARTHENOCÍSSUS (Greek, *parthenos*, virgin, and *kissos*, ivy; translation of its French name). Syn. *Quinària, Psédera*. *Vitàceæ*. Woody vines planted chiefly for their handsome foliage.

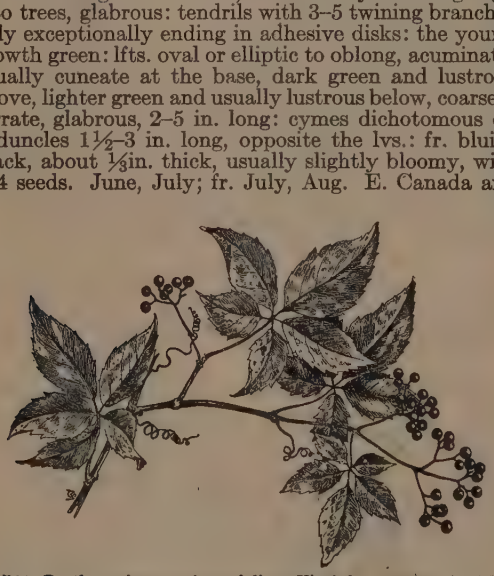
Deciduous or rarely evergreen shrubs climbing by means of tendrils with adhesive tips, rarely these tips not developed: bark with lenticels; pith white: lvs. alternate, digitate or 3-lobed, long-petioled: fls. in peduncled compound cymes opposite to the lvs., often crowded at the end of the branches and forming panicles, perfect, rarely polygamous; calyx minute, petals 5, rarely 4, spreading; stamens 5 or 4; style short and thick; a distinct disk wanting; ovary 2-celled, each cell with 2 ovules: fr. a 1–4-seeded berry.—About 10 species in N. Amer., Mex., E. Asia, and Himalayas. Formerly usually classed with Ampelopsis, which see for the differentiating characters between the allied genera.

These are high-climbing vines with handsome three- to seven-foliolate or three-lobed leaves assuming beautiful tints in autumn and with small greenish flowers in cymes or panicles followed by bluish black or black berries. They are particularly valuable as they cling firmly to walls and trees by means of adhesive tips of the tendrils without any other support. *P. quinquefolia*, *P. vitacea*, and *P. tricuspidata* are hardy North, while the other species are more or less tender; *P. Henryana* may be grown in the greenhouse for its beautiful foliage. In humid and good soil all species grow vigorously and soon cover large spaces. Propagation is by seeds or by hardwood cuttings or by layers, but *P. tricuspidata* and its varieties are usually grown from greenwood cuttings.

A. *Lvs. 5-foliolate.*

B. *Young branchlets terete: lvs. green.*

vitàcea, Hitch. (*P. quinquefòlia,* Graebn. *Ampelópsis quinquefòlia* var. *vitàcea,* Knerr. *A. dumetòrum,* Hort. *P. dumetòrum,* Rehd. *P. laciniàta,* Small). Usually low and rambling over bushes, occasionally climbing high into trees, glabrous: tendrils with 3–5 twining branches only exceptionally ending in adhesive disks: the young growth green: lfts. oval or elliptic to oblong, acuminate, usually cuneate at the base, dark green and lustrous above, lighter green and usually lustrous below, coarsely serrate, glabrous, 2–5 in. long: cymes dichotomous on peduncles 1½–3 in. long, opposite the lvs.: fr. bluish black, about ½in. thick, usually slightly bloomy, with 3–4 seeds. June, July; fr. July, Aug. E. Canada and



2766. Parthenocissus quinquefolia.—Virginia creeper. (×⅙)

New England to Assiniboia and from Mich. south to Texas and Colo. B.M. 2443. S.T.S. 1:89. Var. **laciniàta,** Rehd. (*P. quinquefòlia* var. *laciniàta,* Planch.). Lfts. smaller, narrower, more deeply and incisely serrate, usually yellowish green. Wyo. to New Mex. Var. **macrophýlla,** Rehd. (*Ampelópsis macrophýlla,* Hort. *A. quinquefòlia* var. *latifòlia,* Dipp. *A. Ròylei,* Hort.). Lfts. elliptic, large, dark green, sometimes 8 in. long and 5 in. broad. Garden form. Var. **dùbia,** Rehd. (*P. hirsùta,* Graebn.). Young branchlets and lvs., at least on the veins beneath, more or less hairy.—This species is somewhat hardier than the following, but does not cling to walls; it may be used for covering trellis-work. The foliage is darker green and more lustrous.

quinquefòlia, Planch. (*Vìtis quinquefòlia,* Lam. *Ampelópsis quinquefòlia,* Michx. *A. hederàcea,* DC. *A. virginiàna,* Hort.). Virginia Creeper. Fig. 2766. High-climbing: tendrils with 5–8 branches ending in adhesive tips: the young growth purplish: lfts. elliptic to obovate-oblong, acuminate, usually cuneate at the base, coarsely and often crenately serrate, dull green above, glaucescent beneath: cymes crowded into terminal panicles: fr. bluish black, slightly bloomy, about ¼in. thick, with usually 2 or 3 seeds. July, Aug.: fr. in Sept., Oct. New England south to Fla. and Mex., west to Ohio, Ill., and Mo. Em. 2:535. S.T.S. 1:88. Var. **muròrum,** Rehd. (*P. quinquefòlia* var. *latifòlia,* Rehd. *P. radicantíssima,* Graebn. *Ampelópsis muràlis,* Hort. *A. radicantíssima,* Schelle). Tendrils with shorter and more numerous, usually 8–12 branches: lfts. generally broader, the outer ones usually broadly ovate and rounded at the base. This is a more southern form and somewhat tenderer. Var. **mìnor,** Rehd., is similar to the preceding variety, but lfts. smaller and broader, oval to orbicular-ovate, rounded at the base, on slender stalks about ⅓in. long. Var. **hirsùta,** Planch. (*P. hirsùta,* Small. *Ampelópsis hirsùta,* Don. *A. Graèbneri,* Bolle. *A. pubéscens,* Schlecht. *A. quinquefòlia* var. *radicantíssima,* Rehd. *A. radicantíssima,* Hort.). Young branchlets, infl. and the lvs. soft-pubescent, at least beneath, usually bright red while young, otherwise like the type. Gt. 48:1462. Var. **Saint-Paùlii,** Rehd. (*P. Saint-Paùlii,* Graebn. *Ampelópsis Saint-Paùlii,* Hort.). Young branchlets and lvs. beneath pubescent: lfts. oblong-obovate, cuneate at the base, short-stalked or nearly sessile, sharply serrate with usually spreading teeth: panicles elongated: tendrils with 8–12 branches: aërial rootlets often present. Iowa and Ill. to Mo. and Texas. R.H. 1907, p. 567. Var. **Éngelmannii,** Rehd. (*P. Éngelmannii,* Graebn. *Ampelópsis Éngelmannii,* Hort.), does not differ much from the typical form except in its generally smaller foliage.—The species is a very valuable climber of vigorous growth with the foliage changing to bright scarlet in fall; the varieties *hirsuta, Saint-Paulii,* and *murorum,* are particularly adapted for covering walls; they cling firmly and form a dense, close covering like *P. tricuspidata,* but grow more quickly and more straight upward than that species.

BB. *Young branchlets quadrangular: lvs. usually with white markings above and purplish below.*

Henryàna, Diels & Gilg (*Vìtis Henryàna,* Hemsl. *Ampelópsis Henryàna,* Hort.). Climbing to 20 ft. or more: tendrils with 5–7 slender branches with adhesive tips.: lfts. 5, stalked, elliptic-ovate to cuneate-obovate, acuminate, toothed usually only above the middle, glabrous or hairy on the midrib beneath, 1½–2½ in. long, bright scarlet when unfolding, changing finally to dull reddish green, with silvery markings along the veins above, purple or purplish beneath: fls. in narrow panicles, 3–6 in. long: fr. dark blue, usually 3-seeded. Cent. China. G.C. III. 37:309; 39:354. Gn. 69, p. 341. M.D.G. 1908:259. R.H. 1907, p. 211. R.H.B. 32:213. —This is a very handsome but tender species; the coloring of the lvs. is more beautiful when grown in the greenhouse or outdoors in a partly shaded place; in the full sun the lvs. lose finally the white markings and the purple color.

AA. *Lvs. partly 3-lobed and partly 3-foliolate.*

tricuspidàta, Planch. (*Vìtis incónstans,* Miq. *Ampelópsis tricuspidàta,* Sieb. & Zucc. *A. Veìtchii* var. *robústa,* Hort. *A. Hóggii,* Hort. *A. incónstans,* Hort. *A. japónica,* Hort.). Japanese Ivy. Boston Ivy. Fig. 2767. High-climbing: tendrils short, much-branched, with adhesive tips: lvs. slender-stalked, cordate, either simple and 3-lobed with acuminate serrate lobes, to 10 in. long, or 3-foliolate; lfts. ovate, sessile, serrate,

shining and glabrous on both sides or puberulous on the veins beneath: cymes mostly on short branchlets, axillary or terminal, narrow and somewhat elongated: fr. bluish black, bloomy. June, July; fr. in Sept., Oct. Japan, Cent. China. B.M. 8287. G.C. II. 14:664. A.G. 15:94. B.H. 27:244. R.H. 1877, p. 176. Gng. 1:373; 4:353. R.B. 1877:11. Var. **Veitchii,** Rehd. (*P. Veitchii,* Graebn. *Vitis Veitchii,* Hort. *Ampelópsis Veitchii,* Hort.). Lvs. smaller, crenately serrate, purple while young; lfts. with only 1–3 coarse teeth on each side, the lateral ones inside without teeth. Apparently only a juvenile form which may pass later into the type. Var. **purpùrea,** Hort. (*Ampelópsis Veitchii* var. *purpùrea* or *atropurpùrea,* Hort.). Lvs. dark purple, not changing to green. Var. **Lòwii,** Rehd. (*Ampelópsis Lòwii,* Hort. *Vitis incónstans* var. *Lòwii,* Hort.). Lvs. small, ¾–1½ in. long, mostly entire or 3-foliolate, often broader than long, incisely dentate or almost palmately lobed with very unequal teeth, apple-green, purplish when young, changing to deep red in autumn. Gn. 71, p. 516. J.H. III. 56:335. R.H.B. 33:388. A.F. 30: 1238. M.D.G. 1908:261. Var. **aurâta,** Hort. Lvs. marbled with golden yellow and green.—This species is a hardy and very useful climber, clinging firmly and covering walls densely; the glossy foliage stands dust and smoke well, and turns to a brilliant orange and scarlet in fall. Probably the favorite of all hardy vines in cities. The varieties *Veitchii* and *Lowii* are much slenderer and smaller and are very effective as basket plants (M.D.G. 1892:8).

P. heptaphýlla, Small (P. texana, Rehd. A. quinquefolia var. heptaphylla, Bailey. A. heptaphylla, Buckl.). High-climbing: tendrils with 2–4 branches without disks: lfts. usually 7, oblong-obovate, cuneate at the base, coarsely serrate, 1½–2½ in. long: cymes dichotomous, opposite the lvs. Texas. S.T.S. 1:90.—*P. himalayàna,* Planch. (Ampelopsis himalayana, Royle). Allied to P. tricuspidata: lfts. 3, ovate to oblong-ovate, the lateral ones rounded or subcordate at the base, coarsely serrate, 2–5 in. long: cymes about as long as the lvs. Himalayas. Var. *rubrifòlia,* Gagnep. (Vitis rubrifolia, Léveillé & Vaniot). Lfts. smaller and broader, purplish while young: cymes smaller. W. China.—*P. lætévirens,* Rehd. Allied to P. quinquefolia. Tendrils with 5–8 slender branches: lvs. obovate or elliptic, coarsely serrate, bright yellowish green on both sides, 2–4 in. long, glabrous or hairy on the veins below: fls. in large terminal panicles. Cent. China.—*P. Thómsonii,* Planch. (Vitis rubrifolia, Laws. P. Henryana var. glaucescens, Diels & Gilg. Ampelopsis Thomsonii, Hort.). Tendrils with 3–5 disk-bearing branches: lfts. 5, slender-stalked, elliptic-ovate to elliptic-oblong, cuneate, serrate, glabrous or slightly pubescent on the veins beneath, bluish green, 1½–3 in. long: fls. in dichotomous cymes 1½–3 in. broad, opposite the lvs.: fr. black. Himalayas, Cent. China. Gn. 63, p. 203. J.H.S. 28, p. 216, fig. 184.—A very handsome slender vine; foliage purplish while young, and purplish red in fall. Tender.

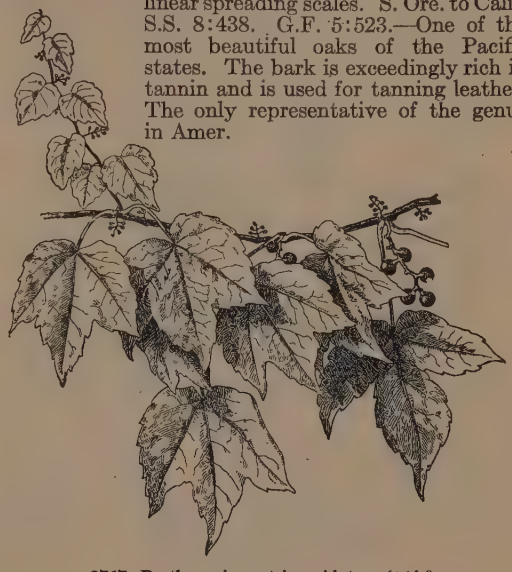
ALFRED REHDER.

PARTRIDGE-BERRY: *Mitchella repens.* Sometimes applied to *Gaultheria procumbens.*

PASÀNIA (the vernacular name of one of the species in Java). *Fagàceæ.* Ornamental trees grown for their handsome foliage.

Evergreen: winter-buds with few foliaceous scales: lvs. short-petioled, entire or dentate: staminate fls. in upright catkins, with a rudimentary ovary; stamens usually 12, much longer than the 4–6-lobed calyx; pistillate fls. solitary or 3–5, on separate catkins or at the base of the staminate catkins; ovary 3-celled, with 3 cylindric styles stigmatic only at the apex: fr. a 1-seeded nut, surrounded at the base or wholly inclosed by the cup, its scales distinct and imbricate or connate into concentric rings.—About 100 species in S. E. Asia, one in Calif. Closely related to Quercus, from which it is easily distinguished by the upright staminate catkins and the cylindric styles stigmatic only at the apex.—The pasanias can be grown in warmer temperate regions only and are little known in cult. Their treatment and propagation is the same as that of the evergreen species of oak.

densiflòra, Oerst. (*Quércus densiflòra,* Hook. & Arn.). TANBARK OAK. Evergreen tree, to 70, occasionally to 100 ft., with spreading branches forming a dense, broad, round-topped head: lvs. oblong-obovate or oblong, acute, remotely dentate, with short acute callous teeth, fulvous-tomentose when young, at maturity glabrous and pale green above, rusty tomentose beneath and finally glabrous and bluish white: fr. peduncled; acorn ovoid or ovate, ¾–1½ in. long, embraced only at the base by the shallow cup coated with linear spreading scales. S. Ore. to Calif. S.S. 8:438. G.F. 5:523.—One of the most beautiful oaks of the Pacific states. The bark is exceedingly rich in tannin and is used for tanning leather. The only representative of the genus in Amer.



2767. Parthenocissus tricuspidata. (×¼)

P. córnea, Oerst. (Quercus cornea, Lour.). Evergreen tree: lvs. oblong, acuminate, glabrous and green beneath, 2–4 in. long: frs. in short spikes; cup broadly turbinate with small prominent scales embracing the hemispherical flat-topped nut. S. China. H.I. 27:2665. The nut is edible. Young plants have proved hardy at Washington, D. C.—*P. cuspidàta,* Oerst. (Quercus cuspidata, Thunb. Castanopsis cuspidata, Schottky). Evergreen tree, to 40 ft., with slender branches: lvs. ovate to oblong, acuminate, crenately serrate toward the apex or entire, glabrous at length, 1½–3½ in. long: fr. in short spikes; cup ovate, inclosing the acorn. S. Z. 1:2. G.C. III. 12:233. S.I.F. 1:34. Very desirable evergreen tree of vigorous growth. Var. *variegàta,* Hort. Lvs. smaller, with a broad, irregular, creamy white margin. G.C. II. 12:233.—*P. glàbra,* Oerst. (Quercus glabra, Thunb.). Evergreen tree: lvs. oblong, obtusely acuminate, entire, glabrous, light green beneath, 3–6 in. long: fr. in spikes, ripening the second year: the oblong nut embraced about one-third by the cup. Japan. G.C. II. 14:785; III. 16:377. R.H. 1858, p. 351. S.Z. 1:89. S.I.F. 1:32.—*P. thalássica,* Oerst. (Quercus thalassica, Hance). Evergreen tree: lvs. elliptic to obovate-oblong, acuminate, serrate toward the apex or entire, glaucous-tomentulose beneath, 3–5 in. long: fr. in short spikes; cup with appressed scales, embracing one-fourth to one-third of the nut. China. S.I.F. 1:33.

ALFRED REHDER.

PASCÀLIA: *Wedelia.*

PÁSPALUM (Greek, *paspalos,* an ancient name for millet). *Gramineæ.* Spikelets 1-fld., plano-convex, mostly rounded, subsessile and overlapping in 2 rows on one side of a narrow or winged axis forming slender racemes. About 150 species in the warmer parts of both hemispheres, but more abundant in Amer., forming an important part of the pampas and campos of S. Amer. *P. dilatàtum,* Poir., of Argentina, a coarse species 3–5 ft. high, is sparingly cult. as a forage grass in the Gulf states and has become naturalized throughout the S. *P. compréssum,* Nees, CARPET-GRASS, a native, 6 in. to 2 ft. high, with creeping sts. and rather broad lvs. makes a good lawn grass in the Gulf region; it is less difficult to eradicate than Bermuda-grass. *P. distichum,* Linn. Extensively creeping rather wiry perennial, the erect fl.-culms 6–12 in., bearing a pair of divergent spikes. Occasionally used for lawns in the South. S. U. S. to S. Amer. *P. membranàceum,* Lam. Slender perennial with few to several spikes, the silvery spikelets arranged on a broad ribbon-like axis, banded with drab and orange. S. Amer. Cult. in Eu. under the name *P. elegans;* worthy of intro.

A. S. HITCHCOCK.

PASSERÌNA (Latin, *sparrow*, from the supposed resemblance of the seed to the head of a sparrow; or possibly after one of the Passerinis, two Italian botanists). *Thymelæàceæ*. Heath-like shrubs sparingly used in horticulture: lvs. small, decussately opposite: fls. hermaphrodite, in axillary, branched spikes; perianth-tube ovoid, with 4 spreading lobes often about as long as the tube; stamens 8; ovary subsessile, glabrous, 1-celled.—About 5 species from S. Afr. *P. filifórmis*, Linn. Branches puberulent: lvs. acerose-linear, 3-cornered, rather acute: spikes terminal, many-fld.; fls. rose; calyx-lobes oval or oblong. S. Afr.

PASSIFLÒRA (i. e., *passion flower*). Including *Disémma* and *Tacsònia*. *Passifloràceæ*. Passion-Flower. Highly interesting herbs, shrubs, or trees, most of the cultivated kinds climbing by means of tendrils, with flowers of odd structure; some of them produce edible fruits.

Mostly vines, but some species erect: lvs. alternate, rarely opposite, the petiole usually gland-bearing, the blade entire, digitately lobed or parted, stipules sometimes present: tendrils (sometimes wanting) lateral, simple: fls. solitary or racemose, mostly axillary, on articulated and often 3-bracted peduncles, mostly hermaphrodite, with colors in yellow, green, blue and red, often large and showy; calyx with short tube (also with long tube when Tacsonia is included), the lobes or petals 4 or 5 and narrow, often colored inside, bearing on the throat a simple double or triple showy fringe or crown; petals 4 or 5 (sometimes wanting, or 3), attached on the calyx-throat; stamens 4 or 5, the filaments joined into a tube in which is the gynophore or stalk of the ovary, the anthers linear-oblong and versatile; ovary oblong or nearly globular, with 3 styles and 3 many-ovuled parietal placentæ: fr. large or small, berry-like, many-seeded, oblong or globular; seeds flat, mostly ovate, with a fleshy aril.—Species probably 250–300. By some, the genus Tacsonia is separated from Passiflora, but it is here combined; it differs in having an elongated rather than very short calyx-tube or hypanthium; Andean species. See *Tacsonia*.

2768. Fruit of Maypop.—Passiflora incarnata. (×⅔)

With the exception of a few Malayan, Chinese and Australian species, the true passifloras are natives of tropical America, some of them in the subtropical and warm temperate parts. Many of them are cultivated as curiosities, and some of them for the beauty of their flowers and for their festooning foliage. The fruit is of many kinds, in most cases not edible. The ovary is supported on a long stalk, which is inclosed in or usually united with the tube formed by the union of the bases of the filaments. The structure of the fruit is well shown in Fig. 2768; the remains of the floral envelopes have broken from the attachment on the torus and rest on the fruit. A dozen passifloras occur in the United States, and one of them, *P. lutea*, grows naturally as far north as southern Pennsylvania and Illinois. From Virginia south, the Maypop, *P. incarnata*, is a very common plant in fields and waste places. Both these species are herbaceous perennials.

In cultivation, the passifloras have been considerably hybridized, and they are also confused with Tacsonia. In 1871 Masters enumerated 184 species (Trans. Linn. Soc. 27), but many species have been discovered since that time. Most of the passion-flowers are yellow or green in color of envelopes, but there are fine reds in *P. racemosa*, *P. Raddiana*, *P. coccinea*, *P. alata*, *P. vitifolia*, and others. The species known to gardeners are few, although many kinds are or have been in cultivation by fanciers and in collections. They usually require much rafter room in greenhouses. According to G. W. Oliver, *P. cærulea* and Constance Elliott are both hardy at Washington. Not many of the tender species and hybrids are grown to any great extent in this country. *P. alata* and *P. quadrangularis* are desirable climbers for a roomy warm greenhouse. *P. quadrangularis* var. *variegata* seems to flower quite as freely as the green-leaved one. Passifloras are propagated from cuttings of the half-ripened growth, with bottom heat. *P. racemosa* and *P. Loudonii* are a trifle difficult to root from cuttings; the growths should be as ripe as possible for this purpose. Keep the under surface of the leaves flat on the sand while rooting. The native *P. incarnata* grows very freely at Washington, becoming more or less of a weed and hard to eradicate.

The peculiar charm of these plants lies in the odd flowers, the parts of which were fancied by the early Spanish and Italian travelers to represent the implements of the crucifixion (whence both the technical and popular names). Legend and superstition have attached to these plants from the first. The ten colored parts of the floral envelope were thought to represent the ten apostles present at the crucifixion, Peter and Judas being absent. Inside the corolla is a showy crown or corona of colored filaments or fringes, taken to represent the crown of thorns, or by some thought to be emblematic of the halo. The stamens are five, to some suggestive of the five wounds, by others thought to be emblematic of the hammers which were used to drive the three nails, the latter being represented by the three styles with capitate stigmas. The long axillary coiling tendrils represent the cords or the scourges. The digitate leaves suggest the hands of the persecutors. The following sketch of the passion-flower legend is from Folkard's "Plant Lore, Legends and Lyrics," and the illustration (Fig. 2769) is also produced from that book: "The passion-flower (*Passiflora cærulea*) is a wild flower of the South American forests, and it is said that the Spaniards, when they first saw the lovely bloom of this plant, as it hung in rich festoons from the branches of the forest trees, regarded the magnificent blossom as a token that the Indians should be converted to Christianity, as they saw in its several parts the emblems of the passion of our Lord. In the year 1610, Jacomo Bosio, the author of an exhaustive treatise on the Cross of Calvary, was busily engaged on this work when there arrived in Rome an Augustinian friar, named Emmanuel de Villegas, a Mexican by birth. He brought with him, and showed to Bosio, the drawing of a flower so 'stupenduously marvelous,' that he hesitated making any mention of it in his book. However, some other drawings and descriptions were sent to him by inhabitants of New Spain, and certain Mexican Jesuits, sojourning at Rome, confirmed all the astonishing reports of this floral marvel; moreover, some Dominicans at Bologna engraved and published a drawing of it, accompanied by poems and descriptive essays. Bosio therefore conceived it to be his duty to present the *Flos Passionis* to the world as the most wondrous example of the *Croce trionfante* discovered in forest or field. The flower represents, he tells us, not so directly the Cross of our Lord, as the past mysteries of the Passion. It is a native of the Indies, of Peru, and of New Spain, where the Spaniards call it 'the Flower of the Five Wounds,' and it had clearly been designed by the great Creator that it might, in due time, assist in

the conversion of the heathen among whom it grows. Alluding to the bell-like shape assumed by the flower during the greater part of its existence (i.e., whilst it is expanding and fading), Bosio remarks: 'And it may well be that, in His infinite wisdom, it pleased Him to create it thus shut up and protected, as though to indicate that the wonderful mysteries of the Cross and of His Passion were to remain hidden from the heathen people of those countries until the time preordained by His Highest Majesty.' The figure given to the Passion-flower in Bosio's work shows the crown of thorns twisted and plaited, the three nails, and the column of the flagellation just as they appear on ecclesiastical banners, etc. 'The upper petals,' writes Bosio in his description, 'are tawny in Peru, but in New Spain they are white, tinged with rose. The filaments above resemble a blood-coloured fringe, as though suggesting the scourge with which our blessed Lord was tormented. The column rises in the middle. The nails are above it; the crown of thorns encircles the column; and close in the center of the flower from which the column rises is a portion of a yellow colour, about the size of a reale, in which are five spots or stains of the hue of blood, evidently setting forth the five wounds received by our Lord on the Cross. The colour of the column, the crown, and the nails is a clear green. The crown itself is surrounded by a kind of veil, or very fine hair, of a violet colour, the filaments of which number seventy-two, answering to the number of thorns with which, according to tradition, our Lord's crown was set; and the leaves of the plant, abundant and beautiful, are shaped like the head of a lance or pike, referring, no doubt, to that which pierced the side of our Savior, whilst they are marked beneath with round spots, signifying the thirty pieces of silver.' "

Passifloras as gardener's ornamental plants. (J. J. M. Farrell.)

These plants constitute a large family or group of evergreen climbers. They will show to best advantage when they can be planted out permanently in a warm conservatory and where they can have comparatively large space to climb. They may also be grown in pots when the conditions do not permit other methods of handling.

Passifloras may be propagated either by cuttings or seeds. They may be rooted from young growth taken any time from the middle of January until April. These cuttings are placed in a warm propagating-bed, and kept shaded and moist, and in a short time they will root; they are also inserted in small pots in a mixture of loam, peat, and sand, in equal parts, and plunged in the propagating-bed. When rooted, the cuttings are potted off, using a compost of loam four parts, leaf-mold two parts, well-rotted cow-manure one part, and which should contain enough sand to keep it porous. Keep shaded until they become well established, when they may be given a place well up to the glass in full sun. The passifloras are also readily raised from seed sown in spring, and the plants potted off as soon as big enough.

The plants will stand a night temperature of 65° to 70°; this can be increased until it reaches 80° to 85° for a day temperature with sun. Give ventilation daily, taking into account the state of the weather; while they like plenty of heat, they will not do well in a stagnant atmosphere; therefore, give air on all favorable occasions. Every morning in bright weather, give them a good syringing, as this is a great aid in keeping them in vigor and supplying the desired atmospheric moisture, but this does not mean a very humid atmosphere. By pinching, the plants are made to produce several growths. These plants can be shifted until they are in 10- or 12-inch pots. The growth may be trained on pillars or along rafters of the conservatory. When planted out in about 8 or 10 inches of soil, passifloras will cover a very large space, but sometimes to such an extent as to obscure the whole glass. The best place is on a back wall in some house where they may ramble at will. Keep well syringed until they show flower, when syringing should be discontinued until they are through blooming. After the plants have covered the position allotted to them, all that is required is the regulation of the young growth, so as to keep them from becoming entangled. In winter they may be cut back and the exhausted soil replaced by good rich compost. They will not need a high temperature, doing well in 55° to 60° at night. When they start off into growth again, keep raising the temperature until it has reached the figures already stated. They may now be given manure water regularly and throughout the growing season. Keep down thrip, red-spider, and mealy-bug by syringing and sponging.

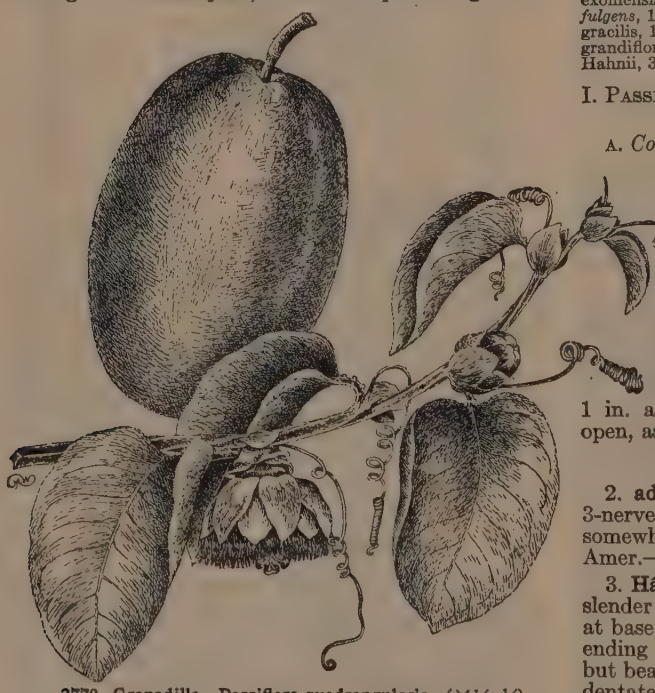
2769. Old conception of the passion-flower.
From Folkard's "Plant Lore," and there taken from Zahn.

The edible-fruited passifloras. (F. W. Popenoe.)

The principal species of Passiflora that are cultivated for their fruits in tropical and subtropical regions are *P. quadrangularis*, the granadilla, granadilla real of Costa Rica, barbadine of the French colonies, pasionaria of Cuba, maracujá melão of Brazil; *P. edulis*, also called granadilla, as well as passion-fruit; and *P. laurifolia*, the water-lemon of the British West Indies, pomme-liane of the French colonies. While *P. quadrangularis* is a common garden plant in tropical America, it is not so extensively grown in any region as is *P. edulis* in Australia. In the United States these species can be grown only in the warmest regions; in California *P. edulis* is the only one that is successfully cultivated in the open, the other two species being much more susceptible to frost; in south Florida all three can be grown, although the tropical species are sometimes injured by frost.

The true granadilla (*P. quadrangularis*) is a strong rapid-growing climber, frequently planted for ornament in tropical regions and allowed to cover arbors and pergolas. Its brownish yellow ovoid fruits are sometimes 8 inches in length, and within the thin brittle pericarp is a large number of small flattened seeds surrounded by gelatinous pulp and subacid juice. When green, they are sometimes boiled and used as a vegetable; when ripe, the acidulous pulp is refreshing, and is used to prepare cooling drinks, or is eaten with a spoon directly from the fruit.

The passion-fruit (*P. edulis*) is considerably smaller than the granadilla, rarely larger than a hen's egg, and dull purple when ripe. Its pulp is slightly more acid than that of the granadilla, but of very pleasant flavor, and highly esteemed in Queensland and New South Wales, where the plant is cultivated commercially. It is used for flavoring sherbets, for confectionery, for icing cakes, for "trifles,"—a dish composed of sponge cake, fruits, cream, and white of egg,—for jams, and for other table purposes. The pulp is also eaten directly from the fruit, after adding a little sugar, or is used to prepare a refreshing drink, by beating it up in a glass of ice-water and adding a pinch of bicarbonate of soda. The plants are grown on trellises about 6 feet high; at the top of the trellis is nailed a crosspiece 18 inches long, from the ends of which are run two wires, the long branches being allowed to hang down over these to the ground. The rows are placed 15 feet apart, with the vines 15 feet apart in the row. The young plants must be protected in regions subject to frost; they begin bearing the second year, sometimes producing a few



2770. Granadilla—Passiflora quadrangularis. (×⅛-¼)

fruits the first season, and continue in profitable production four to six years, when they must be renewed. By proper pruning, two crops a year can be secured, in regions not subject to frost. The most suitable soil seems to be sandy loam, although other soils will grow the plant successfully. Manure should be supplied liberally. In Australia, the profits of passion-fruit culture are reported to run from $100 to $300 an acre annually. Because of the short life of the vines, they are often planted as a catch-crop in young orchards which have not yet come into bearing. Like *P. quadrangularis*, this species is often grown as an ornamental plant, and makes an excellent and rapid-growing cover for fences and trellises.

The passifloras are easily propagated by seeds or cuttings, the latter method being preferable in most cases. Seeds should be removed from the fruit, dried in a shady place, and planted in flats of light soil. They do not germinate very quickly, but the young plants are easily raised, and may be set out in the open ground when six months to a year old. Cuttings should be taken from fairly well-matured shoots, and should be about 6 inches in length. They are easily rooted in sand, no bottom heat being required. Cuttings of *P. edulis* will often fruit in pots at the age of one to two years, and form very interesting greenhouse plants. While this species usually fruits prolifically, *P. quadrangularis* sometimes requires hand-pollination when grown outside its native habitat.

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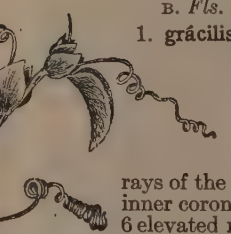
I. PASSIFLORA *proper, with short hypanthium or calyx-tube (species 1–24).*

A. *Corona with sharp folds, and crinkled at the edge.*

B. *Fls. apetalous, usually with no bracts.*



1. **grâcilis,** Jacq. Slender annual: st. terete, glabrous: lvs. rather small, broadly deltoid-ovate, very shallowly and bluntly 3-lobed: fls. solitary, pale green or whitish, considerably surpassed by the lvs., the calyx-lobes oblong or lanceolate, the filiform rays of the corona in a single row and equal, the inner corona a lacerated membrane: seeds with 6 elevated ridges. Brazil. B.R. 870.—Fl. about 1 in. across. Easily grown either indoors or in the open, as a garden annual.

BB. *Fls. petaliferous, with large bracts.*

2. **adenópoda,** Moc. & Sessé. Lvs. glabrous, cordate, 3-nerved and 5-lobed, the lobes ovate-acuminate and somewhat serrate: bracts cut-serrate. Mex. to S. Amer.—Once advertised in the U. S.

3. **Hâhnii,** Mast. Tall, glabrous climber, with very slender terete pendulous branches: lvs. ovate, peltate at base, strongly 3-nerved and each of the side nerves ending in a tooth, but the lf.-margin otherwise entire but bearing minute red glands: stipules kidney-shaped, dentate, purplish, nearly or quite 1 in. across: fl.-bracts 2, entire: fl. about 3 in. across, solitary, whitish and pale green, the corona shorter than the envelopes, the outer filaments being orange-yellow, about ¾in. long. Mex. B.M. 7052. R.H. 1869:430 (as *Disemma Hahnii*). G.C. II. 12:504.

BBB. *Fls. with small or minute petals and also small or minute bracts.*

C. *Lvs. oblong-ovate.*

4. **trifasciàta,** Lem. Lvs. 3-lobed to one-third or one-half their depth, the margins entire, with an irregular

reddish purple band along each of the 3 midribs: fls. yellowish, fragrant, small. Brazil. I.H. 15:544. G.Z. 12:96.—Interesting for its ornamental foliage.

cc. *Lvs. broader than long.*

5. **lùtea,** Linn. Wild Yellow Passion-Flower. Perennial herb, 5–10 ft. tall or long, glabrous or very nearly so: lvs. broader than long, shallowly and bluntly 3-lobed, cordate at base, the petiole glandless: fls. solitary or in pairs, about ¾in. across, greenish yellow: fr. a globular berry about ½in. diam., smooth, purple at maturity. Pa. south and west, in thickets and more or less damp places. B.R. 79.—It has been offered by dealers in native plants.

6. **maculifòlia,** Mast. Notable for its spotted or variegated foliage: branches slender and wiry, puberulous: lvs. short-stalked, roundish cordate, 3-nerved, with 3 shallow lobes at the truncate apex, green and yellow-blotched above, purplish and glandular beneath: fls. in pairs, cream-colored, nearly 1 in. across, the peduncles with 3 remote minute bracts; calyx cup-shaped, with acuminate recurved lobes; petals shorter than calyx-lobes or sepals; crown plicated and with hatchet-shaped processes. Venezuela. G.C. III. 32:suppl. Nov. 8.

aa. *Corona not crinkled or folded on the edge, plain or nearly so.*

b. *Bracts grown together.*

7. **ligulàris,** Juss. (*P. Lòwei,* Heer). Woody below, tall, branchy: lvs. large, cordate, ovate-acuminate, neither lobed nor toothed: fls. solitary, the petals and sepals greenish, the corona white, with zones of red-purple: fr. as grown in S. Calif. described as oval, larger and more oblong than that of *P. edulis,* with a hard shell and buff-brown in color. Trop. Amer. B.M. 2967.—Young foliage has metallic hues.

bb. *Bracts free.*

c. *Tube of fl. evident and cylindrical, swollen at the base.*

8. **racemòsa,** Brot. (*P. princeps,* Hort. *P. amábilis,* Hort., in part). Lvs. glabrous, usually truncate at base, mostly deeply 3-lobed, the margins entire: fls. 4 in. or more across, the narrow petals deep red and wide-spreading, the short, upright crown purplish; calyx keeled on the lower side; fls. solitary, but the peduncles usually 2 from an axil, becoming racemose on the ends of the shoots: bracts 3: fr. described in cult. as cylindrical-ovate, greenish yellow at maturity. Brazil. B.M. 2001. B.R. 285. L.B.C. 1:84. Gn. 39:168. G.L. 24:222. —A fine old species and a parent of various garden hybrids. One of the best of the red-fld. passifloras. Summer and fall.

9. **Raddiàna,** DC. (*P. kermesìna,* Link & Otto). Rather slender climber, glabrous: lvs. shallow-cordate, 3-lobed and sparingly dentate, purplish beneath: fls. solitary, with very narrow distinct sepals and petals of a bright crimson-red, which are wide-spreading at first but finally turning almost straight back; crown black-purple, upright, with smaller whitish filaments inside. Summer and fall. Brazil. B.M. 3503. B.R. 1633. G. 1:453. F.W. 1874:161.—An old and well-known species; said to prop. from cuttings of old well-formed wood. **P. Loùdonii,** Hort., is considered to be a hybrid of this and *P. racemosa.*

10. **Watsoniàna,** Mast. Sts. wiry, purplish, with leafy dentate stipules: lvs. shallow-cordate, rather broader than long, 3-lobed to the middle, with a few teeth: peduncles 1-fld.; fls. about 3 in. across, the sepals linear and shaded with violet; petals also very narrow, lilac; crown of many rows of filaments, violet with bars of white below the middle, the inner and shorter set deep violet. Probably Brazilian. G.C. II. 26:648, 649. I.H. 36:74. Gn. 33:194. A.F. 6:571.—Good grower.

cc. *Tube of fl. very short, thick or fleshy in substance.*

d. *Sts. and branches strongly 4-angled or even winged: lvs. simple.*

11. **quadrangulàris,** Linn. Granadilla. Fig. 2770. Tall strong climber, glabrous: lvs. ovate or round-ovate, cordate at base, mucronate, entire, the petiole with 2 or 3 pairs of glands: stipules large: fl. large (3–5 in. across) and interesting, fragrant, with ovate sepals and petals (the former white within and the latter reddish), the crown composed of 5 series of white-and-purple parti-colored filaments, of which the outermost exceed the floral envelopes: fr. oblong, 5–9 in. long, yellowish green, pulpy and edible. Trop. Amer. B.R. 14. R.H. 1898, p. 569. Gn. 51, p. 313; 59, pp. 4, 7. G. 33:161.—Widely grown in the tropics, and variable, both as a vine and for its edible frs. Frequent in collections of economic plants in the N. It is a good climber for covering a greenhouse roof. Best results are secured if the temperature does not fall below 50°. The fr. ripens in summer. The fls. usually need to be hand-pollinated if fr. is wanted on house-grown plants. Var. **variegàta,** Hort. (*P. variegàta,* Hort. *P. aucubifòlia,* Hort.), has foliage blotched with yellow.

2771. Passiflora edulis. (×¼)

12. **alàta,** Dry. St. winged: lvs. glabrous, oval to ovate, somewhat cordate at base, the margin often undulate but otherwise entire, the petiole with 2 pairs of glands: fl. 3–4 in. across, very fragrant, the interior of the sepals and petals carmine; corona nearly or quite as long as the envelopes, the numerous filaments parti-colored with red, purple, and white: fr. yellow, ovoid-pointed, about 5 in. long, very fragrant and one of the most edible. S. Amer. B.M. 66. G.C. III. 15:19; 22:449–51; 43:187. R.B. 20, p. 104 (see R.H. 1902, pp. 287–9, for taxonomic discussion).—An excellent old species, ripening its fr. in midsummer. It is very variable, and is perhaps one form of a polymorphous species including the granadilla. *P. phœnicea,* Lindl. (B.R. 1603), *P. brasiliana,* Desf., *P. oviformis,* Roem., *P. latifolia,* DC., *P. mauritiana,* Thouars, and *P. mascarensis,* Presl., are all considered to be forms of this species. **P. Lawsoniàna,** Hort., not Mast., is a hybrid of *P. alata* and *P. racemosa:* lvs. oblong-oval, somewhat peltate, entire: fls. 3–4 in. across, brownish inside, the corona with filaments in several series.

13. **Decaisneàna,** Hort., is perhaps a hybrid of *P. quadrangularis* and *P. alata:* fls. bright carmine inside, about 4 in. across; corona as long as or longer than the

envelopes, the more or less tortuous filaments banded with deep blue and white: lvs. bearing about 6 glands. R.H. 1855:281; 1902:288 (as *P. Decaisneana* and *P. quadrangularis* var. *Decaisneana*, where a botanical and historical discussion by André may be found). F.S. 8:848.

DD. *Sts. and branches terete, or at least not winged.*

E. *Lvs. not lobed.*

14. **amábilis,** Hook. St. slender and terete: lvs. ovate, very sharp-pointed, entire, rather thin, the petiole with about 2 pairs of glands: fl. solitary, about 3 in. across, the sepals and petals alike and bright brick-red within; corona or white filaments in 4 series, the 2 inner series being short. Brazil. B.M. 4406. Gn. 55:272.

15. **laurifòlia,** Linn. (*P. tinifòlia,* Juss.). JAMAICA HONEYSUCKLE. WATER-LEMON. St. terete, plant glabrous: lvs. oval to oval-oblong, thickish, entire, with

2772. Passiflora cærulea, the commonest cultivated passion-flower. (×⅔)

a short sharp point; petiole with 2 glands at apex: fl. about 2½ in. across, white, with red spots or blotches; corona somewhat exceeding the petals or at least about equaling them, in 3 series, violet with white bands: fr. about 3 in. long, yellow, spotted with white, edible, according to Lindley, but the plant cult. under this name in S. Calif. said to have frs. not yellow spotted white, but much like those of the plant there known as *P. ligularis* (see No. 7). Trop. Amer. B.R. 13. B.M. 4958.

16. **coccínea,** Aubl. (*P. velùtina,* DC. *P. fúlgens,* Wallis). Glabrous: lvs. ovate and coarsely toothed; petioles with 2–3 pairs of glands: fl. scarlet; corona orange: fr. pulpy, edible. S. Amer. G. 28:512. H.F. II. 6:6.—A free-flowering species, of good constitution.

EE. *Lvs. 3–7-lobed.*

F. *Blossoms bright red.*

17. **vitifòlia,** HBK. (*P. sanguínea,* Smith. *Tacsònia Buchánanii,* Lem.). St. shrubby, climbing, terete: lvs. cordate-ovate in outline, deeply 3-lobed or divided and the divisions coarsely toothed, strong-veined, usually pubescent beneath: fl. 4–6 in. across, nearly flat, the linear-oblong sepals and petals bright scarlet, the sepals with a spine at the tip; outer corona filaments red, the inner ones white, all of them upright or spreading and much shorter than the envelopes. Brazil. B.M. 7936. F.M. 1878:317. G.C. III. 8:213; 43:187. G.Z. 28:145. F.W. 1868:289.—An old species, but not common in cult. Said not to be free-flowering. A very brilliant species.

FF. *Blossoms white, greenish, purplish, or variously tinted, but not red.*

G. *Rays of corona (or the outer ones) about as long as the floral envelopes: lf.-margins strongly serrate (except sometimes in No. 20).*

18. **incarnàta,** Linn. WILD PASSION-FLOWER. MAYPOP. Fig. 2768. Tall-climbing strong perennial vine, glabrous or nearly so, becoming 20–30 ft. long: lvs. 3-lobed to about half their depth, broadly cordate-ovate in outline, serrate, the petiole bearing 2 glands near the top: fl. axillary and solitary, about 2 in. across, white, with a light purple corona band at its center: fr. oblong, about 2 in. long, with 3 sutures, yellow when ripe, edible. Dry places, Va., south and west. B.M. 3697. Mn. 9:17.—A weedy plant, but offered by dealers in native plants. With protection, the roots will survive the winter as far north as Baltimore, and the strong herbaceous vines make a fine cover for arbors and verandas. Easily grown from seeds.

19. **edùlis,** Sims. Fig. 2771. More woody and stronger: lvs. large, deeply 3-lobed and serrate: fl. white, often tinted with purple, the rays nearly as long as the envelopes, white for the upper half but purple at the base: fr. globular-oblong, thickly purple-dotted when ripe, the rind hard. Brazil. B.M. 1989. R.H. 1857, p. 224; 1883, p. 489. Gn. 50:414; 62, p. 259. G.C. III. 23:101. A.G. 13:120.—Runs into several forms. The fr. is fragrant and edible, but there is little pulp, the seeds occupying most of the interior. Readily grown from seeds. Naturalized in tropical countries.

20. **pruinòsa,** Mast. Climbing, the sts. terete, glabrous: lvs. broad in outline, 3-lobed beyond the middle, the lateral lobes diverging, the margins remotely glandular-toothed, glaucous beneath: stipules very large and lf.-like, cordate, 2 in. long: fls. 3 in. across, pale or pearly violet, the corona of numerous filaments, the outermost of which are nearly as long as the petals and are deep violet at the base, yellowish in the middle and curly at the top. British Guiana. G.C. III. 22:393 (desc.).—First described in 1897.

GG. *Rays distinctly shorter than envelopes: lf.-margins nearly or quite entire.*

21. **álba,** Link & Otto (*P. atomària,* Planch.). St. terete: stipules very large and lf.-like: lvs. broad-ovate and somewhat cordate, rather shallowly 3-lobed, glaucous beneath, the margins entire: peduncles exceeding the lvs., 1-fld.; fl. little more than 2 in. across, clear white: fr. obovoid, the size of an egg, green at first, but becoming yellowish. Mex. to S. Amer. G.C. II. 19:693. R.H. 1883, p. 201; 1884:36. G.W. 14, p. 151.

22. **adenophýlla,** Mast. By some thought to be probably identical with *P. alba:* lvs. glabrous, cordate at base, 3-lobed nearly to middle, glandular in the sinus, the lobes oblong and apiculate; petiole with sessile glands: fls. white, the peduncle equaling or exceeding the petiole; sepals bearing a subulate appendage near apex on the back; petals shorter than sepals and narrower. Mex.

23. **violàcea,** Vell. Tall, glabrous, with drooping branches: lvs. straight at base and somewhat peltate, with 3 long, narrow lobes, of which the side ones stand at nearly right angles to the central one, the margins

entire or with a few teeth in the bottom of the sinus, the under surface slightly glaucous: fl. about 3 in. across, the petals and sepals lilac-pink inside (sepals ending in a long spur), the numerous filaments of the corona

2773. Passiflora (Tacsonia) Van Volxemii. Central leaflet broader than common. (×½)

white-tipped and barred with violet and white. Brazil. B.M. 6997. R.H. 1885:468. G.W. 14, p. 151.

24. **cærùlea,** Linn. Fig. 2772. Slender, but a strong grower, glabrous and somewhat glaucous: lvs. divided nearly to the petiole into 5 lanceolate or lance-elliptic entire sharp-pointed segms. of which the 2 lower ones are sometimes again lobed: fl. 3–4 in. across, slightly fragrant, greenish white, the sepals tipped with a short point, the rays of the corona in 2 series, blue at the tip, white in the middle and purple at the base, the styles light purple. Brazil. B.M. 28. Gn. 31, p. 421; 34, p. 114; 46, p. 369. G. 3:611. J.H. III. 47:57.—The commonest of passion-flowers in American greenhouses, and now represented by several named forms and hybrids. It can be grown in the open in the S. and in Calif. as far north as San Francisco. Var. **grandiflòra,** Hort., is only a somewhat larger-fld. form. Constance Elliott (*P. cærùlea* var. *álba*), is a white-fld. fragrant form. G.C. III. 43:186. Gn. 31:420. There are hybrids with *P. Raddiana, P. racemosa, P. alata,* and others. *P. cærulea* grows readily from seeds.

II. Tacsonia, *the hypanthium or calyx-tube long (½in. long and usually much more).*

A. *Fls. orange or rosy orange.*

25. **Párritæ,** Bailey (*Tacsònia Párritæ,* Mast.). Lvs. deeply 3-lobed, glabrous above, pilose beneath, lobes narrow and entire; stipules entire, subulate-acuminate: fl. with a long and slender tube, glabrous, swollen at the base; sepals winged and with points, rosy-orange; petals oblong and flat, shorter than the sepals, orange; corona double, the outer row of tooth-like projections. Colombia. G.C. II. 17:225. I.H. 35:41.—Named for Senor Parra ("better known as Parrita"), through whom it was intro.

AA. *Fls. scarlet or rose-colored.*

B. *Bracts beneath the fl. not united.*

C. *Lvs. simple or not lobed.*

26. **insígnis,** Hook. (*Tacsònia insígnis,* Mast.). Pilose: lvs. ovate-lanceolate, subcordate, dentate, rugose or blistered above and red-downy beneath, the stipules dissected: fl. about 6 in. across, violet, rose or crimson; tube cylindrical, swollen at the base, downy; sepals about twice longer than the tube, lance-oblong, spurred at the end; petals similar in shape, obtuse; corona of one series of short threads, blue and white. Probably Peruvian. G.C. 1873:1113. F.S. 20:2083, 2084. B.M. 6069.

CC. *Lvs. 3-lobed or divided.*

D. *Foliage glabrous at maturity.*

27. **Van Vólxemii,** Triana & Planch. (*Tacsònia Van Vólxemii,* Hook.). Fig. 2773. Sts. slender and slightly pubescent: lvs. cordate-ovate in outline, deeply 3-lobed, the lobes long-lanceolate-acuminate, serrate: fls. 5–7 in. across, bright red with short green calyx-tube that has a swollen base, the acute calyx-lobes green externally; corona an inconspicuous toothed rim. Colombia. B.M. 5571. G.C. 1866:171. G.Z. 9:144.—Less showy than some others, but a well-known species.

28. **Jàmesonii,** Bailey (*Tacsònia Jàmesonii,* Mast.). Lvs. suborbicular, 3-lobed, glabrous: fl. large, bright rose or coral-red, with a cylindrical tube 4 in. long: fr. said to be green at maturity, oval. Peru.

DD. *Foliage downy beneath at maturity.*

29. **exoniénsis,** Hort. (hybrid of *P. Van Volxemii* and *P. mollissima*). Fig. 2774. Lvs. downy, cordate, ovate-oblong, divided nearly to base into 3 lanceolate, serrate segms.: fls. 4½–5 in. across; sepals brick-red outside, brilliant rose-pink within; throat violet; tube white inside, 2½ in. long. Resembles *P. Van Volxemii* in having peduncles as long as lvs., linear stipules, free downy bracts, filamentous corona near base of tube

2774. Passiflora (Tacsonia) exoniensis. (×⅓)

and violet color of throat. Resembles *P. mollissima* in having downy lvs., long flower-tube, color of fl. and aristate sepals.

BB. *Bracts beneath the fl. more or less united.*

C. *Lf.-lobes short, obtuse or nearly so.*

30. **manicàta,** Pers. (*P. ignea,* Hort. *Tacsònia manicàta,* Juss.). RED PASSION-VINE. Fig. 2775. St. nearly terete, finely pale-pubescent: lvs. coriaceous, 3-lobed to about the middle, finely serrate, the lobes broad-oblong, pale beneath; stipules ovate, 1 in. across, notched, clasping: fls. solitary on slender axillary peduncles, brilliant scarlet, 4 in. across; perianth-tube ½in. long, inflated and 10-ribbed at base; outer corona of many short blue filaments, some of which surround the column; inner corona of an inflexed membrane: fr. egg-shaped or almost globular, yellow-green, the skin thick; seeds many in a thin pulp. Colombia, Ecuador, and Peru. B.M. 6129. G.F. 7:265 (from which Fig. 2775 is reduced). R.H. 1903:356.—This plant seems to be grown with difficulty in greenhouses, but it is at home in the open in S. Calif., climbing into the tops of trees and blooming profusely, making a brilliant display. It grows with great vigor and rapidity, renewing itself freely from seeds.

CC. *Lf.-lobes long-acute.*

31. **mixta,** Linn. f. (*Tacsònia mixta,* Juss. *T. eriántha,* Benth.). Glabrous or somewhat pubescent: lvs. orbicular-ovate, thick, 3-lobed to the middle, the lobes long-acute and serrate: fl. 3–4 in. across, rose-pink, the oblong sepals not equaling the green scarcely saccate tube; corona a short multiple rim or disk. Andes.—It is reported that the *P. mixta* that has been grown in Calif. is *P. mollissima.*

32. **mollíssima,** Bailey (*Tacsònia mollissima,* HBK.). Pubescent: lvs. cordate-ovate in outline, very pubescent beneath, the lobes extending nearly to the base of the blade and ovate-lanceolate in shape and serrate, the stipules laciniate: fl. about 3 in. across, rose-color, the green tube exceeding the sepals and swollen at the base; corona a short rim. Andes. B.M. 4187. B.R. 32:11. F.S. 2:78. G. 28:17.—*P. tubiflòra,* offered about 20 years ago in Calif. (and now apparently lost) is said not to differ much from *P. mollissima.*

33. **Smythiàna,** Hort. Seedling of *P. mollissima* or hybrid with it, with very brilliant orange-scarlet or rosy-crimson fls. G.C. III. 12:705. Gn.W. 8:149.

P. alàto-cærùlea (P. Pfordtii, Hort.) is a hybrid from seed of P. alata by pollen of P. cærulea: lvs. much like those of P. alata, 3-lobed: fls. fragrant, beautiful; sepals white; petals pink; corona of 3 series, the outer filaments being white at tip, blue-purple in the middle, and black-purple at the base. B.R. 848. R.H. 1847:121.—*P. álbo-nìgra,* Hort. Said to be a hybrid of P. alata and P. Raddiana: lvs. 5-lobed: petals white; corona white above and blackish purple below. Gt. 1:68.—*P. Allardii,* Hort.=P. quadrangularis×P. cærulea Constance Elliott, raised by Mr. Allard of the Botanic Garden, Cambridge, England: lvs. usually with 3 broad lobes: free-flowering; petals white shaded pink; corona deep cobalt-blue.—*P. ambígua,* Hemsl. Possibly a hybrid of P. laurifolia and P. maliformis: fls. more than double the size of P. laurifolia (5 in. diam., pink and purple): petiole biglandular in middle: lf.-blades attenuate at base; stipules linear. Nicaraugua. B.M. 7822. G.C. III. 31:171.—*P. atropurpùrea,* Hort. Hybrid: has foliage of P. racemosa, but infl. and fl. in general shape more like P. Raddiana: fls. about 3 in. diam., tube less than ½in. long; sepals deeply keeled, reddish violet or prune-colored; petals about length of sepals, dark blood-red; outer corona violet spotted white, the filaments or threads half the length of the petals; inner corona shorter, violet, each thread enlarged at top. G. 26:495.—*P. Bèllottii,* Hort. Sepals flesh-colored; petals rose, corona blue. Thought to be a hybrid of French origin, having been received in England about 1847.—*P. Bournapártea,* Hort., hybrid of P. alata and P. quadrangularis, "possessing the sweet-scented and richly colored fls. of the former with the handsome foliage of the latter:" blooms freely when young: fls. solitary in the axils, reddish crimson, the corona of rich red, white, and blue filaments. J.H. III. 51:253.—*P. capsulàris,* Linn. Tall slender pubescent climber with red tendrils: lvs. with 2 lunate ovate-oblong lobes: fls. solitary, 2 in. across, rose-red; calyx-tube ½in. long, cylindric, the sepals narrowly linear-oblong and obtuse; petals narrower and paler; outer corona much shorter than petals, white; inner corona, short and incurved, white; ovary hairy. Brazil. B.M. 7751 (not 2868, which is P. rubra).—*P. chelidònea,* Mast. Lvs. oblong, forked at the end to one-fourth the length and with a small middle lobe, marked with dots: fl. 2 in. across, greenish, with a folded corona. Ecuador. G.C. II. 12:40.—*P. cinnabarina,* Lindl. Branches terete: lvs. broad-ovate, 3-lobed, margins entire: fls. solitary, 2½ in. across, red; corona short, folded, yellowish. Austral. G.C. 1855:724. B.M. 5911.—*P. colimènsis,* Mast. & Rose. A Mexican species first described in 1899, but cult. for several years in Washington. It is an herbaceous species, with shallow-lobed obtuse denticulate lvs. and small whitish blue-marked fls. on single peduncles. Promising as an outdoor climber.—*P. europhýlla,* Mast. Lvs. oblong, very broad, rounded and biglandular at base, 2-lobed at apex with small lobe between, upper surface dull green and lower surface purplish: fls. whitish, not specially attractive. British Guiana.—*P. fétida,* Linn. (P. hirsuta and P. hircina, Hort.). Allied to P. adenopoda: annual or sometimes perennial; lvs. pubescent, 3-lobed, the margins entire or obscurely angled: fls. whitish, small, the corona as long as the petals and colored purple and blue: fl.-bracts pinnatifid. Trop. Amer. L.B.C. 2:138. B.M. 3635, the form known as var. nigelliflora, Mast.; and 288, the var. ciliata, Mast. Perhaps in cult., but apparently not offered in the trade. Variable.—*P. galbàna,* Mast. Sts. terete: lvs. lance-oblong, short-petioled, entire: stipules

2775. Passiflora manicata. (× about ⅓)

ovate-pointed: fl. solitary on a long peduncle, 3 in. across, greenish yellow, the sepals and petals very narrow, the not folded corona short. Brazil. G.C. III. 20:555.—*P. Imthúrnii,* Mast. Lvs. broad, oblong, acute, entire, thick, glabrous above, but not beneath: fl. erect, 4–5 in. across, brilliant scarlet and rose-color, with white in the center; corona very short. British Guiana. G.C. III. 23:307. Very showy.—*P. kewènsis,* Hort. "It is a cross raised by Mr. Watson, the assistant curator, between the hardy Passiflora cærulea and the Brazilian P. Raddiana. The fls. are larger than those of P. Raddiana, the petals and fringe longer, while the color is carmine suffused with blue, which, though perhaps not so bright and pleasing as it is in the parent, is a lovely color."—*P. macrocárpa,* Mast. Of the P. quadrangularis group: st. 4-angled, strong-climbing: lvs. oval, obtuse: fl. white and purple: fr. as large as a small melon, weighing several pounds. Brazil.—*P. maliformis,* Linn. Of the granadilla section: st. described as cylindrical: lvs. ovate or ovate-oblong, entire, the petiole 2-glandular: fl. fragrant, large; petals white; corona blue: fr. yellow, round, and smooth, 2 in. diam., with agreeable pulp. W. Indies to S. Amer.—*P. Miersii,* Mast. Sts. slender and wiry: lvs. lance-ovate and entire, claret-colored beneath: fl. 2 in. across, white, shaded with pink, the corona half the length of the petals, white, barred with purple. Brazil. G.C. III. 4:353.—*P. militàris,* Hort. (Tacsonia militaris, Hort.). A showy winter-bloomer intro. from the Transvaal, supposed to be a hybrid of P. manicata×P. insignis or P. Van Volxemii×P. insignis: lvs. green and glabrous above, hairy beneath, deeply 3-lobed and sharp-serrate: fls. bright crimson taking on purplish tinge with age, 4–5 in. across, on hairy stalks 5 in. long; tube short, as in P. manicata, glabrous, inflated at base; outer calyx-lobes striped on outside, green in center, dull crimson on margins; corona small, purple; bracts 3 at base of tube, ovate, serrate.—*P. penduliflòra,* Bert. Lvs. very broad, slightly 3-lobed: fls. yellow and green, solitary or twin, often pendulous; corona in 1 series and 12-

14-parted. W. Indies. B.M. 4565. J.F. 2:114.—*P. pinnatistípula*, Cav. (Tacsonia pinnatistipula, Juss.). Resembles T. mollissima, but the bracts are free; stipules pinnatisect: fls. rose-colored. Chile. B.M. 4062. B.R. 1536.—*P. punctàta*, Linn. Herbaceous climber, minutely puberulous: lvs. nearly semi-circular or almost lunate, shallowly 3-lobed, the middle lobe much smaller, variegated on both surfaces with purple: fls. in pairs, pale yellow, about 1½ in. across; sepals ovate-oblong, obtuse, nearly ¾in. long; petals similar but much shorter; corona in 3 rows, yellow, the filaments of the outer row with violet heads. S. Amer. B.M. 8101.—*P. quadriglandulòsa*, Rodschied. Fls. solitary, 4–5 in. diam., rose-color with a darker shade in the center; corona with an outer ring of dark red filaments: inner filaments tubular and paler; sepals and petals much alike, very long and narrow, acuminate-pointed. Habitat unknown. G. 28:575.—*P. serratifòlia*, Linn. Lvs. ovate-lanceolate, acute, serrulate, pubescent beneath; petiole 4-glandular: fls. purple; corona pale purple and bluish. Mex. B.M. 651. H.U. 2, p. 71. —*P. suberòsa*, Linn. Glabrescent, with corky bark: lvs. roundish or ovate, 3-lobed, the lobes ovate to oblong to lanceolate, the petiole 2-glandular above the middle: fls. greenish yellow, without petals; corona short: berry ovoid, small. W. Indies, Venezuela, etc.—*P. tríloba*, Ruiz & Pav. Lvs. large, cordate-ovate, 3-lobed or entire: fl. 3 in. across, with violet reflexed sepals and petals, and a long cuplike corona, with filaments banded white and purple. Peru. I.H. 36:83.—*P. Weberiàna*, André. Glandular-hairy: lvs. large, 3-lobed, the margin usually toothed: fl. solitary, 2 in. across, white, the corona banded with white: fr. setose, purple. Argentina. R.H. 1887.324.

L. H. B.

PASTINÀCA (name from the Latin *pastus*, food). *Umbellíferæ*. About a dozen species of tall herbs native to Eu. and Asia, by Bentham & Hooker united with the genus Peucedanum, but by Engler & Prantl and others kept distinct. It is distinguished from Heracleum and Peucedanum by technical characters of the fr. Fls. yellow, small, in compound naked umbels; calyx-teeth obsolete. Pastinaca is known to horticulturists in the parsnip (which see), *P. sativa*, Linn. It is a native of Eu., but is now grown in cool-temperate countries for its large edible root. In deep moist soil and a cool climate, the roots become 18–20 in. long and 4 in. or more in diam. at the crown. It was cult. before the Christian era. It has run wild from gardens, often becoming a bad weed in neglected fields and on roadsides. *P. sativa* is a robust biennial, sending up a grooved st. (which becomes hollow) 3–5 ft.: lvs. odd-pinnate, with 3–4 pairs of sessile ovate or oblong sharp-toothed and notched lfts. the terminal lft. 3-lobed: fr. ("seed") thin and flat, retaining its vitality only a year or two. When run wild, it loses its thick root, and sometimes it becomes annual.

L. H. B.

PATERSÒNIA (named for William Paterson, an English traveler). *Iridàceæ*. Perennial herbs with short creeping rhizomes and rigid linear lvs. grouped in a distichous basal rosette: perianth-tube elongated; outer segms. obovate-cuneate, spreading; inner minute, erect: ovary clavate, 3-celled; ovules many, superposed; seeds angled by pressure.—About 19 species, all natives of Austral. **P. occidentàlis**, R. Br. (*P. sapphirìna*, Lindl.). Sts. very short: lvs. rigid, longest often over 1 ft.: scapes longer or shorter than lvs., dilated and striate under the spike; outer bracts 1½ in. long or more, prominently or rather obscurely keeled, inner bracts membranaceous, sometimes pubescent on the keel: fls. usually numerous; perianth-tube more or less villous; outer segms. often fully 1 in. long, broad and very obtuse, rich blue; inner segms. minute, ovate or lanceolate; style articulate near the base of the anthers. H.U. 1, p. 324.

PATRÍNIA (E. L. Patrin, 1742–1814, French traveler in Siberia). *Valerianàceæ*. Yellow- or white-flowered valerian-like hardy herbaceous perennials, a foot or so high, blooming in early summer; resemble Valeriana and Fedia.

Glabrous or loosely villous herbs: lvs. once or twice pinnatifid or pinnatisect, the radical ones rarely entire: cymes corymbose-panicled; bracts narrow, free, but sometimes appendaged with a large 2-nerved and netted-veined bracteole which is appressed to the fr.: calyx with a small erect or spreading somewhat dentate limb; corolla-tube very short; lobes 5, spreading; stamens usually 4; style nearly entire at apex: sterile locules of the fr. nearly as large or larger than the fertile ones.—About 15 species in extratropical Asia; little planted. They are of easy cult. in damp or shady places; bloom May to July. They are grown either in borders or in rockwork. Prop. by division of the roots and also by seeds.

scabiosæfòlia, Fisch. St. glabrous: radical lvs. ovate or oblong, incised-serrate and lyrate; cauline lvs. pinnatifid, the lobes lanceolate-linear, acute, terminal one longest: fls. yellow; corymb loosely subpaniculate: fr. 3-cornered. Dahuria. L.B.C. 14:1340.

villòsa, Juss. Coarse, 2–3 ft.: radical lvs. villous, petiolate, auricled; cauline lvs. sessile, dentate: corymb panicled, bearing white fls. Japan.

tríloba, Miq. (*P. palmàta*, Maxim.). Sts. erect, reddish, 8–16 in., simple below, pubescent at nodes and also on peduncles: lvs. cordate in outline, deeply palmately 3–5-lobed or the uppermost little if any lobed, margins coarsely toothed: fls. golden yellow, fragrant, in 3-branched cymes; corolla tubular, about ⅓in. long. Japan. B.M. 8328. G.C. III. 46:244; same cut in III. 52:55. —Useful in rock-garden work. The lvs. are mostly at the base of the plant, the fl.-sts. rising about 4 in. above them; fl.-clusters 3–4 in. across.

gibbòsa, Maxim. Differs from *P. triloba* in smaller fls., rather larger not cordate lvs. and st. not leafy: about 9 in. high: lvs. mostly radical and crowded, long-petioled, suborbicular, the upper ones round-ovate to ovate, acuminate, the base truncate or perhaps subcordate, pinnately lobed, the lobes incised-serrate: fls. yellow, the corolla distinctly gibbous at base; clusters flat: lvs. more or less blistered. Japan.

P. intermèdia, Roem. & Schult. (P. rupestris, Bunge. Fedia rupestris, Hort.). 1–1½ ft.: lvs. pinnatifid, the segms. lanceolate with large terminal lobe: fls. yellow, fragrant, in May and June. Siberia. B.M. 714 (as V. sibirica).—*P. sibírica*, Juss. (Valeriana sibirica, Linn.). 1 ft., most of the lvs. radical, the cauline ones pinnate with entire segms., the radical long-spatulate, serrate, strong-toothed or entire (even on same plant): fls. yellow, fragrant. Siberia. B.M. 2325 (as V. ruthenica).

L. H. B.

PAULLÌNIA (probably after Simon Paulli, 1608–1680, professor of anatomy, surgery, and botany at Copenhagen). *Sapindàceæ*. One species is a greenhouse climber, which may also be grown as an upright fern-like pot-plant.

Twining shrubs: lvs. alternate, stipulate, compound, 1–3-ternate or pinnate, or decompound; petiole often winged; lfts. usually dentate, dotted or minutely lined: racemes axillary, usually with 2 tendrils; fls. whitish or pale, small; sepals 5, the 2 upper larger, connate; petals 4, but there is a fifth abortive one, two of the petals smaller and bearing a scale below the apex; stamens 8; ovary 3-celled, bearing a 3-parted style. Trop. Amer., and sparingly in Afr.; species about 140. Distinguished from allied genera, as Cardiospermum, by the septicidal fr., which is often pear-shaped. *P. thalictrifolia* is a handsome stove foliage plant, with much divided lvs. somewhat resembling a rue, maidenhair, or davallia. The fls. are inconspicuous, pinkish and borne in autumn. Forty to fifty years ago, when the interest in foliage plants was at its height, this plant was widely distributed. It used to be trained to a trellis for exhibition or grown on the pillars and rafters of hothouses. It is now a rare but choice plant for clothing the tops of unsightly tubs in which palms are growing. It is also excellent for large vases and stands the sun well. The young lvs. have a pretty bronze tint unless they are shaded too much. The plant is prop. by cuttings of young shoots taken in early spring. If the tops are pinched, the young plants will branch out and make handsome specimens in 4- or 5- in. pots.

thalictrifòlia, Juss. Lvs. 4–10 in. long, triangular in outline, 3-ternately-pinnate; pinnæ in 6–8 pairs; pinnules 4–8 pairs, 4–8 lines long: fls. inconspicuous, pink-

ish. Brazil. B.M. 5879. Gn. 51, p. 160. F. 1873, p. 124. J.H. III. 46:99. G. 7:153; 19:650. G.M. 46:397. Var. **argéntea,** Hort., has foliage suffused silvery gray.

L. H. B.

PAULÒWNIA (after Anna Paulowna, princess of the Netherlands). *Scrophulariàceæ.* Ornamental trees, grown for their beautiful flowers in showy panicles and for their large handsome foliage.

Deciduous, rarely half-evergreen: lvs. opposite, long-petioled, entire or sometimes 3-lobed or coarsely toothed, without stipules: fls. in terminal panicles; calyx campanulate, 5-lobed; corolla with long slightly curved tube, and spreading oblique 5-lobed limb; stamens 4: fr. a 2-celled caps., loculicidally dehiscent, with numerous small winged seeds.—About 8 species in China; in Japan only cult.

The paulownias are medium-sized or fairly large trees with stout spreading branches, large long-petioled leaves similar to those of catalpa, and violet or nearly white large flowers resembling those of the foxglove or gloxinia in shape, appearing in terminal panicles before or with the leaves and followed by ovoid pods remaining on the tree and conspicuous during the winter. *P. tomentosa* is fairly hardy in sheltered positions as far

2776. Paulownia tomentosa, showing verdurous growth of the young shoots.

north as Massachusetts, but the flower-buds are usually killed in winter, and it does not flower regularly north of New York City; plants raised from seed collected in Korea have proved hardier at the Arnold Arboretum than the commonly cultivated Japanese plant, also the var. *lanata* from Central China seems to be somewhat hardier. As an ornamental foliage plant it may be grown as far north as Montreal, where it is killed to the ground every winter, but throws up from the root vigorous shoots attaining 10 to 14 feet, with leaves over 1 foot and occasionally even 2 feet long. If used as a foliage plant and cut back to the ground every spring, the young shoots should be removed, except one or very few on each plant; during the first years of this treatment they will grow more vigorous every year, but afterward they will decrease in size, weakened by the continuous cutting back; they should then be replaced by strong young plants. Where the flower-buds which are formed the previous year are not killed by frost, the paulownia is one of the most conspicuous flowering trees in spring, and in summer the foliage, although it is of somewhat dull color, attracts attention by the size of the leaves. In temperate climates it is sometimes used as an avenue tree. It thrives best in a light deep loam, and in a sheltered position. The other species are still little known in cultivation and are probably tenderer; they are great favorites with the Chinese and much planted in central and southern China. Propagation is by seeds sown in spring or by root-cuttings, and by greenwood cuttings under glass; it may be grown also from leaf-cuttings; the young unfolding leaves when about 1 inch long are cut off close to the stems and inserted in sand under a hand-glass in the propagating-house.

Paulownia tomentosa in southern California reaches a height of 40 feet in twenty-five years, with a spread nearly as great. When in full leaf it makes a dense shade. It starts to bloom before the leaves come and all is over before the tree is in full leaf. For this reason it is not a favorite. The jacaranda is a prettier blue, more floriferous, lasts three times as long, the blooms continuing until the tree is in full leaf. It is out of leaf not more than half as long as is paulownia and in mild winters holds much of its foliage throughout, being properly an evergreen. It makes as dense shade as the paulownia, has a prettier leaf and is more desirable in every way. The growth of the two trees is about the same at the end of a quarter century. The habit of the paulownia in retaining dry seed-pods on dead limbs 3 or 4 feet long is very unpleasing, and necessitates a thorough cleaning each year to the tip end of the uppermost branch—often a hard task to accomplish. (Ernest Braunton.)

tomentòsa, Steud. (*P. imperiàlis,* Sieb. & Zucc.). Fig. 2776. Tree, to 40 ft., with stout spreading branches forming a round or ovate head: lvs. rather long-petioled, broadly cordate-ovate, entire or sometimes 3-lobed, acuminate, pubescent above, tomentose beneath, 5–8 in. long or on vigorous shoots even larger: panicles to 10 in. long; fls. fragrant, pale violet, 1½–2 in. long; pedicels and calyx densely rusty tomentose; calyx-lobes short, rounded: caps. woody, broadly ovoid, pointed, 1 in. or somewhat longer. April, May. Cent. China, cult. in Japan. S.Z. 1:10. B.M. 4666. P.M. 10:7. Gn. 34, p. 79; 54, p. 476; 60, p. 130. G.C. III. 48:277; 51:430, 431. S.I.F. 1:85. H.U. 4, p. 102. R.H. 1907, p. 378. G. 35:769. Mn. 7, p. 171.—It is sometimes escaped from cult. in the southern states. Var. **pállida,** Schneid. (*P. imperiàlis* var. *pállida,* Dode). Fls. pale or whitish violet: lvs. dull green above. Var. **lanàta,** Schneid. (*P. imperiàlis* var. *lanàta,* Dode). Lvs. more densely yellowish tomentose beneath: calyx more tomentose with longer acutish lobes. Cent. China.

P. Ducloùxii, Dode. Tree, to 60 ft.: lvs. oblong-ovate, with open sinus at the base, tomentose below, to 1 ft. long: fls. about 3 in. long, pale lavender-purple, not spotted; calyx with acute tomentose lobes and glabrous or glabrescent tube; corolla rather gradually narrowed toward the base. Cent. and S. W. China.—*P. Fárgesii,* Franch. Tree, to 60 ft.: branchlets usually pilose: lvs. pubescent or glandular above, slightly pubescent beneath, entire or with few coarse teeth: fls. lavender or whitish, 2½ in. long; calyx tomentose outside with triangular acutish lobes. W. China.—*P. Fórtunei,* Hemsl. Tree, to 20 ft.: lvs. sub-coriaceous, densely tomentose below, ovate or ovate-oblong, to 10 in. long: fls. to 4 in. long, white, spotted purple inside; calyx 1 in. long, glabrous outside except the acutish lobes; corolla rather gradually narrowed toward the base. S. E. China.—*P. Silvéstrii,* Pampanini & Bonat. Small tree: lvs. densely brown-woolly, narrow, deeply cordate, 3–5 in. long: fls. in leafy panicles, sky-blue; calyx densely tomentose, with oblong obtusish lobes. Cent. China.—*P. thyrsoídea,* Rehd. Tree, to 20 ft.: branchlets and petioles pilose: lvs. ovate, usually truncate at the base, sparingly pubescent, often irregularly and remotely toothed, 4–6 in. long: fls. with the lvs., lavender, 1½ in. long, in spike-like racemes forming terminal panicles about 1 ft. long; calyx tomentose, about ⅓in. long. Cent. and S. E. China.

ALFRED REHDER.

PAVÉTTA (Malabar name of *P. indica*). *Rubiàceæ.* Tropical shrubs and small trees closely allied to the brilliant ixoras but less showy, not often seen but deserving of attention; flowers white or greenish.

Leaves opposite or ternate, simple, sometimes particolored, stipules present and joined at base: fls. in mostly terminal bracted corymbs; calyx top-shaped or bell-shaped, the limb mostly with 4 or 5 persistent or deciduous lobes; corolla usually salver-shaped, with a

cylindrical or funnel-shaped commonly slender tube, the throat mostly bearded or pubescent, the limb prevailingly 5-parted (rarely 4-parted) into oval or oblong contorted lobes; stamens 4 or sometimes 5, affixed at the mouth of the corolla; style conspicuously exserted, the stigma entire or 2-toothed: fr. a pea-shaped somewhat fleshy 2-pyrenous berry.—One hundred or more species in the tropical and subtropical parts of the Old World, to the Philippines, with recent numerous extensions in Trop. Afr. Only a few of the species are in cult., and these are known as warmhouse or warm temperate plants.

The pavettas are fine tropical stove evergreens and should be more grown. *P. borbonica* can be propagated from half-ripened wood, leaving an eye and a leaf attached. These cuttings may be put into 2-inch pots, using a mixture of fibry peat and sand in equal parts. These pots may be plunged in a propagating-bed that has a bottom heat of 80° to 85°. Cover with glass so as to keep a humid atmosphere. It will take some little time before they make roots. Keep shaded and moist until this takes place. When roots are seen in the pots, gradually give more air until they are exposed to the full atmosphere of the house. They may also be propagated by being cut down well to make them throw many young soft cuttings that can be rooted with a brisk bottom heat. *P. caffra* will root freely from cuttings of young growth, placed where they have plenty of bottom heat. The pots may be plunged in the propagating-bed up to the rims. Keep shaded, moist and close for about a month. The best season for the increase of this class of plants is January to March.—The general culture for *P. borbonica* is to keep increasing the shifts until they are in 7- or 8-inch pots, using a compost of fibrous loam three parts, fibrous peat two parts, and well-decayed manure one part. Give each pot good drainage. In the spring and summer provide a night temperature of 70°, with 10° to 15° more by day with sun. Supply water when they show dryness of the ball. Keep well syringed. They will need some shade in the summer to keep the foliage perfect. In midwinter the temperature for night may be lowered to about 60°. *P. caffra*, which is a free bloomer, will need different culture. It should be kept growing by shifting as the plants may require, until they are in 6- or 7-inch pots or larger. For summer culture, treat the same as for *P. borbonica* only they will not need so much heat, 60° to 65° being sufficient, with 10° more during the day. They will stand pinching to make them bushy. The temperature in the winter should be from 50° to 55°. The following spring give more pot room and grow on the same as before. Give liquid manure at intervals in the growing season and by autumn they will show bloom. By giving root room, with liquid feeding and by heading in annually, they will bloom for years. Scale and mealybug thrive on pavettas, and the plants must be carefully watched. (J. J. M. Farrell.)

A. *Foliage variegated.*

borbónica, Hort. A foliage plant with unknown fls., referred arbitrarily to this genus: lvs. about 9 in. long, oblong-acuminate, rounded at the base, with a salmon-red midrib, mottled with light green on a dark green ground. Bourbon Isl. Lowe 5.

AA. *Foliage not variegated.*

B. *Calyx-teeth setaceous and much longer than the tube.*

cáffra, Linn. f. (*Ixòra cáffra*, Poir. *P. corymbòsa*, Houtt.). Shrub with whitish branches, to 6 ft., the branches terete and glabrous: lvs. almost sessile, obovate, glabrous (or in var. *pubéscens*, Sond., branches and lvs. pubescent), the margins slightly recurved, to 2 in. long; stipules broad and cuspidate: fls. white, the tube ½in. long, in densely fld. corymbs; calyx-teeth ⅙in. long: fr. black and shining. S. Afr. B.M. 3580. Gn. 60, p. 414. J.F. 3:294.

natalénsis, Sond. Shrub, glabrous, with young branches compressed: lvs. petioled, lance-acuminate, attenuate at base, shining, 3–4 in. long; stipules cuspidate-acuminate: fls. white, in a loose corymb. Natal.

BB. *Calyx-teeth short-triangular, shorter than the tube, or sometimes practically wanting.*

índica, Linn. A variable small tree or bush, common in India, extending to China and Austral.: glabrous, pubescent or tomentose: lvs. from elliptic to obovate or oblanceolate or even orbicular, at the apex from obtuse to caudate: fls. slender-stalked, white, fragrant, the corolla-tube ½–¾in. long: infl. corymb-like, terminal and sessile. B.R. 198, which is var. *polyántha*, Hook. f., with densely crowded pubescent fls. The species has many synonyms. L. H. B.

PÀVIA: *Æsculus.*

PAVÒNIA (J. Pavon, joint author of Ruiz and Pavon's "Flora Peruviana et Chilensis"; died 1844). *Malvàceæ.* Herbs or shrubs, one or two of which are sometimes grown under glass as pot subjects, for the showy bloom.

Tropical plants, tomentose, hispid or glabrescent: lvs. often angled or lobed: fls. of various colors, peduncled or crowded at the tips of the branches: bractlets 5 to many, distinct or more or less connate and resembling a calyx, usually not colored: calyx 5-cut or 5-toothed; petals spreading or convolute-connivent; staminal column truncate below the apex or 5-dentate; ovary 5-loculed, 1-ovuled: ripe carpels surrounding the axis and separating from it, rounded or truncate at top, sometimes winged, indehiscent or imperfectly dehiscent, prickly or awned.—Species about 100, Cent. Amer. to Argentina; also in Trop. Afr. and Asia, to Austral. and the Pacific. The genus is more or less confused with Goethea, but that genus, as usually defined, differs in its larger and more showy fl.-bracts and in the smooth carpels. The plants in cult. derive much of their interest from the showy bracts, although Pavonia is usually characterized as having bracts less conspicuous than those of Goethea.

multiflòra, St. Hil. (*P. Wìoti*, Morr. *Goèthea multiflòra*, Nichols.). Robust, with a stout usually simple st.: lvs. alternate, 6–10 in. long, narrowly oblong- or obovate-lanceolate, long-acuminate, serrate or denticulate: fls. in a short terminal corymb; bractlets beneath the fl. numerous, narrow-linear, whorled, red-hairy, curving, in length about equaling the rolled-together purple corolla (which is 1–1½ in. long); calyx-segms. much shorter than the bractlets; column of stamens 2½ in. long and prominently exserted. Brazil. B.M. 6398. F.M. 1877:276.—What is known as *P. intermedia* by gardeners is apparently not *P. intermedia*, St. Hil.; it is said to be derived from *P. multiflora*. There are forms of *P. intermedia*, Hort., known as var. *ròsea*, var. *floribùnda*, and var. *kermesìna*. This group of plants is readily grown from cuttings taken in spring or early summer, and good blooming plants in 5-in. pots may be had by winter. They grow naturally to about one st., and should not be pinched back. They make attractive pot subjects with the terminal clusters of fls. marked by the long-protruding staminal column with hanging bluish anthers, the narrow rolled corolla and the slender conspicuous bracts.

spìnifex, Willd. Shrub, to 20 ft., from S. Amer., the st. slender, branches few and virgate: lvs. ovate, cordate, crenate sometimes angled, pubescent on both surfaces: fls. large, yellow, not fragrant, the corolla open; petals obovate; calyx-lobes lanceolate: bracteoles 5 or more, linear, hairy on margin: caps. with 3 spines. B.R. 339.

præmórsa, Cav. Shrub with rodlike branches, from S. Afr.: lvs. broad-ovate or fan-shaped, truncate, obtusely dentate, canescent beneath, with petiole and

setaceous stipules: fls. bright yellow and dark-centered, single on axillary pedicels exceeding the lvs., with 12–14 linear involucral bracts: fr. of downy carpels.—This and *P. spinifex* are reported in Calif.

P. Makoyàna, Morr. (Goethea Makoyana, Hook.). Lvs. elliptic, short-stalked, with large stipules: fls. in terminal clusters, subtended by large cordate-ovate crimson bractlets. Brazil. B.M. 6427. G.Z. 22:169.—*P. semperflòrens,* Garcke (Goethea semperflorens, Nees & Mart.). Tall: lvs. elliptic, serrate: fls. usually terminal, purple, with brown bractlets. Brazil. L. H. B.

PAWPAW: *Carica Papaya* and *Asimina.*

2777. Garden pea, American Wonder. The illustration shows an entire plant, cut off at the surface of the ground. (×⅙)

PEA. As known to horticulturists, the pea is the seeds and plant of *Pisum sativum* and its many forms, one of the Leguminosæ, grown for its edible seeds and sometimes for the edible pods. (Figs. 2777–2783.)

The garden pea is native to Europe, but has been cultivated from before the Christian era for the rich seeds. The field or stock pea differs little from the garden pea except in its violet rather than white flowers and its small gray seeds. There are many varieties and several well-marked races of garden peas. Whilst peas are grown mostly for their seeds, there is a race in which the thick soft green pods, with the inclosed seeds, are eaten. The common or shelling peas may be separated into two classes on the character of the seed itself,—those with smooth seeds and those with wrinkled seeds. The latter are the richer, but they are more likely to decay in wet cold ground, and therefore are not so well adapted to very early planting. Peas may also be classified as climbing, half-dwarf or showing a tendency to climb and doing best when support is provided, and dwarf or those not requiring support. Again, the varieties may be classified as to season,—early, second-early, and late. Vilmorin's classification (Les Plantes Potagères) is as follows:

A. The pea round (smooth).
B. Plant climbing.
C. Seed white.
CC. Seed green.
BB. Plant half-dwarf.
C. Seed white.
CC. Seed green.
BBB. Plant dwarf.
C. Seed white.
CC. Seed green.
AA. The pea wrinkled (divisions as above).

Left to themselves, the varieties of peas soon lose their characteristics through variation. They are much influenced by soil and other local conditions. Therefore, many of the varieties are only minor strains of some leading type, and are not distinct enough to be recognized by printed descriptions.

Garden or green peas.

Peas are one of the earliest garden vegetables to reach edible maturity. The date at which a mess of green peas could be gathered used to be regarded as an indication of a man's horticultural ability. In modern times, green peas grown far away to the South come to northern markets while the ground is still frozen and are eagerly purchased only to result in disappointment and a longing for the old-time quality. Such disappointment is inevitable, for even with refrigerator cars, express trains, and modern skilful handling, green peas grown hundreds of miles away cannot come to our tables for many hours, often not for days, after they have been gathered, and with an inevitable loss of the freshness, which is essential for satisfactory quality.

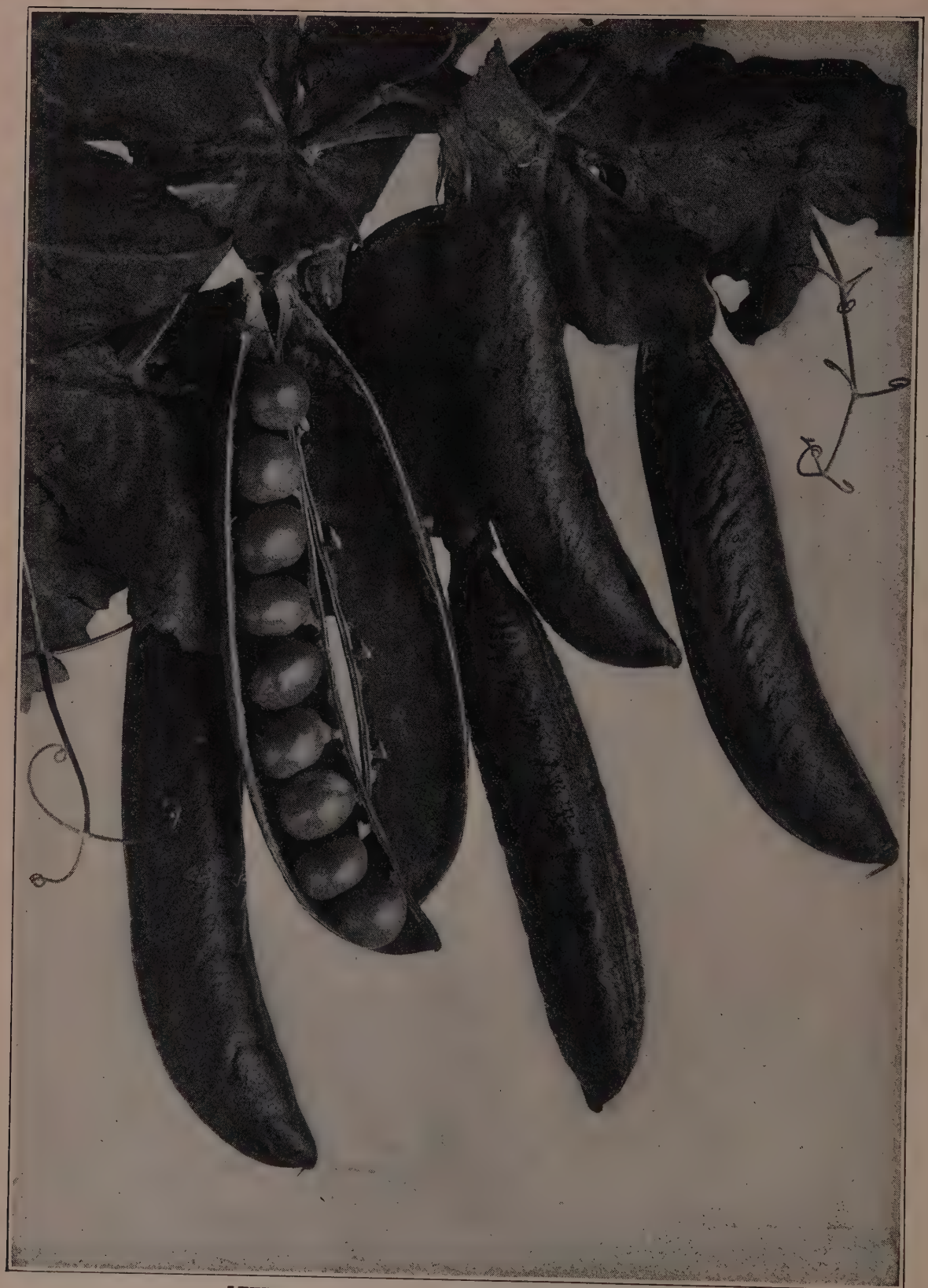
Peas do well in cool moist weather and will germinate and make a slow but healthy and vigorous growth in lower temperatures than most garden vegetables. The young plants will even endure some frost with little injury, but the blossoms and young pods will be injured or killed by a frost which did not seem materially to check the growth of the plant. For this reason it is generally most satisfactory to delay planting until there is little probability of a frost after the plants come into bloom.

The cultural requirements are simple, but a thorough preparation of the soil before planting is desirable, and the use of green and fresh manure should be avoided. The best depth of planting varies with the season and character of the soil, and early plantings on clay land should be covered only 1 to 2 inches deep, while later plantings on sandy land do best in drills 6 or 8 inches deep to be gradually filled as the seedlings grow. Generally anything more than surface tillage will do a growing pea crop more harm than good; but any crust formed after rains, particularly while the plants are young, should be promptly broken up.

Of the better garden sorts, from fifty to one hundred good seeds are in an ounce, and a half-pint should plant 50 to 80 feet of row and furnish a sufficiency of pods for a small family for the week or ten days in which they would be in prime condition. For a continued supply one must depend upon repeated plantings.

Most of the best garden varieties can be well grown without trellising, but the sorts growing over 2 feet high will do better if supported. Nothing better for this purpose is known than brush from the woods, but this is not always available and a good substitute is the wire pea trellis offered by most dealers in horticultural supplies, or a home-made one made by strings stretched 2 to 4 inches apart on alternate sides

2778. Garden pea, Champion of England (×⅙)



LXXXV. Good pods of the garden pea, variety Peter Pan.

of supporting stakes. The ingenuity of the home-gardener will devise good forms of trellising.

It is evident that green peas occupy too much ground to be a practical crop for a city lot or small town garden, and generally the town dweller can be most satisfactorily supplied from a nearby market-garden; and the great superiority of freshly gathered local-grown peas over those which have to be shipped in make this one of the best of crops for a gardener with permanent customers. The best cultural methods for field plantings do not differ materially from those given for the garden. No planting is so likely to give a satisfactory yield both as to quantity and quality as on an old clover sod on a well-drained clay loam, which should be well plowed in the fall or early winter and the surface worked into a good tilth as early as practicable in the spring.

Planting can be best done with a seed-drill so arranged that the rows are 12 to 36 inches apart, according to the variety, with occasional rows left blank for convenience in gathering.

2779. Garden pea, Nott Excelsior. (×½)

Picking should be done after sundown or in early morning before nine o'clock and care be taken not to bulk the pods, as they are liable to heat and spoil.

Peas for canning.

There is no modern industry in which there has been greater improvement within the past ten or more years, both as to methods and the quality of the product, than in the canning of vegetables. This is especially noticeable in canned peas. First there has been a great betterment as to the varietal quality of the stock used. For canning, particularly when modern methods of harvesting and processing are used, it is important not only that the green peas be sweet and palatable, but that the largest possible proportion of the pods shall be in prime edible condition at the same time, and canners are influenced by these qualities in selecting varieties for their plantings, and in the cultural methods followed. The development of each planting is closely watched by an expert, who directs that it be cut and delivered at the factory on the day when he judges it will be in the best condition, the time for individual crops being sometimes modified by the capacity of the farmer to deliver and the factory to handle it. Not infrequently certain crops are left to ripen and be harvested as grain because of such conditions. In hot and sunny weather, the vines are cut either after five in the afternoon or before nine in the morning, hauled to the factory and from the wagon go direct to a specially constructed threshing-machine or "viner," which separates the peas and delivers them on a moving inclined belt, which throws out any bits of vines or pods. They are then washed and graded, and go to the processer. So promptly is this work done that it is known of peas being in the cans and being cooked before the wagon on which they were brought from the field could start for home. Usually peas put up by a well-managed cannery come to the table in more palatable condition than so-called fresh peas which were gathered ten to twenty-four hours before and shipped from 10 to several hundred miles to market.

2780. Pea, Nott Excelsior. (×½)

Canners who are particular as to the labeling of their output often separate it into different grades, determined by the variety and size of peas and labeled somewhat as follows:

Varieties	1st	2nd	3rd	4th
Small, smooth seed, not over	16/64	18/64	20/64	Run of crop
Small, wrinkled seed, not over	18/64	20/64	22/64	Run of crop
Large, smooth seed, not over	20/64	22/64	24/64	Run of crop
Large wrinkled seed, not over	20/64	24/64	26/64	Run of crop

Varieties and seed.

Few vegetables have developed greater varietal differences affecting their horticultural or culinary value than garden peas. As to vines, there are sorts from 6 inches to 6 feet in height and those which very rarely form more than a single stem, while others are so branched that they often are wider than tall; some mature their crop very early and all at once, others not until the vines are fully grown or continuing through a long season; pods which are so broad and long that the inclosed peas never fill them, others in which the growing peas very often split the pod open; peas which are green, yellow or white, smooth and hard; others which are wrinkled, distorted and comparatively soft, even when fully mature. Very conspicuous variations of little practical importance are sometimes correlated with invisible qualities which are of great importance.

When grown for seed, peas of the garden varieties yield a comparatively small fold of increase, seldom over 10 or 12 and often only 2 or 3, so that it is more difficult than with most vegetables always to secure full supplies of certain sorts, and seedsmen's stocks are constantly changing, not only as to character but name. The following are now very popular varieties: Extra-early smooth-seeded—Alaska or Prolific Extra Early; early wrinkled seeded—Thomas Laxton, Gradus, Surprise; dwarf Excelsior, either the Notts or the Suttons; midseason—Advancer, Admiral, Senator; late—Champion of England, Strategem. However, one should confer with the seedsmen

2781. Pea, Pride of the Market. (×½)

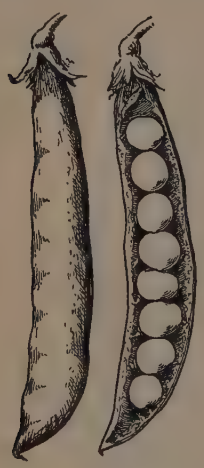
as to the most available stock best suited for the particular needs.

Sugar or edible-podded peas.

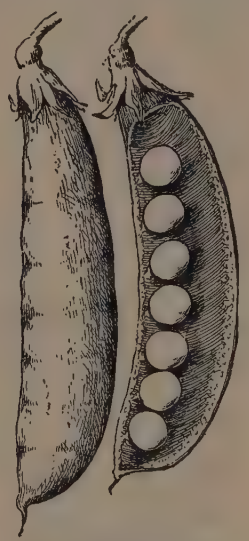
These are a class little known in this country, but are largely grown in Europe. They are characterized by large more or less fleshy and often distorted pods, which are cooked when in the same stage of maturity and in the same way as string beans. Varieties have been developed in which the pods are as white, tender, and wax-like as those of the best varieties of wax-podded beans.

Field peas.

There are a number of kinds of field peas in which the vines are very vigorous, hardy, and productive and the peas generally small, hard, and becoming tough, dry, and unpalatable as they ripen. In one variety of this class known as French Canner, the very young and small peas are sweet and tender, and in this stage are put up by French canners under the name of "petit poise." The larger-seeded Marrowfat peas were formerly commonly used by canners, and large quantities are still packed. If this is done while the peas are sufficiently young and tender they make a fairly good product.



2782. Pea, Stratagem. (×½)



2783. Pea, Melting Sugar. (×½)

Split peas.

Large quantities of field peas, mostly of the smaller-seeded kinds, are used for split peas, the preparation of which consists in cleaning and grading, kiln-drying, splitting, and screening out the hulls and chips from the full half peas. This is all done by special machines, mostly of American invention. The annual consumption of split peas in the United States is about 50,000 barrels, of which, before the European war, 75 per cent came from abroad.

W. W. Tracy.

PEA. **Congo P.,** *Cajanus indicus.* **Everlasting P.,** *Lathyrus latifolius.* **Glory P.,** *Clianthus Dampieri.* **Hoary P., Pigeon P.,** *Cajanus indicus.* **Scurfy P.,** *Psoralea.* **Sweet P.,** *Lathyrus odoratus.*

PEACH. The tree and fruit of *Prunus Persica* (or *Persica vulgaris*), widely cultivated in the United States and parts of Canada for home use and market.

In the northern prairie states and on the plains, and in the colder parts of the mountain regions of the West, the peach is little grown or is even altogether absent; yet the range of adaptability is constantly extending as the local conditions and requirements become better known. There is less dependence on "fruit-belts" than formerly, in which some special favor of climate or location was supposed to exist. Some parts of New England are well adapted to commercial peach-culture. Parts of Canada bordering the Great Lakes, and regions in Nova Scotia, are prominent peach districts. Varieties of special adaptability to climate and useful also for particular purposes have arisen in recent years; and the requirements of the peach are now better understood than formerly. The range of its cultivation will probably be considerably broadened in years to come.

The discussion of the peach is here comprised in four articles:

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The culture of the peach (M. A. Blake)	2492
Peach-culture in the South (J. H. Hale)	2500
Peach-growing in California (George C. Roeding)	2503
Protecting peach trees in cold climates (W. Paddock)	2504

The culture of the peach.

The marked feature in the development of the peach industry in the United States since about 1900 has been the extension of the areas of commercial peach-production because of the introduction of hardier varieties such as Carman, the discovery of materials and methods that make certain the control of peach-scab and brown-rot, and the organization of fast-freight and refrigerator-car service that permits of successful long-distance shipment of this perishable fruit.

The introduction of the San José scale was the cause of the destruction of hundreds of thousands of peach trees throughout the country from about 1900 to 1907, the period of greatest damage varying to some extent in each district. The growers who persisted in the business were those who had the capital, energy, and persistence to take up the new problem of spraying, and these men may appropriately be termed the pioneers of the modern peach business.

The necessity of spraying to control the scale also focused the attention of the growers upon all other factors of peach-production except marketing, which for the time presented few difficulties because of the great reduction in the number of bearing trees and the ability of the local markets to absorb much of the crop produced.

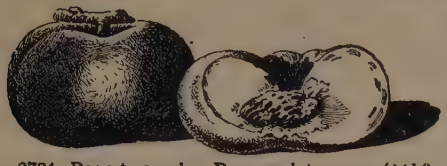
Peach-scab and brown-rot caused serious damage to the crop annually in central and southern peach districts until the self-boiled lime-sulfur summer spray was proved to be a successful remedy.

The development of large commercial areas at long distances from market has resulted in better grading and packing. The Georgia six-basket carrier has become the popular shipping package from southern New Jersey to Georgia, Alabama, and Texas. (Fig. 2707.)

Innumerable changes and improvements in the growing and handling of the crop have occurred within the last ten years.

The United States Census reports show many interesting facts in connection with the extent and development of the peach industry. A few trees are found in every state in the Union. According to the Census of 1910 only three states, Wyoming, North Dakota, and Montana, have less than 5,000 trees. Five other states, Minnesota, South Dakota, Wisconsin, Maine, and Vermont, have less than 10,000 trees. The most significant fact, however, is that twenty-six states reported a total of more than 1,000,000 bearing trees each, which definitely shows the extended area over which this crop is produced to some commercial degree. The Census for 1910 shows Georgia to lead in the total number of bearing trees with 10,609,119; Texas is second with 9,737,827; and California is third with 7,829,011 trees. On the basis of total number of trees, however, Texas leads with 12,696,640; California is second with 12,238,573, and Georgia is third with 12,140,486.

The Census reports also indicate the general trend of the industry in no uncertain way. In 1890, five states led prominently in the total number of bearing trees, as follows: Maryland, 6,113,287; Kansas, 4,876,311; Delaware, 4,521,623; Texas, 4,486,901; and New Jersey, 4,413,568. The greatest peach district in the

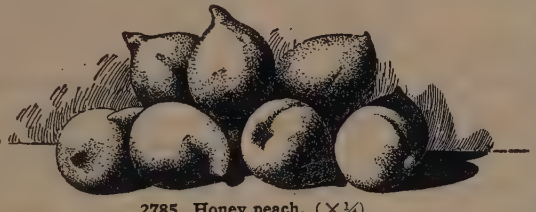


2784. Peen-to peach.—Prunus platycarpa. (×½)

country at that time was comprised by the states of Maryland, Delaware, and New Jersey, with a total of more than 15,000,000 trees.

The three leading states in 1900 were, Michigan with 8,104,415 trees, Georgia with 7,668,639 trees, and California with 7,472,393 trees. The states of Maryland, Delaware, and New Jersey, which geographically comprise one district, reported a total of a little more than 9,000,000 trees, the San José scale and other factors having reduced the total about 6,000,000 trees. Yet as a peach district, this still held its place as having the greatest total number of trees.

The Census of 1910, however, shows that this number was greatly reduced during the period from 1899 to 1909, having less than 4,000,000 bearing trees. This great reduction and loss was due largely to the introduction of the scale. Michigan reports a loss during this period of more than 5,000,000 trees, and Ohio more than 3,000,000. The following states made gains during this period: New Hampshire, Vermont, Illinois, Idaho, Missouri, Nebraska, South Carolina, Georgia, Tennessee, Alabama, Arkansas, Louisiana, Texas, Colorado, New Mexico, Utah, Washington, and California. Summarized to a few words, the Census indicates that while the Middle Atlantic and Great Lakes districts were suffering severe destruction of trees, the southern and western districts were developing. These facts lead one to wonder as to how much of a part the San José scale played in the development of these latter districts, and whether such development could have maintained itself in some cases without the good markets and high prices occasioned by the widespread destruction of trees in the East.



2785. Honey peach. (×¼)

The Census of 1910 is of particular value in showing the recent trend of the industry, because the number of trees in bearing and those not in bearing were tabulated separately.

The western states, Idaho, Oregon, Utah, and Washington are increasing their plantings. The young trees not in bearing in Massachusetts, Michigan, and New Jersey were greatly in excess of those producing fruit in 1909. West Virginia has also been planting peaches extensively in recent years.

The extensive planting of peaches in the eastern and Middle Atlantic states, following the earlier destruction by yellows, was only just beginning in 1909, when the last Census was taken. Since that time, millions of trees have been planted and have come into bearing. As a result, the marketing factor became the most important peach problem in 1915. Southern districts can no longer expect the prices of former years in the great eastern markets, the Middle West is growing quantities of peaches and so also are the states along the Great Lakes. The problem at the beginning of 1916 is where and how can the crops from these trees be marketed profitably.

In any broad discussion of the peach regions of North America, the Ontario district of Canada should not be overlooked. Situated south of the western end of Lake Ontario, climatic conditions are so modified that such yellow-fleshed varieties of peaches as St. John, Fitzgerald, Elberta, and Niagara can be grown successfully in large quantities.

The northern limits of peach-production extend from the southeastern shore of Lake Ontario along the southern shore of Lake Erie and the eastern shore of Lake Michigan as far north as the Grand Traverse on the 44th parallel. This area is often termed the "Great Lakes Belt." Beginning in southwestern and central Massachusetts, another commercial peach area extends across Connecticut, Long Island, the Hudson River Valley, New Jersey, eastern Pennsylvania, Delaware, and Maryland. The Coastal Plain areas in New Jersey, Delaware, and along the eastern shore of Maryland are favorable to peach-production, and the fruit is grown to within a few miles of the seaboard. Farther south, the Coastal Plains area is unfavorable to successful commercial production and the industry is transferred to the Piedmont area across Virginia, North Carolina, and southward to the Gulf districts in Alabama and Texas. Florida has too warm a climate to suit the common standard varieties of peach and has developed a special type from the South China race.

The central or Mississippi Valley district extends from Texas across Oklahoma and Arkansas, Missouri and Kansas to Iowa, Illinois and Indiana, practically connecting with the Great Lakes area. The Pacific Coast Belt includes California, and areas in Nevada, Utah, Colorado, Oregon, and Washington. There are many areas in these so-called "peach-belts" that are not favorable to peach-production, but they indicate the general grouping of the industry.

Varieties and types.

All of the common forms of the peach belong to the species *Prunus Persica*, but are sometimes grouped under the name *Amygdalus Persica*. The flat or Peento peach is *P. platycarpa*. The United States Department of Agriculture, through its Bureau of Foreign Plant and Seed Introduction, has secured a form of peach from China known as *A. Davidiana* which is used there as a stock for certain cherries. It is said to be very hardy and may prove of value in breeding work, or as a stock for the peach. Its fruit is not attractive enough for use as it is now developed. Several other forms

2786. Cabler peach. (×½)

or types have been collected in China by Frank N. Meyer, of the Department of Agriculture, and sent to the United States for propagation and study. See the article *Prunus*.

The common types of peaches have been grouped into certain races. Onderdonk (Rept. Commr. Agric., 1887) and also Price have placed North American peaches in five groups: (1) The Peen-to or flat peach race, comprising the variety known as Peen-to (Fig. 2784), and also the Angel, and Waldo; (2) the South China race, with oval long-pointed fruit with deep suture near the base, represented by the Honey (Fig. 2785); (3) the Spanish or Indian race, with very late yellow firm often streaked fruit, represented by various southern varieties, as the Cabler (Fig. 2786), Columbia, Galveston, Lulu, Texas, and Victoria; (4) the North China race, with large mostly cling or semi-cling fruit and very large flat leaves, represented by the Greensboro, Waddell, and Carman; (5) the Persian race, including the common varieties of the mid-country and the North, as Crawford (Fig. 2787), Mountain Rose, and the like. The so-called North China and Persian types of peaches are now very much mixed in commerical varieties.

2787. Crawford peach. (×⅓)

We have been content to say that Elberta (Fig. 2788) is of the North China type, when it is plainly mixed with the Persian, and when studied carefully its characters resemble the Persian type even more than they do the North China. Two types of peach blossoms are commonly recognized (as shown in Fig. 2790), yet there are three distinct types, the large bloom, typical of Greensboro and Waddell and the North China type, the medium bloom of such varieties as Elberta and Belle, and the small bloom of Early and Late Crawford, and others. The botanical significance of these types is not well understood.

A double-flowered peach (Fig. 2789) is sometimes cultivated as an ornamental, as well as a purple-leaved form. A form of the cultivated peach growing wild near Pekin, large-flowered, is shown in Fig. 2791.

Propagation.

The peach is universally propagated by means of the pits or seeds. A few are sometimes secured by budding upon plum or even cherry stocks, but this dwarfs the tree and makes it susceptible to various stock troubles.

So-called natural seedling pits or seeds gathered in Tennessee and North Carolina are said to be the best for propagation work. Such seeds are considered to be more viable and to produce hardier stock than pits from cultivated varieties. Considerable quantities of so-called "seedling" seeds have undoubtedly been secured from canning factories and represent commercial varieties, although one can readily detect the difference between them. It has not been definitely shown that wild seedling pits will produce a stock that is any more hardy than that which might be secured from the pits of some of our hardier cultivated varieties. Seeds or pits for propagation are treated in two ways. Where severe freezing weather occurs they are commonly planted in the autumn in nursery rows from 4 to 6 feet apart. The pits are scattered a few inches apart in the rows and covered to a depth of about 2 inches. In less severe climates, the pits are stratified very shallow in autumn, are dug up in the spring and the kernels separated from the soil and shells, and planted in nursery rows. By this method, any pit or seed which is not cracked open by the action of the frost may be broken by the use of a hammer. Pits not affected by the frost usually fail to grow the first season, but may do so the second year.

The pits should be planted in good soil and be given careful cultivation so that the seedlings will be at least 24 to 30 inches high by the latter part of August of the first season, and in condition for budding. The buds are inserted the latter part of August or early in September, and simply become united with the seedling stock without making any growth. Early the following spring the seedlings are cut back just above the inserted buds, and all shoots developing from buds of the stock itself are kept rubbed off. In this way the desired bud develops into a vigorous well-branched shoot or tree which should be from 5 to 6 feet high at the close of the season's growth, and is ready for sale that fall or the following spring. So-called "June buds" are secured by budding vigorous seedlings in June and selling the resulting trees in the fall or the spring following. Such trees are smaller and are seldom equal to one-year-old trees except possibly for planting in the South. In Fig. 2792, at the left, is a well-branched one-year-old nursery tree; at the right a slender tree of the same age and height, and in the center a June bud.

The question as to whether trees should be propagated north of the region in which they are grown is a common one. Evidence has shown that it makes little difference as to the latitude in which the trees are raised if they are well grown and are free from injurious insects and diseases. It is generally best, however, to purchase trees as near at hand as good ones may be secured.

2788. Elberta peach. ½ nearly.

The ideal climate for the peach is one in which the winter extremes do not go much lower than zero at any time, and no warm periods of many days' duration occur in winter. The absence of late spring frosts and presence of bright sun during the ripening period are also important essentials. Extremes of either warmth or cold in winter are almost equally detrimental.

Soil.

The peach will succeed upon a wide range of soils from light gravel to heavy clay. It will also develop satisfactorily and bear profusely on poor, hard, stony and arid ground. Heavy, poorly drained soils should be avoided. It succeeds in adobe.

Site and location.

The type of peach-growing business one expects to engage in has much to do with the kind of location and site that appeals to him.

A number of local market business men in small and large communities and in all of the states have found that numerous peach plantings for supplying the wholesale markets should be planted upon relatively inexpensive land within easy delivery distance of their home or packing plants and where plenty of labor is available. Commercial orchards should preferably be grown and cared for in the manner most economical because of large annual yields and low cost of production per unit produced.

The elevation above sea-level at which peaches are planted in any region is a most important matter. It is not difficult to find the elevation in any locality at which the peach will succeed and surroundings. In some localities an elevation of 100 to 250 feet is sufficient to secure good yields, while in others one must seek elevations of 500 to 800 feet or even more for successful crops. The site of the orchard should also be chosen with reference to frost conditions, upon elevations and locations that are least subject to spring frosts. Land sloping to the north or west is to be preferred, as well as land which is not subject to early spring frosts and cold winds. Land sloping to the south or east is to be avoided as well as level areas that are difficult to drain and cultivate to advantage.

The particular exposure is not important in a commercial peach orchard. In hilly or mountainous sections it may happen that the best exposure should be avoided, as well as steep, poorly drained areas. Such peculiar local conditions usually result in poor development and also increase the danger of the early blooming of peaches to a disadvantage.

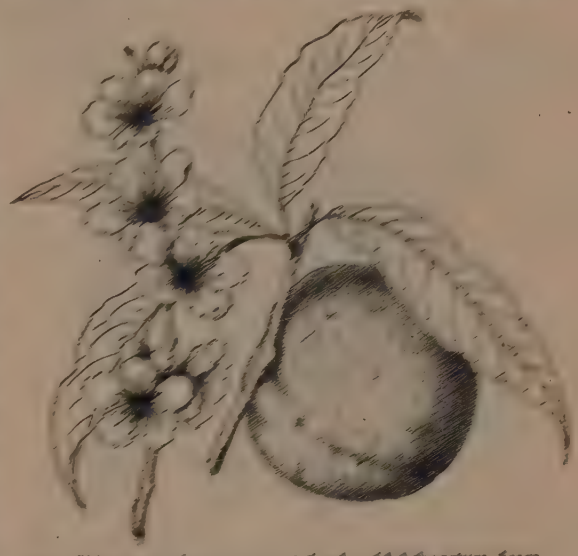
Fertilizing the orchard.

A well-planned plan should be drawn up before planting is begun. The peach is a rapidly developing tree and permanent buildings should be located in connection with the orchard. Roads, ways and passages are to be so made as to result in the most economical procedure of the work.

276. Bloom of native-flowered peach. (×⅓)

277. Bloom of large-flowered and small-flowered peaches. (×⅓)

The selection of varieties must be made previous to the planting of the orchard. Special recommendations for each district cannot be given in a book of this kind, but a statement as to the variety question follows. Yellow-fleshed peaches are preferred by most



278. Chinese peach, as grown at the Arnold Arboretum, from seeds of wild tree in China. (×⅓)
See Garden and Forest, 3:555.

markets, but varieties of blooming June flavor, Oldmixon, and the Crawfords are being raised in profusion except in a few localities. Later varieties are raised commercially. Elberta and Late of Georgia are rapidly gaining in commercial importance. New varieties come to the f. St. Hale are persuading recognition. Choice should be made from as many varieties as possible and as local conditions may require. It is the most widely successful commercial variety of any of our seedlings. In making a choice of commercial varieties for any section, a few hardy sorts that are known to do well in the locality are the safest to plant. One should also have enough trees of each variety for commercial growing and marketing.

Vigorous one-year-old trees that will caliper ⅝ to ¾ inch and are from 5 to 6 feet in height, as illustrated at the left in Fig. 2765, are an ideal size to plant. They should be free from yellows or little-peach or rosette, root-gall, peach-tree borer or other injurious peach diseases.

Fall planting is successful with well-ripened trees in localities in which the winter weather is not severe and where soils are sandy and well drained. In our trial, however, fall planting is not likely to be successful. In spring planting, the land should be prepared and the trees set as early as will conditions permit.

The trees should be set about 20 feet apart each way under average conditions. In some localities 18 feet is sufficient distance, while in others 25 feet is not too much.

Vegetable crops, such as peas, beans, cucumbers and potatoes, may be grown between the rows of young peach trees for the first and second seasons after which the peaches will occupy the ground entirely.

Pruning.

The trees should be pruned annually under the open-vase system. The principles to manage the trees in the same way have commonly resulted in failure. The soil of the orchard should be plowed or dug and

a fine mellow condition in the spring as soon as it becomes dry enough to "work" well. This state of tillage should then be maintained until about mid-season by frequent harrowing. The time when culture should cease varies with the locality and the variety.

2792. Different forms of peach trees for planting.

It is seldom possible to cultivate later than ten days or two weeks previous to the ripening of the fruit, as the branches become bent down with the crop. Early varieties should commonly receive one or more cultivations after the crop has been picked. In the South, tillage is often stopped in bearing orchards in late June, while in the North it is continued until late July. In dry seasons, late varieties require additional culture to reach good size. A large proportion of vegetable matter in the soil is an important factor in the production of large fruit, especially in dry seasons. Cover-crops should be grown wherever possible.

Fertilizing.

Rate and character of growth is a great limiting factor in peach-production. A certain amount of growth is necessary to maintain vigor and a proper number of flower-buds. The extent and time of greatest growth determines size, color and quality of fruit to a marked degree. The application of plant-food or fertilizers is a feature of orchard practice that directly concerns rate of growth.

Trees in full bearing should make an annual growth of at least 12 to 18 inches at the tips of leading branches in most peach regions to maintain a maximum production. Fruit-growers should apply fertilizers to secure a growth according to their soil type and its conditions. If such a growth is obtainable without fertilizer, its application may prove detrimental, while if the soil is thin and poor, heavy fertilizing will be required for good results.

Under the average conditions, the equivalent of 100 pounds nitrate of soda, 150 pounds muriate of potash, and 400 pounds acid phosphate will not be found to be excessive, and additional nitrate will be needed in many cases. In districts where the winters are severe, however, nitrogenous fertilizers must be applied sparingly.

Pruning.

Two distinct types of pruning are practised with the peach. One is to allow the tree to form its own particular habit of development except to thin out the branches somewhat as illustrated in Fig. 2794 as contrasted with Fig. 2793. Figs. 2795 and 2796 show other examples of this treatment. The other is to practise annual cutting back of the branches as well as thinning out, to produce a strong compact and yet well-spread tree, as illustrated in Fig. 2797. The first method may result in the somewhat earlier production of fruit, as much pruning tends to delay fruiting. Trees whose main branches are not cut back annually are more likely to suffer from breakage not only in seasons of heavy crops, but also during ice-storms in winter. On each tree, also, the vigorous fruit-bearing parts tend to extend farther away from the main trunk each year. Fig. 2793 illustrates the habit of growth assumed by an unpruned tree.

The peach produces its fruit-buds upon the one-year-old wood-growth. On vigorous twigs the buds commonly occur in groups of three, as illustrated in Figs. 2798, 2799, the two outer buds being flower-buds and the center bud a leaf-bud. Sometimes all three buds are flower-buds and sometimes only one. Single flower-buds may frequently occur also.

Many fads in pruning prevail, which have no economic bearing upon the amount and quality of the crop. The height to which the trees should be cut back when planted varies with different growers, but from 18 to 24 inches is a good average. Some prefer the extreme of 6 inches, but such low trees often make borer-removal difficult.

At the end of the first season's growth, the real pruning of the tree begins. At that time the main branches of the tree should be chosen. The best three or four well-placed branches should be chosen to form the framework for the future top of the tree as illustrated in Figs. 2800, 2801. These should be distributed upon the trunk and not issue from the same point, although on different sides, as in Fig. 2802. In some cases a tree may have developed only a single irregular shoot and this will then require severe cutting back to encourage branching at the desired height. Fig. 2803 shows a good two-year-old tree, low-headed.

When several side branches occupy much the same space or cross one another, a choice of one should be made and the remainder pruned off. The amount of cutting-back to be practised at the close of the first season upon the main branches selected for the permanent framework of the tree depends on the form of the tree. If it is compact, vigorous, and of the desired form, the cutting back of each tip to the first good side branch is all that is necessary. Should one main branch be irregular in growth, more severe pruning is desirable. Severe cutting-back, save in the case of poorly formed trees, only delays fruiting and increases the expense.

During the second summer, the necessity for severe winter pruning may be prevented by the rubbing off of any shoots that tend to develop as suckers low down upon the trunk, or in the center of the tree where they are not wanted,

2793. Unpruned thick-topped peach tree.

and the pinching back of the tips of any branches that tend to develop in an irregular manner. The removal of shoots should be done before they are more than an inch or two in length. The pinching back of irregular shoots should be accomplished in June or early July before they are more than 18 or 20 inches in length. The removal of much growth and foliage in the summer may cause a severe check to the tree.

The annual dormant-season pruning beginning with the second year should be somewhat as follows: The main branches will develop numerous side branches and the strongest and best placed of these should be retained. A well-formed tree is not only agreeable to look upon, but furthermore the maximum production of good fruit is secured only when the greatest possible amount of vigorous fruit-bearing surface is properly exposed to light. The annual cutting back of the leading branches to the first good side branch will result in well-spread vigorous trees. The cutting of a branch to an "outside bud," however, does not change the direction of growth of that branch to anywhere near the same degree. The cutting back of the branches causes a thickening of the top, and some thinning out of shoots and branches is necessary, otherwise the fruit will lack color.

A central leader is avoided in the pruning of peach trees, and any shoots which tend to shut out the light from the center of the tree should be kept pruned back and not allowed to become more than fruiting twigs. The general form of the tree should be about complete at the close of the third or fourth summer after planting, and the annual pruning will largely consist of the removal of any broken branches and the cutting back of the annual growth on each branch about one-third or one-half, according to the variety and the amount or length of growth. Pruning is often the most economical method of thinning, and this point should not be overlooked.

After peach trees have fruited for several years, they commonly require a severe cutting back to reduce the size of the top and to secure more vigorous wood. Such a cutting back should be practised whenever the fruit-buds are destroyed in winter. All branches may be cut back into wood-growth formed the two or three previous seasons. It is never advisable to saw the main branches back to mere stubs a foot or more in length except upon young trees that are to be top-worked.

Thinning the fruit.

Thinning is now a regular feature of good orchard-management. Small fruit sells for low prices at all times and in seasons of heavy crop-production can hardly be disposed of at any price. When trees are allowed to mature as much fruit as will set in a favorable season, much breakage of branches is the usual result. The small green fruits should be thinned as soon as the so-called "drop" or the natural thinning occurs. Sometimes this fails to take place and then the fruit should be thinned as soon as it is about the size of a shelled hickory-nut. Thinning the fruits to not less than 6 inches apart will not reduce the yield of the tree, and 8 inches apart is not too much to secure extra-large fruit, especially upon such sorts as Waddell, Crosby, Mountain Rose, and Stump, which tend to be small to medium in size under average conditions.

2794. The interior weak branches are removed. (Compare Fig. 2793.)

Harvesting the fruit.

This part of the peach business really begins as soon as a crop is definitely assured for the season. The necessary number of packages should be purchased, the packing-house put in order, and arrangements made for the needed number of teams, trucks, pickers, packers, and other labor.

2795. Peach trees allowed to take their natural form.

When the fruit is ready to pick, the work should be organized with one man in constant charge in the orchard. He should direct the pickers and see that each one picks all the fruit that is mature enough at any one time and yet does not take off that which is too green. An efficient picking-crew is necessary in order to secure good results at the packing-house.

White-fleshed peaches change from a light green to a cream-white ground- or under-color as they mature. So-called yellow-fleshed varieties change from a yellowish green to various shades of yellow or orange as they ripen. Pickers should be instructed to determine the maturity of a fruit by its color, and be corrected if they attempt to test it by pressure with the fingers. Good pickers will harvest from sixty to one hundred sixteen-quart baskets a day from well-pruned trees.

The fruit is not uncommonly picked directly into the package in which it is sold, but this practice is rapidly passing in favor of a distinct picking-basket. The most common type in use is a round flat-bottomed wooden stave basket of sixteen quarts capacity.

A low-wheeled wagon is best adapted for hauling the fruit from the orchard to the packing-house.

Packing the fruit for market.

Some sort of a packing-house is necessary when any considerable amount of fruit is handled. A shelter against rain is imperative to prevent the warping of wooden packages. Rapid work in packing can best be organized in a building with a wooden or cement floor and where stencils and tools can be kept in order. A long and relatively narrow packing-house with large doors upon either side is likely to prove the most economical for the handling of the fruit.

Packages, tables, and box- or crate-presses should be arranged in a way to promote rapid and efficient work. No distinct grades of peaches, unfortunately, have become recognized in any broad way. Persons employed as packers should be chosen for their honesty and interest in the business as well as for their rapidity in filling the packages.

The common commercial packages now in use are the sixteen-quart Jersey or Delaware basket and its modifications, the Georgia six-basket carrier, the Michigan bushel and half-bushel, the Climax basket (Fig. 2804) and the western or California box.

2796. The vase-form, or so-called natural-headed tree, in old age.

Packages often arrive on the market in bad condition because they have not been sufficiently well-filled at the orchard. The fruit must be packed tightly enough so that it cannot move in the package during transit.

Simple mechanical graders have been used for some time in some of the peach regions, but have never been entirely satisfactory. The new types of graders are still in the experimental stage. See *Packages*, page 2426, for description of types of fruit-graders.

Markets.

All the large cities in the United States and Canada, in addition to the local towns, consume large quantities of peaches. A grower who is situated near a large local market can allow his fruit to become well-ripened and haul it by wagon or truck without requiring other transportation facilities. Much of the crop must go to market by rail, however, and if in transit more than a few hours, some refrigeration is necessary. Refrigerator cars are employed for this. The large so-called "Fruit-Growers Express" or "Dispatch Cars" will hold five and one-half tons of ice and are capable of carrying 448 Georgia carriers in four tiers, or 558 crates in five tiers.

All crates, boxes, or baskets should be so arranged when placed in refrigerator cars as to allow of a free circulation of air.

Precooling of peaches previous to shipment is practised to some extent, but is not yet common. One who engages in peach-production upon a large scale cannot depend upon local markets to take his entire crop at a profit and must be prepared to ship to the wholesale markets. The ideal shipment is the carload. To ship at least a carload of fruit constantly, one needs to have from about 1,000 to 1,200 trees of each variety in full bearing.

Insects.

The most serious insect enemies of the peach are the borer, San José scale, and curculio. A few years

2797. Headed-in peach tree.

ago the scale was considered the most troublesome of the three, but the borer is now the most difficult to control. The mature insect is wasp-like in appearance, the male shining steel-blue in color with an orange-yellow band about the abdomen, while the female is of a deeper and duller color. The eggs are laid on the trunk near the ground from June to as late as September, or possibly October. The "grubs" hatch and work their way under the bark and there feed upon the inner bark for about twelve months, when a case is formed of the "sawdust" and other materials, in which the pupa stage is passed. One or two borer larvæ may completely girdle a nursery tree, while several may accomplish similar damage on a young tree in the orchard. In any case the infested tree is greatly weakened. The presence of borers is easily detected by the mass of gum and "chewings" at the base of the tree.

A great variety of materials has been tested as coatings to prevent the entrance of borers, but none has proved to be entirely successful. The expansion of the bark because of growth causes numerous cracks in the coating of most materials that are applied and the borers gain entrance. A soft grade of asphaltum applied to the trunk for a few inches above and below ground is a promising material now under test. Lime-sulfur, whitewash, and other materials may have some value as repellants, but are not very efficient.

The common practice is to remove the soil to a depth of 6 to 8 inches about the trunks of the trees in early spring and to kill the borers by means of a knife and a short piece of wire. Some growers examine their trees in autumn, but there is danger of winter injury unless the soil is put back before severe winter weather occurs.

The San José scale is now easily controlled by a thorough dormant-season spraying of lime-sulfur diluted to a specific gravity of 1.03 to 1.04.

The plum-curculio is a small snout beetle about ¼ inch in length with four irregular humps upon the wing-covers. It is dark mottled gray in color with black markings. The principal damage caused by this insect is during seasons of light crops or upon trees just coming into bearing when the loss of a proportion of the green fruits reduces the crop. In seasons of heavy crops, the loss of a proportion of the green fruit may not prove to be of economic importance. The beetle appears in the orchard about blooming time and feeds on the foliage until the calyces are shed from the fruits, when egg-laying begins. If the egg hatches, the larva makes its way to the center of the peach and feeds upon the developing germ, causing the fruit to fall from the tree later. The mature beetle may also do considerable feeding upon the outside of the peach while it is still small, causing irregular blemishes that may markedly effect the commercial value of the fruit. The curculio is most troublesome when the orchard is surrounded by grasslands and hedgerows of weeds and native trees. When much of the area is under cultivation and good orchard practice prevails, the damage is greatly reduced. A spraying of arsenate of lead just after the petals fall, and again just as the calyces are shedding from the fruits, will destroy many of the curculio. It is best to combine the lead with the self-boiled lime-sulfur to secure a better distribution of the lead and prevent any burning of foliage by an inferior product.

2798. Fruit-buds of the peach with leaf-bud between.

The bark-beetle is a small black insect not more than ⅛ inch in length that attacks the bark upon weakened trees, causing gum to exude in spots upon the trunk and branches. Fortunately, the insect usually causes little or no damage to vigorous healthy trees and its presence indicates that some other factor is really to blame, although it is sometimes reported on healthy trees. The black peach aphis is occasionally troublesome upon light soils, but good culture and a vigorous

growth commonly prevents any serious check to the trees.

Various beetles and grasshoppers may cause some damage at times by feeding upon the peach, such injuries being most common in orchards in which grass or weeds are allowed to grow freely.

Diseases.

The peach is subject to the attacks of a considerable number of diseases. The most difficult to combat are yellows, little-peach, and rosette. The causes of these diseases are still unknown. Some suggest the presence of a fungus, others an organism too small to be detected by the ordinary microscope, and there is also the possibility of enzymes.

The advanced stages of yellows are indicated by a prematuring of the fruit from a few days to at least two weeks in advance of the normal season. Such fruit is commonly red-spotted and blotched in its coloring and may be insipid or bitter in flavor. Affected trees may also develop sickly wiry twig-growths on the trunks and branches.

Little-peach is indicated by a characteristic drooping of the foliage and by the fact that the fruit is smaller and matures later than the fruit on healthy trees.

Rosette occurs only in southern districts and is readily distinguished by the tufts of leaf-development. This disease is fatal within twelve months in many instances.

It is not known whether these diseases are entirely distinct or not, but they have been so regarded. Yellows and little-peach attack all varieties in about the same proportion. Infection does not appear to take place through the soil, flowers, or seed. These diseases can readily be transmitted to healthy trees or stocks, however, by budding. Buds taken from the apparently healthy parts of diseased trees have invariably reproduced the diseases.

The recognition of early stages of yellows and little-peach have shown that these diseases are too frequently distributed in nursery stock. It is now known that a tree may be infected with either of these diseases for three or four years without showing any prominent symptoms. When good growing conditions are provided, the true state of affairs may be masked for a time, but a check to growth will result in the prompt appearance of the advanced stages of disease.

Many cases of so-called "cures" of yellows have been announced, but all have been without sound basis. Too often trees affected with borers, winter injury and other troubles are considered to be affected with yellows. Diseased trees should be destroyed as soon as detected. When such trees are left in an orchard, the disease spreads to surrounding trees until all are affected. If all diseased trees were destroyed annually in any district and no diseased nursery trees were introduced, the annual loss could readily be kept as low as 1 per cent, without much doubt. Yellows attacks Japanese plums as well as peaches, and this should not be overlooked in control work.

Peach leaf-curl, brown-rot, peach-scab and mildew are fungous diseases of the peach which cause much damage annually. The leaf-curl attacks the foliage in early spring just as the leaf-buds open, and the leaves become curled, thickened, and distorted. The tips of shoots may also become affected and the disease is occasionally seen upon the fruit in a fan-shaped discolored area. The affected leaves finally turn brown, and fall from the trees in early summer. In severe attacks, the trees are almost completely defoliated, greatly reducing their vigor and causing them to lose most of the fruit which may have set. This disease is readily controlled by a spraying with lime-sulfur, as directed for the scale, before the leaf-buds begin to make growth. After the leaf-buds begin to expand, however, the spraying may not prove effective. Recent experiments have been tried with apparent success in New York of fall spraying for leaf-curl, as late as the first part of December.

Brown-rot was formerly one of the dreads of the peach-grower. Thousands of baskets of fruit frequently rotted on the trees just at harvest time. Not until the value and safety of self-boiled lime-sulfur summer spray was demonstrated by Scott were the peach-growers supplied with an effective remedy for the disease. This affliction may not only cause a rapid decay of the fruit at ripening time, but it sometimes attacks the blossoms and causes their death. The affected blooms are distinguished from frost injuries from the fact that they cling to the twigs, and gum commonly oozes out from the canker formed upon the twig at the base of the bloom. The small green fruits may also decay at all stages, and the twigs may be killed outright from numerous cankers upon the bark. Such varieties as Triumph and Connecticut frequently begin to rot before they ripen, and the entire crop may be lost even when well sprayed. Such sorts should never be planted. Varieties as susceptible as Champion are not very satisfactory shipping varieties. A thorough system of summer spraying, as outlined under "spraying" (page 2500), should control brown-rot.

Peach-scab is a fungous disease which appears upon the fruits in the form of small black dots. In severe cases these dots may be so numerous as to form a sooty blotch. The skin of the fruit may then crack, offering an excellent opportunity for brown-rot to begin its destruction. Peach-scab is most serious from central New Jersey south to Georgia. Upon hilly areas, north of central New Jersey, it is rather uncommon

2799. The three leaves at a joint, where fruit-buds are forming. Fruit-buds sometimes form in the axil of single leaves, and sometimes on short spurs.

and it seldom requires any attention. The disease occurs only upon the upper surface and ends of the peach as it grows on the branch. It makes its appearance in the form of very minute black spots or dots from about the middle to the last of June upon early varieties in New Jersey, Delaware and Maryland. Farther south it occurs correspondingly earlier. It may be readily controlled by thorough summer spraying with the self-boiled lime-sulfur.

Peach-mildew most frequently occurs along the northern limits of peach-production near the Great Lakes, and in the Northwest. This is probably because of the wider extremes of temperature during the day.

Mildew appears in the form of a white powdery substance upon the leaves and fruit. It may do considerable damage to nursery stock in some cases. Sprayings

with self-boiled lime-sulfur will commonly hold it in check.

Spraying.

The peach is subject to the attacks of numerous disease and insect enemies, and thorough spraying is required for success in most cases. The peach foliage is very sensitive to caustic sprays, however, and great damage may be done from ignorance. Copper sprays, such as bordeaux, are dangerous to use on peach foliage in humid climates. San José scale and leaf-curl can be controlled by a winter spraying of lime-sulfur. Peach-scab and brown-rot can be held in check by several sprayings of the self-boiled lime-sulfur summer spray.

2800. Young peach trees pruned, one of them headed back.

When San José scale, leaf-curl, peach-scab, brown-rot and curculio appear to any considerable extent, the following spraying schedule is suggested:

1. For scale and leaf-curl, apply concentrated lime-sulfur diluted to a specific gravity of 1.03 to 1.04 before the leaf-buds start to make growth in early spring.

2. Just after the petals fall, apply self-boiled lime-sulfur of an 8–8–50 formula and arsenate of lead at the rate of three pounds of paste, or one and one-half pounds of powdered lead to each fifty gallons of spray.

3. Repeat this when the calyces are shedding from the fruits or when the latter are about the size of green peas.

4. Apply self-boiled lime-sulfur without the addition of arsenate of lead three weeks after the third spraying.

5. Apply self-boiled lime-sulfur again three weeks later to all varieties ripening later than Carman.

6. In wet seasons and especially for varieties as late as Fox, Salway, or Bilyeu, an additional spraying may prove profitable.

No spraying should be done within less than three weeks of the ripe stage, or the fruit may have a white-washed appearance.

Where the plum-curculio causes little or no damage, the second spraying may be omitted, and where peach-scab and brown-rot are uncommon, the fourth, fifth, and sixth sprayings may be omitted.

Winter injuries.

There are several forms of winter injury, including bud-killing, twig-killing, collar injury and bark-splitting. Bud-killing takes place when the temperature is too severe in winter. The pistils and stamens are killed in their rudimentary state, giving the center of the bud a brown or black appearance when a cross-section is made. Poorly formed buds often die even when the winter temperatures are not particularly severe. Alternate warm and cold periods may also result in bud-killing. Varieties such as Reeves, Early Crawford, and Mountain Rose suffer more from bud-killing than Greensboro, Carman, or Crosby. Vigorous trees that ripen their wood-growth early are best able to withstand low temperatures successfully. Trees that make a relatively late growth are, however, more successful in resisting the effects of a variable winter.

Twig-killing is a more severe form of injury than bud-killing, and following such injury the trees should be well cut back before growth begins.

Collar injury is caused by the action of the weather upon the bark of the trunk just at or below the surface of the ground. In mild cases, the inner bark becomes yellow in color and very spongy. The tree is checked in growth and the fruit forced to an unusually large size. The lenticels or dots are large and the flavor of the fruit is often astringent, due to a large proportion of tannin. In more severe cases of injury, the trees suddenly die in midsummer with the shriveled fruit clinging to the twigs. Bark-beetles often attack trees checked by winter injury and the death of the trees is often entirely attributed to their attacks. The Elberta appears to be more susceptible to this form of winter injury than such varieties as Greensboro or Carman. The soil should be firmly mounded up for about a foot against the trunks of peach trees just before freezing weather each fall to prevent such winter injury.

The bark on the trunks of old peach trees may occasionally crack open as a result of winter weather. The most that can be done is to cut away the bark that has separated from the sap-wood and to paint the latter to prevent decay.

Peach trees not infrequently suffer injury to the sap-wood of the branches and twigs, and the trees may fail to grow vigorously the following spring. Such trees should be given liberal fertilizing and be kept well cultivated to promote a good growth. M. A. Blake.

Peach-culture in the South.

Peaches have been abundant in the southern states since the very earliest settlement, the so-called Spanish varieties being first distributed by the early settlers in Florida, and to this day, all through the South Atlantic States, the old "Spanish Blood" or "Tinsley" peach, is spoken of as one of the choice fruits of the earth. From time to time all the improved varieties were scattered through the South by the more progressive horticulturists and nurserymen and these and their seedlings were abundant on nearly every plantation. The South being strictly an agricultural country, there was little chance for commercial peach-culture until along between 1870 and 1875, when the introduction of a number of new extra-early varieties of the Alexander type, seedlings of Hale and Rivers, gave such bright showy peaches the latter part of May and early June that attempts were made to market them at a profit in our northern cities.

A lack of quick through railway-express service caused them to be three and four days on the way, and usually to be delivered in poor condition. Occasional lots, arriving in fair to good condition and selling at $12 to $20 a bushel, convinced a few of the shippers that the extra-early peaches of the South were appreciated at the North, and persistent efforts were continued to get them to market in sound condition. Every conceivable style of shipping package was used,—paper-wrapped fruit placed between layers of cotton, excelsior, paper, and the like, and sent by express or steamer,—and all brought about the same returns, "Arrived in bad order." Only occasional lots paid a profit. Finally, heavy refrigerator boxes that would hold about six bushels of fruit in packages, and a sufficient quantity of ice, with strong castor wheels under them so they could

be trundled in and out of freight cars, were utilized to bring peaches north by Savannah and Charleston steamers; and by re-icing on the steamers, much of the early fruit came through in good order and sold at such satisfactory prices as to encourage the sending of the large midsummer peaches to market in the same way, and the planting of moderate-sized orchards and the further experimenting with seedlings and varieties best suited to long shipments.

The perfection of the refrigerator car for fruit transportation, improved machinery for the cheap manufacture of ice, the consolidation of various small railway lines into great through routes of transportation, and a full appreciation by their managers of the importance of a successful peach industry, and last but not least, the originating of the Elberta peach by Mr. Rumph, were the final factors in rapidly developing the great commercial peach industry in Georgia, and its smaller counterparts in South Carolina, Alabama, Mississippi, and the more recent rush of overplanting in Texas, Arkansas, Oklahoma, and southern Missouri.

The year 1889 saw the first large peach crop successfully harvested and marketed. Profits were large, and being reported in the press many times greater than they really were, stimulated much planting by those entirely unfamiliar with fruit-culture, and with no special love for it except the money that might be made out of it. Cheap lands and the abundance of good low-priced labor were encouragements to extensive plantings. In nearly every state of the South, land in vast tracts suitable for peach-culture could be had at $3 to $10 an acre, and labor from sun to sun at 40 to 60 cents a day; while in 1915 these lands are selling at $25 to $100 an acre, with a possible average of $40, and labor costs $1 a day or more, while the added expense of three or more sprayings each year has helped to double the cost of peach-production in the South.

Along the Atlantic and Gulf coasts, varying from 100 to 200 miles inland, most of the land being low and flat, early blooming, followed by spring frost, makes the peach industry too uncertain to be profitable. The hill lands in western sections of Atlantic Coast states, and northern sections of the Gulf States, is really the peach country of the South, where extended lists of varieties are grown, covering a season of fully two months; while the southwestern states, planting almost entirely of one variety, have a season of less than two weeks in many orchards. Fort Valley and Marshallville, the great peach centers of Georgia, though on tablelands about 200 miles from both ocean and Gulf, and at an elevation of a little over 500 feet, are not in what might strictly be called the hill country, being just below the southern edge of it. In this section of Georgia, most of the peach orchards have been planted on old cotton-land, much of which has been in cultivation a century or more, and while the surface-soil is worn and poor, down deep in the red clay soil underlying the 6 or 8 inches of sandy gray loam of the surface, there must be a vast amount of fertility from the way peach trees grow when once started and a reasonable amount of culture is given.

In the early days most of the orchardists, who were cotton-planters as well, planted second- and third-class yearling trees, or else small June-budded trees any time from October to March, opening furrows for the trees and cross-checking the rows 18 to 22 feet apart, later plowing this land and planting it in cotton, continuing it for three and often four years. Two to four hundred pounds of low-grade fertilizer is applied in drills for the cotton and usually very thorough culture given; trees are allowed to grow at will, their culture being incidental to the cotton crop. In such orchards very little if any pruning was ever attempted. After the trees become so large as to drive out the cotton, one plowing is given in winter, then anything from fairly good culture to none at all the remainder of each season. Such a system resulted in many "scrub orchards," that were not very profitable after six or seven years.

In the recent and more highly developed peach orcharding of this section of the South, better preparation is given the land at the start, dynamiting of the holes for planting being largely practised. There is a more careful selection of trees, far more liberal fertilizing, planting at greater distances, seldom less than 20 by 20 feet, better culture, less and less of intercropping, except of cowpeas and other cover-crops, and somewhat more of systematic pruning, though as yet this art is not fully enough practised to show best results. Many of the land-booming orchards, planted between 1890 and 1900, proved financial failures and are either no longer in existence or else have been absorbed into other and better propositions. There are less and less of the cotton farmer orchardists and more peach specialists, as time and experience have shown the business to be unprofitable, except under best business conditions. The writer's plantations, which ten years ago aggregated some 265,000 trees, have now been reduced to less than 100,000 trees, as only by planting at greater distances and giving a less number of trees better care and attention, can any profit be assured.

All land is plowed deep, and sometimes subsoiled before planting. Young orchards are given frequent and thorough tillage up to midseason, when two or three rows of cowpeas are drilled in at least 4 feet away from the rows of trees; these and the trees are cultivated frequently, until the peas have taken almost full possession of the ground, and it is time for both the land and trees to have a rest from cultivation. In the fall when peas are ripe, enough are gathered for next year's seed, after which hogs or mules may be turned in to pasture for a time. The stubble furnishes a fine winter cover, and is turned down at first plowing in February or March, when summer culture begins, and at proper time the orchard is again seeded to cowpeas, across the former direction of the rows. Three years of this usually builds up a perfect orchard without the aid of any other fertilizers, except possibly a very little about the trees at time of planting to give them a start.

Low-headed trees are the rule, the trunks seldom branching over 18 inches up, and often 8 inches to

2801. Before and after pruning.

a foot from the ground. As a rule, the close cutting-back at time of planting, and a general shortening-in of the leading branches for the first two or three years, is about all the pruning given, even in the best orchards. A good plan is to shorten-in every year much of the past season's growth, and from the central head often cut back two or three seasons' growth; but under no circumstances are any of the good side shoots cut out

that force themselves on all the main stems when the top is properly headed back. These little side branches have given several full crops of fruit, when without them there has been failure.

Soil and climate favor the very brightest of color on all peaches in the South; qualities of the soil and the long, hot summer sun give a richness and sweetness of flavor superior to any other section of America, though the same varieties are not so juicy or luscious as when grown farther North.

The orchards in connection with cotton plantations run all the way from 10 to 100 acres in extent, while the "straight-out peach farm" seldom has as few as 50 acres in fruit, more of them having from 100 to 200 acres, while orchards all the way from 300 to nearly 1,000 acres in extent are no uncommon sight. The Georgia peach industry turns out 5,000 to 7,000 carloads of peaches in seven or eight weeks of a busy picking season, even though the 18,000,000 trees estimated to have been in that state ten years ago have now been reduced to less than 8,000,000.

Growth usually ceases early in August, and the trees shed their leaves the last of September, a month or six weeks before any frosts occur. Should the fall be warm and wet, some fruit-buds will be forced into bloom, while the greater number will remain dormant until late January or early February, when spring growth commences, The season of full bloom is usually about the first week in March, though it varies all the way from February 15 to March 25, and no matter whether early or late, the entire blooming season of most varieties covers a period of nearly three weeks. While spring frosts are the greatest menace to southern peach-culture, this long blooming period often gives a chance for a setting of fruit between the various frosts, or after the last one, from some belated buds. Even with these varying chances of escaping between frosts, about one year in three frost destroys the peach crop in some one or more of the great centers of peach-production in the South.

Two other serious troubles hamper the southern peach cultivator—curculio and monilia or brown-rot. Curculios are very abundant; beginning early in April, they keep up their destructive work until the end of the fruiting season. In recent years in the summer spraying for monilia, the addition of arsenate of lead has controlled the ravages of curculio so well that now they are far less destructive than before. The early spring months at the South are inclined to be pleasant and very dry, and the summer rains, which are frequent and abundant when they do come, often do not set in until the latter part of July or early August, near the end of the peach-shipping season. Often, however, they begin in June, and continue for two or three weeks, and in the case of the season of 1900 it rained for six weeks through the main part of the peach harvest. Hot sun between showers and the general mugginess of a warm climate rapidly breed the monilia fungus, and brown-rot is the most serious trouble the southern peach-grower has to contend with, though with proper spraying it may be held almost entirely in check, and except for the extra expense is not now to be feared as in the earlier days of southern peach-culture. In the ten years from 1895 to 1905, probably more than 50 per cent of peaches grown in Georgia rotted on the trees, or else reached market in specky condition as the results of monilia fungus.

2802. A bad form of top.

The first great crop of Georgia peaches that made a strong impress on all northern markets was in 1889, when the Elberta variety by its large size, great beauty, and fine keeping qualities showed up so strongly for the first time as to outclass all other varieties. Great profits were made and, being reported as even greater, there was a mad rush to plant Elberta, and Elberta only. This was kept up until 1896–7 before it came to be realized that there could be too much of even a good thing. The rushing of a great volume of fruit, no matter how choice, into the markets in two or three weeks, before they had been "toned up" to at least a liberal supply of good fruit, was a business mistake. To remedy this there has been a hunt after a good early variety to precede the Elberta, as well as later ones to follow it. So that, while prior to 1896 more than 75 per cent of the plantings were of Elberta, since that time not more than 15 to 20 per cent of Elberta have been planted. There is a better balance of varieties, and a longer and more profitable season of marketing has been assured. Many early and mid-early varieties growing ten or fifteen years ago have mostly been abandoned, Greensboro, Carman, Hiley and Belle (of Georgia) being varieties most largely grown to precede Elberta. Growers are now beginning to abandon the Greensboro and plant excessively of other extra-early varieties, notably Uneeda, Arp (Arp Beauty or Queen of Dixie), and Early Rose. These varieties having sold at extremely high prices in recent years, there now appears as great a tendency to plant extra-early ripening peaches as there was for the Elberta in the earlier days.

When loading in cars, the crates are placed side by side about 2½ inches apart across the car, taking seven crates. Then two strips of inch-square stuff, just long enough to reach across the car, are put on top of the crates at each end and are lightly nailed down. Tier upon tier is built up in this way, either five or six crates high, until the car is full. Spacing of the crates and the slatting provides space for cold air around each and every crate. In dry seasons, when fruit is free from rot-germs, cars as now constructed can with safety be loaded five crates high, but in wet seasons, with rot prevalent, they arrive in market in much better condition when loaded only four high. Besides the original icing, which requires four to six tons to a car, a re-icing after loading takes one to three tons, depending upon how long the car is loading. A car will hold 448 to 525 crates, according to the size of the car and whether loaded four or five crates high. Handled along best modern lines, with careful inspection from start to finish, it costs for the six-basket Georgia carrier, from 30 to 35 cents to take peaches ripe from the tree and place them in the car.

Some peaches of the Crawford type are grown all through the South, but they do not succeed so well as most others of the Persian strain, and none of the Persians does so well in the far South as the North China strains, to which Carman, Hiley, Early Rose, Belle, and Elberta belong. The South China peaches, to which the Peen-to, Honey, and Angel belong, succeed best in Florida and close along the Gulf Coast. While their bitter-sweet flavor is appreciated by some, they are not generally profitable for market.

In preparation for marketing the fruit crop, many of the large orchards have railroad side-tracks running to their packing-houses in the orchard; refrigerator cars are brought South, and every available bit of side-track for 300 or 400 miles about is filled with these cars. At leading centers, refrigerator-car people have constructed great ice-storage-houses, with every convenience for quickly icing and re-icing cars. Agents of these refrigerator-car companies, by frequently driving about among the orchards and keeping in touch with the managers, plan to have enough cars iced and

cooled off so as to be ready for each day's demand, and by placing an order with the railroad agent the night before, the orchardist may have one or a dozen refrigerator cars delivered on his side-track in the morning. For smaller shippers, who cannot load in carlots, the railroads keep at all times in season refrigerator cars on siding at each station in the peach district, into which any number of shippers may load; more often there will be a number of such cars loading at the same time, so that a shipper may have a choice as to which market he will consign his fruit. Except in the height of the season, these cars are often two and sometimes three days in loading, and the continued opening of the car to put in small lots of fruit prevents perfect refrigeration; consequently fruit from small shippers more often goes to market in bad order than from the larger orchards, where a car can be quickly loaded and at once closed up, not to be opened until ready for sale in some northern market. In the Hale orchards, a car is often loaded in an hour, and very little of the fruit is ever so long as two hours passing from the tree through the assorting- and packing-houses to the car.

In some of the smaller orchards, fruit is packed in crates or baskets under the trees, and then hauled in open wagons, often without springs, to the railroad station. In others, some of the old farm buildings are used as packing-houses; more often special fruit-houses are used, their size depending upon the requirements of the orchards, while in style and convenience more depends upon the intelligence of the orchardists and desire to handle the fruit rapidly in best possible manner. The picking-basket most generally used is a shallow, round basket, with a drop handle, and holding about a half-bushel. With good refrigerator cars and prompt railroad service, fruit is now allowed to come to full maturity on the tree, and is picked just before it begins to soften.

Since the organization of the Georgia Fruit Exchange, some eight or ten years ago, about 75 per cent of the peach-growers of Georgia, Alabama, and South Carolina have, through this coöperation, been enabled to secure a wider distribution and a more uniform market-price for their products, and their business is on a more secure foundation than in any other section of the South.

J. H. Hale.

Peach-growing in California.

The peach is a fruit of wide commercial importance in California. The great peach-growing sections are principally in the San Joaquin and Sacramento valleys, but orchards are found and are profitable not only in the mountains up to an altitude of 3,000 feet, but also in the coast sections. The most important districts are the first named. For size, flavor, color, and shipping qualities, the peaches grown in this state have a national reputation.

The tree thrives not only on the sandy, loamy soils which are adapted to irrigation and are well drained, but also on the heavier red and black soils, which are more or less mixed with gravel and are found both in the foothill and coast regions of California. On account of the arid climate, there being no rainfall from May until October, it goes without saying that to produce high-class peaches for either shipping, canning, or drying, irrigation is very essential. The theory that was formerly advanced that irrigated fruit would not keep, has not been borne out in practice, and to attempt to grow peaches without irrigation, particularly in the great valleys, would now be considered the height of folly.

No systematic plan has been followed in fertilizing orchards, although growers are realizing that to grow good fruit and to maintain an orchard up to the very highest standard, the application of fertilizers is essential. Considerable interest is now taken in cover-crops, and a number of experiments have been made with Canada field peas, fenugreek, and vetch. To grow a cover-crop successfully, it is necessary to have water in the fall, and as water from the canals is not obtainable, it must be secured by pumping. Barnyard manure, when it is to be had, is given the preference by growers. This is becoming very scarce, however, and eventually commercial fertilizers will come into general use.

2803. A good two-year-old peach tree.

Peach trees are transplanted in California when they are one year old from the bud, except in years when stock is scarce and trees sell at high prices, when many growers purchase June buds, which transplant readily, providing care is taken to allow them to mature fully in the nursery before digging.

Nothing will bring a peach tree to a premature end more quickly than not to prune. Trees when transplanted to the orchard should be pruned both root and top. The root-pruning should be the shortening-in of all the roots at least one-third and the removal of all bruised and lacerated roots.

After the trees are set, they should have the top cut off to within 20 inches of the ground, even if the tree be 6 feet or more in height. In most cases, the failure of trees to grow may be attributed to the orchardist's failure to observe this simple rule. It is very necessary to settle the soil around the tree, either by irrigating (running the water in furrows), or by tanking (using not less than fifteen gallons of water to a tree).

The winter following the planting in the orchard, the branches forming the head should be confined to not more than five at the very outside, and four is better. These should be cut back at least two-thirds and all laterals removed.

This pruning will not only cause the trees to grow stocky, but it will probably also serve the purpose of making the framework branches very sturdy. The tree will respond by making an immense growth and in the second winter the shortening-in of this growth will again have to be very severe, and thinning will have to be practised. The point to be considered in this case again is to give the tree not only the goblet form, but to perfect it, for this pruning increases its vigor

and makes it capable of producing heavy crops which are well protected from any injury by the sun, due to its wealth of foliage. From the third year, two or three laterals are allowed to grow on each of the frameworks, and their growth is again shortened-in severely. In the fourth year, the pruning need not be so severe, and a reasonable crop of fruit may be expected. Pruning in after years should be followed out regularly each season if good crops are to be secured and the longevity of the tree maintained.

It is a mistake to plant peach trees too close together. In former years it was customary to plant 20 by 20 feet, but now trees are planted 24 by 24 feet, as better results have been secured at this distance.

Thinning must be practised when the crop is heavy, for, if not followed carefully, the fruit will lack size, and no matter for what purpose it is used it will go into an inferior grade and at prices which would be very unsatisfactory to the grower. The peaches should never be closer than 4 inches apart. If the ground underneath the tree has the appearance of being covered with a green carpet from the effect of the thinning, it is evidence that the work has been well done.

When shipped fresh, peaches are wrapped in soft paper and packed in twenty-pound boxes. The number

2804. Peach-packing. The Climax basket.

of peaches shipped out of California is about 2,200 carloads annually. For local consumption in the larger cities, the peaches are shipped in open lug boxes, holding about forty pounds.

The free-stone peaches are the only ones dried, as a rule. These are first halved, the pits are removed, and the fruit is placed in trays. The drying takes place in the sun altogether. Before drying, the peaches are exposed to the fumes of sulfur for not less than four hours. This not only kills any insect life but gives the peaches a much more appetizing appearance. The very heavy tonnage of dried peaches, averaging 30,000 tons annually, would be utterly impossible to handle unless the same could be dried by exposure to the sun's rays. It requires from six to seven pounds of fresh peaches to make one pound of the dried product. Many persons object to the fuzzy skins on the dried fruit and in recent years peeled peaches have been in the markets in a limited way. The method of peeling has been to expose the halved peaches to the sulfur fumes for several hours. This loosens the skins and they peel off readily. This handling of the fruit is expensive, however, and with the difficulty of securing labor, it has not been practicable except on a small scale. This method has been very much improved, however, and the peaches after being halved are now dipped in a hot lye bath for fifty seconds, using about one pound to ten gallons of water. The peaches are then given a bath in cold water, not only to remove every vestige of lye, but to cause the skins to slough off. Peaches treated in this way sell at twice the price of the unpeeled peaches and the entire character of the fruit is changed. Outside of the lve bath, which is the only additional treatment the fruit receives, the process is the same as is followed when the peaches are not peeled.

The canning of peaches is another important branch of the industry, the output from California being in the neighborhood of 84,000 tons annually. This work is conducted exclusively by commercial concerns having every modern appliance to handle the fruit expeditiously and turn out uniform grades. Outside of the halving of the peaches, which work is done by women, the work is accomplished entirely with machinery. Sanitary cans are used as containers and a limited quantity of the fruit is placed in glass jars. The commercializing of the industry has created a demand for well-defined standards. To illustrate this, the only peaches which are regarded as the leaders by the canning trade are the clings; and in the list of varieties, the Tuskena, Orange, and Phillips, all of which are yellow, are in the heaviest demand. Peaches that have no red at the pit are preferred for canning, as the syrup never becomes discolored. The important place which the canning industry occupies in the peach business will be sure to bring about improvements in varieties to meet the demand for peaches with smaller pits, finer-grained and more highly flavored flesh. Already several new varieties, mostly chance seedlings, have been introduced and are attracting considerable attention. For shipping, Alexander, Briggs (Red May), Early Hale, Dewey, Imperial, Sneed, Elberta, and Salway are recognized as standards; for drying, Elberta, Foster, Late Crawford, Lovell, Muir, Susquehanna, and Wheatland; for canning, Tuscan, Runyon, and Seller (Orange) Clings, McDevitt and Phillip and Levy (or Henrietta).

Fortunately, the California peach orchards have never been threatened with insect pests or diseases that cannot be controlled. The crown root-borer is troublesome, in some sections, but it has always been under control. The San José scale is no longer regarded as a very serious pest, for it is held in check by predaceous insects and by spraying with lime-sulfur washes. Leaf-curl in some years gives considerable trouble, but if the trees are given a thorough spraying with bordeaux, it is easily controlled.

The average life of a peach orchard is twenty years, but there are many profitable orchards much older than this, when they have received good care.

A failure of a peach crop has never been known in California, and although in some years the crop has been curtailed by late spring frosts, growers have never practised smudging to any extent.

GEORGE C. ROEDING.

Protecting peach trees in cold climates.

Numerous ways of protecting peach trees from the effects of trying winter weather have been devised. Such plans include the placing of a protective covering about the trunk and branches of the tree. Cornstalks, straw, hay, evergreen boughs, and similar materials may be used for this purpose. Some persons have tried the plan of laying the tree on the ground in an effort to make the work of covering easier as well as more effective.

Peach trees may be laid on one side with comparative ease and without much injury, providing the process is begun when the trees are small. The root-system is manipulated at this time in such a way that most of it extends in two opposite directions. This is accomplished by cutting the roots, beginning when the trees are small, preferably the first winter after planting and thus accustoming them to the operation from the beginning. If this plan is followed from the start, a

little work with the spade will suffice to lay a tree down. Once on its side, the branches should be gathered together with twine and the covering put in place and weighted down.

An interesting method of laying a tree down without disturbing its roots was devised a number of years ago. This is accomplished by bending the newly planted tree over to the ground, where it is fastened. The side branches are cut off at first as fast as they appear, thus inducing a long straight growth. After the prostrate stem has attained a length of 10 to 12 feet, an upright top is allowed to develop. At the approach of winter, the top of a tree trained in this manner can be pushed over easily, as the long prostrate trunk serves as a lever or pivot. The long exposed trunk will need to be protected at all times from the effects of the sun. This is easiest done by using an inverted trough made of light boards.

The process of laying trees down under irrigated conditions is somewhat simplified, as the ground can be made very soft by the use of water. Here, again, the work should be begun the first winter after planting. The ground about the young tree is first saturated with water from the irrigation ditch. The trees are then pushed over in the direction that offers the least resistance. After the branches have been drawn together with cord, they are covered first with burlap, then with a light coating of earth. As the trees become more mature, a basin about 4 feet in diameter is made in the earth about the trunks before the water is turned in.

The nicest of judgment must be used in removing the covering in the spring, as a little too much warmth or a slight exposure to cold may mean the loss of the year's work. At the first sign of swelling buds in the spring, the earth covering must be lightened during the middle of the day and replaced for the night. As growing weather comes on, still more of the covering is removed and a certain amount put back each night until the tree is raised for the summer. The danger of damage by cold continues until the fruits have attained considerable size, consequently the work of uncovering in the middle of the day and of covering for the night extends through a comparatively long period.

After the danger of damage by frost is passed, the ground is again irrigated and the trees are raised. Trees so handled are unable to support themselves in an upright position, consequently they are supported at an angle by props. It is estimated that the entire labor of laying a tree down, covering and of raising again in the spring, can be done at a cost of 50 cents a tree.

W. Paddock.

PEANUT (*Arachis hypogæa*). Popularly the peanut, as the name indicates, is called a nut, but it more properly falls into the class of grain or forage crops. The fruit or "nut" is really a pod, comparable with a bean-pod or pea-pod. The plant is related to beans and peas. The seeds (comparable with bean seeds) furnish excellent food for man as well as for his beasts and fowls, and the cured tops make an excellent hay or forage. The peanut is usually not classed with horticultural crops; for a fuller account, see Vol. II, "Cyclopedia of American Agriculture."

Commercially, the peanut is not grown north of the latitude of Washington, D. C., but on the sandy and loamy soils to the south and west of the above-named city, on lands that have recently been limed, it may be used as a rotation or as a special money crop. North of this territory the plant can be used with profit as a forage for hogs, although only a portion of the pods set will come to maturity. As a garden plant, the peanut can be grown as far north as central New York, but only a few pods will actually mature seeds, except in long warm growing seasons,

There are two general types of peanuts: those known as bunch nuts, and as vine or trailing nuts. The bunch nuts are most desirable because the tops can be more easily harvested for forage, the rows may be closer together and the distance between the plants in the row may be less than with the vining types. The cultivation as well as the harvesting (digging) is easier. The bunch type of nuts, such as the Spanish and Valencia, may be planted in rows 30 to 36 inches apart, with the seeds scattered 6 to 10 inches apart along the row. The large-seeded thick-shelled nuts require to be shelled before planting in order to insure satisfactory germination, but the smaller thin-shelled sorts may be planted whole and a good stand secured. The planting season, as well as the field care of peanuts, is practically the same as for corn. They are tender to frost and grow best during warm weather. The vines will be killed by the first frosts, but when desired for forage should be harvested in advance of that date. As the pods or nuts are borne beneath the surface of the soil, the crop is harvested by lifting or plowing out the whole plant, separating it from the earth and curing the plant and pods together by stacking them in tall narrow stacks built up around a slender stake about 6 feet high, at the bottom of which cleats 3 feet long have been nailed in such a way as to keep the plants off the ground. The stacks are so built as to cause the vines to protect the nuts. The roots with the nuts attached are placed next to the stake, with the tops out. This method permits the nuts to be cured slowly and without discoloration or staining that would result were the nuts exposed to the weather. The plant is a most interesting one, both horticulturally and botanically, and is at the same time an important economic crop as well as a garden novelty.

L. C. Corbett.

PEAR. A popular fruit and tree of the genus Pyrus, long cultivated and much modified.

The cultivated pear, as known in North America, is derived from two distinct sources, the European *Pyrus communis* and the Oriental *Pyrus serotina*. Pears of the European stock have been grown in North America from the earliest settlement of the country. They thrive particularly well in the New England states and New York, and west to the Great Lakes, and again on the Pacific slope. In the great interior basin, pear-culture always has been precarious, due primarily to the great liability of the trees to blight. In the southern states, the climate is too hot for the best development of the tree and the best quality of the fruit. In the north prairie states, the winter climate is so severe that the pear tree will not grow. Forms of pears are shown in Figs. 2806 and 2807, as representing the common species.

2805. Cluster of pear flowers (Pyrus communis). (×⅓)

Some time before the middle of the preceding century the sand or Chinese pear (*Pyrus serotina*, formerly and, as it now appears, erroneously, identified as *P. sinensis*), Fig. 2808, was introduced into the eastern states, although it attracted little attention. It soon hybridized with the common pear, and a race of mongrel varieties was the result. Of these hybrids, only two have gained great commercial prominence. These are LeConte and Kieffer (Figs. 2809, 2810, 2811). The LeConte, which appeared about the middle of last century and which is the first of the American hybrids, so far as we know, was found to be well adapted to the southern states and its general introduction there after the close of the Civil War was the beginning of commercial pear-culture in the South. It was first supposed to be blight-proof, but, in later years, orchards have been nearly decimated by the

blight, with the result that the LeConte is gradually lessening in importance and its place is being taken by the Kieffer, although the latter is by no means blight-free. The Kieffer pear originated with Peter Kieffer, of Roxborough, Philadelphia, an Alsatian gardener, who died in 1890. He grew the Chinese sand pear or Sha

2806. Bartlett pear. The pyriform or "pear-shaped" form of fruit. (×½)

Lea and sold the seedlings as ornamental trees, for this species is of very distinct and handsome growth and the fruit is ornamental and fragrant. Alongside the sand pears were Bartletts. Amongst one of the batches of seedlings from the sand pear he noticed a plant with different foliage, and this he saved. Its fruit was found to be superior to the sand pear, and it was introduced as the Kieffer. It fruited in 1873. The Kieffer pear is now very popular in many parts of the country because of its great vigor, healthiness, productiveness, and the keeping qualities of the fruit. In point of quality, the fruit is distinctly inferior, but it meets the demands of the market and is an excellent fruit for canning.

Pyrus serotina itself bears a very hard pear which is inedible in the raw state, but it is excellent when used as quinces are. It is fragrant and ornamental. The tree is a most vigorous and clean grower. The plant is well worth growing as an ornamental. It is used for stock for ordinary pears, particularly in the southern states. For an historical and horticultural account of the oriental pears and their hybrids, see Bulletin No. 332, Cornell Experiment Station, by Cox (under direction of the late John Craig).

In the cold prairie countries and other parts of the cold north, Russian pears have gained some headway in recent years. These are hardy types of *Pyrus communis*. The fruit is usually of low quality, but the trees are considerably hardier than the ordinary pear.

Pear-culture is the one American fruit industry which seems to show little expansion. Pears are not a popular dessert fruit in this country, and the product is largely used in canning. This is a great pity, and a loss to the people. The cultivation of the Kieffer on a large scale has probably bred a generation of people who are little aware that the pear is a fruit that may be good to eat out of hand; and the commercial and cultural difficulties are greater than with other fruits.

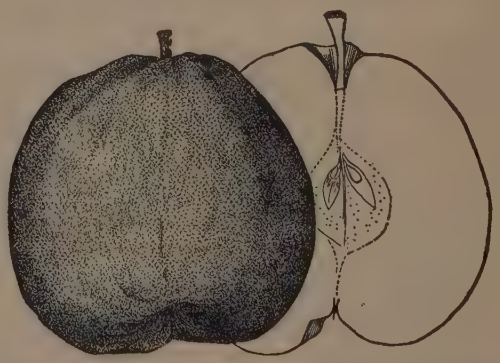
The pear thrives on a variety of soils, but it succeeds best on those that are rather hard clay. On sandy and loamy lands it tends to be short-lived. This is perhaps due, in part, to the fact that trees grow rapidly on such lands, and are, therefore, more liable to the attacks of blight. It is now generally accepted that trees which are making a strong and soft growth are more susceptible to blight than those which grow rather slow and firm, although all trees are liable to attack. Some varieties are more nearly immune than others. Caution must be exercised, therefore, in the tilling of the pear orchard. Whilst pears profit by the best tillage, as apples and potatoes do, it is easy to carry the tilling and fertilizing so far as to produce too vigorous growth and thereby invite the blight, and this disease is the one great menace to pear-culture. Therefore the most careful pear-growers use sparingly of stable manure and of nitrogenous cover-crops. They prefer to supply fertility by means of concentrated fertilizers which are not very rich in nitrogen. If, however, the trees are not making a strong and steady growth, it is as necessary to apply nitrogenous fertilizers to the pear tree as to any other.

In the interior country, pears are likely to suffer from sun-scald, and therefore the tops are started very low, usually not more than 2 or 3 feet from the ground. Standard pears (those not grown as dwarfs) are pruned much as are apple trees, except not so severely. Heavy pruning may open the top and invite sun-scald, and it also tends to make too strong and sappy growth. After the top of the pear tree is well formed and established, it is customary to do little pruning, only keeping the top fairly free and open.

The pear bears mostly on spurs which continue to branch and to bear for a number of years, and in pruning it is important that these spurs be not removed unless it is desired to thin the fruit. The flowers are borne in umbel-like cymes (Fig. 2805), but in most kinds only one fruit sets in a cluster. Pear trees are usually planted much closer than apple trees. The customary distance is 18 to 20 feet. Fig. 2812 shows an average east-American pear orchard. Fig. 2813 is a picking scene.

Many of the varieties of pears are infertile with themselves: they need the pollen of other varieties to cause them to set fruit freely. Probably any variety will fertilize any other variety in case the two bloom simultaneously. Such varieties as Kieffer and Bartlett are usually classed as self-sterile kinds, but the degree of sterility varies in different places and with different conditions. The safest plan in the setting of a pear orchard is to plant not more than two rows of one variety together, and to alternate with one or two rows of another variety.

Good varieties of pears are numerous. The one most important variety is the Bartlett (Fig. 2806), which was early introduced into the United States from Europe,



2807. The globular or apple-shaped form of fruit.—Idaho pear.

where it is known as the Bonchretien. At present, the Kieffer probably holds second place. In the eastern states, the Seckel (Fig. 2814) is a prominent variety, and is the standard of quality. Other prominent varieties are Anjou (Fig. 2815), Clairgeau, Hardy, Howell, Sheldon, and Diel. The list might be almost indefinitely extended. In the Gulf region, the oriental hybrids

alone are successful, and the leaders are Kieffer, LeConte, Garber, and Smith. The most notable pear of early American origin is undoubtedly the Seckel, which originated near Philadelphia in the eighteenth century. As late as 1880, the tree presented the appearance shown in Fig. 2816, which appeared (in larger size) in the Gardener's Monthly. In 1908, all that remained was a dead and decayed stump (Fig. 2817).

The season of the maturity of pears runs from midsummer, when it is introduced by Summer Doyenne and (Manning) Elizabeth, to late winter, when it is closed with such late winter varieties as Nelis (Winter Nelis), Malines, and others. The winter pears are relatively little known in the eastern states. As a rule, they come into bearing late or are not very prolific; but there is no reason why they should not be better known. Winter pears are kept as are winter apples, although somewhat greater care is necessary. They should be stored in a uniformly cool temperature. If allowed to hang too long on the tree, they become over-ripe, and then if placed in an ordinarily warm cellar, they do not keep more than one or two months.

Unlike most other fruits, all pears are greatly improved in quality if they are ripened indoors. They should be picked as soon as they have reached their full size and have begun to color, but before they have become soft, and be placed in a dry and rather cool room. If the wind is allowed to blow over them, they are likely to shrivel. If kept too warm, they ripen too quickly and soon rot. The best quality is secured when they are picked about two weeks in advance of their normal ripening.

Pears are marketed much as are apples, although the barrel is little used for the dessert varieties. For export, as well as for a good home trade, the following sentences by George T. Powell are useful: "The fruit should be gathered when it has reached its most perfect development, but not allowed to come to its full maturity or approximate ripening. This is the right condition of fruit when it is to be shipped without refrigeration. With refrigeration, a little fuller maturity may be allowed. Each specimen should be wrapped in paper. A layer of excelsior should be placed on the bottom of the box, which is marked to be opened; over this place a sheet of paper. Pack the pears in single layers, covering each with paper and excelsior until the box is filled, nailing cover securely under considerable pressure. Boxes should hold thirty-six large pears, and sixty of medium size. [Fig. 2818.] This is a refinement of even the best packing for the common domestic trade. [Fig. 2819.]"

Dwarf pears.

When worked on the quince root, the pear is easily grown as a dwarf. The free stocks—those grown normally on pear roots—are known in this country as standards. The dwarf pear comes into bearing earlier, and, since the trees are small, the fruit can be thinned and the trees sprayed, and the fruit therefore should be of the highest quality. Dwarf pear trees require more care than the ordinary standards, however, and they should not be planted unless the cultivator understands this fact and is willing to give the attention that they need. Although the trees are by nature dwarf, since they are worked on a smaller-growing species, they nevertheless tend to become half standard if left to themselves. Therefore they must be very severely headed-in every year. A dwarf pear tree should never reach a greater height than 12 feet. To keep it down to this stature, from one-half to two-thirds of the annual growth is removed late each winter. The trees are often planted as close together as 10 feet each way, but this is too close. With the ordinary broad-top pruning, which nearly all American growers give, 1 rod apart each way is not too great. A good dwarf pear tree is one in which the union with the quince stock is very close to the ground. When the tree is planted, this union should be 4 to 6 inches below the surface after the ground has settled. This deep planting prevents the breaking of the union and places the quince beyond the reach of borers. If planted deeper than this, the pear cion may throw out roots of its own; in fact, it sometimes does this if planted only 6 inches deep. This rooting of the stock is no particular disadvantage, although the tree thereafter tends to grow stronger and greater pruning is necessary. An expert grower can pick out the trees which are rooted from the pear stock by their more vigorous growth: if he desires to check this redundant growth he may cut off the pear roots. It is the common opinion that dwarf pear trees are

2808. The sand pear.—Pyrus serotina. (×⅛)

short-lived. This may be true as regards the greater number of specimens which one sees about yards and on untilled areas, but a dwarf pear orchard on good well-drained ground, which is well-tilled and given regular pruning, will last a lifetime. Many varieties of pears do well when grafted on the quince root, but the one that is oftenest grown as a dwarf is the Angouleme (Duchesse d'Angouleme). (Fig. 2820.) This is a large pear of irregular shape which sells well because of its size, but it is of indifferent quality and may not be good enough for a special or personal market. Other varieties popular for dwarfs are Louise Bonne, Anjou, Clairgeau, Elizabeth, and, to a less extent, Bartlett and Seckel. Even Kieffer is sometimes dwarfed with satisfactory results. The growing of dwarf pears is a special practice; in general it is not commercially profitable.

Writing on dwarf pears from a long experience in New York, L. T. Yeomans says: "The soil best adapted to dwarf pears is a rich loam, with a subsoil that requires thorough underdraining—a tile drain within 5 feet of every tree in the orchard would be thorough draining. The soil should be good strong corn or potato ground, and kept in such condition of fertility from year to year, for which purpose good well-composted barnyard manure has no equal, but may be supplemented by other fertilizers—as ground bone and potash. Small crops, as beans and potatoes, may be grown between the trees the first few years after planting, but never should they be allowed in the least to interfere with thorough tillage, or to rob the trees of proper and desira-

ble nourishment. The growth of the tree is of far greater value than any farm crops which can be grown between the trees. The soil should be thoroughly cultivated at least every ten to fifteen days during the growing season till about August 15 to September 1. It should cease in time that the wood may fully ripen. Suitable cultivation can hardly be given with any crop on the ground, except, possibly, when sufficient space is left without a crop next to the trees.

"The trees should be planted in rows 15 feet each way, or in rows 20 feet apart each way, with one tree in the center of each square. As the trees become older, the entire ground should be given up to frequent cultivation; and under no conditions should a dwarf pear orchard be seeded to grass, unless to clover for the purpose of plowing it under for fertilization.

"Dwarf pears require thorough annual pruning, which may be done at any convenient time after the falling of the foliage and before the buds become in the least swollen in the spring; but, where the cold is severe, it is better not to prune till about the first to middle of March. This pruning should begin with the first year, and be continued annually during the life of the tree, cutting back all of the growth to within four to eight buds, and thinning out all surplus branches which will not be wanted for limbs to the tree, so that at maturity the tree shall be open-headed, with opportunity for plenty of air and sunshine all through the tree, without which superior quality of fruit cannot be grown. The lower limbs should be within 20 to 24 inches of the ground. Trees when twenty to fifty years old should not be more than 12 to 14 feet high, and the diameter of the branches about 12 to 16 feet. [See Fig. 2821.] It is a very erroneous impression that a dwarf pear orchard under proper conditions is short-lived. There are in the United States orchards in vigorous condition, and now producing annual crops, that are from thirty to fifty years old.

"Some of the advantages of dwarf over standard pears are: more trees can be planted to the acre, they commence bearing much younger, the fruit is not so liable to be blown off by early winds before maturity, it is much more quickly and easily gathered than from high

2809. LeConte pear. (×½)

trees, the fruit is larger and of better quality than that on standards. All varieties do not succeed equally well as dwarfs, because they do not all form an equally perfect union with the quince. Angouleme is the leading and most profitable variety now grown as dwarf, although many others succeed well."

Pears in the prairie region.

On the northern plains, the culture of pears follows the general lines of pear-growing in the Atlantic states, but there are some radical points of difference. According to C. L. Watrous, "The difficulties of pear-growing in the upper Mississippi Valley are many and grievous. Above the 40th parallel and west of the Great Lakes, nearly all efforts have been failures. The best successes have been on high rather steep ridges and bluffs near watercourses, with light-colored clay soils and northerly exposures. Pear trees are not planted to the bottom or to the top, but in belts midway around the slopes. Plums may be used lower down and cherries above. The ground should be already set in clover or blue-grass. Small circles are spaded out for the trees. These are cultivated with the hoe and widened with the growth of the tree. Small trees branched very low are best. The trees may be cut back the second year to within a few inches of the ground. Only a very moderate annual growth is desirable. Use no manure until the tree has borne several crops of fruit, and then only with extreme care. Rich black soils, plenty of manure, and clean culture are deadly to pear trees in this region. The critical period is that of the first fruit crop. The deadly enemy is blight, which is sure to appear then. The successful pear-grower must not neglect his orchard a single day during the season of blight, but watch for the enemy and cut out and burn every blighted twig as soon as seen. Sultry damp weather in June is most critical. Such varieties as Warner, Longworth, Vermont (Beauty), Koonce, and Kieffer are said to succeed farther north and resist blight better than any others. Under slightly more favorable conditions, Clairgeau, Howell, Seckel, Tyson, Washington, and Flemish (Beauty) may be used. The hardiest and blight-resistant varieties may be grown, and when in bearing a branch or two grafted with a more delicate sort with success."

Insects and diseases.

The insect enemies of the pear are numerous, but, with two or three exceptions, are not very serious. The tree is attacked by borers, although to a less extent than peaches and apples. These are kept in check by digging them out once or twice a year as on other fruit stocks. The fruit is attacked to some extent by the codlin-moth, but the arsenical sprays keep this insect in check. Of late years the psylla, attacking the growing parts, has been very damaging in parts of the East, although it is irregular in its outbreaks. It can be controlled by thorough work with a spray in winter and also when the blossom-buds are expanding, at the former time by the use of "Black Leaf 40" tobacco preparation or kerosene emulsion and similar compounds, and at the latter period by lime-sulfur. If the rough bark is removed in winter and burned, very many of the pests will be destroyed. In some parts of the East the fruit is attacked by the pear midge, a minute fly whose maggots work in the very young fruit. Thorough cultivation will check this serious pest, but its complete control often involves the destruction of all the young fruit on the infested trees; the application of kainit to the soil in the second half of June (1,000 to 2,000 pounds to the acre on sandy soils in New Jersey) is said to kill the insect after it leaves the fruit to undergo its transformations. Repeated shallow tillage in early summer is a good protection.

The foliage and fruit of the pear are attacked by parasitic fungi, which cause the leaves to drop and the fruit to become scabby. These diseases are readily held in check by spraying with bordeaux mixture or lime-sulfur. More than fifty years ago the White Doyenne pear was the most popular variety for growing on the quince root, but because of the pear scab it passed away. It was supposed that the disease was due to uncongenial climate. Since the advent of the sprays, however, it has been found that the White Doyenne can be grown as well as ever. Flemish (Flemish Beauty) is also an example in point. Years ago it was one of the most popular standard varieties, but of late years it has been little grown because of the cracking of the fruit.

Pear-blight or fire-blight is the most serious disease of pear trees. It is an American disease. It is caused by a microbe which enters through the growing points

(flowers and tips of shoots) and thrives in soft or "succulent" parts. Gradually the micro-organism works down the stems, killing the tissues and causing the leaves to die. In the leaf-blight, which is a distinct disease, the leaves are more or less spotted and they fall; in the pear-blight, the leaves turn black and hang on the tree. The fire-blight also attacks apple trees,

2810. The Kieffer pear (pointed form), now one of the most important varieties. (×⅓)

particularly in the Plains region. It is probably aboriginal on hawthorns and related plants. There is no perfect preventive of the disease. Some varieties seem to be relatively immune, as, for example, the Angouleme. It is now generally believed that trees are more subject to the disease when they are making excessive growth; therefore it is advised that tillage and the application of stimulating manures be moderate. As soon as the disease appears, cut out the affected parts, severing them some inches below the lowest point of visible attack. Do not allow blighted branches to remain on the tree over winter. Disinfect the wounds or stubs and the implements with bichloride of mercury or other antiseptic. Destroy hedgerows and thickets in which are other trees on which the blight is carried, as hawthorns, quinces, and diseased apple and pear trees. It is probable that there is a connection with insects in the spread of pear-blight.

Literature.

There are no recent American books on the pear. Two books have been written on this fruit: Thos. W. Fields' "Pear Culture," New York, 1858; P. T. Quinn's "Pear Culture for Profit," New York, 1869, new edition, 1883. There are bulletins from the United States Department of Agriculture and some of the state experiment stations. Many years ago the writer secured from the venerable T. T. Lyon (Vol. III, page 1585), an article, for publication, on the pear. This was published in the "Cyclopedia of American Horticulture." The Editor is glad again to place this article alongside the others in order to contrast the viewpoints of two generations. Mr. Lyon's article, which is excellent and cautious and characterized by beauty of style, is of the type that we no longer see. The person who is familiar with present-day points of view will discover that it lays the emphasis on formal presentation, propagation, pruning, varieties, whereas little or no attention is given to systems of tillage, pollination, spraying, and commercial methods. The methods in pear-culture, and the varieties, have probably changed less in the last fifteen to twenty-five years than those of any other standard fruit; as a whole, pear-culture is not extending to any marked degree; and the article that follows is still timely. L. H. B.

The pear and its cultivation.

So far as cultivators generally are concerned, this fruit is less important than its near relative, the apple, for the reason that, while the two begin to ripen at nearly the same season, there are few, if any, desirable varieties of pears in season later than December (if we except a few austere ones, suitable only for culinary purposes), while apples are abundant for four or five months longer. Moreover, during its entire season, the pear is supplemented by the mass of luscious, though perishable, summer and autumn fruits. The liability of very many usually excellent varieties to be rendered indifferent in quality by unfavorable seasons, neglect or unsuitable soil, is also a serious detriment to the general popularity of this fruit. The liability to the loss of the trees by blight, beyond question detracts greatly from the value of the pear, especially for commercial purposes; while it also exerts a discouraging influence upon amateur planting. To the careful and discriminating amateur, as well as to the man of wealth, with a fondness for fruit-culture whether in person or by proxy, this fruit often assumes a prominence over any, if not all, others.

Extent of cultivation.

Doubtless, for reasons heretofore stated, pear trees are but sparingly planted by most persons. The fruit sent to market comes largely from the plantations of specialists who, with soils adapted to the purpose and the necessary knowledge of varieties, have undertaken the business as a commercial enterprise. In the climates of the seaboard, and, to a considerable extent, in the region of the Great Lakes, the pear is exceptionally successful; while away from the influence of large bodies of water, and especially in the prairie regions of the Mississippi Valley, from unsuitableness of climate or soil, or both combined, the trees are liable to be either killed or seriously injured in winter, and hence are short-lived and unprofitable.

Aspect.

Perhaps in no other important particular does the climate of eastern and central North America differ more widely from that of the pear-growing regions of Europe than in its liability to sudden and extreme variations of temperature. Owing to this climatic peculiarity, aspect becomes an important consideration in the selection of a location for a plantation of pear trees. As a means of avoiding the full influence of exposure to the rays of the sun, during the severer paroxysms of summer heat, while the trees are in actual growth, and also to mitigate the liability to alternate freezing and thawing in winter, a northerly or northeasterly slope is to be preferred; which, however, should be so gradual as not seriously to interfere with the convenience of cultivation. As we approach the northern limit of practicable pear-culture, however, a modification of this rule of selection may be found desirable, since, with the shorter growing season, a warmer exposure may prove necessary as a means of hastening maturity.

2811. Section of the Kieffer pear, to show its ordinary form in the North.

Soils.

While the pear tree will yield more or less satisfac-

tory results in a variety of soils, it is found to succeed most perfectly in a strong loam, of moderate depth, overlying a porous subsoil. Soils which are liable to be wet during any considerable portion of the growing season are unfit for this purpose, unless deeply and thoroughly underdrained; while even then they are quite liable not to prove fully satisfactory. A few

2812. A pear plantation.

varieties are found to be moderately successful on sandy soils, but for general planting such soils should be avoided.

Manures.

The liability of the pear tree, in this climate, to the attacks of blight is thought to be increased by excessive growth. It is, therefore, desirable that the annual growth be completed, and ripened at as early a date as practicable; and the more so since the liability to blight apparently exists only while growth is in actual progress. Stable and other nitrogenous manures should, for this reason, be applied in moderate quantities, in autumn, after the liability to excite renewed growth shall be past. Potash, lime, and phosphorus, which enter more or less largely into the composition of both tree and fruit, and which rarely exist in excess in the soil, may be profitably applied in either autumn or spring. Salt may also be profitably applied to the comparatively dry soils recommended for the pear, but with care not to apply in excess. One or even two quarts may be safely applied to each tree, before the commencement of growth in the spring, if well distributed upon the surface over a space of at least 6 or 8 feet in diameter, and left to be carried gradually into the soil by dew and rain. It is believed to possess little, if any, manurial value; but to act rather as a conservator of moisture, and probably also as a repellent of insects. Coarse mulch may be placed about the trees, covering the soil as far out as the roots extend, for the purpose of keeping the earth cool, and also to check evaporation from the soil; but this should not be done as a substitute for cultivation; and the soil beneath the mulch should be kept well pulverized.

Propagation.

(*a*) By seedlings: Seeds, when to be planted for the origination of new varieties, should be selected from well-grown and fully matured fruits, of such varieties as possess in a high degree the qualities sought to be reproduced or improved, since a variety in which a characteristic is strongly developed and persistently manifested is the more likely to transmit such peculiarity to its offspring. Seeds resulting from known or artificial cross-fertilization, and therefore of known and selected parentage on both sides, offer increased probability of valuable results. Seeds intended for the origination of new varieties should be planted very thinly in strong, rich, deeply prepared soil, in a single row, and covered with not more than an inch of earth, so that the young plants shall have ample space for development.

Seeds intended for the growing of stocks for nursery purposes should be collected from varieties in which the seeds are plump and well developed, as well as from healthy, vigorous trees. American nurserymen obtain pear seeds mostly from Europe. Seeds intended for nursery stocks are usually planted in broad, shallow drills. In our American climate the foliage and unripened wood of seedling pears is very liable to be attacked during midsummer by leaf-blight or mildew, which prematurely arrests their growth. For this reason European stocks are generally preferred by nurserymen. This attack of mildew may often be partially or wholly avoided by planting in virgin soil remote from other cultivated grounds. Pear seedlings form a very long tap-root during their first year, with few, if any, side-roots. For this reason they are taken up preferably in autumn, and the tap-roots shortened to 6 or 8 inches, when they may be replanted in nursery rows, and earthed up, or otherwise protected from heaving, or other injury during winter; or, preferably, they may be heeled-in, in a frost-proof cellar, and planted in spring, to be budded during the ensuing summer or left to become more fully established for budding a year later.

Seedlings intended for fruiting are usually transplanted in rows, about 8 feet apart each way, with the expectation that many will be found worthless, and either removed or destroyed. Seedling pears usually require to be fruited several years before their characteristics become fully developed. This generally recognized fact may be taken as a warning that the occasional effort to hasten the puberty of a seedling by fruiting a cion from it upon a bearing tree of different variety cannot be trusted to indicate the ultimate character of the fruit of the yet incipient variety, since it is impossible to foresee to what extent such transfer may interfere with the occult formative processes through which its ultimate qualities would have been developed.

(*b*) By budding: Seedlings of one or two years' growth, intended for standard trees, are usually planted from 6 to 10 inches apart in the nursery row; for the reason that space, as well as cultivation, must be economized to correspond with prices, although it is impossible to grow trees of good form and properly branched of the size and age demanded by most planters when thus closely planted. Trees thus closely planted should

2813. Ladders used in picking pears.

be removed, or at least thinned, after having made one year's growth from the bud; while trees intended to be grown two or more years in the nursery row, and properly branched, should be given twice or even three times the space mentioned.

The budding of pear stocks may be done during July and August if they continue in a growing condition,

but they are liable to be attacked by mildew of the foliage, for which reason they must be closely watched, and should the malady prove troublesome the budding must be done as soon as properly matured buds can be obtained. Such stocks as, for any cause, were left unbudded at budding time, together with any in which buds shall have failed, may be grafted the following spring; but this, as well as any and all grafting of the pear, must be done very early, before the earliest movement of the sap in spring. In the spring, as soon as the swelling of the buds indicates that the germs are alive, the stocks are cut back to force them into growth. Often to insure the formation of straight, upright, symmetrical trees, careful nurserymen leave 3 or 4 inches of the stock above the insertion of the bud, to which the young shoots may be tied, if it shall fail otherwise to take an upright direction. Shoots may also be thus tied to prevent their being blown out, or otherwise injured by the wind. These stubs should be cut back to the bud when no longer needed for the purposes indicated. Such sprouts as spring from the stock in consequence of the cutting back must be removed from time to time to encourage the growth of the bud. This should be done while they are yet tender and succulent and can, therefore, be taken off without the use of a knife. This process must be repeated as they reappear, unless it is rendered unnecessary by the failure or loss of the bud.

Pruning.

Beyond that described under the head of budding, little pruning is required during the first season, except to pinch in such side shoots as threaten to rob the one intended to become the trunk of the future tree. Early in the spring of the second year, all lateral shoots must be wholly cut away, and since the pear tends strongly to renew its growth from the terminal buds of the previous year, the shoot intended to become the trunk of the future tree must be cut down to the point at which the top is to commence, when the branches to form the head will start from the buds nearest the top. The uppermost shoot must, if needful, be confined in an upright position to constitute the continuation of the trunk.

The habits of growth of varieties differ so widely that no inflexible rule can be laid down to determine the height at which the top of a pear tree should be commenced, unless it be that the heads of the more spreading varieties should be started higher than those of a more upright habit. The preferences of the larger number of purchasers have begotten among nurserymen the practice of forming the heads of all varieties at a height of 3 or 4 feet. This height is open to the objection that, while not seriously faulty in the case of such spreading varieties as Onondaga, Osband (Summer), or Flemish (Beauty), it is essentially unsuited to such very upright growers as Buffum, Sterling, Clapp (Favorite), and even Anjou. In this particular, as in various others, the practice of nurserymen, begotten by the preferences of the average of their customers, fails to adapt itself to the needs of the more intelligent and considerate orchardist, and to those of even smaller planters, who regard the health and productiveness of their trees as of higher importance than the possibly increased convenience of cultivation.

A proper system of primary branches, upon which to grow a permanent head, should be provided from the growth of the second season. Probably the most satisfactory provision for this purpose consists of a central shoot, with from three to five laterals diverging from the trunk at its base. A head should, in no case, be grown upon two shoots, forming a crotch, since this will be very liable to split and thus ruin the tree. A few varieties, of which Rostiezer is a notable example, have the habit of producing but few branches, and also of making successive annual growths, mainly from the terminal buds of the previous year, thus forming a too open or straggling head. Such tendency is best overcome by cutting back the branches in spring, the effect being to increase their number, though at the expense of vigor.

After the primary branches have been developed, and the growth of the third year is in progress, comparatively little pruning will be found necessary beyond the occasional cutting away of a straggling or crossing branch, although there is a class of varieties, of which Summer Doyenne and Winter Nelis are types, which, especially when growing vigorously, incline to twist and

2814. Seckel, the standard of quality. (×½)

straggle so awkwardly that the branches must frequently be tied in position to insure the formation of a satisfactory head.

Prior to the third or fourth year, all pruning must necessarily have for its object the direction and encouragement of wood-growth, for which purpose it is most effective when performed in late winter or early spring, while the trees are yet dormant.

The fact should not be forgotten that pruning, in proportion to its extent or severity, may be a tax upon the vigor and health of the tree, and, therefore, to be practised as sparingly as possible. Such necessity may be to a considerable extent avoided if the orchardist, with a well-defined ideal in mind of a tree such as he desires to produce, will, during the growing season, pass frequently through his plantation and pinch out, while yet small and succulent, all growths not needed for his purpose, at the same time "stopping" such of the reserved ones as may be too far outgrowing their fellows. With the efficient performance of this process while the framework of the top is being developed, very little pruning will remain to be done on the arrival of spring, while nearly the entire growth, which would otherwise have been pruned away in spring, will have been employed in developing the reserved branches.

While the cutting away of an occasional small branch may be done at almost any time, large branches should be removed only in case of actual necessity, and at a period early enough to permit the thorough drying and hardening of the cut surface prior to the movement of the sap in spring, as a means of preventing bleeding and consequent decay.

Summer pruning tends to check rather than encourage wood-growth, and since it acts to a greater or less extent as an obstruction to the circulation, it also tends,

as does the permanent bending of the branches and the hardening of the tissues, to hasten the formation of fruit-buds and the production of fruit.

The pear may be successfully grafted upon the white thorn, the mountain-ash, and the apple, and such grafts have occasionally proved more or less productive for a time, but in such cases the union between stock and cion is generally, if not always, imperfect; and such uncongenial combinations are therefore usually short-lived. The quince is the only dissimilar stock upon which the pear is extensively grown. Quince stocks for this purpose are largely imported from France. The Angers quince is generally preferred for this purpose. These stocks are usually planted in nursery rows at the age of two years, to be budded during the following summer, in the same manner as pear stocks. When intended for dwarf trees, nurserymen usually cut them back after one year's growth from the bud to the nearly uniform height of 18 inches, although with the more

2815. Anjou, one of the popular late autumn and early winter pears. (×½)

upright-growing varieties it is by many deemed preferable to branch them even 6 or 8 inches lower. Aside from the height at which they should be branched, the pruning and management should be identical with that prescribed for standards, with the important exception that when planted out for fruiting the junction between the quince and the pear should be 3 or 4 inches below the surface to encourage the formation of roots from the pear. Trees thus planted will begin to bear while yet growing solely from the quince stock, and will continue to produce fruit after rooting from the pear, thus affording the early fruiting of the dwarf, as well as the permanency of the standard.

Not more than a specimen or two should be permitted to grow upon a dwarf the first and second years after planting. Such trees, if left to fruit freely, will almost certainly be ruined from overbearing before they are fully established. Many varieties when grown as dwarfs can never be safely allowed to mature more than a small portion of the fruit which they will naturally set.

While several varieties are found to be especially successful when grown upon the quince, most others prove only moderately so, requiring careful and expert management to insure satisfactory results. A few others, of which Bosc may be named as a prominent case, are obstinately unsuccessful upon the quince, and even when double-worked upon a dwarf of a congenial variety, their success appears to be by no means assured.

Dwarf trees trained as hereinbefore specified are commonly known as half-standards. Other and more elaborate forms are known as pyramids, cordons, and the like, descriptions of which are not deemed necessary here.

Choice of trees.

Aside from the selection of the location for an orchard, the first important particular is the selection of the trees, leaving the choice of varieties for subsequent consideration. Trees of one year's growth from the bud are to be preferred for the following reasons: (1) Fewer roots need be injured or lost in the process of lifting and replanting, for which reason the tree may be expected the more promptly to recover from the shock of removal. (2) The single season's growth may be cut back and the top commenced to suit the preferences of the planter. (3) The top will present little or no obstacle to the force of the wind until the roots shall have gained such hold upon the soil that there will remain little liability to displacement from this cause. (4) The risk of failure from removal is greatly diminished, while the more prompt recovery and increased rate of growth of the trees in the more open orchard rows may be expected to compensate fully for one or two years more of growth in crowded nursery rows. (5) Something will also be saved in the cost of the trees and in the expense of transportation, as well as in the labor of planting.

If older or high-branched trees are not objected to, it will usually be found that they are but imperfectly branched from having been grown in crowded rows.

Preparation of the soil.

When the late John A. Warder was asked how large the holes should be dug for planting orchard trees, he replied, "Of the full size of the orchard;" and it may also be remarked that when the ground for an orchard has been well tilled and fertilized to a depth at least equal to that at which trees are to be planted, there is no longer occasion for holes larger than shall be necessary to receive the roots in their proper position. If the subsoil be not freely pervious to water, the ground must be deeply and thoroughly underdrained, and in no case should the hole in which a tree is to be planted be sunk into a subsoil so impervious as to retain water beneath or about its roots. If such retentive subsoil occurs too near the surface and is not considered suitable to be mixed with the surface soil, it should be thoroughly disintegrated to the requisite depth by means of a subsoil plow or other equivalent device. In all nearly level retentive soils, it will be found advantageous to "back-furrow" a land along the line of each row in the direction of the surface drainage, so that when the trees have been planted the drainage will be away from them.

Laying out, staking, and planting.

The most economical mode of laying out and planting an orchard, so far as space is concerned, is doubtless that commonly, but erroneously, designated as quincunx, and more correctly as hexagonal; but whether planted thus, or in rectangles, the work may be most rapidly and accurately done by planting a stake where each tree is to stand, and using what is known as a planting-board, consisting of a strip of board 6 or 7 feet long, with a hole for a stake near each end, and a notch or slot intermediate and in line between them to receive the stake, and to support the tree while the earth is being carefully filled in, under, among, and above its roots.

The following are good general rules to be observed

in the digging, handling, preparing, and planting of trees:

1. In digging trees, aim to secure as many of the main fibrous roots as possible.

2. Expose the roots as little as possible to the drying influence of sun and wind.

3. Prepare the roots for planting by cutting away the bruised and broken portions.

4. If the roots have been essentially shortened in lifting, cut away the superfluous branches and also cut back such as are to remain till a proper balance of root and top is secured.

5. In heavy retentive soil, plant the tree very little if any deeper than it stood in the nursery, and, in addition, raise a slight mound about the trunk to avoid the occurrence of standing water at that point.

6. In strong but dry soil, a tree may be planted an inch or two deeper than it stood in the nursery.

7. In light sand, with dry subsoil, a tree should be planted 3 or even 4 inches deeper than it stood in the nursery.

8. Dig the hole in which a tree is to be planted deep enough to receive 2 or 3 inches of fine soil, before putting the tree in place, making it large enough to allow the roots to be spread out in their natural position.

9. See that good, friable surface soil is well filled in beneath, among, and over the roots.

10. Should the soil be dry, with no immediate prospect of rain, it will be well, after nearly filling the hole with earth, to apply a pail of water, and, after it shall have settled away, to fill up the hole with earth and tramp it down firmly. Staking will rarely be found necessary, except, possibly, in the case of trees old enough to have been already branched, but such stake must be watched and the tree protected against injury by rubbing against it.

Subsequent cultivation.

(*a*) Newly planted trees: Ground occupied by young trees must be kept well cultivated during the spring and

2816. The Seckel pear tree as it stood in 1880.

early summer. If hoed crops are planted, larger quantities of manure will be required; but, in either case, cultivation should cease as early as the beginning of August in order to hasten the ripening of the young wood. This process should be continued during at least five or six years, after which green crops may be grown and plowed under as a means, in part, of maintaining the fertility of the soil.

(*b*) Mulching: Especially during the first few years after planting, in case of hot dry weather during the growing season, mulch may be applied to check evaporation from the soil and to keep it cool, but it should not be permitted to take the place of cultivation. The soil should be well pulverized before applying it.

(*c*) Manuring: As stated previously, manures should be applied sparingly but regularly, preferably in late autumn, and should be plowed under, or otherwise mixed with the soil at that time or in the early spring, as a means of promoting early growth and the thorough ripening of the wood in advance of severe cold. Thorough maturing of the wood should also be assisted, as already said, by ceasing cultivation the early part of August.

2817. Stump of the Seckel pear tree. 1908.

Gathering and ripening the fruit.

All selected pears, whether intended for the market or for use at home, should be carefully hand-picked.

(*a*) Gathering summer and autumn pears: With very few exceptions all pears acquire a higher quality if gathered before they are fully ripe. The generally accepted rule is to gather the crop when an occasionally full-grown wormy specimen is ripe, or when there is a perceptible change in the color of the maturer specimens, or when the stem parts readily from the branch if the fruit is slightly lifted.

(*b*) Ripening summer and winter pears: When gathered, the fruit should be placed in a cool room devoted to the purpose, and spread upon shelves, or in lack of a suitable room they may be placed in shallow boxes or drawers, where in due time they will acquire their full color and flavor. Since this fruit parts with moisture quite freely, it, and especially the later ripening varieties, should be protected from a drying atmosphere, particularly from drafts of air, which will cause the fruit to shrivel and become tough and leathery. It is also true of at least very many varieties that even if blown off or gathered when but two-thirds grown, the fruit if put away as already described will usually acquire a satisfactory quality. Fruits thus gathered and ripened are found to have less tendency to decay rapidly at the core.

(*c*) Gathering and ripening of winter dessert pears: These should remain upon the tree as long as practicable without danger from frost. When gathered, they should be placed in a cool frost-proof room, and it will be well also to wrap each separately in soft paper. Some varieties are found to ripen perfectly without further attention, but the quality of most kinds will be much improved if they are brought into a temperature of 60° or 70° a fortnight before their usual season of maturity.

(*d*) Winter cooking pears: These should be gathered and put away in close packages in a cool, frost-proof room, in the same manner as russet apples, like which they will shrivel, and become tough and leathery if left exposed to the air. They may remain in this condition until needed for use.

Packing and marketing.

In America, pears are generally packed for market directly from the tree, without awaiting the process of ripening. Barrels are largely used as packages, although this fruit is frequently put up in half-barrels and sometimes in bushel, peck, and even in half-peck baskets.

American growers rarely ripen their fruit before marketing it. This, if done at all, is more generally accomplished by the dealer, doubtless with decided profit, since in the larger cities fully $50 have been known to be paid for a single barrel of selected fruit, and yet the same fruit ripened and offered in quantities to suit customers has been sold at two or three times the original cost. The marketing of unripened pears is obviously unprofitable so far as the producer is concerned.

In Europe, the choicest fruits are carefully selected and house-ripened. When approaching their best condition the fruits are separately wrapped in soft paper, and are then put up in packages of perhaps one or two dozens, and sent so as to appear upon the market when in the best possible condition. Such fruits command prices quite in excess of what they would have realized had they been offered in an immature condition.

Varieties.

Since the popular and desirable varieties of pears may be found fully described in standard pomological works, such descriptions here are not deemed necessary. Among the very numerous varieties of pears described in such works there are doubtless many possessing high quality and other valuable characteristics, which, for some unexplained reason, have failed to attract the attention of growers.

Since varieties vary in their season of ripening with change of latitude, and often, to some extent, with change of location, even in the same latitude, the designation of such season becomes a matter of more or less difficulty. In the following lists the season given will be approximately that between parallels 42 and 43 of north latitude.

(*a*) Amateur pears: It is as true of the pear as of most other species of fruits that very many varieties are of small size, unattractive appearance, or of such delicate texture when ripe as to disqualify them for the market, although they may possess, in an eminent degree, the peculiar characteristics which render them desirable, and to persons of cultivated taste, indispensable for the supply of the family. Such are termed amateur pears.

The following is a list of a few of the most popular of these, arranged approximately in the order of maturity:

Name.	Season.*	Remarks.
Madeleine	m. e. July	Earliest good pear.
Summer Doyenne	e. July.	
Bloodgood	e. July. m. Aug.	
Giffard	m. Aug.	Excellent, but very perishable.
Dearborn	m. e. Aug.	
Rostiezer	m. Aug. m. Sept.	
Elizabeth	e. Aug.	
Brandywine	e. Aug. b. Sept.	
Tyson	e. Aug. b. Sept.	A tardy bearer.
Stevens (Genesee)	b. Sept.	Rots soon at the core.
Clapp	b. m. Sept.	Rots soon at the core.
Washington	m. Sept.	
(Belle) Lucrative	m. e. Sept.	
Bosc	e. Sept. Oct.	
White Doyenne	e. Sept. Nov.	Liable to crack badly.
Seckel	Oct.	
Sarah	Oct.	
Anjou	Oct. Nov.	
Gray Doyenne	m. Oct. Nov.	
Reeder	Nov.	
Heyst (Emile d'Heyst)	Nov. Dec.	
Mount Vernon	Nov. Dec.	
Dana Hovey	Nov. Jan.	
Langelier	Nov. Feb.	
Germain	Nov. March.	
Lawrence	Dec.	
Winter Nelis	Dec. Jan.	
Easter	Jan. March.	

*e, early; m, middle; b, beginning.

(*b*) Culinary pears: Very few dessert pears are found to be satisfactory for culinary uses, since they too generally lose at least a portion of their flavor and aroma in the process of cooking. There are, however, several varieties of high, austere character which prove adapted to this purpose, among which are the following:

Name.	Season.	Remarks.
Vicar	Nov. Jan.	Occasionally good enough for dessert.
(Black) Worcester	Nov. Feb.	
Catillac	Nov. March.	
Pound	Dec. Feb.	

(*c*) Market pears: The markets demand varieties of attractive appearance, of at least medium size and of fine texture. To the grower, productiveness and vigor of tree are also of primary importance. If possessing

2818. Packing pears in boxes.

the foregoing characteristics, a variety may prove at least temporarily popular, even though of comparatively low quality. The following varieties, some of which may also be found in the amateur list, are all more or less popular as market fruits:

Name.	Season.	Remarks.
Tyson	e. Aug. b. Sept.	Excellent, but a tardy bearer.
Sterling	e. Aug. m. Sept.	Productive, and exceedingly beautiful.
Clapp	b. m. Sept.	Rots soon at the core.
Bartlett	b. e. Sept.	Leading market pear.
(Souvenir du) Congress	b. e. Sept.	Sometimes very large.
Buffum	m. Sept.	Variable in quality.
Howell	m. Sept. Oct.	
Flemish (Beauty)	m. e. Sept.	Rots soon at the core.
Bosc	e. Sept. Oct.	Excellent for all purposes.
Boussock	e. Sept. Oct.	
Louis Bonne	e. Sept. Oct.	Grown only as a dwarf.
Onondaga	e. Sept. Nov.	
Superfin	Oct.	
Sheldon	Oct.	Is russeted and dull in color.
Rutter	Oct. Nov.	
Anjou	Oct. Nov.	
Kieffer	Oct. Nov.	Not valuable north of 43°.
LeConte	Oct. Nov.	Succeeds best at the extreme South.
Angouleme	Oct. Nov.	Grown only on quince stocks.
Diel	Oct. Dec	
Clairgeau	Oct. Jan.	
Columbia	Nov. Jan.	
McLaughlin	Nov. Jan.	
Lawrence	Dec.	
Malines	Jan. Feb.	

Relative desirableness of dwarfs.

There are a few varieties, among which Louise Bonne and Angouleme may be especially mentioned, which on free (pear) stocks are either tardy bearers or require to be fruited several years before developing their ultimate qualities, but which succeed unusually well upon the quince. These, especially the Angouleme, are valued as market varieties when grown as dwarfs.

Angouleme, and perhaps some other varieties as dwarfs, occasionally bloom so profusely as apparently to prove unable to develop the fruit, which in consequence proves abortive. The natural and obvious remedy in such case is disbudding, or its equivalent, cutting back the fruit-bearing shoots before growth is commenced.

The fact that very many varieties are not permanently successful when grown upon the quince is doubtless partially, if not in many cases even wholly

due to their increased tendency to early and excessive productiveness when grown upon that stock, which, owing to the very common unwillingness of the grower to remove the excess of fruit, is allowed to consume the material needed for wood-growth, and thus to occasion exhaustion before the tree has gained a thorough hold upon the soil.

If, with any variety capable of forming a satisfactory union with the quince, and with the tree planted in the manner heretofore described, the entire crop of bloom or incipient fruit of the first one, two, or even three years (dependent upon the vigor of the tree) were removed, and if subsequent crops were carefully and thoroughly thinned, it is at least highly probable that permanent health and longevity would prove nearly or quite as general with dwarfs as with standards, thus permitting the more extensive growth of the pear in greater variety in small or amateur plantations and in limited grounds than is practicable with the use of standards.

T. T. Lyon.

The pear in the South.

The following table from the Thirteenth Census shows the status of the pear industry in thirteen southern states, 1910 (crop data 1909):

State.	Number of trees.	Production in bushels.
Alabama	142,300	100,041
Arkansas	221,764	37,547
Florida	110,709	98,223
Georgia	262,982	149,667
Kentucky	337,355	251,536
Louisiana	57 630	35,554
Mississippi	118.536	101,288
North Carolina	243,367	84,019
Oklahoma	235	22
South Carolina	105,251	65,680
Tennessee	233,407	83,557
Texas	558,478	110,967
Virginia	457,177	74,486
Total	2,849,191	1,192,587

Throughout the whole South the average production of pears to the tree is less than one-half bushel. Virginia and Kentucky have many pear trees in comparison with the other southern states, but should hardly be considered with the remainder of the South, as their pears are produced mainly on the northern borders of the states. Texas, on account of its area, has more pear trees than any other southern state; and El Paso County, the most western county, produces over 22,000 bushels. Conditions existing in this region are not at all comparable with the other pear sections in the South.

It can hardly be said that pears are well adapted to southern conditions, although in certain sections, particularly in the mountains, it is possible to produce fruits of good quality; but on account of the blight the industry has never attained importance. At one time, the late P. J. Berckmans, of Augusta, Georgia, had 600 different pears under test in his nursery, 500 of them being named varieties. Berckmans says that of the 600, those of any worth in the South would not exceed twelve in number, and that the great commercial varieties were the LeConte, Garber, and Kieffer, although Bulletin No. 126 of the Bureau of Plant Industry shows seventy-seven varieties of pears that have originated in the thirteen southern states.

The history of the southern pear industry begins with the introduction of the LeConte into Thomasville, Georgia, in the early seventies of the last century by L. L. Varnadoe. The original cutting carried into Thomas County came from Liberty County, Georgia. This pear was planted extensively around Thomasville, being taken from there into northern Florida, southern Alabama, Mississippi, Louisiana, and Texas. The propagation was mainly by cuttings, and in the early days of the industry $1 apiece was often paid for trees. At one time it was conservatively stated that there were at least 200,000 trees in Thomas County. Great prices were received for the product, the growers in those days netting from $3 to $7 a barrel. There are reports from H. H. Sanford, one of the early growers of this fruit, of LeConte trees producing thirty bushels or more. The growing of this pear, like many other horticultural industries in the South, was along extensive rather than intensive lines. The growers thought that they did not need to till or to fertilize their lands and that they could plant these wonderful trees and reap a harvest of dollars, and for a time it seemed as if this were so; then the blight appeared. The "die-back," as it was originally called, began, and between 1890 and 1895 the industry was in a fair way to succumb. No systematic efforts were made to combat this disease, except by introduction of the Kieffer, which was considered at that time resistant, and which was largely planted in the pear sections of the South.

Because of the blight and lack of care, with no systematized methods of marketing, the pear industry of the southern states fell to a low ebb. For the past several years no commercial orchards have been set, and a great number of the trees that were planted in this early period are either dead or cut down; therefore the production of the hybrid pears in the South is not only at a standstill, but is at this time declining.

The management of these orchards, even while the industry was at its height, was very crude. It is reported on good authority that 95 per cent of the pear plantings in the southern pear sections were most seriously neglected. Some orchards were cropped, to the detriment of the land; others so badly neglected that young pine trees contended with the pears for space; consequently the fruits were not of the best quality. The growers who followed approved methods of tillage and fertilizing received a serious set-back when the blight appeared, as these plantings seemed to be more susceptible to this disease. In time a balance was

2819. Box of fancy pears; each fruit wrapped in paper.

reached, and it is now considered good practice to run the orchards in sod and every third year to give a light plowing, the application of fertilizers being determined by the growth of the tree. Spraying was little practised in the older orchards. The growers who are still producing pears now find the use of a spray-pump advisable. Harvesting during the height of the pear industry in south Georgia was aptly described by the Thomasville "Times Enterprise:" "The annual slaughter of the LeConte pears has commenced. The trees are full of little gamins, picking a few, flailing some and shaking off the remainder. All—good, bad, and bruised—are dumped into barrels and rushed to market." It is unfortunately true that many of these fruits were gathered in this way. There were growers who hand-picked their product, carefully packing it into ventilated barrels. These, however, were the smaller

number. There is an instance on record of a gentleman having sold three hundred and odd dollars' worth of pears from a small orchard, on which he had expended $5 since the last harvest. Most of the pears were shipped in barrels, though some were shipped in bulk. The distribution is still poor, and for the past few years

2820. Angouleme pear, the most popular variety for growing on quince roots.

the profits from the remaining trees have not been sufficient to warrant further planting.

At present, the South as a whole cannot be considered as a pear-producing section. There are still quite a number of pear trees around the homes. These are rapidly disappearing, due to the blight and the lack of care. The old orchards along the Atlantic and the Gulf are rapidly dying with blight. The hybrid pears, LeConte, Kieffer, and Garber, do remarkably well in this part of the country; but the pear industry will never thrive as it did once until there is a systematic fight made upon the blight. Besides this disease, the pears are subject to bitter-rot, brown-rot and crown-gall, as well as the codlin-moth and the San José scale; but of course these insects and diseases can be easily controlled by spraying.

In the catalogue of fruits appended to the Proceedings of the Thirty-Ninth Annual Session of the Georgia State Horticultural Society is to be found this remark concerning pears: "Owing to the prevalence of the pear blight, the commercial production of pears is an uncertain and hazardous industry. Until it is demonstrated that pear-blight can be successfully controlled, it is useless to recommend the planting of pears in commercial quantities. So far as is known, the Kieffer pear is the most resistant to the pear-blight of the commercial varieties." This report of the Georgia State Horticultural Society can be taken as a general recommendation for practically all of the South, except for particularly isolated and special places.

T. H. McHatton.

The pear in California.

Visitors at the old California missions during the early part of the last century noted many thrifty seedling pear trees in the mission gardens. Many of these trees survived the neglect which came upon the mission properties after their secularization, and were in thrifty growth and bearing at the time of the American occupation. The first pears sold in San Francisco and in the mines in 1849–1850 were gathered from the old mission trees, and some of these old trees grafted over gave the first California product of the European and American varieties of more than half a century ago. From this beginning the growth of pears increased until the commercial product of 1914 included the following: 2,725 carloads sent overland to eastern and foreign markets (about the same as for the five years preceding); 2,000,000 pounds dried pears shipped to the same destination (a decreasing product because of the increasing demand for shipping fresh and canning); 805,740 cases of canned pears, mostly Bartletts—a product which is rapidly increasing. There are about 2,000,000 pear trees in California orchards. The decade 1905–1915 was a sensational period in California pear-growing because of the appearance of the pear-blight about 1902. It made such rapid progress that in 1904 practically all the pear trees in one district were seriously attacked and largely destroyed. Control measures were provided by state appropriation in 1905 and continued several years, and it was demonstrated that the disease can be held in check and profitability of trees continued by cutting out all blighted parts from twig to root—disinfecting between cuts all tools used in the work. This demonstration, coupled with an apparent lessening of the virulence of the disease, restored confidence among growers and resulted in largely increased new planting in 1914–1915.

It is a most interesting fact that a single variety furnishes a very great part, perhaps even as much as four-fifths, of the pear products of the state, and that is the Bartlett. Whatever it may lack in high quality is more than compensated for by its commercial serviceability. It is handsome and of good size, endures long carriage, cans well and dries well, and is of sufficiently good quality to please consumers: in fact the California-grown Bartlett is said to be better than the same variety grown in the Atlantic states and in the west of Europe. This is not, however, the chief reason why the Bartlett so largely preponderates in California. The ruling condition is found in the fact that owing to the marked differences in localities not widely distant and yet differing in elevation, in exposure to coast influences and away from them, and other local causes, the Bartlett has a very long ripening season, and valley, coast, and mountain Bartletts follow each other through nearly three months and thus make succession of different varieties during this period unnecessary. There is, however, at present a greater disposition than heretofore to extend the season by growing other varieties, but they are selected for resemblance to the Bartlett type. Clapp Favorite is sold as an "Early Bartlett," and a Winter Bartlett, an Oregon seedling, has been planted to carry the same style of pear as late as possible. Still some progress is being made in extending the California list of popular pears and some of local and of distant origin will probably achieve prominence, especially in the shipments to distant markets.

California pears are grown on pear-seedling roots (especially of the Japanese pear because of less liability to blight in the root), very little recourse being had to rooted cuttings or to dwarfing stocks. A dwarf pear tree is almost a curiosity. The heavier loams and even clays are sometimes planted with pear trees, not because they are best for pears but because other fruits do

2821. Dwarf pear trees forty-five years old, in a New York orchard.

worse than they. To plant fully the area intended for fruit, pears will go on the intrusions of heavy or too moist soils, while the freer soil will be given to other fruits. Still the chief product of pears is from the best loams California affords, and the profits from the tree warrant the use of such land. Pear trees are regularly pruned to a low vase form, but seldom opened in the center, the interior being used for bearing wood, and foliage enough retained partially to shade the fruit. The fruit is thinned to favor size and to relieve the tree from overbearing. Irrigation is employed in some parts of the state. The varieties chiefly grown are the following: Bartlett, Winter Nelis, Easter, Comice, Glout Morceau, Hardy, P. Barry (a California seedling), Seckel, Lawson (Comet), Winter Bartlett, Wilder.

E. J. WICKSON.

PEAR. **Alligator P.,** *Persea gratissima.* **Avocado P.,** *Persea gratissima.* **Balsam P.,** *Momordica Charantia.* **Garlic P.,** *Cratæva gynandra.* **Prickly P.,** *Opuntia.*

PEARL BUSH. *Exochorda grandiflora.* **P. Fruit:** *Margyricarpus setosus.* **P. Weed or Wort:** *Sagina.*

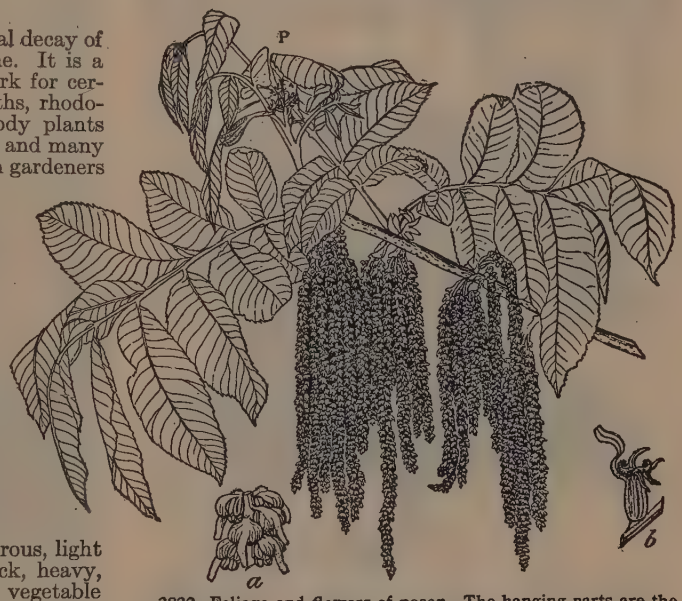
PEAT is a kind of soil formed by the partial decay of plants in the swamps of the temperate zone. It is a standard potting material in greenhouse work for certain classes of plants, as ferns, orchids, heaths, rhododendrons, and other ericaceous plants, woody plants from Australia and the Cape of Good Hope, and many other choice and difficult subjects. American gardeners complain that they are handicapped in growing such plants because American peat is poorer than European, the lack of fiber being chiefly deplored, but it is probable that just as good peat is to be found in this country.

The peat-bogs of England are often 5 or 6 feet deep, and some of the Irish ones are said to be as deep as 40 feet. They have been forming ever since the glacial period, but are now on the decline, owing largely to natural causes. Peat-bogs consist of the remains of many kinds of aquatic and marsh plants, but chiefly sphagnum (which see). This moss grows upward and decays partially below, complete decay being prevented by the antiseptic organic acids formed in the process. Near the top the peat is brown, fibrous, light and porous: lower down it tends to be black, heavy, dense and without visible indication of its vegetable origin. The ash varies from 1 or 2 per cent in newly formed peat to 10, 20, or even 30 per cent in the older peat. Peat is commonly used for fuel by the Irish peasantry, but almost never in America, where other and better fuel is plentiful. In greenhouse work peat is valued more for its porous moisture-holding properties than for its plant-food. If dried, it may be used as an absorbent for liquid manure, "not so much for its inherent value," says Roberts (in his "Fertility of the Land"), "as for conserving the nitrogen in the manure, and for improving the condition of the stables." For this reason the half-decayed peat is extensively used in Europe, under the name of moss litter, as a bedding in stables, and later of course applied to the land.

The transformation of peat-bogs into arable land is rarely a pressing problem in America. It is usually too costly for a new country. The notion, however, is very common that peat lands are extraordinarily rich in plant-food. Nevertheless, according to Roberts, swamp muck and peat are not richer in plant-food than the good soils, with the exception of the nitrogen in the peat, which, however, is far less available than it is in good soils. (American peat contains about .67 per cent nitrogen, .21 per cent phosphoric acid, and .13 per cent potash.) Peat lands differ from good arable soil in being cold, sour, and too wet. To reclaim them, one must drain off the superfluous water and apply lime freely to destroy the harmful organic acids. Sometimes sand or clay may be added to improve the texture of such soils. It takes time to reclaim peat lands. Thoroughly decayed peat intermingled with wet soils is muck. See the article on *Muckland-Gardening,* Vol. IV, page 2072.

WILHELM MILLER.

PECAN, *Carya Pecan,* Engler and Graeb. (*Carya olivæformis,* Nutt. *Hicoria Pecan,* Brit.). Plate LXXV, Vol. IV. Of the nut-trees native to North America, the pecan unquestionably ranks first in economic importance. This is true both because of the quantity and value of the wild crop and because of its cultural promise. The acceptability of the quality of the kernel and the relative thinness of shell and ease of cracking in contrast with the other hickories and the native walnuts, have since an early day continued to win favor among consumers, so that the wild crop of Louisiana and Texas long ago assumed commercial importance and for at least thirty years has, in the latter state, been systematically harvested and distributed in carload shipments to northern markets.



2822. Foliage and flowers of pecan. The hanging parts are the staminate catkins. A pistillate catkin is below *P*. Details are at *a* (staminate flowers) and at *b* (a pistillate flower).

The relatively wide climatic range of the species and the extent of variation in form, size, and quality of nut have stimulated effort to develop methods of nursery propagation in widely separated localities. This has resulted in a larger and more widely scattered development of commercial nursery propagation of the pecan than of any other nut-tree.

Under favorable conditions of growth, the pecan tree attains very large size, trunk diameters of 4 to 6 feet being not infrequent, with heights ranging from 100 to 175 feet and tops spreading 60 to 70 feet. Some of the largest trees reported were in the Wabash Valley, near the northern limit of natural distribution. A tree having a girth of 18 feet 3 inches breast high from the ground, with an estimated height of 130 feet and a spread of 125 feet, is recorded by Reed in Ascension Parish, Louisiana. One having a girth of 19 feet 6 inches with an estimated height of 150 feet and spread of 100 feet, is recorded in Nachitoches Parish, Louisiana. A still larger tree near Webbers Falls, Oklahoma, has the following dimensions: Girth 23 feet 9 inches at 3 feet from ground; estimated height 180 feet.

The pecan is one of the hickories which comprise an American group of great interest. The trees are monœcious; that is, the male and female (staminate and pistillate) are separate on the same plant. (Fig. 2822; adapted from Bulletin No. 251, Bureau of Plant Industry.) The staminate or pollen-bearing flowers are in slender hanging catkins, and the pistillate or fruit-bearing flowers are in small erect or stiff clusters (Fig. 823, page 676). Several of the staminate or male flowers are shown separately at *a*, Fig. 2822, and one of the pistillate or female flowers at *b*.

Natural and cultural range.

The species is native in river-bottoms and lowlands of the Mississippi River and its tributaries as far north as Davenport, Iowa; Covington, Kentucky; Terre Haute, Indiana; and the vicinity of Kansas City, Missouri. It is also found throughout most of the river-valleys of Texas and the adjacent parts of Mexico. It does not appear to have been found native at any point in close proximity to the Gulf of Mexico. It thus occurred wild in considerable regions of Texas,

2823. Pecan tree, the Centennial, St. James Parish, Louisiana. Grafted about 1847.

Oklahoma, Louisiana, Mississippi, Alabama, Arkansas, Missouri, Kansas, Tennessee, Kentucky, Indiana, and Illinois, and small areas in southeastern Nebraska and southeastern Iowa. The species was scatteringly introduced throughout the southeastern states from Florida northward to Virginia at an early date, so that trees of considerable age are found at many points in them. The earliest efforts at commercial planting appear to have been made in Louisiana, Mississippi, and Texas, but some of the greatest activity in this direction in recent years has been outside of the native habitat, in Georgia, Florida, and South Carolina, and considerable plantings have been made also in North Carolina, Virginia, Maryland, and some on the Pacific Coast in California and Oregon.

Commercial importance.

As an article of commerce, the pecan did not receive much recognition until after the Civil War; but, increasingly large shipments of wild nuts moved northward from Louisiana and Texas from 1870 to 1890 at prices which encouraged farmers and ranchers to harvest them systematically, though not to engage in orchard planting. Early in the nineties, as the result of the marketing in New Orleans of the product of a few individual trees yielding nuts of large size and thin shells, demand developed for such nuts at much higher prices, frequently bringing 40 to 75 cents and in some cases as high as $1.50 to $2.50 a pound. This stimulated interest in the planting of seedling orchards grown from the nuts of these high-priced varieties, with the result that many thousands of such trees, mostly dating to the decade 1890–1899, are now found in the Gulf and South Atlantic states. While these seedling orchards contain many productive trees yielding nuts of desirable quality, few of them have proved profitable, largely because of the wide variation in precocity, productiveness, and disease-resistance of the trees, and in the size, cracking quality, and other features of the nuts, so that a large part of the present production still consists of wild nuts. Reed estimated in 1912 ("The Pecan," Bureau of Plant Industry Bulletin No. 251) that the annual wild crop of pecans in Texas during the preceding six or eight years had varied from 3,645,000 to 17,820,000 pounds, the crop of that state being considered approximately three-fifths of the entire product. The census of 1910 reported the crop of 1909 as 9,890,769 pounds, valued at $971,596.

While no accurate statistics regarding later production are available, the product of the orchards of named varieties planted prior to 1905 is now gradually coming to market, and may be expected to appear in rapidly increasing quantity in the future, to offset the gradually declining production of wild nuts resulting from the destruction of trees as the fertile river-bottom lands on which they stand have been brought under cultivation in farm crops.

The gradual development of power nut-cracking machinery, mainly accomplished since 1900, has resulted in a greatly increased demand for pecan meats from confectioners, which promises to keep pace with production for many years to come. These devices greatly lessen the labor cost of cracking, and render possible much more varied use of the nut.

Climatic and soil requirements.

Much confusion of thought with regard to the climatic range of the pecan has resulted from failure to recognize the difference in cold endurance of wild trees of the species in different parts of its native range. Rather early in the period of pecan exploitation, which began about 1885–1890, nuts and young trees of the large varieties conspicuous in the exhibits and advertising matter of that time were planted at many points in the northern states. These rather promptly succumbed to the winter temperatures of the North, very few surviving north of the Potomac, Ohio, and Missouri rivers. More recently, trees well worthy of propagation because of the good size and excellent quality of their nuts have been found in the surviving wild groves of the Ohio and Wabash valley bottoms in Indiana, Illinois, and Kentucky, which give promise of enduring the winters considerably farther north, and which are now in process of experimental introduction. On suitable soils it now appears probable that among these varieties of northern origin may be found sorts fairly well adapted to most of the eastern United States.

Though practically restricted in its native distribution to the low-lying moist sandy loams of the river- and creek-bottoms, gradually accumulated experience has demonstrated the suitability under cultivation of a wide range of soils. The essentials are good depth and fertility, adequate drainage, and freedom from drought. Shallow soils underlaid with hardpan or other impervious strata and loose droughty sands are unsuitable, as are mucks and peats. Occasional overflow, as experienced on creek- and river-bottom lands, is beneficial, but the pecan is about as sensitive to a water-logged soil condition as most orchard trees.

While the orchards thus far planted are too young to determine with accuracy the area of profitable com-

mercial planting will, from present indications, be south of Pennsylvania and Iowa with some probability of success under irrigation in the Southwest and in the great valley of California.

Propagation and top-working.

Few of the earlier efforts to perpetuate trees bearing superior nuts by budding and grafting were successful, the methods commonly practised with fruit-trees in the Gulf States not proving effective with the pecan. Because of this, most of the plantings prior to 1900 were of seedling trees grown from selected parents, even where orchards as large as 500 acres were involved.

Occasionally skilful propagators succeeded in securing fair stands with crown-, trunk- and top-grafting, however, and some by annular-, patch- and chip-budding, so that by 1895 there were a number of

2824. Top-budded pecan. Four years after the operation.

budded and grafted trees of several choice varieties growing in Louisiana, Mississippi, and Texas and a few nurseries offering such trees for sale.

The earliest successful grafting was by Antoine, a slave gardener, on Oak Alley Plantation, St. James Parish, Louisiana, who, under the instruction of his owner, the late Telesphore J. Roman, in 1846 or 1847 succeeded in trunk-grafting sixteen trees of the variety later named the Centennial (Fig. 2823). Somewhat later he propagated 110 more trees of the same variety, so that 126 grafted trees of this variety were growing on that plantation at the end of the Civil War. About 1877, the late Emil Bourgeois, of Central, Louisiana, successfully top-grafted the variety now known as the Van Deman upon his Rapidan Plantation in the same parish, while in 1882 the Rome and Frotscher, as well as Centennial, were propagated by Wm. Nelson in the nursery of the late Richard Frotscher at New Orleans from the original trees in St. James and Iberia parishes. In 1886, the variety now known as Stuart was successfully budded by the late A. G. Delmas on his place at Pascagoula, Mississippi, from the original tree of that sort on the Castanera place near by.

Successful top-working of wild trees was accomplished by E. E. Risien, of San Saba, Texas, about 1889. He transformed a number of such trees by cutting back heavily in late winter with a cross-cut saw, practically beheading trees of diameters up to 12 to 15 inches at points 20 to 30 feet from the ground. An abundant growth of strong shoots was secured by hacking the bark of the trunk for some distance down from the stubs. A sufficient number of the best of these shoots were budded in July by the annular method quickly to develop a symmetrical top. The San Saba variety was chiefly used, the original tree of this standing on Risien's place (Fig. 2824).

2825. Cleft-grafting. Successive steps in the operation: *a* and *b*, views of the cion; *c*, cross-section of the cion, thicker on one side; *d*, the cion in place and the stock securely tied to prevent splitting; *e*, the union covered with grafting wax; *f*, outer wrapping securely held with string.

Although most early efforts failed, as propagators have acquired experience in pecan-propagation most of the methods of budding and grafting practised on the apple and pear have been found to succeed, so that at the present time practically all except shield-budding are more or less practised. The methods most commonly used by nurserymen are ordinary cleft- and whip-grafting, and annular-, patch-, and chip-budding.

While there has been much discussion of other stocks for the pecan and considerable individual experimentation with mockernut (*Carya alba*), pignut (*Carya glabra*), and water-hickory (*Carya aquatica*), commercial nursery propagation is practically all upon pecan stocks. Nuts from trees of vigorous growth, yielding well-filled kernels, are preferred for seed and should be from a region at least as far north as that where trees are to be planted to insure stocks of sufficient cold-endurance. Nuts for seed should not be permitted to dry out before planting in fall, or, if spring-planted, should be stratified in moist sand soon after harvest. Soil for the nursery should be rich, deep, friable, and well drained, as the control of growth during the

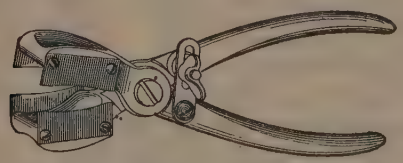
2826. Whip-grafting. Early steps in the operation: *a* and *b*, front and side views of both stock and cion properly cut; *c*, stock and cion in position and ready for wrapping.

propagating season necessitates maintenance of a high state of cultivation with which clods, stones, or continued wetness seriously interfere. Nursery rows should be 5 to 6 feet apart, with nuts planted 8 to 12 inches apart in the row, 2 to 3 inches deep.

When stocks exceed ¾ inch in diameter at the point of grafting, cleft-grafting is preferred. If done above ground, the grafted stub should be securely bound with raffia or waxed cord to avoid splitting, and then thoroughly waxed and wrapped with waxed cloth to exclude air and moisture. (Fig. 2825.) Cions should be entirely dormant and have all exposed cut ends waxed to reduce evaporation. All grafting in place is best done shortly in advance of the pushing of buds on the stock. When stocks are under ¾ inch in diameter at the crown, ordinary whip-grafting in place is considerably practised, selecting cions as near the size of the stock as practicable and tying securely with raffia or waxed cloth. (Figs. 2826 and 2827.) Bench-grafting, though possible, is rarely practised with the pecan.

2827. Whip-grafting. Later steps in the operation: *a*, proper method of tying; *b*, improper method of tying; *c*, one year's growth following a successful union.

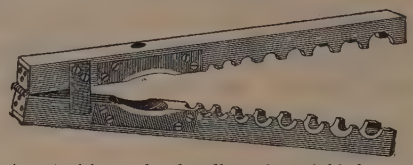
On account of the length of season during which these methods may be practised, annular- and patch-budding have been widely adopted by pecan-propagators, and special tools for cutting the "rings" and "patches" have come into general use in the southern states (Figs. 2828 and 2829), though expert operators succeed well with the ordinary budding-knife. These methods may be used at any time during the growing season when the bark of both stock and cion "slip" well and the bark and buds of the new growth on the cion trees are sufficiently mature to endure the necessary manipulation. The essentials are good "slipping" condition of both stock and cion, close fitting of "rings" or "patches," secure tying with raffia or other suitable material, careful attention to removal of ties and gradual heading back of stock as growth proceeds to avoid "drowning out" the bud, and after growth begins the protection of it against splitting off or breaking down by wind and storms, by tying up to stubs or stakes. (Fig. 2830.)



2828. A metal tool specially designed for use in annular-budding.

One of the simplest and most effective methods is that long used by E. W. Kirkpatrick, of McKinney, Texas, commonly known as "chip-budding." This may be practised prior to and during the early growing season. Dormant cions are used. It consists essentially of the removal of a "chip" from the stock and its replacement by a bud-bearing chip of approximately identical size from the cion, which is securely tied in place without waxing. As this method requires only the ordinary budding-knife and is equally applicable to walnut, persimmon, and other species rather difficult to propagate, it is growing in favor, especially in Louisiana and Texas. (Fig. 2831.)

With all methods of budding and grafting, both in nursery and orchard, careful attention to the tying up of the young buds during the first growing season is required. Their soft and luxuriant growth renders them peculiarly subject to destruction by storms, the only effective protection against which is secure tying to stock, stubs, or stakes.



2829. A tool with wooden handle and steel blades specially designed for use in annular-budding.

The large number of seedling trees in orchards and gardens yielding nuts of indifferent quality is arousing much interest in top-working. This can be done by all methods described, but all top-budding or grafting should be as low in the tree as practicable to prevent the head from becoming "leggy" and "prongy."

Successful methods of budding and grafting the pecan are described by Charles L. Edwards, of Texas. The budding method is shown in Fig. 1686, page 1367, Vol. III. The crown-graft or crown-bud is shown in Fig. 2832 and is described as follows: "Buds from wood that has partially lost its vitality, or has been injured by sap starting before it is cut or after it is cut in early spring, may often be saved by this method when all others fail. But the work must be carefully done and instructions strictly observed, for if the bud is lost, the remaining stock is badly disfigured. The stock is cut off bodily at the desired height. A slit is then made at the top, the bark opened, the bud inserted and part of the flaps of bark pared away. Then the wrapper is put on so as to cover not only the cut made for the insertion of the bud, but the top of stump also. The wrapper should cover not only the stump, but should be long enough at the top to pass over and go down far enough on the opposite side to be caught by the string used for tying on the bud. The waxed cloth covering the top of the stump should be pressed down firmly before tying, and if the top of the stump is ¾ inch across or more, there should be two thicknesses of cloth put over it and firmly pressed down. On large stumps, two buds may be placed on opposite sides so as to increase chances of a 'take.' If both buds live, one of the shoots may be

2830. Annular-budding. *a*, Bud stick from which the bud has been removed; *b*, the bud ready for insertion in the matrix of the stock; *c*, the stock ready to receive the bud; *d*, the bud after being placed in position and carefully wrapped; *e*, growth taking place, the wrapping having been removed; *f*, growth from the bud supported by being tied to the stock, *g*, above the union. Note the scars above the union, where the buds were removed in order to direct the flow of sap to the new bud.

removed later. In working over-grown nursery seedlings and stout wildings, this has been found to be an excellent plan. With good workmanship and favorable weather conditions, excellent savings may be had, and the bud shoots make a beautiful upright growth, with the slightest crook at the point of union. And, oddly enough, they grow straight without stakes to support them, even in a windy country. Buds put on in March and April on nursery stocks easily make a salable tree with 4 to 6 feet of bud-growth the same season in Texas. In summer work, the modified shield-bud may be peeled from the cion, but it is well to cut them to beveled edges on the sides (*D*, Fig. 2832) before removing from the cion. The bark of the stock fits down over them more snugly when so treated and they seem to live better. But the lower ends should always be so trimmed as to remove the fleshy rim of bark at the lower end, in order that the inner bark of the bud and the inner bark of the stock may be brought into contact. The flaps of bark folding down over the bud should always be pared down, so that the waxed wrappers may fit close and exclude those pestiferous little insects that get in under other forms of wrapper and destroy so many buds. Another thing requiring eternal vigilance is to be sure that sap is flowing more freely in the stocks than in the budwood."

2831. Chip- or "dormant" budding. *a*, The bud stick; *b*, the bud ready for insertion; *c*, the bud inserted in the matrix of the stock; *d*, the bud securely tied in place.

Distance, method of planting, and cultivation.

The large size of the tree and the lack of any suitable dwarfing stock render wider planting necessary than for other orchard trees. Many of the earlier orchards were spaced at 40 or 50 feet, with some planted as close as 25 feet, with a view to thinning out to 50 feet after some years of bearing. Accumulated experience indicates that upon all soils suitable for the pecan, a distance of 60 feet will be required before the age of maximum productiveness is reached, and that closer planting than this is inadvisable unless in sections where growth of trees thirty years old and upward indicates that closer distances will not involve harmful crowding and shading, to which the pecan as a nut-bearer is peculiarly sensitive. Well-ripened trees two years from the bud or graft are preferred by most planters and 24 to 30 inches of tap-root is retained in transplanting. In the Gulf States, planting is usually done during the winter months and completed by February, to insure thorough settling of earth and callusing of roots before growth starts. Special care to prevent drying out during shipment and handling is necessary, protection against sun and wind and thorough soaking of roots before planting being advisable.

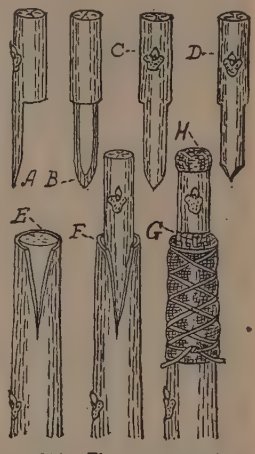
Holes should be of ample size, 6 to 8 inches deeper than the roots require, and be filled in at bottom with good top-soil. Fertilizer should not be in contact with roots.

The unsatisfactory behavior of close-planted orchards and the necessity of deriving profit from the land during the six to twelve years before the trees come into bearing have given rise to varied practice in intercropping. Peaches, Satsuma oranges, truck crops, cotton, corn, and the like, are used in various sections.

It is essential on most soils to maintain good cultivation throughout the growing season. This is satisfactorily accomplished with cotton, corn, truck crops, cowpeas or other tilled crops, provided fertility is maintained by adequate fertilizer application and plowing in of leguminous cover-crops. The laying down of pecan orchards in Bermuda-grass for pasture or mowing even on the deep moist soils of the Mississippi Delta has invariably been followed by stunting of growth and lessened productiveness of trees. The use of winter cover-crops such as hairy vetch and bur clover for plowing under in spring has everything to commend it.

Harvesting and marketing.

The preferred practice in harvesting is to permit the nuts to fall as the hulls open, gathering frequently to prevent soiling by contact with the ground. As the efficiency of this method is largely dependent on the continuance of clear and reasonably dry weather throughout the harvest season, it is usually necessary gently to "thresh" the later-maturing portion of the crop from the trees with bamboo or other light poles. Premature threshing results both in an immature quality of crop and in injury to the trees through the breaking off of fruit-spurs. After gathering, the nuts should be cured by storing in a cool dry place for two or three weeks, during which time there is some loss of weight by evaporation of moisture, after which they are ready for marketing.



2832. The crown-graft or -bud. *A*, *B*, *C*, the cion; *D*, cion trimmed at point; *E*, stock ready to receive the cion; *F*, cion in place; *G*, *H*, the work completely protected by waxed cloth.

A considerable portion of the wild crop is washed and polished by friction in revolving barrels or drums Some tinting of the nuts with dye is also practised. While polishing and tinting are not in themselves harmful, they have so frequently been used to conceal inferiority of damaged or stale nuts and such as are immature that discriminating purchasers show preference for the nuts in their natural state. This is specially true with regard to the product of the named varieties, which is coming to be sold on known varietal merit as to cracking quality, plumpness of kernel, flavor, and the like. While the product of cultivated orchards still constitutes but a small proportion of the market supply, it is destined to early and considerable increase.

Marketing by parcel post direct to consumers is coming into practice and coöperative selling by growers' associations is being undertaken to some extent.

Prices of wild nuts have risen considerably in recent years as the result of increased demand from commercial crackers. Prices of the leading orchard varieties, though gradually receding from the fictitious and novelty values of the exploitation period, range from 30 to 50 cents a pound wholesale, with good demand, and retail at 50 to 75 cents in most markets.

Varieties.

The fact that until about 1900 there were few nurserymen able to propagate the pecan by budding and grafting, coupled with the very high prices received for choice nuts from certain individual trees, stimulated the sale of nuts from such trees under varietal names for the planting of seedling orchards throughout the Gulf States. This was true to a large extent with regard

to Centennial, Rome, Frotscher, Stuart, Russell, Pabst, Jewett, Van Deman, Post, and Hollis, thousands of seedlings of which in dooryards and orchards are now found throughout the South. These seedlings, while frequently bearing a general resemblance to the parent, usually vary widely in important features and, as might be expected, in a large proportion of instances are inferior to the parent variety. Names have in many cases been applied to the nuts of wild trees sold for planting, with the result that much confusion has existed in the varietal nomenclature. The adoption of a code of nomenclature by the National Nut-Growers' Association in 1903, and its systematic application by a standing committee of that organization, has to a large extent clarified the situation in recent years.

The adaptability of varieties to sections, including the important feature of relative resistance to such diseases as scab under varying climatic conditions, is gradually being worked out and is essential to the establishment of commercial pecan-growing on an economically sound basis. At the present time there is much working over of trees of bearing age in progress, with the end in view of replacing the varieties originally planted by those found better adapted to the regional or local conditions.

Out of several hundred named trees, somewhat more than one hundred varieties have been propagated by nurserymen. Of these, many are as yet untested outside of the localities of their origin. Some twenty to thirty sorts have been sufficiently distributed for a long enough time to afford indication of their probable cultural range and value, with the result that a number of the earlier distributed varieties, including Centennial, Jewett, and Rome, and a number of sorts of local repute, have been practically discarded by planters.

The varietal adaptability of the pecan so far as possible to summarize as the result of several years of systematic study in the field was outlined by Reed in 1915 (Farmers' Bulletin No. 700, "Pecan Culture," with special reference to varieties and propagation) as follows:

Varieties now considered best for planting in the plains section of southeastern Virginia and eastern North Carolina are the Stuart, Mantura, Van Deman, Moneymaker, Schley, Pabst, and James.

Varieties which may be recommended for eastern South Carolina, eastern and central Georgia, central Alabama, and central Mississippi are the Schley, Stuart, Van Deman, Moneymaker, James, and Carman.

Varieties for planting in south Georgia and north Florida are the Schley, Curtis, Bradley, Alley, Van Deman, Stuart, Moneymaker, President, Pabst, and Russell.

Varieties for central and north Florida: Curtis, Bradley, Kennedy, President, Schley, Van Deman, and Moneymaker.

Varieties for the coastal section of Alabama, Mississippi, and Louisiana: Schley, Curtis, Alley, Van Deman, Russell, Stuart, Pabst, Success, and Havens.

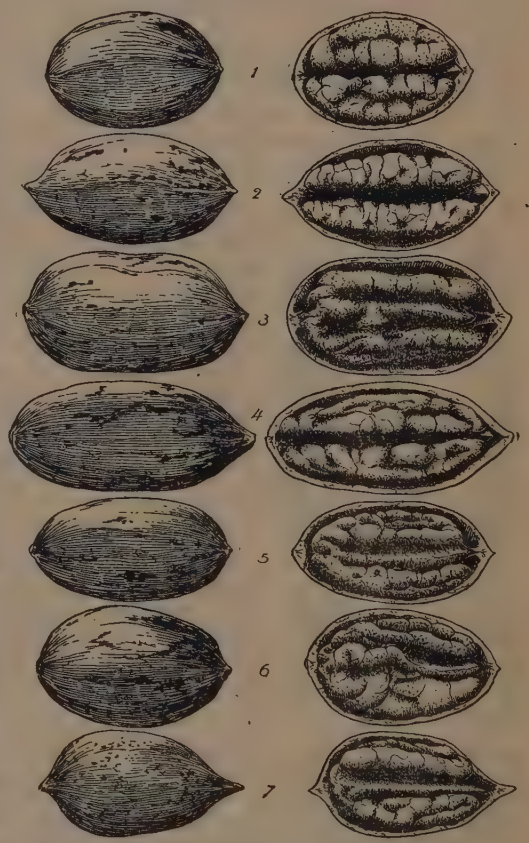
Varieties for east Texas: Very few sorts have been given a fair trial in this section. The varieties here mentioned are recommended very largely because of their performance farther east. They are the Stuart, Moneymaker, Schley, Curtis, Van Deman, Bradley, Carman, and James.

Varieties for west Texas: Sovereign (syn. Texas Prolific), Kincaid, Colorado, San Saba, Halbert, and Burkett.

Varieties for northern Louisiana, southern Arkansas, and northern Mississippi: Very few sorts have been given a fair trial in this section. The following varieties are mentioned because of certain evidence of superior hardiness which they have shown and the general merit of the nuts themselves, but they are recommended for conservative planting only: Moneymaker, Carman, Stuart, Van Deman, Schley, Pabst, and Success.

Varieties for the section including central and western Tennessee, central and western Kentucky, southern Indiana, southern and southwestern Illinois, eastern and southern Missouri, southeastern Kansas, Oklahoma, and northern Arkansas: Only varieties of northern or local origin should be considered for planting in this general area, as none of the southern sorts is sufficiently hardy to justify their recommendation. The best of these are the Major, Niblack, Indiana, Busseron, and Posey.

Some of the best known sorts now in the trade, with locality of origin indicated, are the following:



2833. Varieties of the pecan: *1*, Moneymaker; *2*, Russell; *3*, Frotscher; *4*, Rome; *5*, Alley; *6*, Success; *7*, Curtis. (×⅔)

Alley (Fig. 2833).—Pascagoula, Mississippi. A thin-shelled nut of medium size, with plump kernel of good flavor. Tree a vigorous grower and heavy bearer, though subject to scab in some locations.

Busseron.—Knox County, Indiana. Recently disseminated and considered promising for Indiana and other northern sections.

Centennial (Fig. 2834).—St. James Parish, Louisiana. The first variety propagated by grafting. Exhibited at Philadelphia in 1876. A large long nut, with rather thick shell and slender kernel. Tree a symmetrical, vigorous grower but very tardy in bearing. Practically discarded in favor of better varieties.

Curtis (Fig. 2833).—Orange Heights, Florida. Though rather small in size, a thin-shelled nut with plump kernel of fine quality. Very productive and popular in Florida.

Delmas (Fig. 2834).—Pascagoula, Mississippi. A large, rather thick-shelled productive variety of very sturdy growth, but rather subject to scab. Kernel plump and of high quality.

Frotscher (syns., Eggshell, Frotscher's Eggshell, Olivier, Majestic) (Fig. 2833).—Olivier, Louisiana. One of the most widely disseminated and distinct of the older varieties. Very large and thin-shelled but with kernel rather dark and unattractive in appearance, frequently not filling well. Rapidly giving way to more reliable sorts.

Hollis (syns., Hollis's Jumbo, Jumbo, Risien, Georgia Belle, Post's Select, in part).—Bend, Texas. A medium to large, roundish

nut, rather widely disseminated for several years as Post's Select. Mainly planted in central Texas.

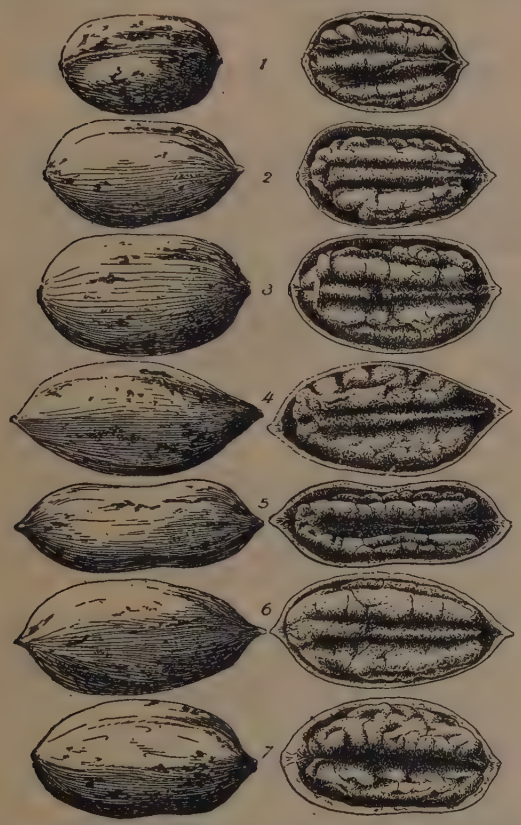
Indiana.—Knox County, Indiana. Of medium size, with thin shell and kernel of excellent quality. Promising for northern planting.

Jewett.—Pascagoula, Mississippi. Widely disseminated at one time, but generally discarded because of unproductiveness and unthriftiness of tree and unsatisfactory filling of the large long nut.

Kincaid.—San Saba, Texas. A large, oblong nut, with moderately thin shell and plump kernel of fine quality. Scabs badly in South Atlantic States.

Major.—Henderson County, Kentucky. Recently introduced, but considered promising in northern pecan territory. Of only medium size but thin-shelled, with plump kernel of fine quality.

Mobile (syns., Laurendine, Batey's Perfection).—Bayou La Batre, Alabama. A very large and handsome nut, coming into bearing early but not filling well in most sections where tested, and therefore little planted in recent years.



2834. Varieties of the pecan: *1*, San Saba; *2*, Teche; *3*, Stuart; *4*, Van Deman; *5*, Centennial; *6*, Schley; *7*, Delmas. (×⅔)

Moneymaker (Fig. 2833).—Mound, Louisiana. A medium-sized, rather thin-shelled nut of excellent cracking and fair dessert quality. A precocious, productive sort. One of the hardiest of the southern varieties.

Niblack.—Knox County, Indiana. Recently introduced. Below medium in size, but its excellent cracking and fine dessert qualities make it promising for the North.

Pabst.—Ocean Springs, Mississippi. A large, rather thick-shelled sort with a very plump and attractive kernel of excellent quality.

Post (syn., Post's Select).—Milburn, Texas. Nuts and seedling trees were widely disseminated for several years under this name, at first from a tree on the Colorado River bottom near Milburn, Texas, later from other trees nearby, and still later from the Hollis tree in the same county. The nut of the original Post tree is of medium size and very attractive appearance and thousands of seedlings from it have been planted throughout the South, but neither the variety nor its seedlings are now propagated.

Rome (syns., Columbia, Columbian, Century, Twentieth Century, Pride of the Coast, Southern Giant) (Fig. 2833).—Convent, Louisiana. One of the largest varieties and for several years the most widely exploited, but now practically discarded by planters. Shell thick and kernel frequently defective.

Russell (Fig. 2833).—Ocean Springs, Mississippi. A medium-sized conical nut with very thin shell. Quality excellent when well filled but often faulty. Tree slender and tender but very productive along the Gulf Coast of Mississippi.

San Saba (syns., Papershell, Risien's Papershell, Royal) (Fig. 2834).—Though small, its thinness of shell, plumpness and sweetness of kernel make it a highly desirable nut where it succeeds. Tree a vigorous, though slender grower; very productive; scabs badly in eastern districts.

Schley (syn., Admiral Schley) (Fig. 2834).—Pascagoula, Mississippi. One of the most widely successful commercial sorts. Nut generally large, with thin shell and plump kernel of excellent quality. Tree pendulous in habit but vigorous and productive.

Sovereign (syn., Texas Prolific).—San Saba, Texas. Seedling of San Saba, larger than the parent, with somewhat thicker shell. Very productive in Texas but susceptible to scab in eastern districts.

Stuart (syn., Castanera) (Fig. 2834).—Widely planted and generally productive. Nut large, filling well but rather difficult to crack and, therefore, less planted as a commercial nut than formerly.

Success (Fig. 2833).—Ocean Springs, Mississippi. A large nut with a relatively thin shell and plump kernel.

Teche (syns., Frotscher No. 2, Duplicate Frotscher, Fake Frotscher, Spurious Frotscher) (Fig. 2834).—Probably a seedling of Frotscher, mixed with that variety in nursery and disseminated as Frotscher. Rather small and not of high quality, but very productive throughout the southeastern states.

Van Deman (syns., Mire, Duminie Mire, Paragon, Bourgeois) (Fig. 2834).—A large to very large nut, cracking well, with plump kernel of high quality. Widely planted in lower Mississippi Valley and Gulf Coast sections. Subject to scab farther east.

Hybrids.—Numerous hybrids of *C. Pecan* with *C. laciniosa* and *C. aquatica* are known and some have been named and propagated in a small way. Of these the *McCallister* (syn., Floyd), found near Mt. Vernon, Indiana, is a very large nut, probably the largest known hickory-nut. The original tree has for many years failed to mature more than a small proportion of plump kernels and top-grafted trees of the variety have exhibited the same weakness, so that it cannot be regarded as of commercial value.

Literature.

Books and bulletins have been published on nut- and pecan-culture and varieties. Some of the works are: "Nut Culture in the United States," Division of Pomology, 1896; "The Nut Culturist," A. S. Fuller, 1896; "Nuts for Profit," John R. Parry, 1897; "Pecan Culture for Western Texas," E. E. Risien, 1904; "The Pecan and Its Culture," H. Harold Hume, 1906; "Pecans," J. B. Wight, 1906. Detailed historical accounts and descriptions of forty of the best known varieties, with colored plates, occur in Department of Agriculture Yearbooks for the years 1904–1909 and 1912.

The following bulletins on the pecan have been issued: Florida Experiment Station Bulletins Nos. 54, 57, 85; Texas Experiment Station Bulletin No. 69; North Carolina Department of Agriculture Bulletins Nos. 30, 156, 224; Georgia State College of Agriculture Bulletin No. 82; Georgia Experiment Station Bulletin No. 116; Bureau of Plant Industry Bulletins Nos. 30, 251; Farmers' Bulletin No. 700.

WM. A. TAYLOR.

PECTINÀRIA (*comb-like*). *Asclepiadàceæ*. The genus as described by Haworth, not of other authors, comprises succulent leafless herbs: sts. tufted, usually procumbent, acutely, obtusely or obscurely 4–8-angled: fls. small, solitary or in fascicles in the grooves or on the sides between the angles; calyx 5-parted; corolla small, budlike, with a short cup-shaped hemispheric or broad and shallow tube and 5 lobes connate at the apex; corona double, outer cuplike and variably cut into 10 to numerous teeth or of 5 minute lobes, inner of 5 lobes incumbent upon the backs of the anthers or erect and about equaling or longer than them and connivent-erect over them; filaments of the stamens connate, forming a tube around the ovary and adnate to the dilated top of the style: follicles narrowly fusiform, glabrous.—Five species, all S. African. The following species have been intro. at Kew: *P. saxátilis*, N. E. Br. Sts. acutely 4-angled, with flat or slightly concave sides and distant acute deltoid teeth along the angles: corolla broadly ovoid or subglobose, covered with fine hairs on the inner surface, blackish purple or purple-brown. *P. asperifòlia*, N. E. Br. Sts. cylindric, with 6–8 series of closely placed tubercles: corolla papillate outside and within also pentagonally subglobose, with the papillæ on the inner surface

covered with short spikelike processes, dull purplish outside, the whole surface inside frosted white, dotted with crimson. F. TRACY HUBBARD.

PEDDIÈA (named after Major Peddie). *Thymelæàceæ*. Glabrous shrubs, hardy in the extreme south of the United States.

Leaves sparse, subcoriaceous or membranaceous: fls. yellowish green, in peduncled umbels at the tips of the branches, pedicelled, perfect; perianth-tube cylindrical, lobes 4 (rarely 5?), short, spreading; stamens 8 (rarely 10?); disk hypogynous, cup-shaped, entire or toothed; ovary glabrous or densely villous at the apex, 2-celled: drupe succulent, with 2 nutlets.—About 10 species, Trop. and S. Afr.

africàna, Harv. Shrub: lvs. subopposite, elliptic, nearly sessile, glabrous: fls. in terminal stalked umbels, tubular, ½–¾in. long, 4–5-lobed, the lobes revolute: fr. a drupe with 2 stones, ovoid, about 1 in. long. S. Afr. F. TRACY HUBBARD.

PEDICULÀRIS (from Latin for *louse;* application not evident). *Scrophulariàceæ*. LOUSEWORT. Herbs, mostly perennial, sometimes planted in grounds for the showy spikes of flowers and often finely cut foliage.

Mostly erect, only seldom annual or biennial: lvs. alternate or whorled (sometimes opposite), rarely subopposite, 1 to many times pinnately divided, rarely merely dentate: fls. purplish, red, rose-color to white, in spring and summer, borne mostly in a terminal bracted spike; calyx anteriorly cut, variously 2–5-toothed, sometimes also posteriorly; corolla 2-lipped, the upper one (or galea) with or without a long beak, the tube cylindrical; stamens 4, didynamous: caps. ovate or lanceolate, oblique; seeds usually few.—There are about 250 species of Pedicularis in many parts of the northern hemisphere (a few S. American), many of them arctic and alpine. Thirty to 40 are native in the U. S., and the genus has a large extension in Asia. They are little known as garden plants, not being really domesticated. Some of them are adaptable to banks and borders, and others to rock-gardens and alpine work; some are swamp plants. They are likely not to persist long without renewal, as they appear to be partially parasitic and may require a particular host plant. Prop. by seeds and division. The following American species are perennial.

2835. Pedicularis Grayi. (×⅓)

A. Lvs. undivided: galea long-beaked.

racemòsa, Douglas. Height 12–18 in.: sts. leafy and simple or branched: lvs. lanceolate, undivided, minutely and doubly crenulate: fls. white; galea (upper lip of the corolla) with a long beak (½in. long), circinate-incurved, nearly reaching the lower lip. Colo. to Brit. Col.; subalpine.

AA. Lvs. variously divided: galea with very short beak or none.

Gràyi, A. Nels. (*P. procèra,* Gray). Fig. 2835. Robust, 1½–4 ft. high, leafy: lvs. pinnately divided, the segms. lanceolate and pinnatifid and the lobes again dentate or cut, the radical lvs. 1 ft. or more long: fls. sordid yellowish and greenish striate, in a dense-fld. pubescent spike 10–20 in. long, the galea not beaked; fl.-bracts long. Mountains of Colo. and New Mex.

lanceolàta, Michx. SWAMP LOUSEWORT. Glabrous or nearly so, 1–3 ft. high, simple, or branched above: lvs. alternate and opposite, pinnately lobed, upper ones sessile: fls. yellow in a short spike; bracts shorter than the fls.: caps. ovate, scarcely longer than the calyx. Aug.–Oct. Swamps, Conn. to Man., to Ohio and Neb.

canadénsis, Linn. WOOD BETONY. The common American lousewort, usually more or less hairy: sts. commonly tufted, ½–1½ ft. high: lvs. mostly alternate, oblong-lanceolate, pinnately parted, all but the uppermost petioled, the lobes oblong and obtuse, incised or dentate: fls. yellow or reddish, rarely white, in a short spike that elongates in fr.: caps. lanceolate, 3 times as long as the calyx. April–June. Dry woods and thickets, Nova Scotia to Man.; south, Fla. to Mex. B.B. 3:186. B.M. 2506.

P. cúrvipes, Hook. f. Sts. 1 ft. long, very slender and curving: lvs. far apart, 1 in. or less long, pinnatifid, the lobes 3 or 4 pairs and incised: fls. rose-colored, axillary, long-pedicelled, the stalks recurving in fr. Himalaya, 10,000 ft. B.M. 7735.—*P. foliòsa,* Linn. Sts. simple, 1–3 ft.: lvs. pinnatifid, the segms. lanceolate and toothed: fls. cream-color, in a dense spike; galea very blunt. Eu. Gn. 62, p. 97.—*P. móllis,* Wall. Annual, 2–3 ft., strict: lvs. all on the st., ovate or oblong, pinnatifid, the segms. linear and crenate or pinnatifid: fls. dark pinkish purple, in strict spikes 6–16 in. long. Himalaya, Thibet, 10,000–14,000 ft. B.M. 4599. J.F. 2:166.—*P. Scéptrum-Carolínum,* Linn. St. few-lvd., 3–4 ft.: lvs. pinnatifid, the lobes ovate and crenulate: fls. golden yellow, 1 in. long, in an interrupted spike, the lower lip tinged red. Eu. G.C. III. 40:385.—*P. siphonántha,* Don. Sts. 1 ft. high or less, erect or ascending: lvs. radical, linear-oblong, pinnatifid: fls. red or pink, axillary and in terminal racemes, the corolla-tube 1–6 times as long as calyx. Afghanistan to Thibet. L. H. B.†

PEDILÂNTHUS (Greek, *shoe-flower*). *Euphorbiàceæ*. SLIPPER PLANT. BIRD CACTUS. REDBIRD CACTUS. SLIPPER SPURGE. JEW BUSH. Low tender cactus-like shrubs, grown in collections of succulents.

Stems thick and fleshy, juice milky: lvs. alternate, often rudimentary, the midrib thickened and often keeled below: infl. of terminal or axillary cymes; the fl. and fr. characters as in Euphorbia, but the involucre with a deep fissure and a short spur on the upper side, the spur containing the glands.—About 30 species in Trop. Amer. Prop. and cult. similar to the succulent euphorbias. See Millspaugh in Field Museum Nat. Hist., Publication 172, 1913, for a revision of the species.

A. Lobe of the involucre above the spur entire.

tithymaloìdes, Poit. (*Euphórbia tithymaloìdes,* Linn. *E. canaliculàta,* Lodd. *E. carinàta,* Donn). St. 4–6 ft. high: lvs. dark green, ovate or oblong, acute; midrib keeled below and dentate: involucres bright red or

purple, ½–¾in. long, in dense terminal cymes, glabrous inside and out; pedicels of the stamens hairy, of the ovary smooth. Fla. to Venezuela. B.R. 837. L.B.C. 8:727. B.M. 2514.—Two varieties are in cult., *cucullàtus* and *variegàtus*, Hort., both with white-bordered lvs.

padifòlius, Poit. Sts. green, glabrous: lvs. few, oblong-ovate, obtuse: cymes terminal, open; tube of the involucre hairy only within; pedicels of both stamens and ovary hairy. W. Indies.

AA. *Lobe above the spur 2-parted; bracts of the infl. green*

aphýllus, Boiss. Branches slender, leafless: cymes terminal; the pubescent peduncle attached at the back of the involucre, which is hairy within; pedicels of the stamens and ovary glabrous. Mex.—Intro. as a wax-yielding plant.

macrocárpus, Benth. Shrubby: sts. whitish: lvs. minute: cymes open, few-fld.; peduncle attached to the center of the involucre, pedicels glabrous. W. Mex.

J. B. S. NORTON.

PEDIOCÁCTUS (*plains cactus*). *Cactàceæ*. Globular, resembling in habit and flower the so-called mammillarias: fls. small, with a rather indefinite funnel-shaped tube; petals pinkish, broad; sepals smaller than the petals and duller in color; bracts on corolla-tube few; stamens numerous; ovary green, nearly globular, usually without bracts (rarely 1, otherwise naked), apex with a truncate or depressed scar left by the deciduous corolla: fr. dry, greenish, bursting irregularly; seeds dull black, tuberculate, keeled on the back, with a large sub-basal hilum. The fl. originates just above the spine areole on the very young tubercles, and therefore this genus belongs to the Echinocactus type rather than to the so-called mammillarias. The seeds are also of the Echinocactus type.

Símpsonii, Brit. & Rose. Subglobose or depressed, turbinate at base, simple, often clustered, 3½–5 in. diam.: ribs 8–13, only indicated by the spiral arrangement of the prominent tubercles, which are ½–⅗in. long, somewhat quadrangular at base and cylindric above; exterior spines 20–30, slender, rigid, straight, whitish, ⅓–½in. long, with 2–5 additional short setaceous ones above; interior spines 8–10, stouter, yellowish and reddish brown or black above, erect-spreading, ⅖–⅗in. long; no truly central spine: fls. ¾–⅘in. long and nearly as broad, yellowish green to pale purple. Mountains of Colo., Wyo., Utah, and Nev.—This species does not grow well in cult., although it is frequently intro. This is the species which forms the "snake cactus" or "brain cactus" often seen in cult.

J. N. ROSE.

PELARGÒNIUM (*stork*, because the fruit is long and slender like a stork's bill). *Geraniàceæ*. GERANIUM of gardens. PELARGONIUM. STORK'S BILL. Many kinds of pot-plants, popular for indoors and for bedding; and some of them much planted permanently out-of-doors in California and elsewhere; flowers showy.

Plants of various habit: some are fleshy and tuberous and are treated as succulents, but those commonly grown are erect or trailing leafy herbs or woody below (sometimes shrubby) with sts. somewhat soft and succulent or small and firm: lvs. mostly opposite, entire to decompound, stipulate, the foliage often strong-scented: infl. mostly umbel-like, on axillary peduncles; fls. irregular, the petals 5 (rarely fewer by abortion), the 2 upper usually larger and more prominently colored, the lower mostly narrow and rarely very small, the colors pink, red, purple, white, sometimes yellow, often attractively blotched or veined; calyx 5-parted (or the sepals said to be connate at base), the uppermost segm. produced at base into a slender nectar-bearing tube or spur adnate to the pedicel; stamens 10, of which 7 or less are anther-bearing and fertile: fr. of 5 valves, each 1-seeded and separating from the beak-like apex mostly by coiling and more or less hygrometrically.—Nearly all the pelargoniums are from S. Afr. All the species mentioned in this article are from that region, unless otherwise stated. Harvey, in Vol. I of Harvey & Sonder's Flora Capensis (1859–60), admits

2836. Pelargonium inquinans (and a variety of it) as figured by Dillenius in 1732.

163 species; and his descriptions are followed closely in the characterizations of species given below. Knuth, the most recent monographer (in Engler's Pflanzenreich, IV. 129, 1912), admits 232 species and very many well-marked hybrids. Pelargonium is distinguished from the genus Geranium by technical characters. In most cases, the fls. of Geranium are regular, but those of Pelargonium are irregular, the 2 upper petals differing from the others in size and shape and often in coloring. The most constant difference between the two genera is the presence in Pelargonium of a nectar-tube, extending from the base of one of the sepals and adherent to the side of the calyx-tube or pedicel. This tube is not seen by the casual observer, but it may be discovered by making a longitudinal section of the fl. and pedicel.

The person who wishes to study the contemporaneous evolution of plants may find his heart's desire in Pelargonium. With great numbers of species and many

of them variable and confusing in a wild state, with plant-breeding in many places and continued through two centuries, and with a large special literature, the genus offers exceptional advantages and perplexities to the student. Most of the species early came into cultivation by the English and Dutch, the South African plants forming at one time almost a separate department of horticultural knowledge. *P. cucullatum*, the dominant parent in the florist's pelargoniums, was known in England as early as 1690. The two originals of the race of zonal or bedding geraniums were introduced into England in 1710 and 1714. Early in that century, a half-dozen species were grown at Eltham, in the famous garden of James Sherard, and these were pictured in 1732 in Dillenius' account of that garden, "Hortus Elthamensis," a sumptuously illustrated work in quarto. Even at that time, *P. inquinans* had varied markedly (see Fig. 2836). In his "Species Plantarum," 1753, Linnæus described the few species which he knew (about twenty-five) under the genus Geranium. In 1787, L'Heritier founded the genus Pelargonium, and transferred many of the Linnæan species. L'Heritier's work "Geraniologia," a quarto, appeared in Paris in 1787 to 1788, with forty-four full-page plates. Recently Kuntze has revived the pre-Linnæan name Geraniospermum (1736) for this genus, but it is not likely to find acceptance.

2837. Gardener's ideal, and the original form, as depicted in 1841.

Early in the nineteenth century, many species were in cultivation in Europe, and experiments in hybridizing and breeding became common. There appears to have been something like a geranium craze. The experiments seem to have been confined largely to the development of the show or fancy pelargoniums, as greenhouse subjects, for bedding plants had not reached their present popularity. The geranium interest seems to have culminated in Robert Sweet's noble work on "Geraniaceæ," published in five volumes in London, 1820 to 1830, containing 500 well-executed colored plates of geraniaceous plants. At that time many distinct garden hybrids were in cultivation, and to these Sweet gave Latin botanical names. His fifth volume is devoted chiefly to garden forms of the show pelargonium type, to which the general class name Domesticum is given in the following sketch. The development of the zonal or bedding geraniums had begun in Sweet's time, and he includes them in his pictures, but the larger part of their evolution is subsequent to his history. Various small works on pelargonium have appeared. De Jonghe's "Traité Méthodique de la Culture du Pélargonium," Brussels, 1844, contains good bibliographical and cultural data.

Few classes of plants should have more interest to the amateur and fancier because the species are numerous and varied, the colors mostly very attractive, the habit of the plant interesting, and the foliage often with pleasing fragrance; yet, excluding the common window and bedding geraniums of the *P. zonale* and *P. inquinans* type and the Lady Washington or Show types, they are very little known to gardeners. A cool greenhouse could be made to yield very interesting subjects in the species here described and others that may be secured from collectors in the regions where they grow.

Most of the cultivated forms of pelargonium may be grouped into four general horticultural classes:

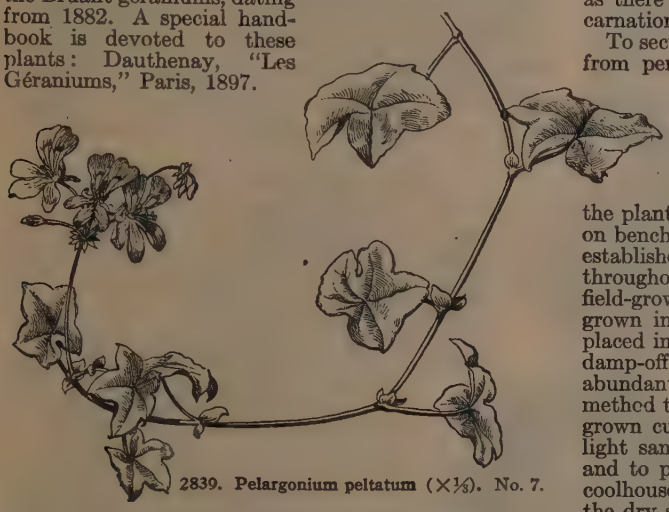
I. The zonal, horseshoe, fish, or bedding types, known to gardeners as "geraniums." They comprise a mongrel class, designated as the Hortorum class. This race seems to be derived from *P. zonale* and *P. inquinans*. These two species were made by Linnæus in 1753, but he founded them on descriptions in earlier works rather than directly on the plants. In America, the zonal geraniums are very popular, for they develop their colors well in the bright climate. They are popular in all countries, however. They probably stand closer to the lives of a great number of persons than any other ornamental plant. If a window or a garden can have but one plant, that plant is likely to be a geranium. The old race of large-flowered and large-clustered geraniums was known as "nosegay geraniums," because they were bouquet-like, but this term is not known in America. Another race has been developed for its zone-marked leaves. There is also a race of double-flowered zonals, which have appeared chiefly since 1860. The very full double and close-clustered forms lose much of the grace and charm of the single types. Some of them are little better, to a sensitive eye, than balls of colored paper. In the development of the individual flower of the geranium, there have been two ideals—the English ideal for a circular flower with the petals broadened and overlapping, and the continental ideal with a somewhat two-lipped flower and the petals well separated. In the "Gardeners' Chronicle" in 1841, p. 644, the proper form is set forth in an illustration, and this is contrasted with the "original form;" the picture is reproduced, somewhat smaller, in Fig. 2837. "The long, narrow, flimsy petals of the old varieties," the writing says, "moved by every breath of wind, and separated to their very base by broad open spaces, have been succeeded by the beautiful compact flowers of the present day, with broad stout petals so entirely overlaying each other as to leave scarcely an indentation in the outline of the flower; while the coarseness which prevailed in the larger of the old sorts is replaced by a firmer substance, and a far more delicate texture." Fig. 2838 shows contrasting ideals, although the picture does not represent the extremes.

2838. Three forms of garden geranium. The upper two show the two-lipped ideal. Uppermost is Mrs. E. G. Hill; middle one, Maculatum; lowest, Wistre.

In more recent years a French type has ap-

LXXXVI. The common garden geranium, a form of Pelargonium.

peared under the name of "gros bois," or "large-wood" race. It is characterized as follows by Dauthenay: umbels ordinarily 4 to 5 inches in diameter: flowers very large; petals roundish, or sometimes triangular, the limb always very large and giving the corolla a remarkably round contour: leaves very large, thick and coriaceous, plane or incurved, more or less indented, strongly nerved, their diameter averaging about 5 inches, pedicels large and short: peduncles large, rigid, and projecting beyond the foliage: wood soft, fleshy, very large, often 1½ inches around. To this type Dauthenay refers the Bruant geraniums, dating from 1882. A special handbook is devoted to these plants: Dauthenay, "Les Géraniums," Paris, 1897.



2839. Pelargonium peltatum (×⅓). No. 7.

II. The ivy-leaved geraniums, products largely of *Pelargonium peltatum* (Fig. 2839). The species is said to have been introduced into England in 1701. It is a weak and straggling plant, used mostly in vases, hanging-baskets, and other places in which an overhanging subject is desired. The foliage is thick and shiny, slightly peltate and prominently angle-lobed, and the pink or reddish two-lipped flowers are always admired. Much-improved and double forms are now in commerce.

III. The "show" or fancy type is known to gardeners as "pelargonium," and in this country also as Lady Washington geraniums (Fig. 2845). These plants are very popular in Europe, being grown in numerous varieties. They are prominent at the exhibitions. Because of the hot trying summer climate, these plants are of very secondary importance in America, although there are many gardeners who succeed well with them. This race of pelargoniums seems to have descended chiefly from *P. cucullatum*, although *P. angulosum* may be nearly equally concerned in it. *P. grandiflorum* is also thought to have been a formative parent. It is probable that two or three other species are concerned in the evolution. In fact, the late Shirley Hibbard once wrote (G.C., July 3, 1880) that "it must be evident to every cultivator of these flowers that the blood of a score or so of species is mingled in them." This marked garden race, which represents no single wild species, is designated as the Domesticum group.

IV. Various scented-leaved geraniums, known mostly as "rose geraniums." These are of several species, with their hybrids and derivatives. The common rose geraniums are nearest *P. graveolens* and *P. Radula*. The nutmeg geranium is *P. odoratissimum* or *P. fragrans*.

Aside from the above groups there are several species which appear sporadically in the trade, as *P. tomentosum*, *P. echinatum*, *P. triste*, *P. quinquevulnerum*, *P. fulgidum*, and *P. quercifolium* or the derivatives of them. Few great collections of pelargonium species and varieties have been made in this country, and this is much to be regretted.

Culture of zonal geraniums. (C. W. Ward.)

While the general florist may consider geranium-culture the easiest of all gardening, the fact remains that it is as necessary to observe the requirements of the geranium as it is to observe the requirements of any other plant, in order to succeed and produce the best effects attainable. While it is true that the geranium will grow and make a good showing with comparatively little care, there is as much difference between a skilfully grown geranium plant and one carelessly grown as there is between a fancy and a common rose or carnation.

To secure the best results it is necessary to propagate from perfectly healthy stock. The dangers of over-propagation are as great with the geranium as with most other plants. To keep most varieties in good health it is necessary to plant the stock intended for propagation in the field and to propagate either from the field-grown wood in August or early September, or to lift the plants in the month of September and plant them on benches in the greenhouse, where they will become established and will maintain a vigorous constitution throughout the winter season. The propagation from field-grown wood is far less successful than from wood grown inside, and when the field-grown cuttings are placed in sand, a large percentage of them is likely to damp-off, especially if there has been a comparatively abundant rainfall in the month of July. The best method that the writer has found for striking the field-grown cuttings is to put them in 2-inch pots, using a light sandy soil free from all manure and chemicals, and to place the pots in the full sunlight either in a coolhouse or a frame. These cuttings must be kept on the dry side until the calluses have been well formed, although they should not be allowed to shrivel at any time. If the cuttings show signs of shriveling, a light syringing is preferable to a heavy watering. After the roots have started, the treatment of the plants is the same as if the cuttings had been rooted in the sand and repotted. The writer considers wood grown inside superior to field-grown wood, as the cuttings are much shorter-jointed; most of them can be taken from the plant with a heel and 95 to 100 per cent of them will root in sand in the ordinary cutting-bench.

A good temperature for the geranium propagating-house is 56° to 60°, with a bottom heat of 65° to 68°. While the cuttings are in the sand and before they are rooted, care must be taken about keeping them too moist for fear of "damping-off," or what geranium-growers know as "black-rot." As soon as the cutting is thoroughly callused and begins to emit roots, it should be potted up at once. The best soil for geraniums, according to the writer's experience, is a firm pliable clay loam; this is best if used absolutely without any manure, especially fresh manure. After potting the cuttings they should be lightly watered and shaded for a day or so if the sun is extremely hot, until the roots take hold and the foliage fills up and the stems begin to look plump. The geranium should not be grown at any time in its young state in a soil that is too rich, and care must also be taken that the plants are not kept too wet.

The geranium is subject to few diseases, and so far as the writer has been able to observe these diseases are brought on by improper treatment, such as having too much fresh rank manure in the soil or keeping the plants too wet. Too much strong plant-food in the earth combined with too much moisture induces a condition of the leaves ordinarily called "spot." It usually appears in the hottest weather or immediately after extreme heat accompanied by copious showers or rains.

Excellent specimen geranium plants may be grown in pots, especially of some of the newer French and English round-flowered varieties. In order to produce the best results, choose young vigorous plants that have

been propagated either in the latter part of August or the forepart of September, and that have shown a disposition to take hold immediately, both in rooting and in starting to grow after being potted. The soil should not be too rich, and it is best to start with the plant in a rather small pot, say 2½ inches, and proceed onward with light shifts,—that is, shifting the plant from a 2½-inch to a 3½-inch pot, and so on, letting the sizes increase an inch at each shift until a 7-, 8-, or 9-inch pot is reached, which will usually be large enough to flower the finest specimens. Whenever shifting the geranium, be sure to pot firmly, as a firm soil produces a short-jointed stocky growth, and far more bloom than a loose or over-rich soil. When the plants reach a 5- or 6-inch pot they may be regularly fed with manure-water. The most critical time for these specimen geraniums will be in the months of July, August, and September; in these periods exposure to intense sunshine should be avoided. Too much water and a close temperature are always detrimental to the geranium. Syringing the foliage frequently to keep down the temperature is also injurious. If these plants are kept under glass, a light shading or stripping upon the glass is beneficial. Probably the best position for such plants in these three extreme months is on the north side of a row of trees, some distance away from the trees, where the plants will have the benefit of the subdued shading of the foliage. If kept under glass and shaded, abundant ventilation should always be provided. As the winter approaches, a night temperature of 60° and day temperature of 70° to 75°, with plenty of ventilation in the daytime, especially in bright weather, seem best to suit the plants. Syringing ruins the flowers, and too much moisture either in the pot or upon the foliage causes the spotting of the leaves known as "dropsy." In planting the geranium in the field or in beds, always avoid an over-rich soil. The earth should be in good condition and fertile, but must not be loaded with either chemical or animal fertilizer. Too much water at any period during the hot weather produces a rank growth, reduces the quantity of bloom and in most instances induces the spotted foliage to appear.

Another disease, which is sometimes serious, especially in extremely hot seasons accompanied with a superabundance of moisture, is "stem-rot." This frequently attacks imported stock. It is most serious in intensely hot seasons; the entire plant turns black and fades and withers away. The stem-rot occurs in varieties that have been very heavily propagated.

The insects that affect the geranium are also comparatively few. The red-spider is sometimes a serious pest in summer and is difficult to get rid of when it is once well established. The only method is to syringe the plants with an extremely fine spray, and also to pick off the leaves that are seriously affected and burn them. The green-fly is also troublesome at times, but is easily managed with the ordinary fumigation of tobacco. There is a small caterpillar that eats the foliage and sometimes proves a serious pest. If one can induce a few ground sparrows or any of the warblers, or even English sparrows, to make their home about the greenhouse, they will put a speedy end to these caterpillars. Another remedy is to go over the plants carefully and to pick the caterpillars off and destroy them. This is tedious, as it must be done frequently.

In the way of bedding geraniums, as a rule the Bruant section produces the best results, but there are a number of English and French varieties that do especially well in our hot climate. The greatest difficulty in successful geranium-culture in America is the intense heat of the summer months, chiefly July and August. Some varieties withstand the heat better than others.

2840. Leaves of various fancy-leaved geraniums.—Hortorums (×½). No. 13.

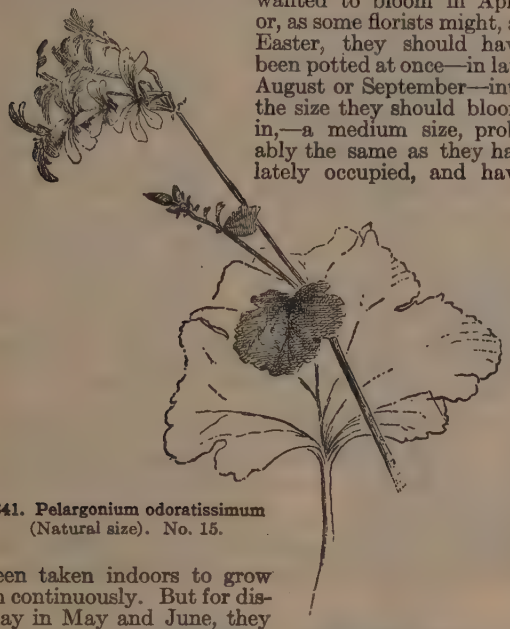
Show pelargoniums. (T. D. Hatfield.)

What are known as show pelargoniums have enjoyed a long popularity. By the general public, and by old people especially, they are known as Lady Washington geraniums. They are not so commonly grown as the so-called geraniums, chiefly on account of their limited season of bloom and the fact that they cannot endure our hot midsummer suns. Through the greater part of the summer they are liable to be neglected. They also require different treatment from geraniums, and—if skill there be—more skill in cultivation.

At the end of the blooming season, they require rest,—a season of ripening the growth already made. At this time very little water will be needed, and they may be stood out in the full sun. Only the old flower-stems may be removed. In no sense should they be cut back at this time, neither should water enough be given to encourage new growth. All the leaves should stay on until they naturally turn yellow with age, thus securing a thoroughly ripened growth. In September, one may prune them into shape, sometimes rather severely, but in any case cut out all weak and soft shoots. They should then be shaken out and repotted in a light compost, not rich, into the smallest-sized pots that will hold them, for the process of growing them on has to be gone over every season. After potting, a good soaking will be necessary, and they may be placed in a well-lighted coldframe. There is no need to keep them close; the stimulation of water, and the slight protection of a frame are usually enough to start them into new growth. No forcing will ever be needed at any season, and if the grower wished, he might keep them in a coldframe until very late in the season, so long as adequate protection against frost is afforded. They are at their best in May, and to have them in good condition, one may grow them slowly in a house averaging about

50° night temperature (slightly less in midwinter), from October onward.

After the turn of the days—in January—repot them, using now a richer compost. Give a fairly good shift, depending in part on the size of plants desired, the vigor they show, and the difference in varieties. If wanted to bloom in April or, as some florists might, at Easter, they should have been potted at once—in late August or September—into the size they should bloom in,—a medium size, probably the same as they had lately occupied, and have been taken indoors to grow on continuously. But for display in May and June, they are potted again in January, and some plants may be given another shift when extra vigor or the possible need of a few extra-large specimens demand it. They will need careful stopping. Some rubbing out of weak shoots, when they break abundantly, will help those that remain, and one may even have to do a little pruning. Stopping, however, must be discontinued as soon as the flowering stems begin to show, which is about the end of February in the writer's practice. These stems can be distinguished easily by a slightly different manner of growth. Up to this time the plants may be allowed to grow naturally; but if the gardener wants trained specimens he must begin to bend them as he wishes them to grow, as their growth speedily hardens and the plant will readily take and keep the form to which it is shaped.



2841. Pelargonium odoratissimum (Natural size). No. 15.

Water should be given sparingly through the dead of winter. February and March are the months when the most growth is made, and at this time one may stimulate them materially by the judicious use of artificial manures, which may be continued, if necessary, until they come into bloom. They are much subject to the attacks of green-fly and red-spider; and as the foliage is fairly tender and liable to injury from tobacco smoke, reliance must be placed on fluid insecticides almost wholly. The blooming season is very much lengthened by giving a slight degree of shade.

The best time to take cuttings is soon after the flowering season. Often toward the last of the season, the plants make a few "growing" shoots, and these may be taken; but off and on during the summer one can get cuttings, and any time until August will do. Cuttings taken in winter-time with a heel make pretty little plants in 4- or 5-inch pots without stopping. Cuttings taken at the usual time and grown in 6- or 7-inch pots come in handy in grouping for the front lines. It is necessary to raise a few plants every season to replace older plants which have grown too large.

New varieties are raised from seed, which is freely produced. In hybridizing it does not appear that hand-pollination has any effect, as the seedlings seldom show any particular affinity to either parent.

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I. *Lvs. on the pinnate order, although sometimes entire, usually pinnately lobed or compound.* (*Nos. 1–5*).

A. *Plant with short, more or less succulent st. and tuberous or thickened roots: lvs. pinnate or pinnately parted, long-petioled: fls. in many-fld. dense umbels, on very short pedicels; petals 5, nearly equal; stamens 5–7, one filament broad.* (*Polyáctium.*)

1. **triste,** Ait. (*Geránium triste,* Linn. *G. pastinacæfólium* and *P. villósum,* Mill.). St. or caudex very short, succulent: lvs. large, 2–3 pinnately compound, pubescent, the ultimate teeth gland-tipped: calyx-tube long and stalk-like, much exceeding the pedicel, the lobes half as long as the petals: fls. brown-yellow with dark spots.—A well-marked species, sometimes offered in the trade. It runs into several forms. The various names and synonyms suggest the divided lvs. of the umbellifers and other plants. Var. **filipendulifólium,** Sims. Caulescent: lvs. sub-bipinnatifid, the segms. oblong. B.M. 1641. Var. **daucifólium,** Harv. (*Geránium daucifólium,* Linn.), has lf.-segms. narrow-linear or linear-oblong. Var. **laxátum,** Harv., has lvs. 4-pinnate, the pinnæ stalked and ultimate segms linear.

2. **quinquevúlnerum,** Willd. Somewhat shrubby at base, sparingly branched, hirsute: lvs. 2-pinnatifid with linear toothed segms., the stipules broadly cordate and mucronate: fls. purple, scentless, the petals obovate, velvety, and pale-edged; calyx-tube as long as the pedicels, somewhat hairy, the lobes obtuse.—Thought by Sweet to be a hybrid of *P. triste* and *P. bicolor,* and so regarded by Knuth.

3. **fúlgidum,** Ait. (*Geránium fúlgidum,* Linn.). St. shrubby, densely pubescent: lvs. pinnately 3-parted, silky on both sides, the lateral segms. 3-lobed, all

2842. Pelargonium cordatum (×⅓). No. 18.

deeply toothed, the terminal lobe oblong and pinnatifid; stipules acute, broadly cordate: peduncles usually branched, many-fld.; fls. small, bright scarlet, the petals obtuse; calyx-tube conspicuously swollen at the base and again just underneath the fl., thrice as long as the pedicel, the lobes linear-obtuse; petals brilliant scarlet with dark lines.—Perhaps not now seen in its pure form, but it is probably a remote parent in various small-fld. scarlet geraniums. Cult. in England as early as 1723.

2843. Pelargonium cordatum. Leaves often are much more cordate at base. (×½)

aa. *Plant either succulent, or shrubby and slender, the root branching: lvs. mostly cut or decompound (rarely entire), pinnately formed: petals nearly equal, narrow-spatulate; fertile stamens 7. (Ligulària.)*

4. **exstipulàtum,** L'Her. Shrubby, canescent: lvs. round-ovate, small, velvety, about 3-lobed, the lobes cut-toothed or lobed, the lateral lobes small; stipules adnate and very minute: peduncles slender and few-fld., with very small bracts; fls. small, white, with short spatulate petals.—Lvs. about ½in. across, with odor of pennyroyal. Appears not to be in the trade, at least not in a pure form.

5. **artemisæfòlium,** DC. (*P. artemisioìdes,* Hort.). Suffruticose, erect and slender, glabrous, nearly simple: lvs. long-petioled, 2-pinnately parted, nearly glabrous, the segms. linear-filiform and channeled; stipules free, subulate: peduncles long, 2–3-fld.; fls. white or blush; calyx-tube swollen at base, 2–3 times as long as the lance-cuspidate segms., not ribbed; petals about twice longer than calyx-segms. or sepals, spatulate or obovate, rounded at apex, more or less veined and spotted at base. G.M. 54:629.

II. *Lvs. on the palmate order, although sometimes entire, usually lobed (Nos. 6–31).*

A. *Plant shrubby, or sometimes succulent and jointed: lvs. palmately nerved or lobed; stipules persistent and either rigid or membranaceous: petals 4 or 5, the two uppermost broadly obovate and long-clawed, very much longer than the lower ones; fertile stamens 7. (Jenkinsònia.)*

6. **Endlicheriànum,** Fenzl. Herbaceous perennial, 1–1½ ft. high, noteworthy in being W. Asian: st. little branched, somewhat fleshy, terete, pubescent: basal lvs. more or less numerous, glaucous, cordate-orbicular, broadly and obscurely 5-lobed, lobes crenate-dentate, with whitish appressed hairs; stipules lanceolate, hairy: fls. many in the umbel, rose-colored; spur of calyx exceeding pedicel; upper 2 petals 2–3 times longer than sepals. Asia Minor, Syria. B.M. 4946. G.C. III. 30:149. Gn. 60, p. 185. G.M. 52:214. H.F. II. 7:71.

aa. *Plant weak and usually trailing, the branches slender and not succulent: lvs. thick or fleshy and glossy, lobed, mostly marginally peltate: infl. umbellate; good stamens 7, 2 upper shorter; petals unequal. (Dibràchya.)* Ivy-leaved Geraniums.

7. **peltàtum,** Ait. (*Geránium peltàtum,* Linn.). Fig. 2839. Plant with slender-jointed more or less zigzag angled sts. which are glabrous or very nearly so (except at the top): lvs. glabrous or minutely pubescent, fleshy, the petiole inserted just inside the margin at the base, about 5-nerved and with 5 short wide mostly obtuse main lobes and often with smaller minor lobes or angles and notches, the margins very entire: peduncle very long, originally 4–8-fld., but now bearing many greatly modified fls., the calyx-tube slender and stalk-like, often longer than the pedicel and 2–3 times longer than the pointed nerved and mostly ciliate lobes; petals twice as long as calyx-lobes, red to white or purplish, the 2 upper ones erect and purple-blotched or striped, the 3 lower ones usually smaller and not marked and separated from the upper as if the fl. were 2-lipped. B.M. 20.—Parent of the ivy-leaved geraniums, now much improved and varied. Prized for baskets. There are forms with double fls. and colors of various kinds It is a most desirable plant and very floriferous in most of the garden sorts. In the wild there are the following forms: Var. **glàbrum,** Harv. Calyx and foliage glabrous: fls. purplish pink. Var. **scutàtum,** Harv. (*P. scutàtum,* Sweet). Calyx villous: lvs. glabrous. Var. **clypeàtum,** Harv. (*P. clypeàtum,* Steud.). Calyx and lvs. soft-pubescent. **P. latéripes,** L'Her. (*P. hederæfòlium,* Salisb.), has lvs. cordate, not peltate.

aaa. *Plant woody or herbaceous, with slender sts.: lvs. very long-petioled, palmately 5–7-nerved, lobed or cut; stipules free, ovate or lanceolate: petals unequal, the two upper ones broad; fertile stamens 7, unequal. (Eumórpha.)*

8. **grandiflòrum,** Willd. Shrubby, glabrous and glaucous: lvs. long-stalked, strongly 3–7-nerved from the top of the petiole, deeply 5–7-lobed, the lobes broad

2844. Pelargonium angulosum. From Dillenius' figure in 1732. (One-half the size of the original plate.) No. 20.

and sharp-toothed, the stipules ovate and mucronate: fls. about 3 on each peduncle, the stalk-like calyx-tube 3–4 times as long as the lanceolate segms., the obovate white petals (upper 2 with red lines) 3 times as long as calyx-segms.—A handsome and distinct species, probably not now in cult. in its pure form. Intro. to England in 1794.

9. **multibracteàtum,** Hochst. Somewhat shrubby below, 1–2 ft., thinly hairy but becoming glabrous: lvs. palmately about 7-cut or -lobed, the segms. broadly oblong or ovate, serrate or crenate, more or less hairy, 2–5 in. across; stipules about ½in. long, ovate to elliptic.: peduncles long, 6 in. to 1 ft., bearing 6–10-fld. umbels; fls. whitish or white, on pedicels about 1½ in. long; petals obovate-spatulate, entire, twice longer than the narrow sepals. Trop. Afr. G. M. 54:628.

10. **transvaalénse,** Knuth (*P. Thórncroftii,* Hort.). Erect, 16 in. to 2 ft. in bloom, the st. terete and soft-hairy, sparingly branched: lvs. few, cordate-angular in outline, 5–7-lobed, the lobes triangular or rhomboid, serrate-dentate, the petiole as long as blade or longer; stipules broadly ovate, acute: umbels many, corymbose at apex of st.; fls. nearly sessile, rose-colored or carmine-rose, or pale pink, 1½ in. across vertically, the 2 larger petals strongly narrowed at base and emarginate at top, the 3 smaller ones paler and retuse or emarginate. Transvaal, 3,000 ft. altitude. G.C. III. 55:103.

2845. Domesticum pelargonium. One of the Show or Lady Washington pelargoniums (×⅓). No. 21.

AAAA. *Plant with thick succulent branches, and strong fishy odor, shrubby in the wild and in warm countries: lvs. obovate, orbicular or reniform, shallowly if at all lobed: infl. umbel-like; good stamens 7, the 2 upper ones short; petals typically all of one color.* (*Cicònium.*) FISH or BEDDING GERANIUMS.

11. **zonàle,** Willd. (*Geràniun zonàle,* Linn.). ZONAL or HORSESHOE GERANIUM. Shrubby, becoming woody at the base even in pots, the young branches succulent and somewhat hispid: lvs. round-cordate, glabrous or pubescent, long-stalked, usually with a zone or horseshoe mark of deeper color on the upper surface, the margin crenate-dentate, with several very shallow rounded lobes; stipules broad, cordate-oblong: peduncles long, the many fls. nearly sessile; calyx-tube glabrous or nearly so, 4–5 times longer than the lanceolate segms.; petals separated, narrow-wedge shape or spatulate.—S. Afr., "among shrubs and on hillsides. . . . The fls. vary from scarlet and crimson through all shades of red to pure white."—Harvey. Probably originally red. *P. zonale* was intro. into England in 1710. Linnæus described it in 1753 as *Geranium zonale,* founding the species on previous descriptions, not on specimens. It is probable that the species had been considerably modified by domestication when Linnæus wrote. There seems to be no accepted early portrait of the original form of the plant.

12. **înquinans,** Ait. (*Geràniun înquinans,* Linn.). FISH GERANIUM. Fig. 2836. Plant more velvety than *P. zonale,* sometimes more or less viscid, the lvs. not zoned: lvs. long-petioled, orbicular-reniform, crenate, only obscurely many-lobed, velvety and somewhat viscid: calyx-tube densely glandular and viscid, 3–4 times longer than the lanceolate segms.; petals broadly obovate, scarlet, but now varying to lighter colors.—"Among shrubs and on hillsides." This is the *Geranium inquinans* of Linnæus, who founded the species on previous descriptions. One of the descriptions (Dillenius, in "Hortus Elthamensis," 1732) was accompanied by a picture, and this picture, reduced, is reproduced in Fig. 2836. It will be seen that even in that early day the species had varied into a form with short-notched petals and short pedicels. Intro. into England in 1714. Said by Harvey (1859–60) to be the parent of most of the "scarlet geraniums" of English gardens.

13. **hortòrum class.** COMMON FISH or BEDDING GERANIUM. Fig. 2840. The common geranium in great numbers of forms, derived from the variation and probably the blending of *P. zonale* and *P. inquinans* (and possibly others) in more than a century of careful selection. The original species are not now in cult. Practically all garden geraniums have the zonal marks on the lvs., or bands, or a central blotch of variegation. Some of them have intermingled colors of green, white, and red on the same lf. Some are "silver-banded" and some "gold-banded." (See Fig. 2840.)

AAAAA. *Plant with a short and thick more or less fleshy st. or caudex, from which arise slender branches, the lvs. long-stalked and reniform or cordate and obscurely lobed: stamens 6 or 7.* (*Cortusìna.*)

B. *With spine-like stipules.*

14. **echinàtum,** Curt. Fleshy caudex armed with persistent spine-like stipules: lvs. long-petioled, white-tomentose, cordate-ovate and obtuse, about 3–7-shallow-lobed, the lobes rounded and crenulate: peduncle long and branched; fls. white, with a spot near the center (varying to all purple), the petals notched; calyx downy, the tube several times longer than the lobes. B.M. 309. G.C. III. 46:245. J.H. III. 49:71. G.W. 15, p. 203.—Now and then advertised. The fls. are said to change color during the day; and the color may be shades of purple. It is offered in S. Calif.

BB. *Without spines.*

15. **odoratíssimum,** Ait. (*Geràniun odoratíssimum,* Linn.). NUTMEG GERANIUM. Fig. 2841. Plant lax, the sts. ascending or more or less tortuose: st. or caudex very short, throwing up many slender and weak soft-pubescent branches: lvs. very long-stalked, soft, round-cordate and very obtuse, the blade 1 in. or somewhat more in length and broader, obscurely 3- or more-lobed, the margins dentate-crenate; petioles 3–4 in. long and shorter above; stipules triquetrous or broadly ovate, usually connate: peduncles long and borne opposite the lvs., 5–10-fld.; fls. pedicelled, white or whitish; calyx more or less pubescent, the spur ¼in. or less long, the sepals or lobes lanceolate, acute, with membranaceous margins; petals twice or less longer than calyx-lobes, about ½in. long, linear-spatulate, rounded at apex.—

Apparently a common plant., cult. for its pleasant-scented foliage. The plant known to gardeners as *P. fragrans* is either this species or a close derivative from it. Harvey refers *P. fragrans*, Willd., to *P. exstipulatum;* but Knuth separates it as follows:

16. **frágrans,** Willd. (*P. odoratíssimum* × *P. exstipulàtum*, Sweet. *Geránium frágrans*, Poir. *G. odoratíssimum eréctum*, Andr.). Plant strict, the branches more or less erect: scarcely suffruticose, the sts. more or less squarrose-branched, leafy: lf.-blade to 1 in. long and nearly as wide, obtuse-cordate, the margin crenate or crisped, pubescent, the upper lvs. sessile and the lower long-petioled; stipules triquetrous, free: fls. nearly sessile, whitish, and more or less red-veined; calyx pubescent, the spur ¼–½in. long; sepals or calyx-lobes lanceolate or ovate-lanceolate, acute; petals twice or more longer than calyx-lobes, about ½in. long, much narrowed at base, the apex rounded.

AAAAAA. *Plant woody, not succulent, much branched, the foliage often scented but not "fishy:" lvs. various, but not pinnately parted: infl. paniculate or umbel-like; 2 upper petals longer and broader than the others, marked; good stamens 7 or 6.* (*Pelárgium.*)

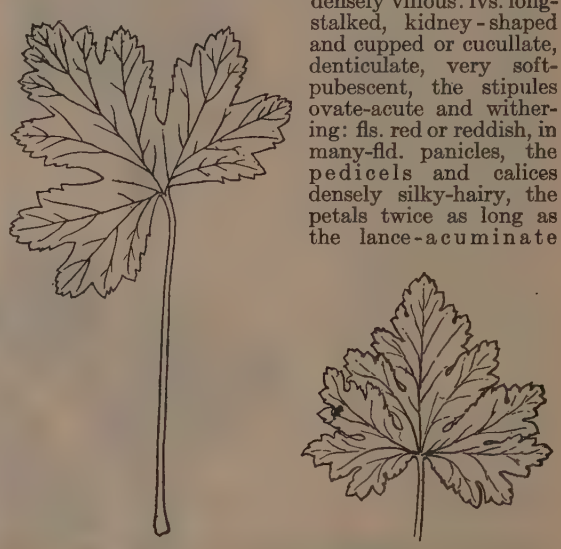
B. *Lvs. not distinctly lobed, though often angled, mostly oval or ovate and cordate* (*exceptions in P. domesticum*).

17. **betulínum,** Ait. (*Geránium betulínum*, Linn.). Erect and shrubby, downy on the young growths: lvs. subglabrous, stalked, oval or ovate, obtuse or not prominently acute, rounded or truncate at base, the stipules sharp and deciduous: fls. light purple, the broad upper petals with dark streaks; petals 2–3 times longer than lanceolate sepals, nearly equal, 1 in. or more long, cuneate-obovate, rounded and entire at apex. B.M. 148.—A handsome and neat plant.

18. **cordàtum,** L'Her. Figs. 2842, 2843. Shrubby and erect, villous or nearly glabrous: lvs. long-stalked, cordate-acute, denticulate and sometimes obscurely lobed; stipules with broad base but subulate, deciduous: peduncles usually branched, the pedicels and calyx soft-hairy; fls. purplish, the petals twice as long as the sepals, the two larger nearly or quite 1 in. long, cuneate-obovate, the apex rounded and entire. B.M. 165 (as *P. cordifolium*). G.M. 54:627.—Distinguished from *P. cucullatum* by its flat cordate acute lvs. It is a handsome plant in bloom. The plant in cult. as *P. cordatum* (Fig. 2843), has lvs. more truncate at the base than the descriptions and old pictures call for, although on some shoots the lvs. may be typically cordate. In the wild, the plant runs into several forms, distinguished largely by pubescence.

2846. Pelargonium quercifolium. Leaves often more deeply lobed (×¼). No. 25.

19. **cucullàtum,** Ait. (*Geránium cucullàtum*, Linn.). Tall and shrubby plant, much branched, softly and densely villous: lvs. long-stalked, kidney-shaped and cupped or cucullate, denticulate, very soft-pubescent, the stipules ovate-acute and withering: fls. red or reddish, in many-fld. panicles, the pedicels and calices densely silky-hairy, the petals twice as long as the lance-acuminate sepals, the two larger ones about 1 in. long and ½in. broad, rounded or retuse at apex, red with darker veins. —"Very common round Capetown and in the western districts, where it is often used as an ornamental hedge-plant."—Harvey. Known in England from 1690, and the parent, with *P. angulosum* and probably others, of the fancy or show pelargoniums of gardeners. Probably not known in cult. in its pure or original form.



2847. Forms of leaf of Pelargonium graveolens (×½). No. 26.

20. **angulòsum,** Ait. (*Geránium angulòsum*, Mill.). Fig. 2844. Differs from *P. cucullatum* in its harsh-hairy covering and rigid angled lvs.: the lvs. are short-stalked, truncate or broadly cuneate at base, with 3–5 shallow angular and acute short rigid lobes: panicles with fewer-fld. umbels; pedicels and calices densely rough-hairy; petals twice as long as the acuminate sepals.—Linnæus included this plant in his *Geranium cucullatum*, but Aiton separated it as a distinct species. Linnæus' *cucullatum* was founded on literature. One of his sources of information was Dillenius' "Hortus Elthamensis," with a picture; but this picture, which is reduced in Fig. 2844, is what is now known as *P. angulosum*. This is one of the species which has entered largely into the pelargoniums of florists. Has been cult. since 1724.

21. **domésticum class.** Common, Show, Fancy, and Lady Washington Geraniums (or Pelargoniums). Fig. 2845. This name distinguishes the garden type of florist's and fancy pelargonium. The race is said to be derived chiefly from *P. cucullatum*, *P. angulosum*, and *P. grandiflorum*, but the writer can see little evidence of the blood of *P. grandiflorum*. It seems to be nearest to *P. cucullatum*, having the cucullate or disk-shaped not lobed lvs. and mostly the soft-hairiness of that species. In many of them, however, the lvs. are distinctly angle-lobed, suggesting *P. angulosum*. *P. domesticum* is meant to comprise the whole range of garden forms of the Show or Lady Washington pelargoniums. The name will enable one to talk about these garden plants with precision. To many of these garden forms specific botanical names have been given, so that

P. domesticum is not the first name that has been applied in this group, but the writer is not aware that any collective or group name has been given. Sweet, in particular, has given Latin names to various forms. These old names, however, apply to particular historical forms, and it would be violence to enlarge their application to cover the entire group, and it would be difficult to choose any one of them as more applicable, under botanical rules, than others. It is probably also inaccurate to call this garden form either *P. cucullatum* or *P. angulosum*.

2848. Pelargonium Radula. (×½)

BB. *Lvs. cordate-lobed, soft and velvety.*

22. **tomentòsum,** Jacq. Plant rather thick- and soft-stemmed, the branches becoming several feet long, white-hairy all over: lvs. very long-stalked, very broadly cordate-ovate or hastate-cordate at base, 3–5–7-lobed and small-toothed, soft and velvety on both surfaces; stipules ovate-acuminate, withering: fls. small, white, with red near the center, in a lax panicle, the pedicels many times longer than calyx-tube; 3 lower petals longer than sepals. B.M. 518.—Scent like peppermint, and for that reason it is somewhat grown. The sts. are long and straggly.

BBB. *Lvs. sharply 3–7-lobed and sharply toothed or serrate.*

23. **capitàtum,** Ait. (*P. Drúmmondii,* Turcz. *Geránium capitàtum,* Linn.). Sts. weak and trailing, but suffruticose at base, with long white hairs: lvs. long-stalked, cordate, 3–5-lobed and the lobe rounded and toothed; stipules broad-cordate, pointed: peduncles longer than the lvs., densely many-fld., the fls. sessile, rose-purple, with calyx-tube much shorter than the hairy mucronate calyx-lobes. B.M. 7346.—Plant rose-scented, but not in general cult. in its pure form; fls. in dense many-fld. heads.

24. **vitifòlium,** Ait. (*Geránium vitifòlium,* Linn.). Erect, more or less woody, densely hairy and villous: lvs. long-petioled, cordate at base, 3-lobed, the lobes shallow and very obtuse and rounded, dentate; stipules broad-cordate: peduncle longer than lf., simple and densely many-fld.; fls. sessile, small, purple; calyx-tube not half so long as the hairy aristate segms.; petals twice longer than sepals, 2 of them larger and purple at base and the other 3 smaller and unicolored.—Differs from *P. capitatum* in erect habit and lvs. less deeply cut.

BBBB. *Lvs. deeply several to many-lobed, with narrow divisions, rather rough or stiff, strong-scented.* Rose Geraniums.

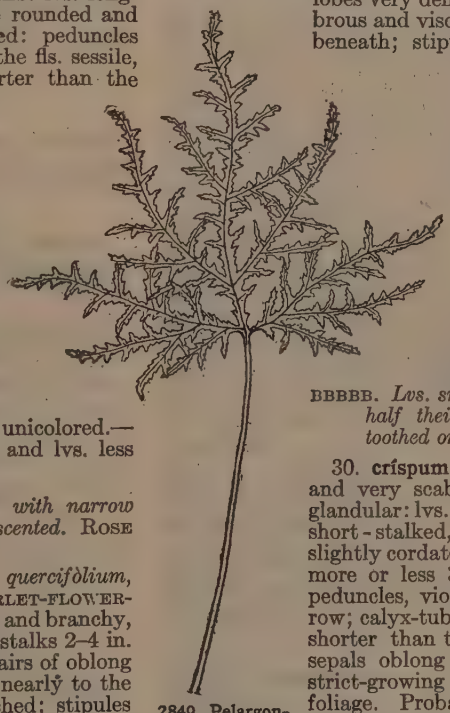
25. **quercifòlium,** Ait. (*Geránium quercifòlium,* Linn. f.). Oak-leaved Geranium. Scarlet-flowering Rose Geranium. Fig. 2846. Shrubby and branchy, somewhat hairy and glandular: lvs. with stalks 2–4 in. long, cordate-ovate in outline, with 2–3 pairs of oblong side lobes (lvs. pinnatifid), which extend nearly to the midrib and are again toothed and notched; stipules small, 2 pairs at each node (or bifid): fls. few to several, rather small, red or purplish, in umbels and with short pedicels, the bracts laciniate; sepals elliptical and mucronate, half as long as the petals.—A rather common greenhouse plant, the lvs. often with a dark spot, and not agreeably scented.

26. **gravèolens,** L'Her. (*Geránium gravèolens,* Thunb.). Fig. 2847. Much like the last, but lvs. longer-petioled and palmately 5–7-lobed or parted, the broad lobes flat and pinnatifid into many mostly obtuse lobes; stipules cordate-acute: fls. many, on mostly long peduncles, pink or light purple, small, the calyx hairy and nearly sessile, the calyx-lobes half as long as the petals.—This is one of the commonest forms of rose geranium, a leafy plant with a rather heavy balsamic odor. A lf. is well depicted in Fig. 2847. There are many derivatives from it.

27. **hìspidum,** Willd. (*Geránium hìspidum,* Linn. f.). Woody at base but herbaceous upward, 2–3 ft., much branched, hairy and glandular: lvs. long-stalked, hispid on both surfaces, 4–5 in. across, 5–7-lobed, the lobes acuminate and unequally sharp-toothed and more or less lobulate; stipules cuspidate: fls. panicled, small, white to carmine; calyx-tube shorter than pedicels, the segms. lance-acuminate; petals about twice longer than sepals.—An old cult. plant.

28. **Rádula,** L'Her. (*P. multífidum,* Salisb. *Geránium Rádula,* Cav. *G. revolùtum,* Jacq. f.). Fig. 2848. Differs from *P. graveolens* in the narrower divisions with revolute margins of the lvs.: the lvs. are deeply palmately parted, the lobes narrow linear and pinnatifid, all rough-hispid on the upper surface and soft-pubescent beneath: fls. small, pale purple, with dark streaks, the peduncles short and hispid and about 4–5-fld., fls. pedicellate; calyx-tube short, the lobes or sepals setose and glandular. B.M. 95.—Does not appear to be in the trade in a pure form, but the narrow-lvd. rose geraniums are probably hybrids between this and *P. graveolens*.

29. **denticulàtum,** Jacq. (*Geránium denticulàtum,* Poir.). Fig. 2849. Much like *P. Radula,* but the lf.-lobes very denticulate and flat: lvs. glabrous and viscid above, somewhat hispid beneath; stipules ovate-lanceolate: fls. 3–4, subsessile, on short hairy peduncles, lilac or rose-purple, the 2 upper petals toothed or 2-lobed and with dark streaks; calyx-tube short, the segms. or lobes oblong, mucronate and villous.—Plant weaker than *P. Radula.* It has a balsamic odor. Perhaps it has entered into the garden forms of rose geranium. Intro. into England in 1789.



2849. Pelargonium denticulatum. (×⅔)

BBBBB. *Lvs. small, round-cordate, 3-lobed half their depth and the margins toothed or jagged.*

30. **crìspum,** L'Her. Much branched and very scabrous or rough, shrubby, glandular: lvs. 2-ranked, small and rigid, short-stalked, cuneate, truncate or slightly cordate at base, coarsely toothed, more or less 3-lobed: fls. 2–3 on short peduncles, violet, the lower petals narrow; calyx-tube glandular and roughish, shorter than the pedicels, the lobes or sepals oblong and acuminate.—A neat strict-growing plant with lemon-scented foliage. Probably not in general cult. now in a pure form. Variable in the wild. Var. **latifòlium,** Harv., Figs. 2850,

2851, has lvs. twice the size of the type, and is a worthy plant.

31. **Limòneum,** Sweet. LEMON GERANIUM. Lvs. larger than in the last, not 2-ranked, soft: fls. purple and lilac.—A garden hybrid, *P. crispum* probably being one of its parents. There is a form with variegated lvs. Sometimes known to gardeners as *P. odoratum.* It is a neat and worthy plant, and showy when in flower. It has a lemon or balm scent. The variety known as Lady Mary is of this group.

2850. Pelargonium crispum var. latifolium. (×¼)

2851. Pelargonium crispum var. latifolium. A lower leaf. (×½)

Any number of Latin-formed names of Pelargonium may appear in the trade, for the hybrids and varieties are numerous and not always readily referable to the species as forms or varieties.—*P. Blandfordiànum,* Sweet (P. graveolens×P. echinatum). A good grower, shrubby, the branches roughish pubescent: lvs. flat, 7-lobed, the lower lobes deeply lobed again, all bluntly toothed, strong-scented: fls. white or pale blush, the upper petals with 2 red spots. G.M. 54:626.—*P. brevipétalum,* N. E. Br.=P. polycephalum.—*P. Cotyledònis,* L'Her. Lvs. evergreen, at base of plant, cordate, 3 in. across, entire or nearly so, whitish beneath, wrinkled above: fls. on scape-like peduncles above the lvs., ¾in. across, white. St. Helena. Requires little heat. G. 35:235.—*P. inæquilobum,* Mast. Allied to P. multibracteatum. Pilose: lvs. 3-lobed, the terminal lobe ovate-lanceolate and again lobed in middle, margins toothed: fls. greenish yellow with purple in base. Trop. Afr. Perhaps same as P. Fischeri, Engl.—*P. lutèolum,* N. E. Br. A very recent species from S. Afr.: herb with bulbous rootstock: lvs. 4 or 5, all radical, twice ternately divided, ½–1¼ in. long and broad, the ultimate segms. linear: petals nearly ½in. long, pale yellow with 2 red lines at base.—*P. polycéphalum,* E. Mey. (P. brevipetalum, N. E. Br.). St. thick and fleshy, ovoid, rising very little above the ground, short-branched at top: lvs. in a rosette, bipinnately divided, ovate-oblong in outline, thick and fleshy; pinnæ 5 or 6 pairs, pinnatisect: fls. pale yellow, the petals shorter than sepals. Cape Colony.—*P.ròseum,* Hort., is a name of no botanical standing, applied to some of the common forms of rose geranium of the P. Radula group.

L. H. B.

PELECÝPHORA (Greek, *hatchet-bearing;* from an alleged resemblance in the tubercles). *Cactàceæ.* HATCHET CACTUS. Two species closely allied to Mammillaria; sometimes seen in cactus collections.

Stems globular, short-cylindric or clavate, small, often cespitose: tubercles strongly compressed from the sides; areoles very long and narrow, bordered on each side by a row of about 20 very short, appressed comb-like spines: fr. naked.

asellifórmis, Ehrb. (from a fancied resemblance to Asellus, the wood-louse). Juice watery: tubercles ashy green, more or less deeply grooved to the woolly axil; spines not projecting beyond the margin of areole: fls. purple with paler sepals: fr. near the center, red. Nuevo Leon and San Luis Potosi, Mex. I.H. 5:186. Var. **cóncolor** has pure purple fls. B.M. 6061.

pectinàta, Schum. Juice milky: tubercles bright green with naked axils; spines projecting a little beyond the margin of tubercle: fls. yellow, lateral. Oaxaca, Mex.

KATHARINE BRANDEGEE.

PELIOSÁNTHES (Greek, *livid flowers,* referring to the flowers of certain species). *Liliàceæ.* Plants with short horizontal rhizomes, long-petioled radical lvs. and fls. borne in spikes or simple racemes: perianth-tube above the ovary, short, broad, campanulate; limb spreading-rotate with 6 subequal, broad, obtuse lobes; stamens 6 with very short filaments; ovary inferior, 3-celled; stigma 3-lobed; cells with 2 ovules erect from the base, anatropous; seeds oblong or globose, fleshy. About 12 species from India, the E. Indies, and Malayan Peninsula. The following have occasionally appeared in cult: *P. Tèta,* Andr. Lvs. 2–7; petiole variable in length: scape naked or with a few scales above and large membranous sheaths at the base; raceme 6–12 in.; bracts 1–3 to every fascicle of fls., pedicels short; fls. ¼–⅓in. diam., purplish or bluish green: seeds as large as a pea, olive-blue. Himalaya, Malaya. B.M. 1302. The var. *Mantegazziàna,* Pampanini, is a form with less rigid lvs. than the type. Malaya. *P. violàcea,* Wall., has the habit of *P. Teta* and fls. of the same size and color but solitary in the bracts: seeds ⅔in. long, oblong. Himalaya, Burma. Var. *Clárkei,* Baker, differs from the type in having more conspicuous transverse nervules and a darker purple fl. Assam and Malaya. B.M. 8276. Cult. in botanic gardens in the tropical house.

F. TRACY HUBBARD.

PELLÆA (Greek, *pellos,* dusky; from the usually dark-colored leaf-stalks). *Polypodiàceæ.* Small rock-loving ferns thriving best on limestone rocks.

Sori at the ends of free veins forming a mostly continuous marginal band around the segms. and covered by the more or less changed margin of the segms. The species are perhaps 40 or more, widely scattered in many countries. Some of them are glasshouse subjects and others are hardy.

A. *Lvs. simply pinnate.*

B. *Lfts. 4–5 pairs.*

Prínglei, Dav. Lvs. with 4–5 pairs of large triangular hastate stalked lfts. 1 in. or more across either way: sorus forming a wide marginal band. Mex.

BB. *Lfts. 5–8 pairs.*

Brídgesii, Hook. (*Platylòma Brídgesii,* J. Smith). Lfts. subsessile, orbicular or subcordate, 4–5 lines long: sori confluent in a broad intramarginal band. Calif.

BBB. *Lfts. 20–40.*

rotundifòlia, Hook. Fig. 2852. Lfts. mostly short-stalked, oblong or roundish, entire, obtuse. New Zeal.

falcàta, Fée (*Platylòma falcàtum,* J. Smith). Lfts. nearly sessile, lanceolate or lanceolate-oblong, mucronate and often slightly falcate: sori in broad lines. India to Austral. and New Zeal.

2852. Pellæa rotundifolia. (×⅙)

AA. *Lvs. bipinnate.*

B. *Pinnæ formed of 3 sessile lfts.*

ternifòlia, Link. Lvs. 6–12 in. long on strong dark chestnut stalks, narrow, with 6–12 opposite pairs of pinnæ; lfts. closely rolled together, linear. Trop. Amer.

BB. *Pinnæ (at least the lower ones) of more than 3 lfts.*

mucronàta, Eaton (*P. Wrightiàna,* Hook.). Lvs. 3–6 in. long, 1–3 in. wide, deltoid; pinnæ with several linear-oblong pinnules on each side ¼in. long, with inrolled edges and a sharp mucronate point. Texas to Calif.

atropurpùrea, Link. Lvs. 4–12 in. long, 2–6 in. wide, lanceolate to ovate-lanceolate, with several pinnules which are sessile, auricled or heart-shaped at the base, the broad line of sporangia nearly hiding the narrow marginal indusium. E. Amer., to the Rocky Mts.

2853. Pellæa viridis. A good greenhouse fern, likely to be known to gardeners as P. hastata.

AAA. *Lvs. at least tripinnatifid.*

B. *The lvs. triangular-deltoid, with narrow ultimate divisions.*

dénsa, Hook. Cliff Brake. Lvs. 2–3 in. long, 1–1½ in. wide, on slender brown stalks; segms. linear with inrolled edges sharp-pointed: indusium permanently covering the sori. Pacific N. Amer., and eastward to Wyo.

BB. *The lvs. elongate, ovate, or lanceolate.*

andromedæfòlia, Fée. Lvs. 6–12 in. long, 3–6 in. wide; ultimate divisions 1½–2 lines long, linear-oblong, with inrolled edges. Calif.—Sometimes known as the coffee fern.

víridis, Prantl (*P. hastàta,* Link). Fig. 2853. Lvs. 6–24 in. long, 6–12 in. wide; ultimate divisions ovate or lanceolate, 1–2 in. long, nearly sessile: sori in a narrow marginal line. E. and S. Afr. Small lvs. are sometimes only bipinnate. Very commonly used in small ferneries.

P. Stélleri, Beddome (P. gracilis, Hook.), a rare membranous species of the eastern states, is more closely allied to the genus Cryptogramma, to which Prantl has referred it.

L. M. Underwood.

PELLIÒNIA (J. Alphonse Pellion, officer in Freycinet's voyage around the world). *Urticàceæ.* Two choice tender creeping foliage plants of this genus are cultivated, suitable for baskets and for the borders of greenhouses under the benches.

Herbs, often creepers, rarely subshrubs from Trop. and E. Asia and the Pacific Isls.: lvs. alternate, 2-ranked, unequal at the base, entire or serrate: fls. monœcious or dicœcious, mostly in dense cymes; perianth-segms. 5, rarely 4, in fr. sometimes unchanged but usually increased and investing the fr. —Species 15–20. The cult. species require warm temperature and moist atmosphere. Prop. by cuttings and division. One of the species was once advertised as a Peperomia.

2854. Toad-flax—Linaria. Showing normal flowers above and an abnormal or peloric flower beneath.

Daveauàna, N. E. Br. Prostrate, 1–2 ft. long, the sts. succulent and creeping below, the tips pubescent: lvs. 1–2½ in. long, sessile, obliquely oblong or orbicular, crenate and obtuse at tip, dark bronzy olive-green more or less flushed violet or red, with a fern-like figure of light green down the middle of the lf., the figure being narrowly oblong and crenate. This figure is sometimes absent from some of the lvs. The lvs. are more acuminate than in the next. Burma to Cochin-China. R.H. 1880:290 (as *Begonia Daveauana,* a charming picture). I.H. 29:472.

púlchra, N. E. Br. Practically glabrous, with creeping fleshy sts. tinged purplish: lvs. obliquely oblong and very obtuse, dull blackish along the midrib and veins, the inter-spaces being light green, the under surface pale purplish. Cochin-China. I.H. 30:479. A.G. 15:4.

Wilhelm Miller.
L. H. B.†

PELORIA (Greek for *monster*). A term applied to the phenomenon when usually irregular flowers, such as those with some of the petals or sepals spurred or saccate, develop all the parts of each set alike, thus becoming radially symmetrical. The case was observed by Linnæus in *Linaria vulgaris,* Fig. 2854, and the term peloria was given by him. Flowers often become peloric on account of changes in their relations to light, but other causes certainly contribute. A reverse change, by which radial flowers become zygomorphic, occurs in many Compositæ when the corollas of disk-florets become strap-shaped, as in the cultivated asters and chrysanthemums. Sometimes, on the contrary, all spurs fail to develop

2855. Normal columbine flower with spurs present.

(Figs. 2855, 2856.) Peloric forms have been of little significance in horticulture. See Keeble, Pellew and Jones on inheritance of peloria in foxgloves, "New Phytologist," Vol. IX, page 68 (1910).

PELTÁNDRA (Greek, referring to the peltate anthers). *Aràceæ*. Arrow Arum. Stemless herbs, being excellent subaquatic plants, their large thick sagittate leaves always adding variety and interest to margins of ponds and to bog-gardens.

Leaves glossy, arrow-shaped, arising from strong underground parts: fls. monœcious and naked, the staminate ones on the upper part of the long spadix, the anthers sessile and imbedded and opening by terminal pores, the 1-loculed ovaries attended by 4 or 5 scale-like bodies or staminodia: spathe usually exceeding the spadix: fr. a 1–3-seeded, mostly leathery berry, borne in large globose clusters. —Two species in E. Amer. which have been much confused. Single specimens or clumps are usually most prized. Peltandras are easy to colonize.

2856. Peloria.—Lack of spurs in the columbine. (Compare Fig. 2855.)

virgínica, Kunth (*P. undulàta*, Raf.). Lvs. narrow-sagittate, the basal lobes long and nearly or quite acute: spathe 4–8 in. long, green, convolute around the spadix for its whole length; sterile part of the spadix much longer than the pistillate part: fr. green, 1–3-seeded. In shallow pools or bog margins, New England to Fla. and west. A.G. 14:111.—The root is composed of thick cords or fibers.

sagittæfòlia, Morong (*P. álba*, Raf.). Lvs. broader the basal lobes short: spathe white, the upper part expanded and calla-like; sterile part of spadix little, if any, longer than pistillate part: fr. red, 1-seeded. Va., south.—Root tuberous. L. H. B.

PELTÀRIA (Greek, *small shield*, referring to the roundish form of the pod). *Cruciferæ*. Tall glabrous herbs with entire cauline lvs., sagittate-cordate at base: fls. white, subcorymbose; fruiting pedicels spreading or recurved, filiform, without bracts; sepals broad; stamens free, not toothed: silique orbiculate or obovate, 1-celled, indehiscent, much compressed, reticulate. About 4 species, natives of S. Eu., Asia Minor, Syria, and Persia. *P. alliàcea*, Jacq. About 1 ft. high, with entire petals, smooth flat pods, and sagittate-clasping lvs. This species has the odor of garlic, as its name would suggest. E. Eu. Offered in the trade as a cut-fl. R.H. 1908, p. 131.

PELTIPHÝLLUM: *Saxifraga*.

PELTÓPHORUM (Greek, *shield* and *bearing*, referring to the peculiar stigma). *Leguminòsæ*. A few species of splendid tropical trees, belonging to the same tribe as the gorgeous Poinciana and Cæsalpinia.

Flowers yellow; petals 5, roundish; stamens 10, free, declinate; filaments pilose at base; ovary sessile, 2- to many-ovuled: pod flattish, indehiscent, with narrowly winged margins. Peltophorum is distinguished from Cæsalpinia and Poinciana by the valvate calyx-segms. of the latter, while the two former have their calyx-segms. strongly imbricated. The peculiar stigma of Peltophorum readily distinguishes it from its close allies, Cæsalpinia and Hæmatoxylon (logwood). These genera represent a type of structure widely different from the northern pea-shaped fls., as they have 5 distinct petals which are all about the same size and shape. There is a fine colored plate of a Peltophorum in Blanco's "Flora of the Philippines," where the golden fls. are nearly 1½ in. across, a dozen of them in each raceme, and 4 racemes uniting to form a great panicle. Peltophorums have the Mimosa type of foliage. Each lf. of *P. inerme* has 8–10 pairs of pinnæ, and each pinna 10–20 pairs of lfts. The generic name is preoccupied by Peltophorus, a genus of grasses, and is consequently replaced by some recent authors by the name Baryxylum.

A. *Lfts. ½–¾in. long, 10–20-pinnate.*

inérme, Naves (*Cæsalpinia inérmis*, Roxbg. *P. ferrugíneum*, Benth. *Barýxylum inérme*, Pierre). Tree, attaining 100 ft., taking its specific name from the dense rusty tomentum which covers the young branches, petioles, and infl.: lvs. 8–10-pinnate, oblong, obtuse or retuse, oblique at the base, ½–¾in. long, shining above, rusty tomentose beneath: racemes 5–6 in. long, in a large terminal panicle; calyx about ⅜in. long; petals obovate, undulate, villous at the base: pod 3–4 in. long, ¾–1 in. wide, 1–3-seeded. Austral., Philippines. —Intro. at Santa Barbara, Calif., by Franceschi, but has not been a success there.

AA. *Lfts. ¼–½in. long, 20–30-pinnate.*

dùbium, Taub. (*Cæsalpinia dùbia*, Spreng. *P. Vogeliànum*, Walp. *Barýxylum dùbium*, Pierre). A large beautiful tree with rusty tomentose branches, petioles, and infl.: lvs. 9–18 in. long, 12–20-pinnate, 2–4 in. broad; lfts. 20–30-pinnate, oblique, oblong, obtuse, symmetrical or base unequal, ¼–½in. long, minutely rusty tomentose beneath, becoming glabrate: infl. a broad terminal panicle; fls. in simple or branched racemes; pedicels ¼–½in. long; calyx-tube very short, turbinate; petals broadly obovate, ½–¾in. long, margin wrinkled; very short-stalked, rusty tomentose: pod 3 in. long, ¾in. broad, acute at both ends, 2-seeded. Brazil. P. L. Ricker.

PENIOCÈREUS (Latin combination, meaning *phalloid Cereus*). *Cactàceæ*. Low slender erect plants, growing from very large fleshy turnip-shaped roots: sts. usually 4- or 5-ribbed: fls. large, nocturnal, usually white: fr. ovoid, long-acuminate, bright scarlet, edible.

Gréggii, Brit. & Rose (*Cèreus Gréggii*, Engelm.). Slender, branching, 2–3 ft. high, ¾–1 in. diam., from an extraordinarily large tuberous root (often 6–10 in. long and 4–6 in. diam.): ribs 3–6, acute; spines subulate from bulbous base, very short and sharp, 7–11, 1 or 2 being central: fls. white or yellowish, 6–8 in. long: fr. ovate, alternate at base and apex, bright scarlet, fleshy and edible, 1–2 in. long. Borders of Texas, New Mex., Ariz., and southward. J. N. Rose.

PENNISÈTUM (Latin, *penna*, feather; *seta*, bristle). *Gramíneæ*. Mostly stout grasses with bristly spike-like inflorescence, making conspicuous border and lawn plants.

Spikelets as in Panicum, but surrounded by several bristles that fall with the spikelet.—Species about 40 in tropical regions, one species cult. for fodder, some of the others for ornament.

The plumy grass known to gardeners as *P. longistylum* is much used for bedding. It is, perhaps, the finest dwarf grass which is grown chiefly for its flower parts. It sometimes survives the winter at Washington, D. C., but should always be treated as a tender

subject. Plants raised every year from seed are satisfactory if seed is sown early enough, but divisions of old plants will give larger pieces which flower sooner and require less attention than seedlings. The old plants may be wintered anywhere out of reach of frost. About February 1, in the latitude of Washington (a month later North), cut off the old leaves to within 6 inches of the crowns; divide the clumps into small pieces, trim the roots so that they will ultimately go into 3- or 4-inch pots, and place the pieces thickly together in boxes of sandy soil in a greenhouse with a temperature of about 60°. As soon as new roots have started, pot the young plants. They may be removed to a coldframe long before the soft bedding material demands all the available indoor space. (G. W. Oliver.)

A. *Annual: bristles about as long as the spikelet.*

americànum, Schum. (*Penicillària spicàta,* Willd. *Pennisètum typhoídeum,* Rich.). Pearl Millet. Culm 3–8 ft., pubescent below the spike: lvs. long and broad: spike cylindrical, 3–10 in. long, ¾in. thick, the globose grain bursting through its lemma and palea. Native country unknown.—Occasionally grown in the southern states, where it ripens seed. May be grown farther north for forage. A luxuriant annual, long cult. in the Old World for forage and more or less for the grain which is used as food.

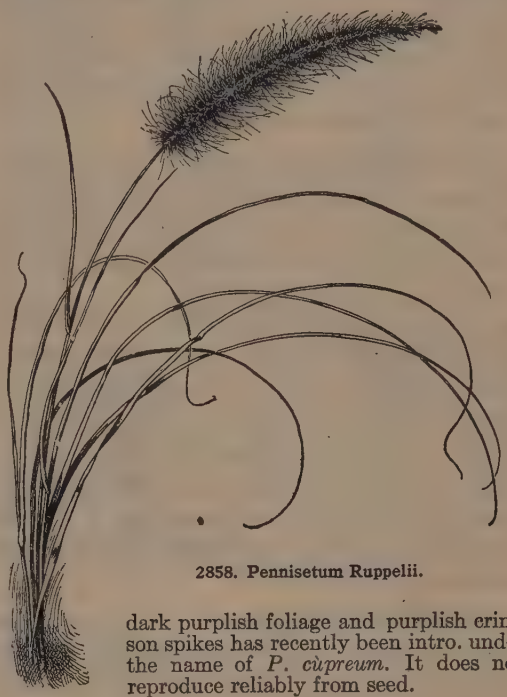
AA. *Perennials: bristles much exceeding the spikelet.*

B. *Bristles plumose.*

villòsum, Brown (*P. longistlyum* of florists, not of Hochst.). Fig. 2857. Spike broad, 2–4 in. long, and feathery from the bearded bristles; culm 1–2 ft. high, pubescent below the spike. Abyssinia. R.H. 1890, p. 489.

Rùppelii, Steud. (*P. Ruppeliànum* of some works). Fig. 2858. Culms taller and spikes 6–10 in., longer and more graceful than the preceding. Abyssinia. R.H. 1897, pp. 54, 55. I.H. 42, p. 206. G.W. 1:363.—The form most frequently cult. has a pale roseate spike. This is sold under the names *P. atrosanguíneum, P. hýbridum Henkeliànum,* or Crimson Fountain Grass. G.W. 13:255. R.B. 36, p. 58.—A half-hardy form with dark purplish foliage and purplish crimson spikes has recently been intro. under the name of *P. cùpreum.* It does not reproduce reliably from seed.

2857. Pennisetum villosum.



2858. Pennisetum Ruppelii.

BB. *Bristles naked.*

C. *Spikes several on each main culm, borne on short branches; one bristle in each cluster much longer than the others.*

latifòlium, Spreng. (*Gymnòthrix latifòlia,* Schult.). Culm 3–4 ft., bearing several nodding spikes 1–2 in. long: lvs. lanceolate, ½in. broad. Argentina. R.H. 1890, p. 546. G.W. 3, p. 424; 6, p. 113.

CC. *Spikes single, terminating each main culm; bristles more or less equal.*

japónicum, Trin. (*P. compréssum,* R. Br. *Gymnòthrix japónica,* Kunth). Culm 2–3 ft., scabrous, especially under the dense cylindrical 2–3-in.-long spike: blades long and narrow. China.

macroùrum, Trin. (*Gymnòthrix càudàta,* Schrad.). Culms tall, bearing a slender spike as much as a foot long. S. Afr.

macrostàchyum, Trin. (*Gymnòthrix macrostàchys,* Brongn.). Culms 4–5 ft., blades broad, flat; spike 8–12 in., resembling that of *P. Ruppelii.* E. Indies.—A half-hardy form with dark purplish foliage and handsome dark crimson spikes has recently been intro. under the name of *P. macrophýllum atropurpùreum.* M.D.G. 1906:9. Does not reproduce reliably from seed.

nervòsum, Trin. Tall branching perennial with tawny or purplish compact spikes is offered by a western nursery. S. Amer.

A. S. Hitchcock.

PENNYROYAL of Europe, *Mentha Pulegium;* of America, *Hedeoma pulegioides.* **Bastard P.,** or blue curls, is *Trichostema dichotomum.* All are members of the mint family.

The garden pennyroyal, *Mentha Pulegium,* is a European perennial, used for seasoning. It is one of the

"sweet herbs." It is easily grown, profiting by a winter protection of leaves or litter. Propagation is mostly by division. Beds should be renewed frequently.

PENTACHÆTA (Greek, referring to five bristles at the base of the pappus). *Compósitæ.* A few species of low slender Californian annuals with thread-like alternate lvs. and small or medium-sized heads, the rays when present usually yellow, sometimes white: the disk-fls. sometimes turning purple. *P. aùrea,* Nutt., growing 3–12 in. high and with 7–40 deep golden rays, was once offered and was pictured in Gt. 33:1153, but it has no horticultural standing.

PENTÁPETES (Greek, *having five leaves;* an ancient name of some cinquefoil, transferred by Linnæus to this plant, which has five leafy growths (staminodes) accompanying the stamens; or perhaps to the 5-merous arrangement). *Sterculiàceæ.* A pretty red-flowered tender annual, widely distributed in tropical Asia, rare in gardens.

Species one, **P. phœnícea,** Linn. Erect branched herb, nearly or quite glabrous, 3–5 ft.: lvs. 3–5 in. long, hastate-lanceolate, 1-nerved, crenate-serrate; petiole 1 in. long; stipules awl-shaped: fls. red, about 1½ in. across, opening at noon and closing early following morning; bractlets 3, caducous; sepals 5, lanceolate, connate at the base; petals 5; stamens 20, connate at the base, 15 fertile in 5 groups of 3 each, alternating with 5 staminodes which are nearly as long as the petals; ovary 5-celled; cells many-ovuled: caps. loculicidally 5-valved; seeds 8–12, in 2 series in each cell. B.R. 575.—An interesting plant for amateurs in the warmhouse or for cult. in the open in summer. Prop. by seeds and cuttings. L. H. B.

PENTAPTERÝGIUM (Greek words, *five* and *a small wing;* alluding to the five-winged calyx). *Ericàceæ.* Epiphytic shrubs, glabrous or strigose-hirsute, with alternate subsessile lvs., rather large and scattered or small and sub-distichously clustered: fls. rather large, axillary, solitary or in few-fld. corymbs; calyx-tube turbinate or hemispherical, 5-winged; limb of 5 persistent leafy lobes; corolla tubular, 5-angled, with a limb of 5 suberect or recurved lobes; stamens 10; ovary 5-celled. About 6 species, 1 from the Malay Peninsula, the remainder from the temperate Himalayan region. Two species have been occasionally in cult. *P. rugòsum,* Hook. Fls. pendulous; corolla nearly white, beautifully marked between the 5 angles with purple or blood-red bands: lvs. almost sessile, subcordate at base, very much wrinkled, lanceolate or ovate-lanceolate. Khasia Mts. B.M. 5198. G. 36:617. G.W. 2, p. 502. *P. sérpens,* Klotzsch. Fls. numerous, axillary, hanging along the under side of the branches; calyx green, 5-angled; corolla bright red, with darker V-shaped marking: lvs. small, lanceolate: sts. slender, drooping: rootstock large, tuberous. Himalayas. B.M. 6777. G.W. 13, p. 90.

PENTARHÀPHIA (Greek, *five needles,* referring to the form of the open calyx). *Gesneriàceæ.* Shrubs or subshrubs, one or two of which are grown under glass for the fls. This genus is most commonly treated as a section of the genus Gesneria, but is considered distinct by some. The principal characters of the section are the relatively bare branches, the 1- to several-fld. elongated peduncles borne in the lf.-axils: fls. with a crooked cylindrical tube; stamens more or less long-exserted. At least 15 species, Mex., W. Indies, and S. Amer. *P. floribúnda,* Carr. Much of the material cult. under this name is referable to *Gesneria libanensis* (Vol. III, p. 1333), but some of it may be other species, as there appears to be more than one plant passing under this name. R.H. 1878:30. B.M. 4380. R.B. 25: 241. These portraits may not all represent the same plant.

PÉNTAS (Greek, *five,* referring to the floral parts) *Rubiàceæ.* Tender herbs and subshrubs, resembling bouvardias and of the same family, grown under glass for the lilac or white bloom.

Herbs or subshrubs, erect or prostrate, hispid or tomentose: lvs. opposite, stalked, usually ovate or ovate-lanceolate; stipules multifid or multi-setose: infl. usually corymbose; calyx-lobes 4–6, unequal; corolla pilose, the long tube dilated and villous in the throat; lobes valvate; stamens 4–6, inserted below the throat; filaments short or long; anthers fixed at the back, included or exserted; disk tumid or annular, often produced into a cone after anthesis; ovary 2-loculed; ovules numerous; style-branches papillose: caps. membranous or leathery, 2-loculed, loculicidal; seeds minute.—There are about 30 known species in Trop. and S. Afr., including Madagascar. Only one is well known in cult., whose color varieties range through lilac and flesh-color to crimson-pink and rosy purple. A good cluster is 3 in. across and contains 20 or more fls., each of which is ½in. across. The fls. are about ¾in. long, funnel-shaped, and usually have 5 spreading lobes, sometimes 4 or 6. It is mostly grown like bouvardia in warm conservatories for winter bloom, but it is sometimes used for bedding in warmer countries, as it gives 3 months of rather showy bloom when treated like lantana. In general, the species seem to be less worthy than bouvardias.

The pentas may be propagated from February to the middle of April. Choose cuttings of half-matured wood and place in a warm propagating-bed; by keeping moist and shaded they will root. Before they have made too long roots, lift and transfer into small pots. They like a sandy open mixture, as of loam, peat, and sand in equal parts for the first potting. Place where they may have shade until well started, when they should have sun. In their growing season, which is from the end of January until autumn, they should have a temperature of 60° to 65° at night with 10° to 15° rise during the day with sun. Keep the young plants vigorous by giving larger pots until they are in 6- to 8-inch pots. For a compost give them fibrous loam four parts, fibry peat one part, well-decayed cow-manure one part, and enough sand to keep it open. Always give plenty of drainage in the pots, and pot moderately firm. In the spring and summer they will require plenty of water. In the hot days of summer give daily syringing, getting well under the foliage. As they grow, tie the branches out horizontally; they then will break away into a number of growths which will make headway for flowers in autumn. If they show bloom before this time, pinch the flowers out. When the pots become well supplied with roots, give liquid feed once a week. The flowers are very useful for cutting. The care in winter should require a lower temperature; they do well in 55° to 58° at night, with about 10° more with sunshine. Give enough water to keep them in good health and a good syringing now and then. After January, they may have any necessary repotting, such as renewing the old compost with a good rich material and growing on as treated the preceding spring and summer with the exception of cutting back the shoots well. (J. J. M. Farrell.)

lanceolàta, Schum. (*Ophiorrhìza lanceolàta,* Forsk. *P. cárnea,* Benth., under which name it is known to gardeners). Erect or decumbent, 1–2 ft. high, shrubby at base, merely puberulous, not rusty-hairy: lvs. 1–6 in. long, 4 lines to 2 in. broad, ovate, elliptic or lance-oblong, more or less acute, narrowed at base into a short petiole, the lateral veins many: cymes peduncled or not; fls. nearly sessile, to 1 in. long, dimorphic, naturally pale purple; corolla very hairy at throat. Trop. Afr., Arabia. B.M. 4086. B.R. 30:32. R.B. 21:217. Gn. 21, p. 329. J.H. III. 30:209; 52:417. G.W. 10, p. 378. Var. **kermesìna,** Hort. Fls. carmine-rose, tinted violet in throat. R.H. 1870:130. Var. **álba,** Hort., has

white fls. G.W. 10, p. 611. Var. **Quartiniàna**, Hort. (*P. Quartiniàna*, Oliver) is a rosy-fld. variety said to be much better than the type. Gt. 45, p. 464.

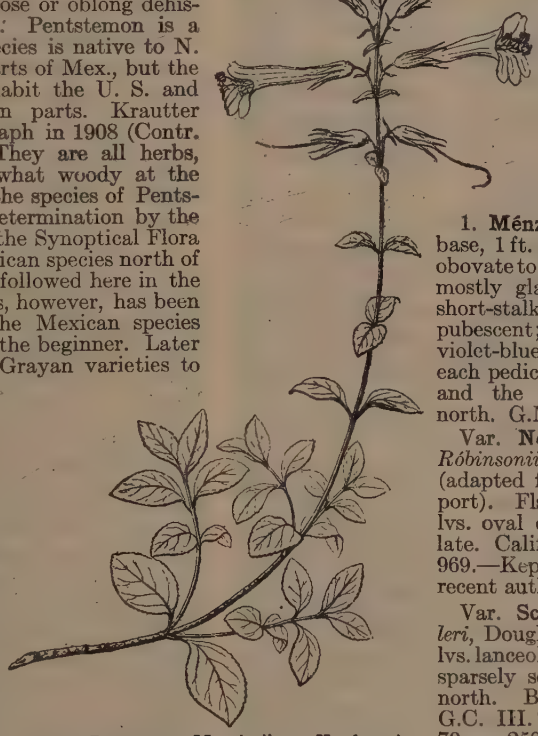
WILHELM MILLER.
L. H. B.†

PENTLÁNDIA: *Urceolina.*

PENTSTÈMON (Greek for *five stamens*, all five stamens being present, whereas related genera have only four; but in Pentstemon one of the stamens is sterile). Sometimes written *Pentastemon*. *Scrophulariàceæ*. PENTSTEMON. BEARD-TONGUE. Tubular-flowered bedding and border plants, mostly of bright colors; many are natives in the United States.

Perennial herbs or shrubs of medium or small size, spring- and summer-blooming, glabrous or pubescent, the sts. mostly little branched: lvs. opposite or whorled, entire or toothed (the upper ones sometimes alternate): fls. in terminal racemes or thyrsoid clusters, mostly showy, blue, red, purple, white; calyx 5-parted, with imbricated segms.: corolla tubular, usually dilated at the throat, distinctly or obscurely 2-lipped, the upper lip 2-lobed or notched and the lower 3-lobed; fertile stamens 4, didynamous, the fifth sterile and sometimes bearded, all of them included or not exserted; style filiform and stigma capitate: fr. an ovoid, globose or oblong dehiscent caps., with numerous seeds. Pentstemon is a typical American genus. One species is native to N. E. Asia and many to the cooler parts of Mex., but the larger number of the species inhabit the U. S. and Canada, particularly the western parts. Krautter admits 148 species in his monograph in 1908 (Contr. Bot. Lab., Univ. of Pa. III). They are all herbs, although some species are somewhat woody at the base. It is difficult so to arrange the species of Pentstemon as to make them easy of determination by the horticulturist. Gray's account in the Synoptical Flora (Vol. 2, Part 1) describes the American species north of Mex.; and this account has been followed here in the main. The arrangement of species, however, has been modified considerably to admit the Mexican species and to make the group easier for the beginner. Later writers are inclined to raise the Grayan varieties to the rank of species.

For the hardy border, pentstemons are most satisfactory plants, and the great number of showy species allows much latitude in choice of color and habit. All are perennial, but some of them bloom the first year from seed. In a dry and hot place they are likely to be short-lived, although nearly all the species thrive best in full exposure to sun. They should have good deep garden soil. They are propagated by division and by seed, the latter usually being preferred. Many of the species are not hardy in the northern states, but *P. barbatus* and its varieties, *P. hirsutus*, *P. lævigatus* and variety, *P. confertus* and variety, *P. diffusus*, *P. ovatus*, *P. grandiflorus*, *P. acuminatus*, *P. angustifolius*, *P. glaber* and varieties, and also others, may be expected to stand in the North, particularly if given a protection of leaves. An excellent garden race has been produced, here designated as *P. gloxinioides*. This seems to be a product of hybridization and selection. It is little known in American gardens, although it is a handsome and deserving plant. Some of the forms of it are treated as annuals. Most of the species described in this account are not domesticated or modified plants, but are sold or distributed as stock secured more or less directly from the wild.



2859. Pentstemon Menziesii var. Newberryi. By many authors considered to be a distinct species, and then known as P. Newberryi. (×¾)

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A. *Cells of anthers dehiscent for nearly or quite their whole length, united or connivent at the apex and soon spreading from each other.* (*Nos. 1–38.*) *Nos. 4, 10, 16 are in doubt as to position in key.*

B. *Anthers covered with long wool.*

1. **Ménziesii,** Hook. Woody at base, 1 ft. or less high: lvs. thick, obovate to oblong, serrate or entire, mostly glabrous, the lower ones short-stalked: cluster a raceme, pubescent; fls. 1 in. or more long, violet-blue to purple, usually 1 on each pedicel, the upper lip 2-cleft and the lower 2-cleft. Wash., north. G.M. 45:100.

Var. **Néwberryi,** Gray (var. *Róbinsonii*, Mast.). Fig. 2859 (adapted from Pacific R. R. Report). Fls. pink or rose-purple: lvs. oval or ovate-oblong, serrulate. Calif. to Wash. G.C. 1872: 969.—Kept specifically distinct by recent authors as *P. Newberryi*.

Var. **Scoùleri,** Gray (*P. Scoùleri*, Douglas). Fls. violet-purple: lvs. lanceolate to linear-lanceolate, sparsely serrulate. Wyo. to Ore., north. B.R. 1277. B.M. 6834. G.C. III. 7, p. 204. Gn. 52, p. 42; 70, p. 250. G. 36:23; 37:408.—Kept specifically distinct by some as **P. fruticòsus,** Greene (*Gerárdia fruticòsa*. Pursh). **P. fruticòsus** var. **crassifòlius,** Kraut. (*P. crassifòlius*, Lindl. *P. Douglasii*, Hook.). Fls. lilac-purple, pink at base: lvs. oblong or obovate-lanceolate, entire. Ore., north. B.R. 24:16.

2. **Dâvidsonii,** Greene. An alpine dwarf, differing from *P. Menziesii* in having its tough and almost herbaceous branching sts. underground except the very short and erect flowering branches, and obovate and oval obtuse or acutish entire veinless lvs.: proper st. mainly subterranean and horizontal, rooting at joints; free branches 1–2 in. high, the fls. usually exceeding in size all the remainder of the plant above ground: corolla

1 in. long, lilac-purple, ventricose from near the tips of the sepals, the lobes rather short and not very unequal; stamens included, woolly. Discovered by George Davidson, on Mt. Conness, Calif., altitude 12,300 ft.; occurs on Mt. Shasta and north to Wash.—Offered abroad.

BB. *Anthers glabrous or only hairy (not woolly).*

C. *Plant semi-scandent (somewhat climbing) by means of long slender branches, or at least some of the branches long and weak or slender.*

3. **cordifòlius,** Benth. Plant very leafy, somewhat pubescent, clambering over shrubs: lvs. ovate, often more or less cordate, serrate, 1 in. or less long: cluster or thyrse short and leafy, the peduncles several-fld.; corolla tubular, scarlet, the tube 1 in. long and the limb half as long. S. Calif. B.M. 4497. R.H. 1850:221. J.F. 1:14.

2860. Pentstemon Hartwegii. (×⅙)

4. **ternàtus,** Torr. Flowering shoots 2–4 ft. long, virgate, glabrous and glaucous: lvs. linear-lanceolate, rigid, serrate or denticulate, the upper ones in 3's: fls. in a raceme-like thyrse, pale scarlet; calyx with ovate-acuminate parts; corolla 1 in. long, the lips ¼ in. long. S. Calif., in mountains.

CC. *Plant erect, self-supporting.*

D. *Fls. lemon-yellow to yellow-red.*

5. **antirrhinoìdes,** Benth. (*P. Lóbbii,* Hort.). Plant 1–5 ft., glabrous or nearly so, branched and leafy: lvs. small, oval or spatulate, entire: fls. in leafy panicles, the peduncles 1-fld., the broad fls. about 1 in. long, the lower lip deeply 2-lobed; sterile filament bearded on one side. S. Calif. B.M. 6157. I.H. 9:315.

6. **Lémmonii,** Gray. Slender shrub, 5 ft. or less tall, bright green and glabrous: lvs. ovate-lanceolate, toothed: panicle loose and branchy, the long peduncles 2–7-fld.; fls. small, dull yellowish and red, the segms. nearly equal. Cent. Calif.

DD. *Fls. not yellow (unless sometimes in P. confertus), mostly in shades of red or purple, sometimes white.*

E. *St. and lvs. glabrous, at least up to the infl. (Nos. 7–34).*

F. *Corolla long and slender, not swollen near the base or greatly widened at the mouth: straight-fld. species.*

7. **barbàtus,** Nutt. (*Chelòne barbàta,* Cav.). Tall, erect, branching, glabrous and more or less glaucous herb: lvs. firm, varying from lanceolate to linear, entire, strong-veined, the radical ones oblanceolate or spatulate: fl.-cluster long and open, narrow, the peduncles about 2–3-fld.; fls. slender, about 1 in. long in wild forms, strongly 2-lipped, varying from light pink and flesh-color to carmine, the lower lip usually bearded. Colo., south. B.R. 116; 25:21. R.H. 1896, p. 347. G. 32:75. Mn. 7:141.—Showy perennial, common in cult.

Var. **Tórreyi,** Gray (*P. Tórreyi,* Benth.), is a scarlet-fld. form, with almost no beard on the lower lip; the commonest form of the species in cult. Hillsides, Utah, Colo., south and to Texas.—Excellent.

Var. **coccíneus,** Hort., is a scarlet-fld. horticultural form.

8. **labròsus,** Hook. (*P. barbàtus* var. *labròsus,* Gray). Much like *P. barbatus,* but narrower-lvd., the infl. almost simply racemose and the corolla more slender, light scarlet, not bearded, the limb longer; 3 lobes of lower lip linear, spreading, half the length of tube, equaling those of upper lip. Calif. and Low. Calif. B.M. 6738. G.C. II. 20:537.—A good perennial, 1–2 ft., making many sts.

9. **Èatonii,** Gray. Sts. 1–2 ft. high: lvs. lanceolate to ovate, the upper ones partly clasping: fls. bright carmine-red, in a simple and strict thyrse, the peduncles 1–3-fld.; calyx-lobes or sepals ovate-lanceolate; corolla 1 in. long, tubular, the throat naked and scarcely enlarged, the lobes broadly oval and all much alike; sterile filament sometimes minutely bearded. Utah, Nev., New Mex., Ariz., and S. Calif. B.R. 10:14. F.S. 3:232 (as *P. miniatus*).

10. **isophýllus,** Robs. St. somewhat decumbent at base, erect, 2 ft. or so high, simple, purplish, pulverulent, very leafy, with lvs. in nearly equal pairs: lvs. lanceolate, entire, thickish, glabrous, sessile, acute, margin revolute: fls. in a long secund panicle, nodding, scarlet; calyx deeply 5-parted; corolla about 1½ in. long, the 5-lobed limb erose-crenulate, the throat somewhat enlarged and more or less white-puberulent. Mex.

11. **triflòrus,** Heller. Perhaps to be entered at this point: glabrous or nearly so to the infl., 2–3 ft.: lower lvs. spatulate or oblong, almost entire, with margined petioles; upper lvs. oblong to ovate: fls. rose-purple, the peduncles glandular-pubescent and usually 3-fld.; calyx-lobes lanceolate or oblong-lanceolate; corolla about 1 in. long, the tube gradually dilated; sterile filament glabrous. Cent. Texas.—Under this name a coral-red pentstemon with fls. 1½–1¾ in. long is offered abroad, said to be Mexican.

12. **Hártwegii,** Benth. (*P. gentianoìdes,* Lindl.). Fig. 2860. Tall and erect (3–4 ft. high), somewhat branched, the sts. dark purple: lvs. lanceolate to lance-oblong-linear, or the upper ones broader, sessile, glabrous and entire: fl.-cluster somewhat pubescent, long and open, the pedicels 3–6-fld.; fls. drooping, dark rich scarlet-red, slightly curved, the limb somewhat 2-lipped and the lobes acute. Cool regions in Mex. B.M. 3661. B.R. 24:3. Gn. 37, p. 603; 49, p. 406. G. 2:391. J.F. 3:231. Gn.W. 23:679. G.L. 17:397. G.W. 2, p. 157 (as var. *hybridus grandiflorus.*)—A fine garden plant, now much modified by domestication. **P. gentianoìdes,** Poir., and in F. S. 7:730, from S. Mex. and Guatemala, is kept distinct by Krautter, the infl. being a long leafy raceme rather than a loose naked panicle: fls. purplish.

13. **gloxinioìdes,** Hort. A race of garden hybrids, issuing largely from *P. Hartwegii,* the other most important parent being *P. Cobæa.* Probably other species have entered into the amalgamation. The group needs critical study from the growing plants. The fls. are large, with a broad nearly regular limb, and in many colors. The plants are strong and floriferous. Fls. sometimes measure 2 in. across. Some of the strains bloom freely from seed the first year. Not hardy in N. Y. unless very thoroughly protected; it is probably better to winter it in deep coldframe.

14. **centranthifòlius,** Benth. (*Chelòne centranthifòlia,* Benth.). Plant strict and leafy, 1–3 ft. tall, very glaucous: lvs. thick and entire, from ovate-lanceolate

to linear, mostly sessile and clasping: infl. long and narrow, the peduncles 2–3-fld.; fls. about 1 in. long, scarlet, narrow-tubular, the lobes short and acute; sterile filament naked. Calif. to W. Ariz. B.M. 5142. B.R. 1737. F.S. 22:2309.

FF. *Corolla (except in P. rotundifolius) with a prominently enlarging tube, which is often contracted near the base: thick-fld. species. Corolla nearly straight but short in P. confertus.*

G. *Lvs. entire (sometimes serrulate in P. confertus).*

H. *Infl. usually rather close and compact.*

I. *Some or all the lvs. lanceolate to broad-lanceolate.*

15. **glàber,** Pursh (*P. Górdonii,* Hook. *P. speciòsus,* Douglas). Erect herb (1–2 ft.), with simple sts. glabrous and somewhat glaucous: lvs. oblong-lanceolate to ovate-lanceolate: fl. 1 in. or more long, broad, and wide at the mouth, bright blue to purplish. Missouri River, west. B.M. 1672 (as *P. glabra*) and 4319. B.R. 1270. Gn. 27, p. 42. R.H. 1895, p. 383; 1896, p. 347. G.M. 44:563.—A very handsome plant, known by its large blue fls. Variable.

2861. Pentstemon grandiflorus. (×¼)

Var. **cyanánthus,** Gray (*P. cyanánthus,* Hook. *P. cyánthus,* Hort.). Tall and less glaucous, the lvs. broader (ovate or cordate-ovate to lance-ovate): fl.-cluster dense; fls. bright blue. Rocky Mts., Colo., Mont., Utah. B.M. 4464. F.S. 6:157. R.H. 1851: 453.—Preferable to the type. By many considered to be specifically distinct.

Var. **alpìnus,** Gray (*P. alpìnus,* Torr.). A foot or less high: st.-lvs. narrow- or broad-lanceolate: thyrse short and few-fld. High plains and mountains, Rocky Mts. Kept distinct from *P. glaber* by some authors.

II. *Some or all the lvs. as broad as ovate, oval or obovate.*

16. **arizónicus,** Heller. St. slender but erect, 6–8 in. high, usually with several leafy short prostrate branches at base: lvs. glabrous, dull green, coriaceous, oval and finely crenate or undulate on prostrate branches, oblanceolate to ovate-lanceolate on the erect sts. and crenate or entire: fls. in a lax more or less secund infl., purplish; calyx nearly ⅔in. long, pubescent and somewhat glandular, the lobes long-acuminate and ciliate; corolla about 1 in. long, minutely puberulent, abruptly dilated above calyx; sterile filament glabrous, not enlarged above. Mt. San Francisco, Ariz.

17. **puníceus,** Gray. Very glaucous, with short ovate sometimes connate lvs.: fl. about 1 in. long, more funnelform (or widening upward) and with wide-spreading rounded lobes, scarlet; sterile filament bearded down one side. N. Mex. R.H. 1892, p. 448.

18. **Wrìghtii,** Hook. Rather stout, 2 ft. or less tall, more or less glaucous: lowest lvs. obovate, the upper ones oblong and clasping: infl. long and loosely fld., to peduncles about 2-fld.; fls. about ¾in. long, bright red, the mouth broad and the rounded lobes spreading ¾in.; sterile stamen bearded. W. Texas to Ariz. B.M. 4601. F.S. 7:685. J.F. 2:190.

19. **grandiflòrus,** Nutt. Fig. 2861. Stout, very glaucous: lvs. thick, broad and obtuse, the floral ones with very broad bases: peduncles very short or almost none; fls. nearly or quite 2 in. long, lilac or blue, enlarging near the base, somewhat 2-lipped and the upper lip the smaller; sterile filament minutely pubescent at the tip: fr. large. Prairies, Ill. and Minn., westward. G. 29:82. —Handsome.

20. **Murrayànus,** Hook. Erect, 3 ft.: lvs. broad-ovate, clasping, and the upper pairs grown together into a cup-shaped body (connate): pedicels 2–3 in. long; fls. deep scarlet, with rather small lobes; sterile filament glabrous. Ark., Texas. B.M. 3472. Gn. 26, p. 229. R.H. 1896, p. 348.

21. **acuminàtus,** Douglas. Glaucous, strict and usually stiffish, 2 ft. or less tall: lvs. thickish, the lowermost broadly ovate to obovate, the uppermost broad-lanceolate to broad-ovate and clasping and usually acuminate, the floral lvs. shorter than the fls.: infl. narrow, the peduncles 1–3 or more-fld.; fls. nearly 1 in. long, lilac to violet, wide at the throat, the obtuse lobes spreading; sterile filament bearded at the tip. Neb. and Minn., south and far westward. B.R. 1285. —Very satisfactory. There is confusion in the application of the name *P. acuminatus.* **P. nítidus,** Douglas (*P. Féndleri,* Gray), sometimes referred here, is considered to be a distinct species, with upper lvs. ovate or narrower. Sask. to Mex., and westward.

III. *Some or all the lvs. lanceolate to linear.*

22. **angustifòlius,** Pursh (*P. cærùleus,* Nutt.). Fig. 2862. Mostly lower: lvs. linear to lanceolate, those at the base of the fl.-cluster usually exceeding the fls.: infl. usually close; fls. blue, varying to lilac or white. Dakota to Colo. and New Mex. G.M. 54:377.—Seems to run into *P. acuminatus.*

23. **secundiflòrus,** Benth. About 2 ft. tall: lvs. narrow-lanceolate, somewhat glaucous, the radical ones spatulate: infl. long and strict, the peduncles 1–3-fld.; fls. lilac or purple, the basal tube about twice the length of the calyx, the throat broad and bell-shaped and about equaled by the spreading rounded lobes; sterile filament glabrous or bearded only at the top. Colo. and Wyo.—Handsome.

24. **confértus,** Douglas. One to 2 ft., pubescent in the infl.: lvs. oblong to lanceolate to linear, usually entire but sometimes minutely serrate: infl. a narrow interrupted spike, the peduncles sessile or the lower ones stalked; fls. ½in. or less long, cream-white to sulfur-yellow, narrow, 2-lipped, the lower lip bearded within. Rocky Mts. to Ore. and Calif. B.R. 1260. —Variable, and has received many names, but little known in cult.

Var. **cærùleo-purpùreus,** Gray (*P. pròcerus,* Douglas). Fls. blue-purple to violet. Colo., west and north. B.M. 2954. L.B.C. 17:1616.—A common form in gardens, and a reliable and satisfactory plant, often kept as specifically distinct.

2862. Pentstemon angustifolius. A slender form. (×¼)

HH. *Infl. very open and loose, due to the fact that the peduncles are 3–6 in. long and the pedicels 1 in. or more long and the fls. drooping.*

25. **rotundifòlius,** Gray. Fig. 2863. About 2 ft. tall, branching from the base, glaucous: lower lvs. thick and leathery, orbicular-ovate and obtuse, long-petioled, st.-lvs. sessile and cordate-orbicular: fls. 1–1½ in. long, narrow-tubular, yellow-red, the lobes short and acute; sterile filament glabrous. N. Mex. B.M. 7055. G.C. III. 4:265. G.F. 1:473 (reduced in Fig. 2863).

GG. *Lvs. serrate or dentate.*

H. *Sterile filament bearded at the tip or along one side (Nos. 26–32).*

I. *Color of fls. purple, blue or rose, sometimes ranging to white.*

26. **campanulàtus,** Willd. Branching from the base, 2 ft. or less tall: lvs. lanceolate or the upper ones ovate-lanceolate, long-acuminate, broad at the base and sessile, strongly serrate: infl. long and narrow, the peduncles usually 2-fld.; fls. 1 in. long, rose-purple or violet (sometimes white in cult.), the corolla funnelform, the lobes rounded and spreading and the lower lip broader than the upper, the sterile filament hairy at the top. Mex. and Guatemala. B.M. 3884.—An old garden plant which is variable in color and which has received many names, as *P. angustifolius, P. atropurpeus, P. roseus.* See B.R. 1122. L.B.C. 15:1429, 1438. G.C. III. 50:93 (a white form). **P. pulchéllus,** Lindl., by some referred here, is by others kept distinct, differing in corolla abruptly ventricose or swollen above, violet or lilac with white veins, the lips nearly equal, throat spotted and villous, sterile filament bearded at end. Mex. B.R. 1138.

27. **hûmilis,** Nutt. Low, usually not over 6 in. tall, pubescent in the infl.: lvs. oblong to lanceolate, somewhat glaucous, the upper ones small-toothed: infl. 3–4 in. long, with 2–5-fld. peduncles; fls. ½in. long, rather narrow, deep blue or sometimes ranging to white, the lower lip bearded within. Rocky Mts., west. F. 1875:241.

2863. Pentstemon rotundifolius. (×½)

28. **grâcilis,** Nutt. Taller, sometimes minutely puberulent, slender: lvs. linear-lanceolate, sometimes nearly entire, the radical ones spatulate or oblong: infl. strict, the peduncles 2- or more-fld.; fls. nearly 1 in. long, mostly narrow-funnelform, lilac-purple ranging to white. Neb. to Colo. and northward, on moist prairies. B.M. 2945. L.B.C. 16:1541.—A pretty species.

II. *Color of fls. nearly or quite white, but sometimes shaded with red or purple.*

29. **tubiflòrus,** Nutt. St. 2–3 ft., erect, not leafy above: lvs. oblong to ovate-lanceolate, barely serrulate, passing into small bracts above: infl. of densely-fld., somewhat whorled clusters; fls. about ¾in. long, scarcely 2-lipped, the spreading limb nearly as long as the tube, white or nearly so and sometimes tinged with purple. Mo., Kans., and Ark.

30. **lævigàtus,** Soland. (*Chelòne Pentstèmon,* Linn.). Tall and slender, 2–4 ft., more or less glaucous: lvs. rather firm, purplish, somewhat glossy, ovate to ovate-oblong-lanceolate and clasping, the radical ones oblanceolate or broader, all small-toothed: infl. long and loose; fls. about 1 in. long, white and sometimes tinged with color, rather slender, narrow at the base, the short lobes not wide-spreading, the small lower lip bearded at the base. Pa., west and south. B.M. 1425.—A common plant, best known in the following form.

Var. **Digitàlis,** Gray (*P. Digitàlis,* Nutt. *Chelòne Digitàlis,* Sweet). Very tall, 4–5 ft., with larger white abruptly inflated fls. B.M. 2587.—Sometimes becomes a weed in old fields, from Maine south and west, but probably not indigenous in all this range. It is in cult., as a border plant. By some authors kept distinct as a species. **P. Smâllii,** Heller, is a handsome allied species from N. C. and Tenn., with bright pink-purple gibbous corolla, pubescent or puberulent sts.: root-lvs. oval or ovate; st.-lvs. lanceolate or ovate-lanceolate, smooth both sides, serrate.

31. **Pâlmeri,** Gray. Plant 2–3 ft. tall, the foliage glaucous: lvs. thick, ovate to oblong-lanceolate, the lower petioled and the upper connate, very sharp-dentate or sometimes almost entire: infl. long, mostly glandular; fls. cream-white tinted with pink, the narrow part of the tube about as long as the calyx, the upper part very wide and open, the mouth ¾in. across and 2-lipped; sterile filament yellow-bearded. Utah, south and west. B.M. 6064. F.S. 20:2094. F. 1874:37.

III. *Color of fls. red.*

32. **Clèvelandii,** Gray. Two ft. or above, more or less glaucous, becoming woody at the base: lvs. rigid, oblong or ovate, sharp-toothed, the upper ones usually connate by their bases: infl. long and narrow; fls. ¾in. long, crimson, with narrow throat; sterile filament bearded at top. S. Calif. and Low. Calif. G.M. 36: 626. F. 1878, p. 149.

HH. *Sterile filament glabrous.*

33. **deùstus,** Douglas. Sts. 1 ft. or less tall, from a woody base, glabrous throughout: lvs. thickish, varying from nearly linear to lanceolate to ovate, some or all of them serrate, the uppermost sessile: infl. many-fld., loose and open; fls. not over ½in. long, dull white or yellowish white and sometimes tinged with purple, wide-mouthed, the lobes wide-spreading. Mont. and Wyo. to Calif. B.R. 1318.

34. **spectâbilis,** Thurb. Two to 4 ft., erect, somewhat glaucous: lvs. ovate to ovate-lanceolate or sometimes oblong, acute, the upper ones acuminate and connate by their bases, very sharp serrate-dentate: infl. long and many-fld.; fl. 1 in. or more long, rose-purple or lilac, the narrow part of the tube about twice the length of the calyx, the upper part broad and full, the lobes rounded. New Mex. to S. Calif. B.M. 5260.—A beautiful species.

EE. *St. and lvs. more or less pubescent or hirsute.*

F. *Corolla 2 in. long.*

35. **Cobæa,** Nutt. Fig. 2864. Straight and erect, stout, about 2 ft., minutely pubescent: lvs. thick, ovate-oblong to oblong to broad-lanceolate, the upper ones clasping: infl. mostly simple and open; fls. very large, reddish purple to white, the base very narrow but the upper part of the fl. broad and open, the limb only obscurely 2-lipped; sterile filament bearded. Prairies, Mo. and Neb., south. B.M. 3465. Gn. 49:406. G. 29:83. F.S.R.2, p. 271. Mn. 4:113.—Very showy, and probably one of the parents of the garden race of hybrid pentstemons (see No. 13).

FF. *Corolla 1 in. or less long.*

36. **eriánthera,** Pursh (*P. cristàtus,* Nutt.). Only a few inches high, pubescent, usually viscid above: lvs. linear-lanceolate to narrow-oblong: infl. erect, leafy below; fls. about 1 in. long, purplish, rather abruptly dilated above, the lower lip bearded; sterile filament strongly yellow-bearded. Dakota to Colo., north and west.—Good.

37. **ovàtus,** Douglas. St. slender but erect, 2–4 ft., more or less pubescent: lvs. ovate, rather thin, bright green, serrate, the upper ones clasping: infl. erect but lax, the peduncles 2- to several-fld.; fls. about ⅔in. long, blue changing to purple, 2-lipped and the lower lip bearded. Idaho, west and north. B.M. 2903.—Good.

38. **hirsùtus,** Willd. (*P. pubéscens,* Soland. *Chelòne hirsùta,* Linn.). Loose-growing, the slender often decumbent sts. reaching 2 ft., usually viscid-pubescent: lvs. oblong to narrow-lanceolate, small-toothed, the radical ones ovate to spatulate: infl. loose and open, the peduncles 2–3 in. long and the pedicels often 1 in. long; fls. about 1 in. long, drooping, dull purple or violet or varying to flesh-color, rather narrow, with 2 short lobes densely bearded on the palate; sterile filament densely bearded. Dry fields and banks from Maine and Ont. to Fla. and Texas. B.M. 1424. G.M. 56:493.—The common pentstemon of the E., and useful in cult. **P. Mackayànus,** Knowles & Westc., is perhaps distinct: corolla often shorter, sparingly bearded in throat, purple: upper st.-lvs. with dilated or rounded bases rather than narrow-lanceolate. Ala. to Ark.

AA. *Cells of anthers not dehiscing or opening to the base, the basal part remaining saccate*

B. *Lvs. dentate or serrate.*

C. *Plant viscid and soft-pubescent.*

39. **glandulòsus,** Douglas (*P. staticifòlius,* Lindl.). Rather stout, 2–3 ft. tall: lvs. rather thin, ovate-lanceolate, acuminate, the upper ones clasping, the radical ovate or oblong, all toothed or serrate: infl. narrow, leafy below, the peduncles few- to several-fld.; fls. large, somewhat over 1 in. long, lilac, with inflated throat, the lips short and broad; sterile filament glabrous. Idaho to Wash. and Ore. B.M. 3688. B.R. 1262; 1770.—Showy.

CC. *Plant not viscid, either glabrous or puberulent.*

40. **venústus,** Douglas. St. erect, nearly simple, leafy, 2 ft. or less tall, glabrous: lvs. thickish, oblong-lanceolate to ovate-lanceolate, very sharply serrate: infl. narrow, not leafy, the peduncles 1–3-fld.; fls. usually more than 1 in. long, somewhat 2-lipped, light purple, somewhat hairy within; sterile filament hairy above. Idaho, Ore., and Wash. B.R. 1309.

41. **diffùsus,** Douglas (*P. argùtus,* Paxt.). Sts. about 2 ft. tall, diffuse: lvs. ovate to oblong-lanceolate to cordate-ovate, unevenly and deeply serrate: infl. leafy, the pedicels very short; fls. ¾in. long, light purple, 2-lipped; sterile filament hairy above. Ore., north. B.M. 3645. B.R. 1132. R.H. 1872:410.

BB. *Lvs. deep-cut.*

42. **Rìchardsonii,** Douglas. Rather loosely branching: lvs. ovate-lanceolate to narrow-lanceolate, deeply cut or pinnatifid, the upper ones not opposite: infl. loose; fls. ¾in. long, light purple; sterile filament somewhat hairy at top. Ore. and Wash. B.M. 3391. B.R. 1121. L.B.C. 17:1641.

BBB. *Lvs. entire.*

C. *Sterile filament somewhat bearded.*

43. **graciléntus,** Gray. A foot or more tall from a woody base, naked above: lvs. lanceolate to linear or oblong, glabrous: infl. loose, the viscid peduncles 2–5-fld.; fls. ½in. long, violet-blue, the lobes very short. N. Calif., Nev., and Ore.

CC. *Sterile filament glabrous.*

44. **làtus,** Gray. About 1 ft. tall, from a woody base, closely pubescent: lvs. lanceolate to linear-lanceolate, the radical ones spatulate: fls. 1 in. long, blue. Calif. and Nev.

45. **Roèzlii,** Regel. Smaller than the last, 1 ft. or less, glabrous or minutely puberulent below: lvs. lanceolate, linear, or oblanceolate: fls. pale blue or violet, on divergent branches, the corolla ½–⅔in. long. Nev., Calif., Ore.—The plant cult. under this name may be, in some cases, *P. azureus* var. *Jaffrayanus.*

2864. Pentstemon Cobæa. (×¼)

46. **azùreus,** Benth. Erect or ascending, 3 ft. or less, glaucous, sometimes minutely pubescent: lvs. narrow-ovate to narrow-lanceolate: infl. loose and open; fls. 1½ in. or less long, blue to violet, sometimes reddish at the base, the limb about 1 in. across. Calif. B.M. 7504. J.F. 2:211.

Var. **Jaffrayànus,** Gray (*P. Jaffrayànus,* Hook.). Lower (about 1 ft. tall), young sts. tinged with red: lvs. oblong to oval or the upper ones ovate-lanceolate, glaucous: fls. large and showy, rich blue and reddish at base and in the throat. Calif. B.M. 5045. R.H. 1874:430. H. F.II. 1:5. G.C. III. 58:67.—By some kept specifically distinct.

47. **heterophýllus,** Lindl. Sts. reaching 3–5 ft., from a woody base, the plant mostly green: lvs. varying from oblong-lanceolate above to lanceolate and linear below: infl. loose and open, the peduncles usually 1- or 2-fld.; fls. about 1 in. long, pink or rose-purple, very slender at the base but full or inflated above, the lips well marked. Calif. B.R. 1899. B.M. 3853. R.H. 1875:110; 1896, p. 348; 1901:164.

48. **Brídgesii,** Gray. Sts. 1–2 ft., from a somewhat woody base, glabrous or perhaps puberulent up to the thyrse: lvs. lanceolate to linear: peduncles 1–5-fld., short, glandular; corolla about 1 in. long, bright scarlet, narrow, the lips one-third length of tube; anthers sagittate. S. W. Colo. and N. Ariz. to Calif. Gn. 66, p. 348.

As the pentstemons are mostly attractive plants, any number of them may appear in the lists of distributors of native plants. *P. baccharifòlius,* Hook. Glabrous or only obscurely puberulent, leafy at base, 2 ft.: lvs. oblong, sharp-toothed, sessile: fls. deep carmine-red, on 1–3-fld. peduncles; corolla 1 in. long, broadly tubular, with short 2-lipped limb; sterile filament naked. Texas. J.F. 3:227.—*P. pygmæus* is a name listed abroad: "very compact-growing; pale purple and white fls."—*P. virgàtus,* Gray. Glabrous or slightly glandular, the st. strict and long: lvs. linear-lanceolate: fls. lilac with purple veins, in a virgate thyrse; corolla ¾in. long, with a wide throat and distinctly 2-lipped. New Mex., Ariz.

L. H. B.

PEONY: *Paonia.*

PEPERÒMIA (Greek, *pepper-like*). *Piperàceæ.* An enormous genus of tropical and subtropical herbs, including a few small but choice foliage plants for warmhouse, conservatory, or house decoration.

Annual, or perennial by a creeping caudex or by

tubers formed at the base: sts. prostrate, creeping and thread-like, or erect and slender, or short thick, and succulent: lvs. alternate, opposite, or in whorls of 3–4 (rarely 5–6), entire, fleshy or membranous, often with pellucid dots, sometimes attractively veined or colored: fls. minute, usually disposed in a dense spike; stamens 2; anther-cells confluent; stigma sessile, undivided, often tufted: fr. a small or minute berry, 1-seeded, with thin pericarp. —Species perhaps 500 or more, widely dispersed, but mostly in Amer., from Fla. to Chile and Argentina. Very few are cult. The names of peperomias are much confused, partly owing to the vast size of the genus, which always increases the difficulties of discrimination, and partly to the minuteness of the fls. Moreover, the duration of many kinds is uncertain, while great numbers are monocarpic, that is, they flower and fruit once and then die. In the following account, the names are those that mostly appear in the trade and in horticultural literature; how far these names may be properly determined botanically is a subject for investigation.

2865. Peperomia Sandersii, usually known as P. arifolia var. argyreia.

Peperomias are very attractive and beautiful small-stature glasshouse plants, having particularly a very decorative appearance among other foliage plants. For their general culture they need a warm house. By the end of January they will become active both in root and foliage. From February on they will stand an increase in temperature to about 62° at night; this may be increased until they are having 65° to 70° with an increase of 10° to 15° on bright days. As the sun gets powerful in the spring, they will need shade, or as soon as the foliage shows signs of losing color. In the summer they need a good supply of water, but in autumn and winter they require very careful watering. In spring and summer they profit by frequent light spraying. Keep the atmosphere of the house in a moist state, but avoid a stuffy or stagnant condition. In the slow time of winter, they will stand the temperature to be lowered to about 60° with 10° to 15° increase with sun. Give less spraying and be very careful in giving water during the dark and dull time, otherwise the roots will rot.—They can be propagated readily from pieces of the stems or leaves placed in pans of silver sand and plunged where they will have bottom heat of 75° to 80°. Do not cover with glass as it tends to make them rot. Keep shaded and be very careful about watering, and they will soon root. When they make sufficient roots, they may be potted up into small pots, using loam four parts, fibrous peat two parts, and enough sand to keep it open. For larger shifts, use a more lumpy mixture of fibrous loam, fibrous peat, and well-decayed cow-manure. By July or August they should get their last shift, until the coming of spring. They will stand full sun by the end of September and through the winter, and this greatly aids in keeping them in good condition at that season. (J. J. M. Farrell.)

A. *Plants for pots or pans, erect-habited.*

B. *Lvs. alternate.*

C. *Sts. short or wanting.*

Sándersii, A. DC. (*P. arifòlia,* Hort., not Miq.). Fig. 2865. Stemless: lvs. alternate, peltate, 5 x 3½ in., rounded at base; petioles dark red, 4–8 in. long. Cult. only in the form var. **argyrèia,** Hook., f., which differs from the type in having broad, parallel longitudinal bands of white between the nerves. Brazil. B.M. 5634. F.S. 23:2438. G. 25:197. A.G. 19:17. F.R. 1:637.—This plant seems to be the commonest in cult. here, under the name of *P. arifolia* var. *argyreia.* However, Casimir DeCandolle thought that this plant is not the true *P. arifolia,* and he renamed it *P. Sandersii* (after Wilson Sanders), but the name is often spelled Saundersii in trade catalogues. The distinctions which DeCandolle makes are technical. The evident ones are that *P. arifolia* has a short st. and catkins much longer than the lvs., while *P. Sandersii* has no st. and the catkins are about as long as the lvs.

Verschafféltii, Lem. Distinguished from *P. marmorata,* which it much resembles, by the lvs. being alternate, by the basal lobes, which do not overlap but are separated by a notch as in a typical cordate lf. A smaller and more delicate but more branched plant: st. short: st., branches, petioles, and peduncles much longer, translucent, and pale rose (not green): lvs. heart-shaped at base. Upper Amazon, Brazil. I.H. 16:598.

tithymaloìdes, A. Dietr. (*P. magnoliæfòlia,* A. Dietr.). Lvs. alternate, subovate, acutish, narrowed at base, 2–3 in. long, base acute, more than 9-nerved; nerves subopposite; petiole 1 in. long, keeled beneath: st. rooting below. Santo Domingo.—Monocarpic (annual or biennial.)

maculòsa, A. Dietr. Lvs. alternate(?), ovate-lanceolate, bright shining green, very fleshy; petioles beautifully spotted with purple. Santo Domingo.—A good subject for a pan. Perennial.

CC. *Sts. numerous, long, slender.*

metállica, Lind. & Rod., is distinct from all others here described by its numerous slender unbranched sts. 12–16 in. high, and lanceolate lvs. It probably belongs in some other genus or family. It was intro. in 1892 before the fls. were known and its exact botanical position determined. Lvs. blackish green, painted white down the middle, red-veined below; petioles short, reddish brown. Peru. I.H. 39:157. G.W. 3, p. 160.

BB. *Lvs. opposite or in whorls.*

marmoràta, Hook. St. short, much-branched, nearly ½in. thick: lvs. opposite, ovate-cordate, deeply 2-lobed at the base, the lobes rounded and overlapping. The lvs. are 3–5 x 1½–2¾ in., not so broad as *P. Sandersii,* and less concave. Not advertised, but has been unnecessarily confused with *P. Sandersii.*

latifòlia, Miq. St. 10 in. high, decumbent: lvs. obovate or obtusely ovate, 5–7-nerved, opposite or in whorls of 3, base acute, glabrous above, pubescent beneath; petiole 7–8 lines long. Hawaii.—Monocarpic (annual or biennial).

AA. *Plants for hanging-baskets, drooping.*

nummularifòlia, HBK. Delicate creeper, with long, thread-like, rooting sts. and small orbicular lvs., puberulous or glabrate: lvs. alternate, ciliate, obscurely palmately 3-nerved, 3–4 lines diam. Trop. Amer.—The above description is from Grisebach. Five other species in the W. Indies have the same habit. *P. prostràta,* Hort., is probably a synonym. It is a stove basket-plant figured in G.C. II. 11:717 and F. 1881, p. 103, with a good-sized petiole. The lvs. are very small for the genus, and are said not to exceed ⅖in. Lvs. bordered and nerved with greenish white. Annual. Nicholson refers *P. prostrata* to *P. brevipes,* and keeps *P. nummularifolia* separate. *P. brévipes,* C. DC., has lvs. alternate, orbiculate, younger ones hirsute, older ones glabrate, ciliate, 1-nerved: style none: berry with a very short stipe. Trop. Amer.

In some collections is a plant known as *P. crassifòlia* (which is probably not P. crassifolia, Baker, of Trop. Afr.). It is a very distinct species with dark green, ovate, fleshy lvs. 3 x 5 in., becoming very hard when old: sts. branched and upright in habit, a foot in height: fls. in insignificant catkins. It is a very good plant and deserves to be more generally known.—*P. pubifòlia*, Veitch. Perennial creeper of unknown habitat, suitable for hanging-baskets. Lvs. small, ovate, marked with a central gray bar.—*P. resedæflòra*, André, intro. in 1865, was "found in all stoves" 2 years later and said to be "a plant for the million." It differs from all the above in being a flowering plant rather than a foliage plant, for the lvs. are merely bordered lighter green and the fls. are about as showy as those of a mignonette, each one 3–4 lines long, and 100 or so in a raceme. St. 1–1½ ft. high, red, forked: lvs. broadly ovate, cordate. Colombia. B.M. 6619.

WILHELM MILLER.
L. H. B.†

PEPÒNIA (Greek, *melon, gourd*). *Cucurbitàceæ*. Climbing or sprawling plants, little known in horticulture.

Perennial herbs, prostrate or scandent, often villous, with fibrous roots: lvs. lobed or rarely entire, dentate: fls. large, yellow or whitish, monœcious, the males solitary or racemose; corolla-lobes 5, obovate; stamens 3; female fls. solitary: fr. large or medium, fleshy, oblong or cylindrical; seeds many, black, flattened.—Species about a dozen in Trop. and S. Afr. Because of an earlier genus of the same name, Engler has proposed the name Peponium for this group.

Mackénnii, Naudin. Lvs. broadly ovate-cordate, 5-lobed to the middle: male fls. solitary; calyx-tube subglabrous, narrowed from apex to base. It is hardly scandent, densely villous and the st. grows ½–6 ft. long: lvs. 4 in. long: petals over 1 in. long: fr. oblong-ovoid, about the size of a hen's egg, green at first, then marbled with white, finally all red; pulp orange-colored, insipid. Natal.—Once intro. in S. Calif., but now apparently lost; probably not of much value as an ornamental.

L. H. B.

PEPPER. With American horticulturists "pepper" usually means the red pepper (Capsicum, which see) of which the green pepper is merely the unripe stage. The black and white pepper of commerce are treated under *Piper*.

The red pepper (Capsicum) is doubtless native of the New World, as there is no record of its having been known prior to the discovery of America. According to Irving's "Life of Columbus," this plant was first mentioned by Martyr in 1493, who says Columbus brought home "pepper more pungent than that from Caucasus," evidently comparing it with the black pepper of commerce from the oriental countries. It was cultivated by the natives in tropical and southern America before this time, and about a century later Gerarde speaks of its being brought into European gardens from Africa and southern Asia. The ease with which the plant spreads in warm latitudes, together with the increased commercial trade immediately following the discovery of America, doubtless caused a rapid dissemination through tropical Asia and Africa, where it was supposed by many to be indigenous and from there introduced into European gardens.

The first record of the use of pepper is apparently by Chauca, physician to the fleet of Columbus, who in 1494 alludes to it as a condiment. Writers about a century later considered it valuable as an aid to digestion and also mentioned its use in dressing meats, dyeing, and other purposes. Medicinally it was much used for various ailments, such as dropsy, colic, ague, and toothache, and when mixed with honey and applied externally was used as a remedy for quinsy. At a later date preparations were given for black vomit and various tropical fevers, and for a tonic, also for gout, paralysis and other diseases. Its modern use is largely as a condiment, forming a seasoning in almost every dish eaten by the inhabitants of warm countries. The smaller varieties are mostly used for this purpose. The cayenne pepper of commerce consists of the small pungent fruits reduced to a powder. The unground fruit is also made into pepper sauce of various brands by preserving in brine or strong vinegar. The Tabasco variety furnishes the well-known Tabasco pepper sauce and Tabasco catsup. "Chilli con carnie" consists of the small pungent varieties finely ground and mixed with meat. These hot varieties are often eaten raw by native Mexicans, as are radishes, and also form an important ingredient of tomales so common in that country and fairly well known in the southern United States. The large thick-fleshed sweet varieties are desired more by persons farther north, who use them in various ways, served like tomatoes in either ripe or green state, with vinegar and salt, or made into mangoes by cutting one side, removing seeds and filling with chow-chow pickles. The parts are then tied together, placed in jars with vinegar and kept until wanted. The fruit is often used in stuffing pitted olives after being cooked in olive oil. In Spain some are canned after being thus cooked and eaten with French salad dressing.

Paprika is a well-known Hungarian and Spanish condiment made from the long, and more or less pointed type of peppers. The Spanish paprika is much milder in flavor than the Hungarian, it being made from a less pungent pepper and doubtless in its preparation more of the seeds and placentæ are removed, which process makes a milder condiment. The seed of peppers is more or less used as a bird food; and the plants of some varieties, like Little Gem and Celestial, are grown more especially for ornamental purposes.

Some thirty varieties are recorded by American seedsmen. They differ from one another mainly in the form and pungency of fruit and habit of growth. There are endless forms among peppers, but certain types are

2866. Pepper.—The Ruby King variety.

well fixed, as indicated by the botanical varieties under Capsicum. Pungency is to be found in all peppers and while located in the placentæ, other parts may acquire it by contact. Most of the smaller sorts, like Coral Gem, Tabasco, Chilli, Cayenne, and Cherry contain more of the pungent properties than the large kinds, like Ruby King (Fig. 2866), Squash, Bell, Sweet Mountain, and Golden Queen. Some medium-sized varieties,

like Long Red, Celestial, and Oxheart, are hot; others, like County Fair and Kaleidoscope, are mild.

Peppers are classed as one of the minor vegetables in that they have not been grown in large quantities in any one locality and the aggregate production is smaller than the so-called truck crops, such as tomatoes, cucumbers, and the like. Most gardens near large cities in the central and southern states have been growing a few to supply the local markets. During the last decade there has been a decided increase in acreage. The census report for 1900 gives no report of production of peppers, but for 1910 there were recorded for the United States, 1,641 farms containing 3,483 acres, valued at $408,741, an average of $117.47 an acre. Four states with the largest acreage are:

	No. of farms	Aver. area Acres	a farm	Value	Aver. value an acre
New Jersey.....	822	1,882	2.29	$149,433	$79 40
California.....	55	417	7.56	52,294	124 92
Florida.....	143	296	2.07	94,246	318 40
New Mexico.....	266	260	0.97	17,228	66 26

This record ignores quantities of less than an acre with the evident exception of New Mexico, which averages .03 less than 1 acre to a farm.

It is estimated that approximately 4,000,000 pounds of paprika were imported each year during the last three or four years. The United States Department of Agriculture has demonstrated that this product can be profitably produced in the South, but if the consumption is limited to the above figure the acreage must continue to be very limited.

In growing peppers, the seed is usually planted under glass in February or March, and the young plants transplanted to pots or boxes when of sufficient size to handle. From twelve to twenty days are required for the seed to germinate, the time varying according to the age of the seed and the manner in which it has been kept. Its germinating power is said to last four years, and if kept in pods until sown will grow when six or seven years old. A light warm soil, heavily charged with humus and one that will not quickly dry out, appears to be the best. In May or June, or after all danger of frost is past, the plants (Fig. 2867) are set in the field in rows about 2½ feet apart and 18 inches apart in the rows.

2867. Pepper plant ready to transplant to the field.

The ground is kept thoroughly cultivated, not only to keep down weeds but to maintain an even but not excessive moisture at all times, which is very essential for best results in growing this plant. By keeping the soil well worked up around the plants, they stand up much better against the winds and weight of their own fruit. Pruning or pinching the tip ends after the fruit begins to mature is occasionally recommended, but is rarely practised except when specimens of especially fine fruit are desired, in which case the fruit is thinned, leaving only a few on each plant of the larger sorts. In gathering, the fruit should not be torn off but cut with a knife or scissors, leaving at least 1 inch of stem. The usual vegetable crate is used for packing and marketing the crop.

Insects rarely injure peppers growing in the field. The pepper weevil (*Anthonomus eugenii*) has done some damage to crops in the South. It is said to be easily kept in control by gathering and destroying infested pods. Tomato-worm, bollworm, white-fly and Colorado potato-beetle sometimes attack the plant, but seldom do noticeable injury. Red-spider and green-fly (aphis) frequently attack plants growing under glass. The red-spider may be kept in check by repeatedly syringing with water, and the green-fly may be killed by fumigating with tobacco dust. Two fungous diseases frequently occur on the large varieties growing outdoors. One is a pink anthracnose (*Glœosporium piperatum*), which causes the fruit to rot about the time it begins to ripen; the other is a dark anthracnose (*Colletotrichum nigrum*).

In preparing peppers for table use, handle them with gloves to prevent burning the fingers. Neither soap nor water will soothe hands burned by peppers, but milk will.

H. C. Irish.

PEPPER-GRASS: *Lepidium.*

PEPPERMINT: *Mentha.* **P. Stringy-bark:** *Eucalyptus piperita.*

PEPPER-ROOT: *Dentaria diphylla.*

PERAPHÝLLUM (from Greek, *pera*, excessively, and *phyllon;* alluding to the crowded lvs.). *Rosàceæ*, subfam. *Pòmeæ*. A much-branched rigid shrub, with deciduous alternate rather small and narrow partly fascicled lvs., white fls. similar to apple-blossoms in few-fld. upright umbels appearing with the lvs., and berry-like edible fr. Hardy as far north as Mass., but seems to possess only little ornamental value. It is of very slow growth and blooms only when rather old. It grows in well-drained soil and in sunny position, and is best suited to be planted on rocky slopes of southern aspect. Prop. by seeds and layers and by grafting on amelanchier or cratægus. It is closely allied to Amelanchier, but distinguished by its nearly umbellate fls., cylindric calyx-tube, the perfectly inferior ovary, and also by its narrow lvs. The only species is **P. ramosíssimum,** Nutt., a rigid shrub, 2–6 ft. high: lvs. oblong to oblanceolate, almost sessile, entire or sparingly serrulate, silky pubescent when young, ¾–2 in. long: fls. in few-fld. erect umbel-like racemes, white or slightly tinged pink, with rose-colored disk, ¾in. across; petals obovate, spreading; styles 2–3, free; ovary 2- or incompletely 4-celled: fr. pendulous, globose, yellow with brownish cheek, about ½in. across. May. Ore. to Calif. and Colo. B.M. 7420.

Alfred Rehder.

PERENNIALS tend to live from year to year, as opposed to annuals and biennials, which die root and branch after flowering and fruiting. Annuals live only one year, biennials two years. Perennials include trees, shrubs and herbs, the two former being woody, the latter not. "Perennials," as commonly used by gardeners, is a convenient shortening of the phrase "hardy herbaceous perennials," which includes peony, phlox and other non-woody plants whose roots live over the winter while their tops may die to the ground. The phrase "hardy herbaceous perennials" is also shortened in common speech to "herbaceous plants;" or one speaks of the "hardy border." See *Herbs* and *Border;* also *Annuals* and *Biennials.*

A popular fallacy about perennials lies in the common statement that "they die down every year and come up again in the spring." Many of them never come up after two or three years of flowering; that is, perennials are not necessarily perpetual. Peonies may be as long-lived as shrubbery, and a clump of fraxinella has been known to outlive father, son, and grandson in the same spot. But these are exceptions. The general practice with perennials is to divide them every second or third year. Nearly all hardy herbaceous plants should be lifted now and then, because the crowns that give the flowers in most desirable kinds flower only two or three seasons and then die; but the plant may be continually spreading and making new growths, which

LXXXVII. A branch of Pereskia aculeata, one of the leaf-bearing cacti.

furnish the flowers, and, unless lifted and divided, the stocks become scattering and unattractive. Another very good reason for lifting and dividing the perennials is that, being mostly strong-rooted plants, they deplete the soil; when shifted, they are likely to be set in a new place.

PERÉSKIA (named for Nicolas Claude Fabry de Peiresc). Also written *Peirescia, Peireskia,* and *Perescia. Cactàceæ.* Shrubs or clambering vines, grown for ornament and also for the edible fruit.

Spines in the axils in the lvs.: lvs. alternate, broad and flat, resembling those of ordinary flowering plants: fls. wheel-shaped, more or less clustered; ovary naked or leafy: fr. juicy, sometimes edible; seeds black, thin-shelled.—Some 40 names have been given in Pereskia for species in this and related genera, but only 13 are now recognized. Only two species are very common in collections, although *P. cubensis, P. amapola,* and the true *P. Bleo* have recently been intro.

aculeàta, Mill. (*Cáctus Peréskia,* Linn. *Peréskia fœtans,* Speg.). Lemon Vine. Blade Apple. Barbados Gooseberry. Branches woody, clambering, 10–20 ft. long: lvs. flat, lanceolate, 2–3 in. long, 1–2 in. broad: spines on old wood in clusters and straight, 1–2 in. long, on young branches 2, short and curved: fls. pale yellow with pink varieties, 1–1½ in. broad: fr. lemon-colored, the size of an olive, in age smooth. Widely spread in Trop. Amer. B.M. 7147. B.R. 1928. G.C. III. 20:625.—This species is much used as stock on which to graft other species of cacti. Var. **Godseffiàna,** Hort. Lvs. richly colored, when young crimson, yellow and green above. G.C. III. 43:257 (note).

grandifòlia, Haw. (*P. Blèo* of authors, not *Cáctus Blèo,* HBK.). Usually tall shrubs, but sometimes growing as half clambering: lvs. often large, some 5 in. long: spines form large clusters on the old wood, usually solitary on young branches, straight: fls. in small clusters, purple, 1½–2 in. broad: fr. 2 in. long, pear-shaped. Brazil, and now grown in many warm countries. B.M. 3478. G.C. III. 20:427.

P. subulàta, and *P. spathulàta* are to be excluded from Pereskia. Schumann in his Monograph of the Cactaceæ referred them to the genus Opuntia, but they more properly belong to the genus Pereskiopsis, Brit. & Rose, which see.

J. N. Rose.

PERESKIÓPSIS (*like Pereskia*). *Cactàceæ.* Opuntia-like plants grown for ornament and curiosity.

Trees and shrubs: sts. and branches cylindrical: lvs. large, flat, and persistent: areoles bearing spines and glochids: fr. usually red; seeds covered with matted hairs. This genus, lately segregated from Opuntia, where recent writers have placed it, is very different from Opuntia in many ways, and resembles more closely in habit and foliage the genus Pereskia, although it is very different in fr. and seeds from that genus.—Eleven species have been recognized, of which 9 are now grown in Washington and in the New York Botanical Garden, although none is known in the trade.

velûtina, Rose. Sts. weak, forming compact bushes: branches soft, velvety: lvs. broadly ovate: fls. yellow. Mex.

subulàta, Brit. & Rose (*Peréskia subulàta,* Muehl.). St. 2 ft. or less high, below half wood, above fleshy and branching: lvs. persisting a few years, dark green, shiny, as thick as a pencil, about 3 in. long, half-cylindrical and ending in a spine: areoles felted, in the young plant with a few hair-bristles, later with 2–4 straight, pale yellow spines 3–4 in. long. Mex.—Can be used as stock for epiphyllum.

spathulàta, Brit. & Rose (*Peréskia spathulàta,* Otto). St. upright, with few horizontal, spatulate, shiny green lvs.: the diffuse areoles at first somewhat woolly, later felted, above with a bunch of short bristles, below with 1–2 yellowish white, straight spines. Mex.

J. N. Rose.

PERFUMERY-GARDENING. The growing of plants commercially as a source for perfume-making.

The perfumes of the market are derived in part from animal secretions (musk, civet), in part from artificial chemical compounds, and in part, and chiefly, from the class of vegetable products loosely called essential oils. "Synthetic" or chemical perfumery materials are the more or less perfect artificial reproductions of organic compounds used in perfumery. If it were possible in all cases and with perfect success to compound these substances, the production of floral perfumes would soon be at an end, as the chemical process would be sure to be cheaper than the horticultural. But nature knows how to add some touches which the chemist's art cannot imitate, and even when synthetic manufacture is possible, the result is in general regarded as a cheaper substitute. At the same time, sentimental reasons count considerably in favor of the natural perfume, and considering, further, that some perfumes cannot well be imitated chemically, there is no present cause to apprehend the extinction, or, in view of increasing demand, even the decline, of the industry of producing natural perfumery oils.

The essential oils used in perfumery are secreted in different parts of the plant. The flowers are naturally thought of first, being the seat of the fragrance of the rose, violet, cassie, jasmine, tuberose, the orange in part, and numberless other plants whose perfume is extracted or only enjoyed as naturally exhaled. The oil of lavender is yielded more by the green parts of the flower-head than by the corollas. In rose geranium, thyme, wintergreen, and patchouli the foliage is the fragrant part. A number of essences are derived from woods, as those of sandalwood, red cedar, and rhodium. The oil of sweet birch comes partly from the wood, but mainly from the inner bark, and the same is true of sassafras. In the case of the latter, however, the roots only are used; in the case of the former, the young tops. Several herbaceous roots also furnish oils, as orris-root, Canada snakeroot, and sweet flag. The rinds of the orange and other citrous fruits contain important perfumery oils, and the oil of bitter almonds comes from the fermented kernel of the nut.

The standard methods of extracting essential oils are four, namely, the use of mechanical means (chiefly expression), distillation, *enfleurage* or inflowering, and maceration. Expression appears to be applied only to the rinds of the citrous fruits. These are placed under pressure in a screw press, or sections turned wrong side out are squeezed in the fingers, the oil being taken up with a sponge, or the fruit is rubbed in a cup lined with spikes (*écuelle à piquer*), the oil collecting in a hollow handle. An *écuelle* on a larger scale in the shape of a hollow drum has also been used.

In distillation, the oil-bearing material is heated with water or subjected to hot steam, and the oil, being volatile, passes off with the steam. The oil would be lost if the vapor were not condensed, and this is accomplished by passing it through a coil or equivalent arrangement of pipe kept cool by a flow of water. The condensed steam and oil fall into a "Florentine recipient," a vessel with a spout coming out at the base but rising to the level of the top, so that the heavier liquid, sometimes oil, sometimes water, alone will enter it and can be poured off separately. After the water and oil have mainly separated, the water will still contain enough oil to make it highly fragrant, and in this state it goes to market as rose-water, orange-flower water, and the like, or is returned to the still to be redistilled with the next charge.

The remaining two methods depend on the fact that grease has the power of absorbing essential oils. In *enfleurage* the grease, without heating, is spread over both surfaces of panes of glass which are set in frames (*châssis*), so that they can be piled one over another with spaces between. In these spaces are placed the

flowers, the charge being renewed daily until the grease is sufficiently impregnated, when it constitutes a "pomade." "Extracts" are made by digesting the pomade in alcohol, which has a still stronger attraction for the perfume than has the grease. The alcohol must first be deodorized, to save perverting the floral perfume, and is then known as "Cologne spirit." The grease used in this and the next process, moreover, must be freed from all corruptible matter by a special process. Tallow and lard, commonly mixed, and sometimes the fat of the deer and other animals, are employed.

In maceration, the pomade is produced by immersing repeated charges of the flowers in melted grease or fine olive oil.

In recent times, various chemical processes for extracting perfumery have been tried, apparently with some practical success; but they have not yet supplanted the old methods. Carbon bisulfid and petroleum ether are among the solvents employed. These methods would be less easily practised by beginners and amateurs than the ordinary ones.

The art of distilling is not only not difficult to learn, but is already in practice in this country in the case of peppermint, sweet birch, sassafras, eucalyptus, and the like. More care and better apparatus would be required for distilling roses and other flowers, but the process is essentially the same. Nor do the grease processes involve any difficulties which may not be overcome by the application of a little American ingenuity and capital. In fact, the production of the raw materials of perfumery might proceed almost at once, so far as the difficulty of the processes is concerned. But can we grow the requisite plants?

That many of the standard perfumery plants will grow in this country needs no proof, and there is no reason to doubt that their fragrance in properly chosen localities will equal that of the same plants in the European centers. In general, success in this line must be looked for only southward, even in dealing with hardy plants, though there may be exceptions to this rule. Cool trade-winds and fogs at flowering time are to be shunned. The natural conditions in Florida and large parts of the other Gulf states seem not very different from those of the south of France, the great center of perfumery-farming in Europe, and in fact the feasibility of successful perfumery-farming in Florida has been demonstrated by actual trial. California has also been the scene of experiments, some of them seeming to promise success as soon as economic conditions admit. A large territory between these two points is available for some lines of the industry.

Among the particular plants to be noticed, the citrous fruits deserve a leading place. Nearly or quite all of the trees of this group, including the sweet, the bitter or Seville, and the bergamot oranges, the sweet and sour limes, the lemon, the citron, and the shaddock, contain valuable perfumes either in the peel of their fruit, or in their flowers, or in their leaves, or in more than one of these. Of the fruit-oils, that of lemon is imported into this country in largest quantity, followed by oil of bergamot, oil of orange—bitter and sweet, oil of limes and "cedrat" or citron oil, the last two in very small quantities, but the cedrat at a very high price. These oils are extracted by expression, the distilled being inferior, though it is asserted that when the "rag," or inner soft layer, is removed, the distilled oil equals the other. The oil of the bitter orange is superior to that of the sweet; the oil of bergamot is far more valuable than either, but can rarely be had in an unadulterated state. The flowers of the orange treated by distillation yield "neroli." The scent of neroli, however, is not that of the flowers, an alteration taking place during the distillation. Orange-flower water, consisting of the condensed vapor of water with a little unchanged oil adhering, affords the true odor of the flowers. By maceration, likewise, the true floral fragrance is obtained. The abortive flowers which fall from the trees are available for perfumery use, but the flowers are also sometimes picked, presumably with a better result. Besides the product of fruit and flowers, the leaves and young twigs pruned from the sweet and bitter oranges yield to distillation the oil of "petit grain," of considerable though minor value. There is no reason to doubt the perfumery capacity of American orange groves. Indeed it has been asserted that the orange flowers of Louisiana excel in sweetness those of foreign parts. In Los Angeles, California, something has been done toward utilizing the peel, and in Florida a beginning has been made with both peel and flowers, but for the most part these resources are at present suffered to go to waste.

The lemon verbena, *Lippia citriodora* (Fig. 2868), may be mentioned in passing as furnishing an attractive perfume of the citrous order, and as available at least in Florida and California.

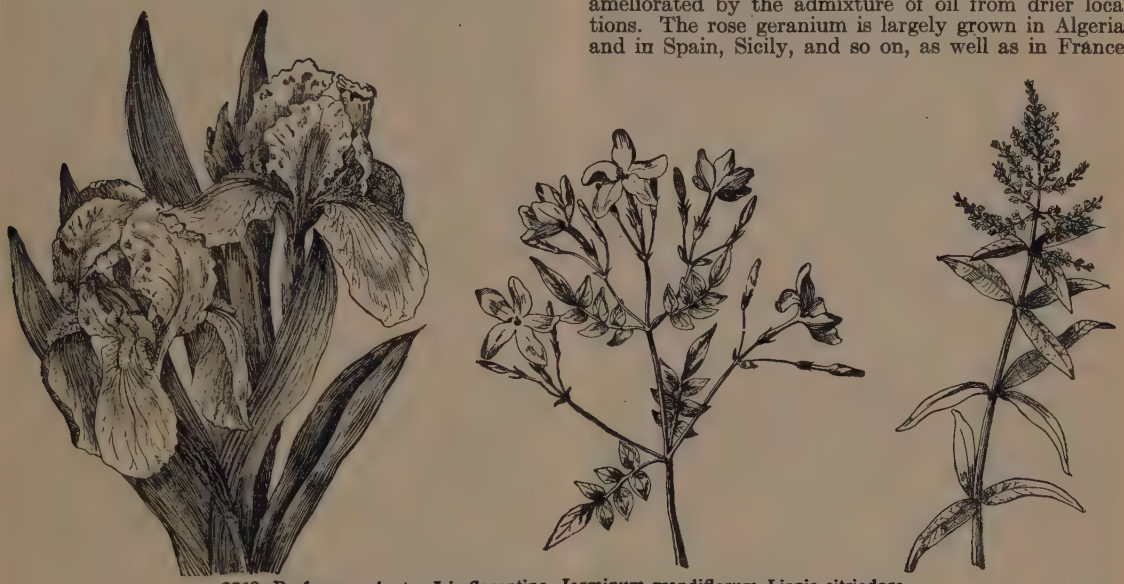
The perfumery products of the rose and its allies merit next attention. The value of the importation of attar of roses—to say nothing of rose perfume in other forms—exceeds that of any single citrous perfume, and at the same time the capacity of this country for producing this and the other rose perfumes can scarcely be called in question. The present supply of the European and American markets is derived chiefly from Turkey and from the perfumery region of the south of France. The attar or oil of roses is produced most largely in Bulgaria and parts of other Balkan states as well as in Asiatic Turkey, principally from the damask rose, which may be taken as a form of *Rosa gallica*. A white-flowered rose, *R. alba*, is much grown in the more exposed situations, as it is considered hardier than the red-flowered damask rose. It is very free in bloom and productive of oil, which is, however, inferior in quality. The attar is obtained by distillation, which is there conducted in a crude manner. In the Grasse district (southern France), the rose-water, obtained as explained above, is considered to yield more profit than the attar, which is rather regarded as a by-product of the distillation.

But the best rose perfumes in France are extracted by maceration, finishing with *enfleurage*, processes that secure the true rose odor, which is not altogether represented by attar or rose-water. Rose pomade and its alcoholic extract are perhaps the finest of rose products. What is known as the Provence rose, a hybrid or variety of *Rosa centifolia*, the type to which the cabbage or hundred-leaf rose of old gardens and the moss roses belong, is almost exclusively used in France and also in Germany, where a limited quantity of very fine attar is produced.

The centifolia and gallica varieties of perfume roses, as well as a hybrid of *Rosa rugosa* under the name of Rose Parfum de L'Hay, have been tried in this country with encouraging results as far as facility of culture, quantity, and quality of perfume-content are concerned, but the economic possibilities of rose-culture here for this purpose are far from being worked out at this time. These varieties are all quite hardy and may, without doubt, successfully be grown over a vast extent of country, though for practical perfume-production the warmer climates, coupled with abundant summer moisture, seem to be needed. Deep fertile and retentive but well-drained clay or loam soils are best adapted for rose-culture, and these may be had in abundance in the Southern and Middle Atlantic states, where the future rose industry of the United States, when it becomes a commercial possibility, may be expected to develop. The luxuriant growth of roses on the Pacific Coast has long attracted attention, but exuberant vegetation does not always imply a rich perfumery-content, and there is a suspicion that the cool fogs of the coast and the hot aridity of the interior

valleys of the Pacific States do not favor perfume-production, however stimulating local conditions may be to vegetative growth; but direct experiments in this connection appear to be lacking.

The centifolia and gallica roses have practically but one season of bloom in this country. They are covered with flowers in May or June, according to the latitude in which they are grown, producing only occasional blooms in the fall, the gallicas being most free in this respect; but the hybrid with *R. rugosa* has a long blooming season, with repeated crops coming on in late summer and autumn. This peculiarity might be of advantage in localities where labor is scarce, as a smaller force of workers could care for the same amount of bloom developing over a longer season. The perfume of the hybrid rugosa is of the most exquisite quality and the yield somewhat greater than of the older types of perfume roses, but there is greater difficulty of propagation, as rugosa varieties are increased only by budding or grafting, while the centifolias and gallicas are freely propagated by means of layers or cuttings.



2868. Perfumery plants: Iris florentina, Jasminum grandiflorum, Lippia citriodora.

The production of high-quality rose-water, rather than attar, appears likely to be more profitable in this country, as the latter requires repeated distillations, or washing out by ether and subsequent evaporation of the menstruum, and realizes a relatively less price in market on account of competition with adulterated imported oils and synthetic imitations.

The type of rose bloom best suited for perfume purposes is semi-double, with large, thick petals that can easily be collected, rather than the more showy varieties with full disks of shorter petals so crowded that they hide the pistils. Many of the latter varieties possess exquisite fragrance and possibly a satisfactory oil-content, but are seldom sufficiently vigorous or free in bloom to offset the added difficulty of manipulation. In a field trial of "Princess Bonnie," one of the most fragrant of American-raised hybrid tea roses, not enough blooms could be collected at a given time for a practical distillation. New varieties will be developed especially adapted to the purpose as interest in rose-perfume production increases, and those with peculiarly attractive odors may become available for the grease process, when not altogether suited for distillation.

The culture of perfume roses and the extraction of their fragrance present no difficulties to American skill, the main question being that of efficient labor for promptly collecting the blooms during the relatively short productive season. It requires in this country, as abroad, fully 3,000 pounds of fresh rose petals to produce a pound of oil, valued at the present time at $125, or more if of really high quality. The value of the rose-water represented by this amount of oil would be considerably greater.

The oil distilled from the green parts of the common rose geraniums, *Pelargonium capitatum* (?) and *P. Radula*, resembles in fragrance the oil of roses and is largely used as a substitute for it. Although generally not sold at retail under its own name, it is in itself a legitimate perfume, and its production should be undertaken in this country—only, however, in the South, where the long season admits of three crops of leaves and where the stumps with the soil heaped around them will survive the winter. The largest crop is to be had on rich lowland, but the finest quality is produced on drier and less fertile ground. In France, it is now grown mainly on irrigated land, but the product has to be ameliorated by the admixture of oil from drier locations. The rose geranium is largely grown in Algeria, and in Spain, Sicily, and so on, as well as in France. Geranium oil, in turn, has its substitutes, among which the oil of lemon-grass from India is conspicuous.

The European sweet violet, *Viola odorata*, affords the finest example of a favorite type of odors quite different from the citrine and the rose. The oil of the violet itself is necessarily so expensive as to be little used. The large amount of flowers required and the amount of hand labor necessary for gathering such small flowers, each growing on a separate stem, are apparently insurmountable obstacles to the extensive use of true oil of violet. Still it may be presumed that there will permanently be a class of buyers willing to pay the necessary cost of so choice a perfume. The violet yields its full fragrance only southward, but it must be grown in partial shade. When labor conditions admit, true violet perfume may be produced in California and in the South. An expert grower of violets has even thought that they might be grown under glass for this purpose.

Of the same general type and in some wise a substitute for violet perfume, is that of *Acacia Farnesiana*, the "cassie" of the French, known in the South as "opopanax." The small yellow balls of flowers are treated by the grease processes, particularly maceration. While not ranked so high as violet, the perfume is in entirely good standing and produced in large

quantities. The flowers, dried with proper care, have a market value for sachets. The opopanax tree grows freely in Florida, is apparently native in Texas, and is suited to the climate of Arizona and southern California. The labor of picking the flowers would be somewhat expensive. Several other acacias are eligible for perfumery use.

To the same group belongs the perfume of orris- or iris-root. It is afforded by the rootstocks of three species of iris, formerly gathered wild and now cultivated near Florence and at other points in Italy. The species are *Iris germanica* (Fig. 1968, Vol. III), *I. pallida*, and *I. florentina* (Fig. 2868), the first of these being our common garden iris, with deep blue flowers, the second a paler-flowered species, the third having white flowers. High authority affirms that the use of the first two species is only a falsification, and, in fact, that the root of *I. germanica* causes serious inflammations. It is certain that the first two are extensively grown; but *I. florentina* alone appears to be much used for distillation. When cultivated, the iris is generally propagated by root-division, the cuttings being placed for the first year in a nursery, afterward set in rows a foot apart. It is grown in stony dry soils on hillsides or mountains. The crop is gathered once in two or three years. The cuticle is scraped from the root, which after being dried in the sun is stored in a dry place for the development of its fragrance. This is wanting in the fresh root, and does not reach its maximum under three years. When distilled, the root yields "orris butter," but it is more largely used in the form of an alcoholic tincture or ground up for sachets. There is no reason why orris-root should not be grown in many parts of this country, but the returns at present are not large.

Another important group of perfumery plants consists of several members of the mint family. Peppermint and spearmint (Fig. 2359, Vol. IV) can hardly be placed in the perfumery class, but lavender, thyme, and rosemary could not easily be spared from the perfumer's resources. Lavender is native on dry slopes in the Mediterranean region, and the oil is most largely produced in the region of the maritime Alps. The plant has been introduced, however, into some of the southern counties of England (Mitcham and Hitchin being the centers), and found to produce there an oil which has commonly been regarded as far superior to the French, and at any rate is different in kind (see *Mentha*). The English lavender is grown in light and well-drained calcareous soils. In well-drained ground, lavender will bear some cold, especially if protected, but profit cannot be looked for far north. Lavender of the French type may be expected to succeed in California out of the reach of the trade-winds, and may perhaps not require irrigation. There are shallow calcareous soils in the "black belt" of the Gulf States which might perhaps yield an oil like the English, and the same may be true of some tracts northward on the Pacific slope. Lavender is treated by distillation, and it is said in England that direct contact with the water yields better results than the application of dry steam. (See, also, *Lavandula*.)

Thyme (chiefly the garden thyme, *Thymus vulgaris*) furnishes a perfume particularly suited to soaps and imported into this country in large quantities. Rosemary has a stimulating property and is an essential ingredient in Cologne water. Both of these could quite possibly be grown, say in California, but might not be able to compete well with the spontaneous product of Europe.

Some notice should be taken, too, of the rather humble group of odorous plants belonging to the parsley family, including anise, caraway, and fennel. Not only are the oils of these three (chiefly anise) largely imported but also their seeds (chiefly caraway). Caraway runs wild northerly, fennel has established itself on the lower Potomac, and anise could doubtless be grown, but there is no reason to expect large profits from these plants.

There are several plants deserving consideration which do not fall into any of these groups. One is the jasmine (*Jasminum grandiflorum* and *J. Sambac*) (Fig. 2868). This furnishes almost the only odor which cannot be imitated by combinations of others. The oil of jasmine is very valuable. The plants can be grown in our warmest regions. The tuberose furnishes another choice perfume and has been very successfully grown for the purpose in Florida and South Carolina. (See *Polianthes*.) The heliotrope (Fig. 1801, Vol. III), jonquil (Fig. 2448, Vol. IV), and mignonette are also to be named. Of a quite different scent from any of these is the oil of bitter almond, so important for fine soaps. This so-called oil is a poisonous compound formed in the process of fermenting the cake of the kernels from which the fixed oil has been expressed. Its production should be considered in our almond-growing regions, especially California.

Several tropical grasses of the genus Cymbopogon, including *Cymbopogon Schœnanthus*, which yields the previously mentioned lemon-grass oil, are of easy culture in Florida and the Gulf States generally, and doubtless will be largely used in the future for the production of fragrant oils having a wide range of usefulness, especially in the form of combinations for scenting soaps. Those best known are vetiver, *Vetiveria zizanioides*, citronella, *C. Nardus* and the true lemon-grass, *C. citratus*, not possessing the geranium-like odor found in *C. Schœnanthus*. With the exception of vetiver, which contains the fragrant principle in the roots, the leaves and flowering parts of the Cymbopogon grasses are used for distillation.

Of our native growths there are some which are already utilized as the source of scenting materials. The root of sassafras is or has been distilled in Pennsylvania, Maryland, and Virginia, and in other northern states, and sparingly southward. Wintergreen, *Gaultheria procumbens*, is distilled in small quantity in several eastern states, but has very largely given place to sweet or cherry birch, *Betula lenta*, which yields a similar oil with less expense. The wood of the red cedar, *Juniperus virginiana*, has long been distilled in Germany, and latterly in this country. It furnishes a finer cedar-of-Lebanon perfume than the cedar of Lebanon itself.

Three native plants representing respectively the thyme-like and citrine odors,—widely known as weeds but amenable to cultivation over a great extent of country,—are wild bergamot, *Monarda punctata*, mountain mint, *Pycnanthemum albescens* and Canada fleabane, *Erigeron canadense*. The first two yield oils useful for soaps as well as for the production of thymol, now a valued medicament, while the latter contains a high percentage of limonene that may largely displace turpentine in the manufacture of agreeable varnishes for inside uses.

The root of the wild ginger or Canada snakeroot, *Asarum canadense*, yields a fragrant oil quoted in market reports, and said to be used especially for strengthening other perfumes. The sweet goldenrod, *Solidago odora*, furnishes an oil which has a market standing. The rich odor of the yellow jessamine of the South has been successfully extracted in Florida. The common market perfume of magnolia is doubtless mostly or entirely an imitation, and the same is probably true of *Clethra alnifolia* perfume. The great magnolia, *Magnolia grandiflora*, abounds in the South, but its flowers might be difficult to secure in quantity. Clethra is abundant enough in the Atlantic Coast region, but some difficulty might be experienced with it owing to the fact that only a part of the flowers in the raceme open at one time. The flowers of the swamp magnolia or sweet bay, *Magnolia virginiana* or *M. glauca* (Fig. 2298, Vol. IV), should be tried. The spice bush, *Benzoin æstivale*, affords several scents. The sweet

and copious bloom of *Rhododendron arborescens* in the southern mountains has been suggested for treatment. It is to be feared that the delicious odor of the native crab-apples would be too expensive, considering the difficulty of collecting enough petals. The bloom of the wild grape might well be thought of. Many of our plants—these are only examples—will eventually be tried and a few will be found steadily valuable. It is useless to expect commercial success with small and scanty-flowered plants like trailing arbutus, *Epigæa repens*, however pleasing in their natural state.

The production of perfumery oils may be conducted on large farms by capitalists; or a central establishment may contract with individuals for flowers, and other materials; or the business may be conducted coöperatively; or individuals may operate on a small scale in connection with other lines of farming. Some competent women to whom other avenues are closed may find this work available and congenial.

Intending experimenters should seek further information in one or more of the books which are before the public. With regard to methods of extraction, Askinson's "Perfumes and Their Preparation" may be confidently recommended. Sawer's "Odorographia" (especially the first series) is valuable both to the extractor and the grower. Piesse's "Art of Perfumery" will also be found useful on both sides of the subject. Gildemeister and Hoffman's "Volatile Oils" is also very valuable. Also consult E. S. Steele's article on "Perfumery-Gardening" in the Yearbook of the United States Department of Agriculture for 1898. Vol. XXII, part 2, of the Journal of the Royal Horticultural Society (London, 1898) contains a list of perfumes and plants that yield them, and also a list of books on perfumes.

E. S. Steele.
W. Van Fleet.†

PERGOLA. The word "pergola" closely interprets its original meaning: from the Latin "pergula," a projecting roof, shed, or vine arbor, from "pergere," to reach forward or project; and from the Italian "pergola," a grape which remains upon its trellis all winter. From this derivation and use of the word, it will readily be seen how the term has become one of common usage in modern garden design, rightly or wrongly to designate almost any type of arbor or vine-support in the present-day garden. In order to understand the purer and less general meaning of the word, the garden vine-supports may be divided into two kinds or types: (1) treillages, decorative or otherwise, which may broadly be considered as designed in one simple geometric plane, perpendicular to the garden, their dimensions, height, and length being determined only by their use and detail design; and (2) pergolas and arbors, designed or planned in three planes, having height, length, and breadth, and, in brief, being architecturally conceived tunnels over which vines are trained or grown, the arbor and the pergola differing only in the detail of their design.

The pergola is invariably flat-topped, its semi-open roof being formed either by rustic poles or timbers of varying size, laid at right angles to the length of the structure, or by similarly laid but regularly spaced rafters or timbers of definite size and cut, this partially open roof being supported in either case by posts or columns of an architectural character equally and oppositely spaced. In simpler description, the pergola is a horizontal vine-support raised upon piers or columns, each of the latter standing free and independent of the other, the vines being encouraged to lie flat over its top.

The arbor, in distinction from the pergola, is, in its simplest form, a treillage or vine-support of a skeletonized form, with sides and top generally alike, its top, or roof, being flat or curved as its design may determine. In detail, its construction consists usually of regularly and oppositely spaced wooden posts supporting not over-thick strips and rails of the same material, these extending horizontally. Other material than wood is often used in arbor-construction, but the design and character remain generally the same,—a skeletonized tunnel for the support and training of vines over its entire surface. Therefore, while similar in origin and use in the garden, the pergola and the arbor must not be confused in their character and design. The arbor is, in fact, a development of the even earlier-used pergola, which in medieval gardening often became the pleached alley (or alleé), and in the early French and English gardens the very decorative and often complicated tunnel or gallery of treillage.

The pergola is numbered among the oldest pieces of garden architecture extant. The Egyptian used it as a covered walk from one part of his domicile to another, or to his garden house; Pompeii and ancient Rome prove its constant use, Vitruvius, describing the garden attached to the villa of Diomedes, saying, "behind the fish pond ornamented by a fountain, there was a platform over which vines were trained on a wooden framework supported upon six columns of stucco." In Italy, the pergola can be traced through the various transitions of the Italian gardens from those of early imperial times through the medieval, to the architectural or formal gardens of the Renaissance and today. In the great medieval period, the pergola and the cloister were often synonomous in use, differing only in the material of their construction, the latter being largely the outgrowth and development of the former. As early as the beginning of the fifteenth century, the pergola was in common use in France, being found not only in the magnificent gardens of the kings, but as a feature of the smallest town gardens of Paris. Riat, in his most authentic garden history, "L'Art des Jardins," carefully notes and describes the use of the pergola at this time; Hill, one of the earliest of English writers on gardening, in his "Gardener's Labyrinth," published about the middle of the sixteenth century, claims the pergola to be "so winded that the branches of the vine, melon, or cucumber, running or spreading all over, might shadow and keep both the heat and the sun from the sitter there under, and offer him cool and shaded passage." William Horman, in his "Vulgaria," published in 1519, tells us that "alleys in gardens, covered with vines, do great pleasure with the shadow in parchynge heat, and clusters of grapis maketh a pleasant walkynge alley." Thus, in brief, it will be seen that the pergola and its close kin, the arbor, have been used in all time and manner of gardening, the earlier English colonists bringing both to America, where their popularity, especially of late, has been so great as often to cause their degeneration in design and misconception in use.

There is no decorative or useful feature in the garden scheme which has been more inadvisedly used than the pergola. Like our gardening, which has naturally become composite and therefore often impure in taste, so the pergola has become subjected to all manner of diversity in use, material, and design. It can be made an excellent motif and component of a good garden scheme, if properly and carefully considered. Its value is not as a mere floating incident, untied and nonrelated to some stronger element or to the frame of the garden. It must be given a "tying-together" or corridor value in order best to serve and express its use. The garden should be designed in a manner to call for its use as a covered passage between the house and the garden entrance; or to connect one garden, or part of a garden, with another; or to separate garden from garden, offering substitute for the wall, hedges, or lattice, which might otherwise be used; or allowed to enframe or terminate the garden, a situation in which it may often be used to fine advantage either alone or in combination with a garden house or shelter; but it should not be so designed and placed as to serve merely

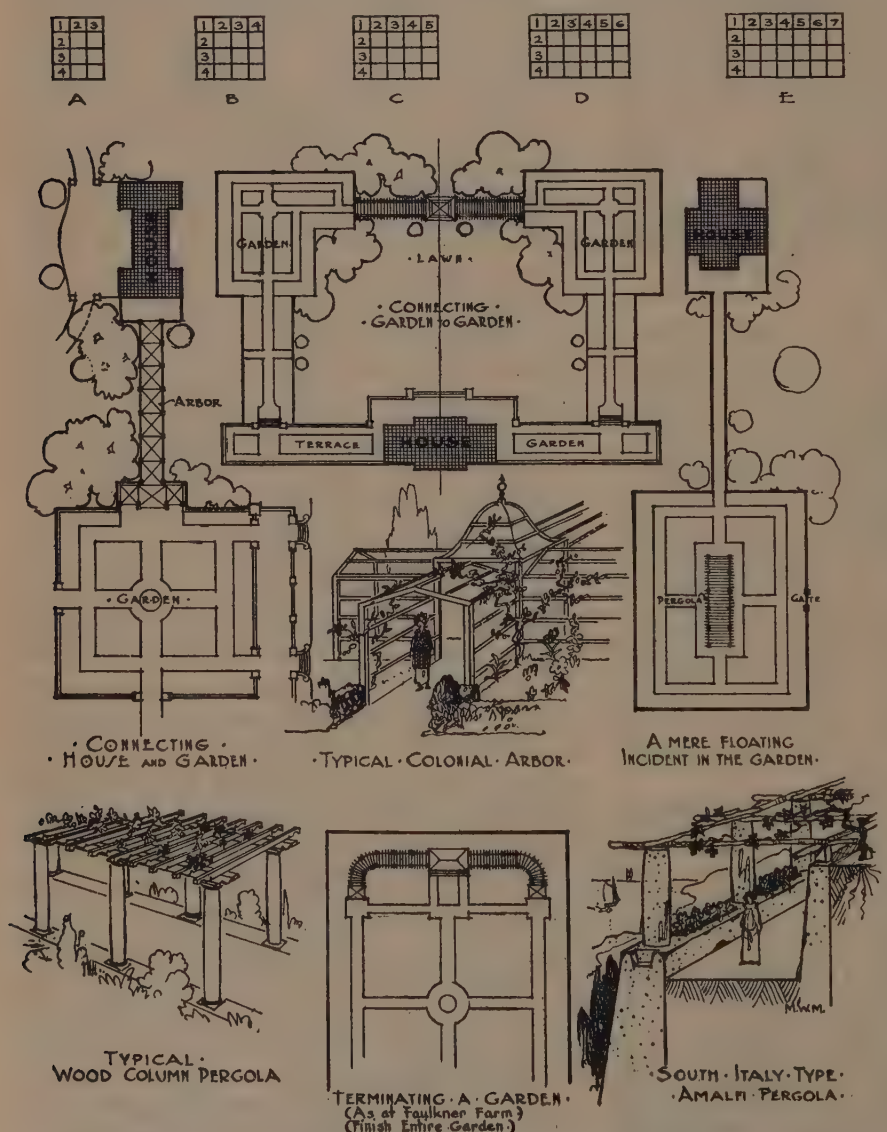
as an isolated decorative garden feature. For such location and use there is the garden shelter, the tea-house, the pavilion, the seat, and various exedra, far more suitable.

As is generally the case with all decorative garden motifs, the design and material of the pergola should be in strict harmony with its more important and controlling architectural surroundings. This does not mean, nor does it necessarily follow, that the material of the pergola should be like that of the house, garden wall, or other more or less important adjacent architectural features; but it does mean that its architectural character or style, design, and scale, must be determined and dominated by that common to the entire problem, and its material be in harmony or at least reflective. The designer or builder is safest when he considers not only his pergola but all of the architectural features of the garden as details, the character of which are to be largely determined by, or closely interrelated with, the architectural treatment of the garden and its environment as a whole. Materials and minor methods of expression may vary with personal taste, but architectural period and style cannot, for with a lack of appreciation of the proper architectural relation between the interrelated parts of a garden comes a breaking down of one of the most important principles of garden or other composition, namely unity of idea.

While, of course, there can be no rules governing the dimensions of pergolas, the relation of width to height is most important, as is the relation of height to length. The scale may be either human or relative. The width of a pergola or arbor, however, is seemingly best when slightly greater than its height, for if less it will appear stilted and in poor proportion. From diagrams A to E in Fig. 2869, it will readily be seen that (A), showing a proportion of 4 to 3 is less pleasing than (B), 4 to 4, or even (C), 4 to 5. When the width increases noticeably over the height, as in (D) 4 to 6, or (E) 4 to 7, there is a resultant weakening in proportion. As for length, this of course is determined by the individual problem, but in no case should the length be merely equal to, or less than, the width or height. In summary, the dimension of the pergola should produce a form of sufficiently dominant and pleasing horizontal and perpendicular dimensions to produce a satisfactory feeling of stability and repose.

In regard to plant materials used in connection with pergolas, the effect sought is that the pergola shall count as a support for vines; the variety and kind of growth, however, must naturally be determined by the exigencies of the particular case. Vines of fine and delicate foliage, flower, and fruit are better suited to the delicate arbor or treillage, and the larger-leaved, more heavily fruited vines to the architecturally stronger and coarser pergola. Also, vines with coarse and woody stems, such as the wistaria, the grape, the bittersweet and the like, are better adapted to the true use of the pergola, as a rack upon which vines lie, not a treillage or support up which they climb or against which they are trained.

BRYANT FLEMING.



2869. Pergolas.—Various architectural forms; also diagrams of proportions in A to E.

PERÍCOME (from the Greek for *around*, and *tuft*, from the tuft of hairs around the achene). *Compósitæ*. A small group of hardy perennials grown for their golden yellow conspicuous flowers.

Strong-scented much-branched herbs with long-acuminate lvs. and numerous heads in a terminal corymbiform cyme: involucral bracts slightly connected by their edges,

thus forming a bell-shaped cup: disk-fls. sticky, the anthers much exserted: achenes villous and ciliate.—There are only 2 known species, both of W. N. Amer. The genus is of little horticultural importance and is offered only by dealers in western native plants. The showy golden yellow fls. are not unattractive.

caudàta, Gray. Lvs. opposite, long-petioled, triangular-hastate with crenate or entire margins, the apex and sometimes the basal lobes long, caudate-acuminate: heads many, the fls. conspicuously longer than the involucre. Rocky cañons in the mountains, Colo. to New Mex. and Ariz.—Useful in dry or exposed places.

N. Taylor.

PERÍLLA (said to be a native name in India; by others, a Greek and Latin proper name). *Labiàtæ.* Herbs, one of which is sometimes grown for the colored foliage.

Erect, with opposite lvs. and small fls. in whorls of 2 that are aggregated into axillary and terminal simple or panicled racemes: calyx bell-shaped, 5-toothed, much enlarged and gibbous in fr.; corolla short-tubed, the tube not exceeding calyx, limb oblique and somewhat unequally 5-lobed; stamens 4, erect and separate; disk represented by a large gland; style 2-parted.—Two or 3 species, Himalaya region to China and Japan. The plant known in gardens as *P. nankinensis* is distinct by the color of its foliage. The lvs. are a dark wine-purple, with a bronzy luster. These colors are more or less toned with green, especially in young plants. It is an annual herb, growing about 1½ ft. high. It is considerably used in subtropical beds and for the back of ribbon borders. It is sometimes planted next to a dusty miller or other white-lvd. plants for the sake of contrast. The foliage has an odor suggesting cinnamon. In Japan the perilla is of economic importance for the production of oil.

Perillas need a sunny or at least half-sunny position. They thrive under the treatment given half-hardy annuals. Sow the seeds thinly and cover nearly an inch. Avoid planting too closely; leggy specimens are unattractive, and the plant has a tendency to become weedy. The flowers are inconspicuous and produced in autumn. Before the introduction of the coleus, this plant was much used as an ornamental flower-garden plant, but in our warmer summers it is displaced by the more brilliantly colored and free-growing forms of that plant.

frutéscens, Brit. (*Ocimum frutéscens,* Linn. *P. ocymoìdes,* Linn. *Méntha perilloìdes,* Willd.). The typical form has lvs. green on both sides and is worthless for gardens. Annual: lvs. opposite, rarely speckled with brownish purple, only slightly wrinkled, base wedge-shaped or narrow; blade broadly ovate or roundish, pointed or blunt, hairy or not, dentate or variously cut at the margin. In the wild, it is a coarse often shaggy plant, 2–4 ft. high, with lvs. 3–6 in. long, petioles 1–3 in. long: racemes 3–8 in. long; corolla white or reddish, 2 lines long; fruiting calyx about ⅛in. long. Himalayas, Burma, China, Japan. B.M. 2395.—Sparingly run wild. Following are new combinations.

Var. **nankinénsis,** Bailey (*P. nankinénsis,* Decne. *P. ocymoìdes* var. *nankinénsis,* Voss). Slightly hairy, rarely glabrous: lvs. dark purple-brown, with a bronzy luster; base wedge-shaped (rounded in strong-growing specimens); blade ovate, acute, coarsely and deeply saw-toothed, margin wavy. Seedlings are sometimes green. R.H. 1852:60; 1879, p. 272. Forms of this variety are: (1) Var. **laciniàta,** Bailey (*P. laciniàta,* Hort. *P. nankinénsis fòliis atropurpùreis laciniàtis,* Hort.), has lvs. cut nearly to the middle, foliage undulate, wrinkled or crisped. Colors said to be more intense. Intro. about 1872. P.G. 2:77. (2) **macrophýlla,** Bailey (*P. nankinénsis macrophýlla compácta,* Hort.), is a large-lvd. form characterized by its almost "bell-shaped" form. The lvs. are wavy-fringed. Habit compact. (3) Var. **elàtior,** Bailey (*P. nankinénsis macrophýlla elàtior,* Hort. Benary), is a taller form of var. *macrophylla.* (4) Var. **variegàta,** Bailey (*P. nankinénsis fòliis variegàtis,* Hort.), differs in having the foliage spotted with white. (5) Var. **microphýlla,** Bailey (*P. nankinénsis microphýlla nígricans,* Hort.), is a small-lvd. form intro. about 1899.

Wilhelm Miller.
L. H. B.†

PERÍPLOCA (Greek, *around,* and *to twine;* alluding to the twining habit). *Asclepiadàceæ.* Ornamental vines grown for the handsome glossy foliage and the fragrant flowers appearing in summer.

2870. Periploca sepium. (×¼)

Twining or upright deciduous or evergreen shrubs, glabrous, with milky juice: lvs. opposite, entire, without stipules: fls. in axillary or terminal cymes; calyx 5-lobed; corolla 5-parted, bearing inside at the base a 5- or 10-lobed crown; stamens 5, with very short filaments and with the anthers connected at the apex and villous; style short, with broad stigma: fr. consisting of 2 follicles, containing numerous, small, winged seeds.—About 12 species from S. Eu. to Trop. Afr., China and E. India.

The periplocas in cultivation have dark green and glossy leaves and dull-colored fragrant flowers followed by long and slender pods. *P. sepium* has proved perfectly hardy as far north as Massachusetts and *P. græca* is hardy north to New York, and can be grown even in Canada when trailing on the ground and somewhat protected during the winter. They thrive in any well-drained soil and prefer sunny positions; they are well suited for covering arbors, trelliswork and trunks of trees. Propagation is by seeds or by greenwood cuttings in summer under glass; also by layers.

græca, Linn. Silk-Vine. Deciduous shrub, twining to 40 ft.: lvs. petioled, ovate to oblong-lanceolate, acuminate, dark green and glossy above, 1½–4 in. long and 1–2 in. broad: fls. in loose, long-peduncled cymes, brownish purple inside, greenish at the margin and outside, 1 in. across; corolla-lobes oblong, spreading, villous; crown with 5 slender thread-like incurved glabrous appendages: follicles narrow, about 4 in. long. July, Aug. S. Eu., W. Asia. B.M. 2289. B.R. 803. L.B.C. 14:1389. Gn. 34, p. 78.—A vigorous and high-growing climber with handsome dark green and shining foliage remaining unchanged until late in fall. Under the name of *P. angustifolia* a narrow-lvd. form is sometimes cult., which is *P. græca* var. *angustifolia,* Jäg. The true *P. angustifolia,* Labill., is synonymous with *P. lævigata,* Ait., from the Canary Isls. and N. Afr., with persistent lvs. and pubescent appendages of the crown.

sèpium, Bunge. Fig. 2870. Lower and slenderer than the preceding species: lvs. lanceolate, long-acuminate, dark green and glossy above, paler beneath, 2–3½ in. long and ½–¾in. broad: fls. in few-fld. cymes, similar to those of the preceding species, but smaller, about ¾in. across and with revolute corolla-lobes: follicles 4–5 in. long. June, July. N. China.

Alfred Rehder.

PERISTÈRIA (Greek, *dove,* from the form of the column and wings). *Orchidàceæ.* A group of stately South American pseudobulbous warmhouse orchids.

Leaves large, plicate, unfolding successively: fl.-

spikes tall, erect or hanging; fls. nearly globular or cup-shaped, of a waxy texture, with broad concave segms. The genus is distinguished from the related genera Acineta, Lacæna, Gongora, and the like, by the curious shape of the labellum and column. The base of the labellum (hypochil) is united with the column by broad wings (pleuridia). The upper part of the labellum (epichil) is movably joined to the hypochil.—Five species, of which 2 are commonly cult.

2871. Peristeria elata.—Holy Ghost plant. (Flower ×½)

The chief factors in growing peristerias are moisture during the growing period, the ideal location being in proximity to water, in a temperature of 65° to 70° F., and a decided rest when growth is completed. The growing medium should consist of two-thirds fibrous sod soil and one-third peat and sand, an addition of dried cow-manure being beneficial. The pots should be well supplied with drainage. When the plant is growing freely, water occasionally with organic fertilizer until the growth is completed. Then reduce the water-supply to induce flowering when the young growth appears. An excellent specimen of *P. elata* in the Missouri Botanical Garden recently produced a flower-spike 3 feet 6 inches high and produced twenty well-formed flowers. From the first appearance of the spike until the last flower opened, covered a period of three and a half months. This noteworthy specimen was grown over a tank of water, in a house of miscellaneous warmhouse plants, and organic manure was given freely during growth. The plant was then transferred to the cactus house to rest, enough water was given to prevent shriveling of the pseudobulbs, until the young growth appeared bearing a well-formed flower-spike; it was again transferred to its former position and watered freely to develop the spike. (G. H. Pring.)

elàta, Hook. Dove-Flower. Holy-Ghost-Flower. Fig. 2871. Pseudobulbs 4–5 in. high, bearing several strongly veined lvs. 2–3 ft. high: fl.-st. 3–4 ft. high; fls. in a raceme covering about one-third the length of the fl.-stalk, cup-shaped, creamy white, wax-like and fragrant, 2 in. across; sepals broadly ovate to rotund; petals more delicate; labellum fleshy, broadly obovate, truncate, sprinkled with deep purple; column with large, curious wings, supposed to bear resemblance to a dove. June–Sept. Panama. B.M. 3116. Gng. 5:151. V. 8:163. Gn. 12, p. 153; 30, p. 574; 42, p. 324. R.H. 1876, p. 133; 1877:110.—The labellum and wings of the column are sometimes spotted with purple. Intro. into cult. in 1826.

péndula, Hook. Pseudobulbs ovate-oblong, 4–5 in. high, bearing lanceolate, strongly veined lvs.: scape pendulous, from the base of the pseudobulb, bearing as many as 20 fls.; fls. globular in outline, 1½ in. across, fragrant, greenish white outside, tinged with rose and thickly dotted with purple within; sepals roundish concave, united at base; petals rather smaller; labellum fleshy, curiously shaped, inclosed within the fl. Guiana. B.M. 3479. G.C. II. 25:116.—Requires tropical treatment, but rarely flowers in cult.

cérina, Lindl. Pseudobulbs oblong-ovoid, up to 3 in. long, 3–4-lvd.: lvs. oblong-lanceolate, up to 1 ft. long: scape pendulous, short, bearing a dense raceme of 6–10 fls.; fls. about 1 in. across, pale lemon-yellow, waxy; sepals and petals broadly ovate, concave; lip 3-lobed, the acute lateral lobes ovate, the midlobe emarginate, inflexed, the margin crisped. Cent. Amer. B.R. 1953.

P. áspera, Rolfe. Pseudobulbs ovoid-oblong: racemes dense, 8–10-fld.; fls. light brownish yellow, densely spotted with reddish brown, the front lobe of lip brownish crimson; sepals and petals elliptic-oblong, obtusish. Venezuela. L. 267.—*P. Húmboldtii,* Lindl. =Acineta.

George V. Nash.†

PERÍSTROPHE (Greek, *peri,* around, and *strophos,* belt; alluding to the involucre). *Acanthàceæ.* Greenhouse plants, grown for the bloom.

Erect, branched or loosely creeping herbs or half-shrubby: lvs. entire: fls. solitary or in clusters of 2–3 surrounded by an involucre, in loose cymes or cymose panicles, or distant on slender branches; bracts of the involucre narrow; calyx deeply 5-parted, shorter than the bracts, scariose or hyaline; corolla-tube long, slender, slightly enlarged above, limb deeply bilabiate, the posterior lip narrow, erect, concave, entire or emarginate, lower lip spreading, apex 3-parted; stamens 2, a little shorter than the corolla-lips; anthers 2-celled; sterile stamens none; style filiform: caps. oblong, contracted into a solid stalk.—About 15 species, ranging from Trop. Afr. and India to the Malay Isls., Philippines, and Austral.

The plants are cultivated like jacobinias or justicias, of the same family. Cuttings taken at any time when the wood is soft will root in a warm bed in three to four weeks, after which the potted plants may be removed to a house of lower temperature. They require a rich loam mixed with some leaf-mold, and plenty of air.

speciòsa, Nees (*Justícia speciòsa,* Roxbg.). Fig. 2872. The plant erect, spreading and branched, becoming 2–3 ft. high: lvs. opposite, petioled, ovate-acuminate, smooth: fls. in clusters of 2–3 on slender branches, violet-purple, 1¾ in. long. Blooms for a long period in winter. India. B.M. 2722. L.B.C. 20:1915. B. 2:74. Gn. 73, p. 42.—A pot-plant of bushy compact habit when well grown. Good for the window. Usually thrives best in partial shade.

2872. Peristrophe speciosa. (×½)

angustifòlia, Nees. Plant low, erect, very much branched:

branches nearly horizontal, pubescent above: lvs. lanceolate, pointed at both ends: fls. sparse, in terminal cymes, rose-colored. Flowers freely. Java. Var. **aûrea variegàta,** Hort., has the center of the lvs. variegated with yellow. Useful for vases and baskets.

HEINRICH HASSELBRING.

PERIWINKLE: *Vinca.*

PERNÉTTYA (after A. J. Pernetty, 1716–1801; he accompanied Bougainville on his voyage and wrote "A Voyage to the Falkland Islands"). *Ericàceæ.* Ornamental plants grown chiefly for their attractive variously colored and profusely produced berries, also for their neat evergreen foliage and white or pinkish flowers.

Evergreen shrubs: lvs. alternate, short-petioled, small, usually serrate: fls. axillary, usually solitary on slender nodding pedicels, rarely in racemes; calyx 5-parted; corolla urceolate, with short 5-lobed limb; stamens 10, the anthers 4-awned at the apex: fr. a 5-celled many-seeded berry.—About 25 species from Mex. to the Magellan region, mostly in the mountains, and 1 species in Tasmania and New Zeal. Allied to Gaultheria, but the calyx not enlarged and rarely fleshy after flowering.

The pernettyas are low much-branched shrubs with dense and small evergreen leaves and small nodding flowers, followed by very decorative berries varying in color from white to purplish black or bluish black and remaining on the branches all winter. These exceedingly pretty shrubs are great favorites in England, but are little known in this country. *P. mucronata* and *P. angustifolia*, the hardiest, are probably hardy in sheltered positions as far north as New York. They are well suited for rockeries and borders of evergreen shrubberies and also make very handsome pot-plants. They grow best in a peaty and porous moderately moist soil and prefer sunny positions, but seem to grow almost as well in any other well-drained soil; in shade they will not fruit so profusely as in the full sun. Propagation is by seeds or by cuttings of half-ripened wood in summer under glass; also by means of layers and suckers.

mucronàta, Gaud. (*Árbutus mucronàtus*, Linn. f.). Much-branched shrub, to 2 ft., with glabrous or sparingly hairy branches: lvs. almost 2-ranked, ovate to ovate-oblong, spiny-pointed, serrate, dark green and shining above, glabrous, ⅛–¾in. long: fls. solitary, nodding, globose-ovoid, white or slightly tinged pink, about ⅓in. long, on pedicels 2–3 times as long as the fl.; stamens longer than the ovary: fr. white to dark purple, ⅜–½in. across, red in the typical form. May, June. Magellan region to Chile. B.M. 3093; 8023. B.R. 1695. L.B.C. 19:1848. Gn. 23:389; 59, p. 41. Gt. 34, p. 214. G.M. 40:811. M.D.G. 1898:397.—Many varieties (*P. hýbrida*, Zabel), partly originated by hybridizing with the following species are cult. in English and Dutch nurseries, mostly differing in the color of the fr., which is usually indicated by the name of the variety, as vars. **álba, atropurpùrea, coccínea** (F.M. 1879:339), **lilácina** (F.M. 1879:339), **nìgra, purpùrea** (F.M. 1879:339), **ròsea, sanguínea,** Hort. Also *P. Drummondii, P. Cummingii, P. speciosa, P. floribunda* (G.C. II. 18:649 and III. 28:465) belong here. *P. mucronata* and its varieties are among our most ornamental fruiting shrubs in wintertime, when they are loaded with bright-colored berries contrasting well with the dark glossy foliage; they are also very handsome in spring when covered with their numerous white fls.

angustifòlia, Lindl. (*P. mucronàta* var. *angustifòlia*, Nichols.). Closely allied to the preceding: lvs. lanceolate to linear-lanceolate, usually arched backward, smaller, not spiny-pointed: fls. somewhat smaller, on slender pedicels; anthers twice as long as filaments; style as long as ovary. May, June. Chile. B.R. 26:63. B.M. 3889.—The plant usually cult. under this name is a narrow-lvd. form of the preceding species.

P. ciliàris, Don. Spreading shrub: lvs. oblong to narrow-oblong, serrulate, ½–1 in. long: fls. solitary, ovate, white: fr. almost black. Mex.—*P. ciliàris*, Lindl., not Don. J.H.S. 1851, p. 268. G.C. II. 10:89, and III. 28:463, belongs probably to P. furens.—*P. fùrens*, Klotzsch. Upright shrub: lvs. ovate to ovate-lanceolate, ciliate, to 1½ in. long: fls. in axillary, secund, rather dense racemes: fr. brownish red. Peru, Chile. B.M. 4920.—*P. Péntlandii*, DC. Similar to P. mucronata, but lvs. not spiny-tipped: fr. dark purplish blue, with the calyx-lobes fleshy. Venezuela to Chile. B.M. 6204.—*P. phillyreæfòlia*, DC. Similar to P. mucronata: branches sparingly hispid: corolla ovate, pubescent inside; anthers twice as long as filaments. Peru, Chile.—*P. pilòsa*, Don (Arbutus pilosa, Graham). Prostrate shrub, with densely hispid branches: lvs. elliptic-oblong, serrate, to ¾in. long: fls. ovate, white, solitary. Mex. B.M. 3177.—*P. rupícola*, Phil. Closely allied to P. mucronata: lvs. smaller, with few minute teeth: fls. on pedicels scarcely twice as long as fl.; stamens not exceeding the ovary. Chile. Sometimes cult. as P. mucronata.—*P. rupicoloìdes*, Schneid. Supposed hybrid of the preceding species and P. mucronata.

ALFRED REHDER.

PERÓVSKIA (after B. A. Perovski, about 1840, governor of the Russian province Orenburg). Also spelled *Perowskia. Labiàtæ.* About 4 herbaceous or shrubby plants from Cent. Asia, allied to Salvia, with opposite serrate or pinnatifid lvs. and rather small heterostylous fls. in whorls usually arranged in terminal spikes: calyx tubular-campanulate, 2-lipped; corolla 2-lipped, the upper lip unequally 4-lobed, the lower undivided; 2 sterile and 2 fertile stamens, the latter with 2 distinct contiguous anther-cells: fr. consisting of 4 ovoid-oblong nutlets inclosed by the calyx. The only species in cult. is **P. atriplicifòlia,** Benth. Shrub, to 5 ft., erect, of aromatic sage-like odor when bruised: sts. hoary-tomentose: lvs. ovate-lanceolate to lanceolate, acutish, unequally and coarsely serrate, at first pubescent, finally nearly glabrous, glandular, 1½–2¼ in. long: fls. blue, about ½in. long, in 2–6-fld. remote whorls arranged in slender spikes forming terminal panicles 1–1½ ft. long; calyx densely villous. Aug., Sept. Afghanistan to W. Himalayas and W. Thibet. B.M. 8441. R.H. 1905:344. G. 33:511; 36:539.—Handsome shrub, valuable for its late blue fls. forming a pleasing contrast with the silvery gray sts. Not quite hardy N., but if killed partly back, it sends forth young shoots which will flower the same year. It prefers sunny positions and well-drained loamy soil. Prop. is usually by greenwood cuttings, which grow readily in summer under glass.

ALFRED REHDER.

PERSÈA (ancient Greek name of an Egyptian tree with sweet fruit; derivation unknown, probably from Perseus). *Lauràceæ.* Woody plants sometimes grown for ornament; and one of them yields the avocado, one of the best of the semi-tropical fruits.

Leaves alternate, entire: fls. small, hermaphrodite, usually in panicles; corolla wanting, the calyx deeply 6-parted; stamens usually 12, in 4 series, with one series sterile; ovary sessile and tapering into a slender style bearing a simple stigma.—Shrubs and trees distributed throughout the tropics and subtropics, most of the species being confined to S. Amer., but one coming from the Canary Isls. and a few from S. E. Asia. As defined by Bentham & Hooker, the genus contains about 100 species, but Meissner (DC. Prodr. 15, pt. 1, 43) distributes some of the species in other genera and retains only 50 in Persea. Mez, in his monograph on the American Lauraceæ (Jahrb. Königl. Bot. Gart. 1889, 5. 135), describes 47 American species. *P. gratissima*, the avocado, widely cult. throughout Trop. Amer. and elsewhere for its fr., is the only species of great economic importance. Others are of ornamental value, and may prove useful as stocks upon which to bud or graft the avocado, although experiments have not been very encouraging up to the present. *P. Borbonia* grows naturally as far north as N. C.; *P. indica* is now and then seen in cult. in Fla. and Calif. Some of the Cent American types referred to *P. gratissima* seem distinct, and may be found to constitute good species.

A. *Outer calyx-lobes distinctly shorter than the inner.*

Borbònia, Spreng. (*P. carolinénsis,* Nees). RED BAY. BULL BAY. Tree, reaching 40 ft., with smoothish branches: lvs. 2–3 in. long, oblong to lanceolate-oblong, glabrous and deep green above, glaucous beneath: fls. pubescent, the peduncles of the clusters shorter than the petioles: fr. a small blue drupe. Woods, N. C. to Fla.—A handsome evergreen, with wood useful for cabinet work and other purposes.

AA. *Outer calyx-lobes equaling the inner, or very nearly so.*

índica, Spreng. Handsome tree, with elliptic-oblong or lanceolate-oblong attenuate-acute glabrous lvs., 3–8 in. long: panicle 3–6 in. long, the peduncles compressed, and the branches 3–5-fld., the fls. white and ¼in. long: fr. scarcely fleshy. Canary Isls., Madeira, and the Azores.

gratíssima, Gaertn. f. (*P. americàna,* Mill.). AVOCADO. ALLIGATOR PEAR. AHUACATE. AGUACATE. AVOCAT. AVOCATO. ABACATE. Fig. 2873; Figs. 445, 446, Vol. I. A large tree, commonly with broad crown up to 60 ft.: lvs. oblong-lanceolate or elliptic-lanceolate to oval or

2873. Persea gratissima.—Avocado. (×⅛)

obovate, 4–10 in. long, 2–6 in. broad, apex acute or shortly acuminate, sometimes almost blunt, the base acute to truncate, frequently rounded, surface glabrous above, usually somewhat glaucous with the venation prominent below; petiole ¾–2 in. long, canaliculate above: fls. shortly pedicellate, in broad compact panicles at the ends of the young branchlets, about ⅜in. across, greenish, the calyx-lobes oblong-lanceolate, acute, slightly concave, finely pubescent; fertile stamens 9, in 3 series, each stamen of the inner series bearing just above its base 2 oval flattened orange-colored glands; filaments slender, finely hairy, the anthers oblong-ovate, dehiscing by 4 valves hinged distally, the 2 outer series dehiscing extrorsely, the inner series with the 2 distal valves extrorse and the proximal pair introrse; staminodes 3, flattened, orange-colored; ovary ovate-elliptic, the style slender, attenuate, finely pubescent: fr. a large fleshy drupe, commonly pyriform, ovate or spherical, 2–8 in. long, green, maroon or purple in color, the epicarp membranous to thick and woody, mesocarp soft, yellow, and buttery; seed 1, large, conical to oblate, inverted, exalbuminous, with 2 thin seed-coats often distinct, reticulated. Certainly indigenous in Mex. and Cent. Amer., extending perhaps to N. S. Amer.

The avocado is cultivated commercially in Florida and California, as well as in other parts of tropical America. See *Avocado.* Several distinct forms are known in cultivation, some of them having been considered botanical varieties by certain botanists. The horticultural varieties grown in the United States are generally grouped into three types, which may be distinguished as follows:

A. *Lvs. anise-scented: skin of fr. thin and soft*..... 1. Mexican type

AA. *Lvs. not anise-scented: skin of fr. thick.*

B. *Surface of fr. usually smooth; skin leathery, usually not more than* ⅛*in. thick; seed-coats frequently distinct, the outer one adhering to wall of seed-cavity; cotyledons often rough*..... 2. West Indian type

BB. *Surface of fr. usually rough or warty; skin brittle, granular,* ⅛–⅛*in. thick; seed-coats adhering closely to the nearly smooth cotyledons*.....3. Guatemalan type

Occasional forms will be found which are difficult to classify by the above key. Especially is this true of the Guatemalan type, of which there are several varieties in California with the skin no thicker than in some varieties of the West Indian type, and nearly as smooth. These can usually be distinguished, however, by the character of the seed and its coats. Solano and Blakeman may be mentioned as smooth-skinned examples of this class. Trees of the Guatemalan type usually have darker-colored foliage than those of the West Indian, and ripen their fruit from January to April, while the West Indian ripens from July to November. The Guatemalan type is considerably the hardier of the two. Both are greatly exceeded in hardiness by the Mexican type, which has been known to withstand temperatures of 18° to 20° without serious injury. Chappelow, Ganter, and Harman are varieties of this type well known in California, where they originated. This type is exceedingly common in northern Mexico; the Guatemalan type is found in southern Mexico (whence are derived many of the varieties cultivated in the United States), Guatemala, and doubtless in other Central American states. The West Indian type is the commonest one in Florida, Cuba, and the West Indies in general, and on the eastern coast of South America. The well-known Florida varieties, Trapp and Pollock, are representatives of it.

P. drymifòlia, Cham. & Schlect., is now considered to be a form of P. gratissima; it is the type with anise-scented lvs. and small, thin-skinned frs. described above as Mexican. Mez recognizes it as a botanical variety, and describes it along with another variety, *P. gratissima* var. *Schiedìana,* also indigenous to Mex.—The hardy avocado or yas of San José, Costa Rica, has been referred by Wercklé to *P. frígida,* Lind., but this name is of doubtful validity. The fr. is figured by Collins (Bull. 77, Bur. Pl. Ind.), and is said to be of possible value for hybridization with more tender species. It is spherical, about 3 in. diam., with a very large seed.—*P. lingue,* Nees, and *P. Meyenìana,* Nees, are two species which have recently been intro. to the U. S. from Chile. F. W. POPENOE.†

PÉRSICA: *Prunus.*

PERSICÀRIA: *Polygonum.*

PERSIMMON. Interesting and valuable edible fruits.

Of edible persimmons, two distinct types are grown in this country,—*Diospyros virginiana,* the native species, and *D. Kaki,* the Chinese-Japanese species, known as the kaki. The latter is much the more improved, and is the source of the commercial persimmons. See *Diospyros.* Other species have been introduced, but are yet under experiment (cf. "Yearbook, United States Department of Agriculture," 1911, page 416).

The native persimmon.

The American persimmon (*Diospyros virginiana*) is found wild in most of the southern states and as far north as 38° latitude. It will thrive and ripen its fruit, however, as far north as Rhode Island and the Great Lakes. The fruit is little known except to those who live in localities in which it grows wild, and even there

but little attention has been given to its cultivation and improvement. The tree is usually of small size when grown in the open ground, reaching a height of 20 to 30 feet; when grown in the forest, it often reaches a height of 60 to 80 feet; and in the rich alluvial river bottoms, from 2 to 3 feet in diameter. In exceptional cases, it may attain still greater size, even to 7 feet in circumference and 125 to 130 feet high ("Journal Heredity," November, 1915). The wood is hard and elastic, and very durable when used for inside work but it will rot quickly when placed under ground.

The fruit is subglobose and ranges in size from ½ to 2 inches in diameter, depending largely on the number of seeds which it contains, although seedless varieties an inch in diameter are sometimes found. The fruit has a very disagreeable astringent quality when green, but this disappears in most varieties when it becomes fully ripe. The date of ripening in the central states varies from August 1 to December 1. The old notion that this fruit must be subjected to the action of frost before it becomes edible is erroneous; many of the very best varieties ripen long before the appearance of frost, while others never become edible, being so exceedingly astringent that neither sun nor frost has any appreciable effect on them.

The persimmon is readily propagated from seeds, which should be procured in autumn or early winter and planted in the same way as peach pits; but as the seedlings, especially from cultivated varieties, cannot be relied upon to reproduce themselves, they should be budded or grafted when two or three years old. This should be done in the spring as soon as the bark will slip freely. Ordinary shield-budding works well; also annular- or ring-budding, patch-budding, and chip-budding. Large trees may be cleft-grafted, and small shoots or stocks may be whip-grafted.

This tree is more difficult to transplant successfully than almost any other kind of fruit. If too much of the long tap-root is cut off, the tree will be sure to die. Transplant in the autumn, cut back most of the top, but preserve as much of the root as possible, and plant in a deep well-prepared soil. The persimmon will do fairly well on almost any land not too wet, but it will give good results if planted on a rich warm soil, well exposed to the sunlight, and kept well tilled for the first few years after planting, until it becomes adapted to its new surroundings. The orderly growing of persimmon trees in nurseries will remove much of the difficulty in establishing the plantation. The tree and fruit are little attacked by insects and fungous diseases.

The trees should be planted in the orchard 2 or 3 inches deeper than they stood in the nursery. The trees may be kept low-headed so that the fruit can be picked by hand; in this case, they may stand 16 to 20 feet apart each way. If the fruit is not to be hand-picked but gathered as it falls and size and quality are not so important, the trees may stand at about one-half these distances. As the roots run deep, the plantation is adapted to other crops until the tree require the space.

Several chance seedlings of superior size or quality have received names. They are small fruits, yellow or reddish in color, about 1½ to 1¾ inches in diameter. Some of the forms are shown in Figs. 2874 and 2875.

For a general horticultural account of the native persimmon, see W. F. Fletcher, Farmers' Bulletin No. 685, United States Department of Agriculture (1915), from which most of the following descriptions of varieties are taken.

Boone (Daniel Boone).—Origin Indiana, where it ripens during October and November; form roundish oblate, size medium, color yellow, with a dull blush in the sun; skin rather tough; seeds numerous; flavor sweet but not rich; quality good.

Burrier.—Origin central Kentucky, where it ripens rather early; form oblate, size medium, color yellow; practically seedless; flesh soft; quality very good.

Delmas.—Origin Scranton, Mississippi, where it ripens during October and early November; form roundish oblate, size medium to large, color reddish yellow; skin thin and tough; seeds numerous; flavor sweet and rich; quality very good.

Early Bearing.—Introduced from Cartersburg, Indiana, where it ripens early in October; form round-ovate, size medium, color dull yellow; quality good.

Early Golden.—Origin Illinois, where it ripens in September; form oblong, size medium to large, color yellow; skin thin; seeds few, flavor sweet; quality very good.

Golden Gem (Fig. 2875).—Introduced from Borden, Indiana, where it ripens from August to October; form roundish oblong, size medium to large, color dark orange to red; seeds few, flavor rich and sweet; quality good.

Hicks.—Origin Washington County, Indiana, where it ripens in October; form roundish oblate, size medium to large, color dark red; skin thin and tender; seeds few, flavor rich; quality very good.

Josephine (American Honey, Honey) (Fig. 2875).—Origin near Bluffton, Missouri, where it ripens in September; form roundish oblate, size medium, color bright yellow, changing to pale translucent; skin tough; seeds few, flavor sweet and rich; quality good.

Kansas.—Introduced from Missouri, where it ripens in September; form roundish oblate, size rather large, color yellow splashed with red; flavor rich; quality very good.

2874. The native persimmon, Diospyros virginiana. (×⅓)

Marion (Fig. 2875).—Original tree found near Fulton, Missouri, where the fruit ripens in October; form roundish oblate, size large, color dull red; skin rather tough; seeds few; quality good though less rich than some other kinds.

Miller (Fig. 2875).—Origin Jackson County, Missouri, where it ripens in September; form roundish oblate, size large, color reddish yellow, translucent; skin tough; seeds rather numerous; flavor sweet; quality good.

Ruby (Little's Ruby) (Fig. 2875).—Introduced from Cartersburg, Indiana, where it ripens during September and for some time later; roundish oblate, small to medium, yellowish red, shading to deep red; skin tender; seeds few, flavor sweet; quality very good.

Shoto.—Introduced from Danville, Indiana, where it ripens during October; form oblong-ovate, size large, color dull yellow, blushed in the sun; skin rather tough; seeds few; quality very good.

Smeech.—Introduced from Pennsylvania, where it ripens during October and November; form roundish oblate, size medium, color dull yellow, splashed with red; flavor rich and sweet; very good.

The kaki.

The Japanese persimmon (*Diospyros Kaki*) is considered by the Japanese as their best native pomological product. Although cultivated in the south of France for more than ninety years, there is no record of its successful introduction into the United States previous to about 1870. Trees were first sent to California and subsequently to Augusta, Georgia, but owing to defective roots and long delay in transit, the first and second shipments proved a failure, and not until 1876 came the first success with a few trees. All early impor-

tations of trees grown in Japan consisted of trees of small sizes with long tap-roots and no laterals; and probably the stocks on which they were grafted were not adaptable to this country. American enterprise, however, remedied this, as nurseries were established near Yokohama and well-grown trees of the best varieties were exported to the United States. Experiments were made in the South by grafting upon native stocks. This proved successful when the graft was inserted upon the collar of the root, 3 to 4 inches below the surface of the soil. The United States Department of Agriculture received a large quantity of trees from Japan about 1878 or 1879, and fearing that the winter of Washington might prove too cold the trees were sent to Norfolk, Virginia, where many bore fruit the following year. The first fruiting of which there is any record was at Augusta, Georgia, in 1879, upon trees grafted upon native seedlings growing in the forest.

The kaki, or Japanese persimmon, is a fruit for the cotton-belt. However, as regards the hardiness of the

2875. Native persimmons: *a*, Josephine; *b*, Marion; *c*, Golden Gem; *d*, Miller; *e*, Ruby. (×½)

Japanese persimmons, experience demonstrates that some varieties are more resistant to excessive cold than others; but few can withstand a temperature of zero; and as a rule they are more successful below the 32d degree of latitude than farther north. Many seedlings have been produced that seem to have increased frost-resisting powers. Instances are reported in which some of these trees have withstood the winters of east Tennessee. By successive sowing of seeds from these hardier seedlings we may look for a race of trees that will be adapted to the middle sections of the United States. There is a probability, also, that importations from the north of Japan and China may considerably extend the range northward in this country. Some varieties have succeeded in central Virginia and Kentucky. Attempts to cross with the native species have so far been unsuccessful.

The best method of propagating Japan persimmons is by collar-grafting upon seedlings of the native species (*Diospyros virginiana*), which are grown either by planting the seed in nursery rows or transplanting the young seedlings from seed-beds early in the spring. The seedlings can be budded in summer, and in favorable seasons a fair proportion of the buds will succeed. Thus propagated, the trees seem to be longer-lived than those imported from Japan. Inasmuch as the native stock is used, the range of adaptation as to soils and similar conditions is very great. As a stock, *Diospyros Lotus* is adapted to the drier parts of the West, where *D. virginiana* does not succeed. *D. chinensis* will probably be a good stock, but has not yet been tested in this country.

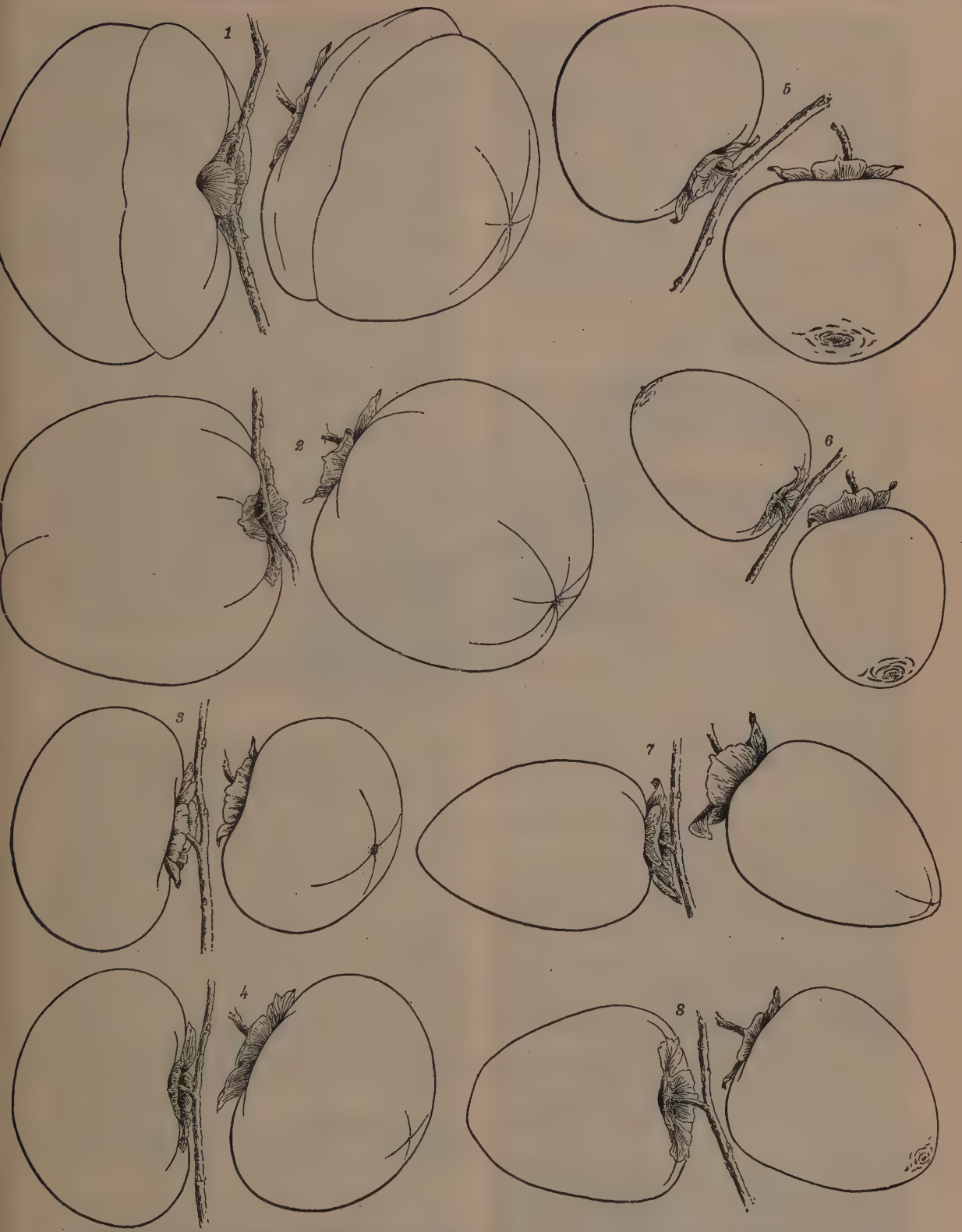
One of the great drawbacks in the cultivation of the Japanese persimmon has been the dropping of the flowers, so that trees and plantations may remain barren. Recently this has been shown to be due to lack of pollination (see Hume, "Proceedings of the Society for Horticultural Science," 1913). A constantly staminate variety is now on the market, the Gailey, which, if planted one tree to seven or eight trees of sterile varieties, will insure a crop so far as pollination is concerned. The Tane-Nashi, however, is self-fertile. It is to be expected that the subject of sterile and fertile varieties, and of inter-pollination, will now receive much attention, with considerable change in the practice of persimmon-growing.

Another difficulty is the great variation in fruits in the same variety or even on the same tree, in shape, size, and other characters. While the cause of all this variation has not been determined, it is known that much of it is eliminated by the good inter-pollination of which we have spoken. Hume writes: "All varieties of Japanese persimmons so far studied are light-fleshed when seedless but certain varieties always show a dark area in the flesh when seeds are present and others are always light-fleshed even when seeds are present. Both dark- and light-fleshed fruits may occur on the same tree. The physiological causes which underlie the changes in color of the flesh are not understood, and offer an interesting field for investigation."

In color, size, and surface texture, the Japanese persimmons somewhat resemble ripe tomatoes. They are now frequently seen in the northern markets. Some of the varieties ship well. Many persons do not like them at first, largely because of the very soft flesh and their sweetness, but the quality is good, it varies much in the different varieties, and the fruit is certain to find increased demand. It is eaten out of hand.

Some of the varieties ripen in August, some in November, and others intermediate between these dates. It requires some experience to determine just when the fruit has reached the proper stage to be marketed, and this varies with the different varieties. Some of the varieties have dark flesh, others light flesh, still others a mixture of the two. The light and dark flesh differ radically in texture and consistency, as well as appearance, and when found in the same fruit are never blended, but always distinct. The dark flesh is never astringent; the light flesh is astringent until it softens. The dark-fleshed fruit is crisp and meaty, like an apple, and is edible before it matures. Some of the entirely dark-fleshed kinds improve as they soften. The light-fleshed kinds and those with mixed light and dark flesh are very delicious when they reach the custard-like consistency of full ripeness. In some, the astringency disappears as the fruit begins to soften; in others, it persists until the fruit is fully ripe. The round-shaped varieties usually ripen first, the oblong are likely to last and keep the longest; these latter should be slowly house-ripened to remove the slight astringency inherent to these varieties.

The market value of the fruit is at present more or less uncertain. A large proportion of the fruit-eating people of the North do not yet know what a fine fruit the Japanese persimmon is. The fruits have to be shipped while hard and allowed to ripen after reaching destination. Commission men are likely to sell them and the public to eat them—or attempt to do so—a week or two ahead of the proper stage of ripeness; hence the Japan persimmon in its best condition is yet comparatively little known. In Japan, the dried fruit, somewhat like a dried or cured fig, is much esteemed



2876. Kaki or Japanese persimmon, in various forms as grown in Florida. *1*, Tamopan; *2*, Hyakume; *3*, Fuyugaki; *4*, Triumph; *5*, Bcufarik (said to be Diospyros chinensis); *6*, Gailey; *7*, Tsuru; *8*, Tane-Nashi. (× about ⅓)

There is a great difference also in the habit of growth and foliage of the varieties. All have broad and shiny simple leaves. Some varieties make a growth of 5 to 7 feet the first year from graft, and at ten years form a tree 10 feet in height. Others assume a dwarf compact habit and seldom grow above 5 to 6 feet in height; this class is more precocious in reaching the bearing age than the taller-growing sorts, and is also likely to overbear. It is not uncommon for a three-year-old tree to yield several hundred perfect fruits. Thinning the fruit as soon as set in early summer will prevent an early failure of the tree.

Trees thrive in any soil in which the native species grows, but usually fail in wet soils. They respond well to good care and treatment, and yet they thrive with less attention than is required by most other fruits. The insects and diseases are few. In the orchard, they are set about 15 to 20 feet apart, except for very dwarf kinds. The general culture is the same as for other fruits.

Some of the varieties of kaki, now known in this country, are as follows:

Bennett.—Of medium size, measuring 2½ by 2¼ inches in cross-section; fruit almost quadrangular-conical, the sides often deeply creased, basin shallow, fairly regular; calyx depressed; apex rounded to a rather blunt point, marked by a brown tip; color deep orange-red. Seedless, owing to lack of pollination. A remarkable fruit, noteworthy for its hardiness; the original tree is a seedling some twenty years old standing in the yard of Dr. C. D. Bennett, Newark, New Jersey.

Boufarik (Fig. 2876).—Size medium, 1⅞ by 2⅛ inches; shape round-ovate to ovate, apex rounded, slightly depressed, the remains of the pistil set in the depression, base rounded, with obtuse shallow rounded cavity; color yellowish green, the skin greasy, slightly sticky, covered with rather rusty colored hairs which are most abundant about the apex; calyx broken up and reflexed; stem short, rather stout; cells eight, pith open, seedless; flesh light-colored, very astringent before ripening and with strong odor of jimson weed.

Costata.—Medium size, conical, pointed, somewhat four-sided; diameter 2½ inches longitudinally and 2⅝ inches transversely; skin salmon-yellow; flesh light yellow, dark flesh and seeds occurring seldom, astringent until ripe, then very fine; a good keeper. Tree distinct; a rapid, upright grower; foliage luxuriant; the most ornamental of all the varieties mentioned.

Fuyugaki (Fig. 2876).—Size medium large, measuring 2 by 2¾ inches to 1⅞ by 2⅝ inches; color deep orange-red; oblate in form, very smooth, sometimes quartered with four slight creases from the top, apex rounded, very slightly depressed with remains of style persisting, basin very smooth, regular, shallow, calyx reflexed in the ripe fruits; skin thin, tough, smooth; flesh firm, meaty when ripe, light-colored, of a deep carrot-orange; close examination shows the presence of minute widely scattered dark specks; taste sweet, of fine flavor and quality; seeds present, slightly curved along the inner face, the back rounded, brown-shiny, ¾ inch long by ½ inch broad by $\frac{3}{16}$ inch thick. An excellent fruit and a decided acquisition.

Gailey (Fig. 2876).—Recommended as a pollinizer, not for its fruit, although the latter is good though small; fruit oblong-conical with a rounded apex and a small sharp point, dull red with pebbled surface; flesh meaty, firm, and juicy.

Hachiya.—Very large, oblong, conical, with short point; very showy; diameter 3¾ inches longitudinally and 3¼ inches transversely; skin dark, bright red, with occasional dark spots or blotches and rings at the apex; flesh deep yellow, sometimes having occasional dark streaks, with seed, astringent until ripe, then very fine. The largest and handsomest of all. Tree vigorous and shapely; bears fairly well, but is not so prolific as some of the other varieties.

Hyakume (Fig. 2876).—Large to very large, varying from roundish oblong to roundish oblate, but always somewhat flattened at both ends; generally slightly depressed at the point opposite the stem; diameter 2¾ inches longitudinally and 3⅛ inches transversely; skin light buffish yellow, nearly always marked with rings and veins at the apex; flesh dark brown, sweet, crisp, and meaty, not astringent; good while still hard; a good keeper; one of the best market sorts. Of good growth and a free bearer.

Miyo-tan.—Round or slightly oblong, 2½ inches diameter; average weight, five and one-half ounces; slightly ribbed; deep orange-red; flesh usually deep brown-red, but bright red- or half red- and half brown-fleshed specimens are often produced upon the same tree the results of cross-fertilization by other varieties. Tree of medium or dwarf growth; exceedingly prolific. Fruit keeps very late. The brown-fleshed specimens are edible while solid, and as early as October 1.

Okame.—Large, roundish oblate, with well-defined quarter marks, point not depressed; diameter 2⅝ inches longitudinally and 3⅛ inches transversely; skin orange-yellow, changing to brilliant carmine, with delicate bloom and waxy, translucent appearance; the most beautiful of all; light, clear flesh when ripe, with light brown center around the seeds, of which it has several; loses its astringency as soon as it begins to ripen; quality fine. Tree vigorous and good bearer.

Ormond (Bostrom Vining).—Small to medium, oblong, with a tapering pointed four-furrowed apex and rounded base, the large calyx strongly reflexed; surface deep bright red, carrying a thin bloom, the skin thin and tough; flesh orange-red, becoming very soft when ripe. December in northern Florida, long-keeping.

Taber No. 23.—Medium, oblate, flat or depressed point; diameter 1⅞ inches longitudinally and 2⅜ inches transversely; skin rather dark red, with peculiar stipple marks; flesh dark brown, sweet and not astringent; seedy; good. Prolific.

Taber No. 129.—Medium, roundish, flattened at base; has a small but well-defined point at the apex; diameter about 2½ inches both ways; skin dark yellow-red, with peculiar roughened surface, somewhat resembling alligator leather in appearance and markings, except that the marks are usually very small and uniform; flesh light brown, crisp, sweet, meaty, free from astringency; excellent; a good keeper and shipper.

Tamopan (Fig. 2876).—Imported recently from China, and known as the Chinese Grindstone persimmon; fruit perfectly seedless, not astringent and may be eaten when green and hard; large (3 to 5 inches diameter), sometimes weighing more than one pound, broadly oblate and constricted all the way around below the middle so that it has a turban-like shape; color bright orange-red, the skin tough and rather thick; flesh light-colored, astringent until ripe, excellent in quality; tree strong and upright.

Tane-Nashi (Fig. 2876).—Large to very large, roundish conical, pointed, very smooth and symmetrical; diameter 3¼ inches longitudinally and 3⅝ inches transversely; skin light yellow, changing to bright red at full maturity; flesh yellow and seedless; quality very fine; perhaps the most highly esteemed of light-fleshed kinds.

Triumph (Fig. 2876).—Medium; tomato-shaped; skin yellow; flesh yellow; generally has a few seeds; very productive; quality of the best. Ripens from September till November.

Tsuru (Fig. 2876).—Large, slender, pointed, longest in proportion to its size of all; diameter 3⅜ inches longitudinally and 2⅜ inches transversely; skin bright red; flesh orange-yellow, some dark flesh around the few seeds; astringent until fully ripe, then good.

Yeddo-Ichi.—Large, oblate; diameter 2½ inches longitudinally and 3 inches transversely; very smooth and regular in outline, with dinted appearing surface and slight depression at end opposite the stem; skin darker red than most varieties, with heavy bloom; flesh very dark brown, verging toward purplish; sweet, rich, crisp; in quality one of the best. The fruit is good to eat when still hard.

Yemon (Among).—Large, flat, tomato-shaped, somewhat four-sided; diameter 2¼ inches longitudinally and 3¼ inches transversely; skin light yellow, changing to dull red, mottled with orange-yellow; distinct in color; flesh deep, dull red, brown around the seeds, of which there are usually a few; some specimens are entirely light-fleshed and seedless; there is no astringency after the fruit begins to soften; quality fine; one of the best. In form some of the fruits have the corrugations converging to the depressed apex, as it is usually figured, but most do not.

Zengi.—The smallest of all; round or roundish oblate; diameter 1¾ inches longitudinally and 2¼ inches transversely; skin yellowish red; flesh very dark, quality good; seedy; edible when still hard; one of the earliest to ripen. Vigorous, prolific.

L. H. B.†

PÉRTYA (after A. M. Perty, professor of natural history at Berne, Switzerland). *Compósitæ.* A genus of about 4 shrubs from Japan, Cent. China and Afghanistan, allied to Mutisia but the corolla tubular and 5-parted: lvs. alternate, often crowded under the fl.-heads, entire or serrulate, deciduous: heads homogamous, solitary, with 5–15 fls.; involucre campanulate, with few large, imbricate bracts; corolla tubular, deeply 5-lobed: achene pubescent, with a conspicuous dense whitish or purplish pappus. They are not particularly ornamental, but interesting for botanical collections, as hardy shrubby Compositæ are few. Prop. by seeds and probably by cuttings of half-ripened wood. The only species in cult. is **P. sinénsis,** Oliver. Slender upright shrub, to 6 ft.: lvs. ovate- to oblong-lanceolate, acutish, entire, glabrous, 2–3 in. long: heads pinkish, 10–12-fld., on slender pedicels ½–1 in. long; involucre nearly glabrous: achenes sericeous; pappus whitish. June. Cent. China. H.I. 23:2214.—The Japanese *P. scándens,* Schultz. Bip., which is likely to be intro., is a slender decumbent shrub with serrulate lvs., sessile somewhat larger heads with light purple pappus.

Alfred Rehder.

PESCATO-BÓLLEA (compounded from *Pescatoria* and *Bollea*). *Orchidàceæ.* A genus established to contain hybrids between the genera Pescatoria and Bollea. *P.-B. bélla*=P. Klabochorum × B. cœlestis.

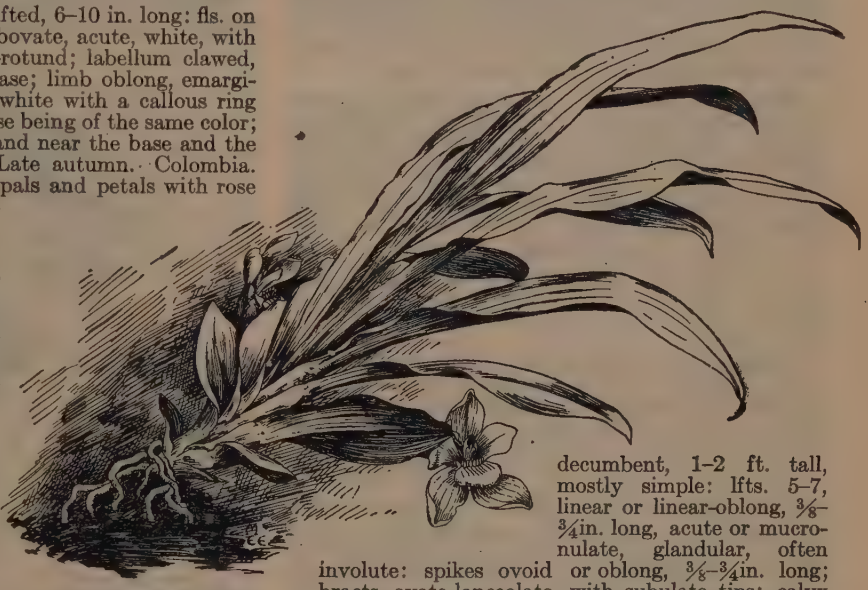
PESCATÒRIA (after M. Pescatore, who had a large collection of orchids at St. Cloud, near Paris). Sometimes spelled *Pescatorea. Orchidàceæ.* A group of orchids often united with Zygopetalum, but in horticultural works usually treated as a distinct genus.

Leaves equitant, tufted, without pseudobulbs: fls. solitary on sts. 3–6 in. long, from the axils of the lvs., mostly large and showy and fragrant; sepals and petals broad, concave, spreading, the lateral sepals forming a mentum; labellum clawed, lateral lobes small, middle lobe rounded, spreading; crest thick, consisting of a number of keels arranged in a semi-circle near the base of the lip; column slender, not boat-shaped.—About 12 species. For cult., see *Zygopetalum*.

Klabochòrum, Reichb. f. Lvs. strap-shaped, 1 ft. or more long: fls. 3–3½ in. across, variable in color; sepals oblong, obtuse; petals shorter, all white with chocolate-purple points; labellum 3-lobed, yellowish or white, and having many purple-tipped hairs; callus sulfur-colored, with brown keels. June, July. Ecuador. Gn. 22:24.

Dayàna, Reichb. f. Lvs. tufted, 6–10 in. long: fls. on short scapes; sepals oblong-obovate, acute, white, with green tips; petals rhomboid-rotund; labellum clawed, angled on each side of the base; limb oblong, emarginate, revolute on the sides, white with a callous ring which is purple-violet, the base being of the same color; column yellow, with a red band near the base and the anther of the same color. Late autumn. Colombia. Var. **rhodàcra,** Reichb. f. Sepals and petals with rose tips; labellum orbicular, suffused crimson. B.M. 6214.

cérina, Reichb. f. Fig. 2877. Lvs. in tufts of 4 or 5, cuneate-oblong, pointed, 1 ft. long: peduncles 2–6 in. long, 1-fld.; sepals and petals nearly equal, the latter somewhat clawed, fleshy, rounded, concave, pale straw-color; labellum ovate, yellow, with a thick semi-circular crest. Chiriqui. B. M. 5598 (as *Huntleya cerina*). F.S. 17: 1815 (as *Zygopetalum cerinum*).—Flowers at various seasons, the fls. lasting a long time.



2877. Pescatoria cerina.

P. cochleàris, Rolfe. Lvs. oblanceolate-oblong, acute, 5–9 in. long: sepals and petals nearly equal, lower halves ivory-white, upper reddish maroon; lip 3-lobed, white; column maroon. Andes.

HEINRICH HASSELBRING.

PETALOSTÈMUM (Greek for *petal* and *stamen,* alluding to the way in which these organs are joined). Sometimes spelled *Petalostèmon.* By some authors, the species have been referred to *Kuhnístera. Leguminòsæ.* American herbs, mostly western, with long or deep perennial roots, sometimes planted for ornament.

Leaves glandular, alternate; blades unequally pinnately compound; lfts. often broadest above the middle and involute: fls. perfect, in short or elongated spikes; calyx-teeth nearly equal, rather broad, shorter than the tube; corolla white, pink, purple, or violet; petals on long slender claws; standard oblong or obcordate; wings and keel-petal similar, their claws adnate to the sheath of the stamen-tube almost to its summit; stamens 5, monadelphous, alternate with the petals; ovary sessile, 2-ovuled; style subulate: pod included in the calyx, mostly dehiscent, 1–2-seeded. Distinguished from its close relative Dalea by having only 5 stamens instead of 9–10 as in that genus.—About 27 species. These low bushy plants with fine-cut lvs. and bearing a constant succession of showy spikes of fls. are very attractive, and well adapted for borders and rock-gardens.

A. *Fls. white.*

cándidum, Michx. (*Dàlea cándida,* Willd.). WHITE PRAIRIE CLOVER. Plants glabrous: sts. erect or rarely prostrate, simple or sparingly branched, 1–2 ft. tall: lfts. 5–9, the blades linear, oblong or oblanceolate, ⅜–1⅛ in. long, acute, or mucronulate, glandular beneath, more or less cuneate at base, very short-stalked: peduncles terminal, elongated, bracted; spikes cylindric, 1–4 in. long, about ½in. thick; bracts aculeate, longer than the calyx; corolla white, 2–3 lines long; wings and keel oval; standard cordate; calyx-teeth and pod slightly pubescent. Tenn. to Minn., La., and Texas. B.B. 2 (ed. 2):369.

AA. *Fls. rosy purple or violet.*

B. *Pubescence of the calyx of short close-set appressed hairs.*

decúmbens, Nutt. Plants sparingly pubescent above or glabrate: sts. solitary or cespitose, ascending or decumbent, 1–2 ft. tall, mostly simple: lfts. 5–7, linear or linear-oblong, ⅜–¾in. long, acute or mucronulate, glandular, often involute: spikes ovoid or oblong, ⅜–¾in. long; bracts ovate-lanceolate, with subulate tips; calyx strigillose, shorter than the bracts, tube campanulate, lobes lanceolate or ovate-lanceolate, shorter than tube, acute; corolla pink or rose-purple; standard with an oblong-ovate cordate blade, other petals with oblong blades. N. E. Texas.

BB. *Pubescence of the calyx villous or silky-villous.*

C. *Bracts glabrous or merely puberulent tips.*

purpùreum, Rydb. (*Dàlea purpùrea,* Vent. *P. violàceum,* Michx.). VIOLET PRAIRIE CLOVER. Glabrous or slightly pubescent, erect, 1½–3 ft. high, branching above: lvs. short-petioled; lfts. 3–5, narrowly linear, ¼–¾in. long, ½–1 line wide, acute or mucronate at the apex, narrowed at the base, short-stalked: spikes peduncled, oblong to cylindric, ½–2 in. long, about ½in. thick; bracts above mucronate, nearly glabrous, nearly equaling the pubescent calyx; corolla violet to purple, about 2 lines long; standard cordate, wings and keel oblong. Ind. to Sask. and Texas. B.M. 1707. B.B. 2 (ed. 2):370.

CC. *Bracts with silky-pubescent tips.*

tenuifòlium, Gray. SILKY PRAIRIE CLOVER. Erect, somewhat pubescent, branching, 1–2 ft. high: lvs. short-petioled; lfts. 3–5, linear, obtuse, glandular-dotted, margin somewhat involute, ¼–½in. long, nearly sessile: spikes cylindric, ½–1½ in. long, about ½in. thick; rachis pubescent; fls. rose-purple, about ¼in. long; bracts ovate-pointed, pubescent, equaling the calyx; standard somewhat orbicular to cordate. Kans. to New Mex. B.B. 2 (ed. 2):370.

P. L. RICKER.

PETASÌTES (Greek, *a broad-brimmed hat;* referring to the large broad leaves). *Compósitæ.* Hardy perennial herbs much like the common coltsfoot (*Tussilago Farfara*), having large leaves of the same general shape, but the flowers range from purple to white, not yellow, and are borne in corymbs instead of singly. They are rather coarse and weedy, but the big felty lvs., appearing after the very early leafless scapes, make a good cover for rough or unoccupied places.

The genus is widely distributed in north temperate and subarctic regions. The number of species is about 20; the essential character of the genus (as distinguished from Tussilago) is that the heads are nearly or quite dicœcious, and rayless or with very short and mostly not showy rays; also the fact that the scapes usually have many heads instead of one. The lvs. are orbicular or reniform, always with a deep heart-shaped base and the scapes are covered with scales like a coltsfoot, but sometimes the lower ones are more leafy.

japónicus, F. Schmidt. Lvs. large, 3½–4 ft. across, radical: peduncle with 2 or 3 linear bracts: fl.-heads in a fastigiate thyrse. Isl. of Sachalin. B.M. 8032. Var. **gigantèus,** Hort. Lvs. orbicular, margin wavy: fl.-heads densely clustered. Gn.M. 10:180.—The stalks are eaten as a vegetable after being boiled, and are also preserved in salt or sugar. The fl.-buds, which appear in Feb., are used as a condiment, as they have a slightly bitter but agreeable flavor. The plant has been advertised in Amer. since 1900 by several dealers. Grows as high as a man, and is useful for bold effects in the subtropical garden.

fràgrans, Presl. Winter Heliotrope. Sweet Coltsfoot. Height 8 in.: lvs. appearing during or after anthesis, orbicular, margined with small cartilaginous teeth, glabrous above, pubescent and green below: heads fragrant, the marginal fls. of the female heads in the form of short rays; fls. small, varying from pale lilac to purple. Medit. region. Gn. 23, p. 113; 53, p. 328; 62, p. 58.—Has the merit of blooming in winter and its fls. have a delightful vanilla-like odor. A few sprays are desirable for cutting during winter. The plant also differs from the common coltsfoot in having darker colored and evergreen foliage. It is suitable for carpeting shrubberies and for dry banks of stiff clay where choicer subjects will not thrive. Like most others of the genus, it spreads rapidly by underground runners.

palmàtus, Gray (*Nardósmia palmàta,* Hook.). Height 6–24 in.: lvs. orbicular or somewhat kidney-shaped, deeply 7–11-cleft beyond the middle, and the lobes sharply dentate, green and glabrous above, densely white-tomentose beneath: heads fragrant, 4–6 lines across, the marginal fls. of the female heads in the form of short rays, whitish. E. Asia, N. Amer. B.B. 3:469.—Blooms from April to June, its fls. varying from nearly white to pale blue or purplish. It is found in rich dark swamps or sphagnum bogs from Newfoundland to Alaska and south to N. Y., Wis., and Calif. It has been offered by dealers in native plants.

officinàlis, Moench (*P. vulgàris,* Desf.). Height 16 in.: lvs. 3 in. to 3 ft. diam., reniform or orbicularly cordate, white-hairy below: fls. purplish, appearing before the lvs. in March–May, borne in cylindric panicles. Eu., N. Asia.

Wilhelm Miller.
L. H. B.†

PETIVÈRIA (named after James Petiver, 1665–1718, an apothecary and botanist of London). *Phytolaccàceæ.* Shrubby herbs: lvs. alternate: fls. small, in axillary and terminal racemes, solitary or in 2's; perianth herbaceous, conical at base, 4-parted, segms. subequal, lanceolate, spreading; stamens inserted at the base of the perianth on a hypogynous disk, either 4 alternate with the segms. of the perianth or 5–8 placed without order; ovary 2-celled.—About 2 species, S. Fla. to Paraguay. The genus has been recently monographed by Hans Walter in Engler's Pflanzenreich, hft. 39 (IV. 83). *P. alliàcea,* Linn. (*P. octándra,* Linn. *P. alliàcea* var. *octándra,* Moq.). Guinea-hen Weed. Half-shrubby, perennial: sts. 2–3 ft. high: lvs. alternate, ovate, entire, membranaceous, attenuate at both ends, pellucid-dotted: infl. erect in a lax raceme; fls. rose or white. Mex. to Brazil. An ornamental stove plant probably not now in cult.

PETRÈA (Robert James, Lord Petré, 1710–1742, a patron of botany who had the finest collection of exotic plants in Europe). Sometimes spelled *Petræa. Verbenàceæ.* Tropical American woody plants, one of which is a choice blue- or purple-flowered climber.

Twining or arborescent shrubs: lvs. opposite, leathery, pinnate-veined: fls. violet, purple or bluish, in

2878. Petrea volubilis.
From a cluster 7 or 8 inches long.

long terminal racemes; calyx with 5 scales in the throat; calyx-lobes colored during anthesis but often becoming green and rigid in fr.; corolla usually a little more intensely colored; limb 5-cut, oblique, the tube short and cylindrical; stamens 4, didynamous; ovary imperfectly 2-loculed; locules 1-ovuled: fr. included in calyx, indehiscent, 2-celled and 2-seeded or 1-seeded by abortion.—Species about a dozen, Mex., W. Indies to Brazil.

Petrea is well adapted to be grown with other stove climbers. The plants do well when trained to a balloon-shaped or flat wire frame, to pillars, or carried near the roof, where they add greatly to the beauty of the house. When it is intended to plant them out in the border, the first point to be considered is the drainage in the pot. This is best effected by placing a layer of brick rubbish of about 4 to 5 inches. This will keep the compost from becoming sour or stagnant in the pot. For a compost, use turfy loam four parts, turfy peat one part, well-decayed cow-manure one part, with admixture of a liberal quantity of sharp gritty sand. By the end of January the temperature may be increased to about 62° for night with 10° to 15° higher by day. Just as soon as they show renewed vigor they will not stand to become dry at the roots. They will want a good syringing over and under the foliage every morning on bright days. Give enough ventilation to keep the air pure and sweet. In midsummer they need some shade if only during the most powerful sunshine. When they are well established, they will be benefited by liquid manure once a week. For midsummer the temperature may be allowed to run up 80° or 85° with sun, and a night temperature of 70°. They are easily propagated from shoot-cuttings placed in a brisk bottom heat and

subjected to the usual condition of moisture and shade required for other plants. When they are wanted to grow in pots, keep shifting until they are in 8- or 10-inch pots. The compost may be renewed in the spring. (J. J. M. Farrell.)

volùbilis, Jacq. Purple Wreath. Fig. 2878. Twining: lvs. 3–4 in. long, short-stalked, ovate, elliptic or oblong, acuminate or obtuse, entire or wavy: fls. blue, in terminal elongated racemes (7–8 in. long); calyx with a tube one-fourth to one-half as long as the pedicel, and in fr. one-third to one-fourth as long as the narrow lobes; corolla included in the calyx. Cuba to Brazil; a showy plant. B.M. 628. G.C. III. 39:24, 25; 45:252; 51:287. J.H. III. 54:390. G. 29:192. H.F. 8:50. F.E. 23:582. F.C. 3:108. Gn. 12:40.—The purple wreath is one of the most distinct and beautiful of tender climbers. The fls. are like a 5-pointed star of lilac with a violet in the middle. The fls. begin to open at the base of the raceme and the showy 5-pointed star is the calyx, whose sepals are colored like petals. The calyx spreads open while the corolla is still a round bud in the middle, and it remains after the corolla has fallen, so that the vine, at first glance, seems to bear two kinds of fls. The blooms appear in March and April. It does not bloom freely in small plants; it probably has other drawbacks, for it has always been a rare plant in Eu., though enthusiastically commended. Offered in S. Calif. The fls. seem to vary considerably in color. Wilhelm Miller.
L. H. B.†

PETROCÁLLIS (Greek, *rock beauty*). *Cruciferæ.* This genus has been commonly included in Draba but differs from it in technical botanical characters as follows: silique oval with swollen reticulate valves having 1–2 seeds in a cell with the funiculum adnate to the septum. One species in the Pyrenees, **P. pyrenàica,** R. Br. Height 2–3 in.: lvs. wedge-shaped, 3-lobed at apex: fls. white at first, changing to rosy pink. May. Mountains, S. Eu. B.M. 713.—Also found under *Draba pyrenaica,* page 1068; grown as a little rock-plant in choice collections.

PETROCÓPTIS (Greek, equivalent to the Latin Saxifraga,—to *break* or *cleft* the *rock:* rooting in the clefts of rocks). *Caryophyllàceæ.* Two or 3 perennials from the Pyrenees, sometimes used in alpine- and rock-gardening. Allied to Lychnis and sometimes united with it, differing in imbricated rather than convolute estivation and in bearded or woolly seeds. Perennials of small size with uncut petals and a corolla-crown, the lvs. mostly tufted or in a rosette: st.-lvs. opposite. **P. pyrenàica,** A. Br. (*Lýchnis pyrenàica,* Berger). Three to 4 in. high from a fusiform root: lvs. glaucous-green, spatulate, those on the st. cordate and sessile: fls. pale flesh-color or rose-color, about ½in. across, in forked clusters, the slender pedicels 1-fld.; petals shallowly notched at top, bearing 2 erect serrate scales. B.M. 3269. Var. **álba,** Hort., is listed as a beautiful and easily grown alpine, late blooming. **P. Lagáscæ,** Willk. (*Lýchnis Lagáscæ,* Hook. f.). Low and tufted, glabrous and glaucous, 2–4 in. high: st. densely distichous, leafy below: lowest lvs. linear and obtuse, middle ones ovate-lanceolate, subacute: fls. pale rose with white center, about ⅔in. across, with 2 white acute scales at base, slightly notched at apex. B.M. 5746.—A charming plant. L. H. B.

PETRÓPHYES: *Monanthes. P. muralis,* Webb=*Monanthes muralis,* Hook. f., which equals *M. atlantica.*

PETRÓPHYTUM (*petros,* rock, and *phyton,* plant; alluding to its habitat). *Rosàceæ.* A genus of 5 cespitose undershrubs with prostrate branches in W. N. Amer., allied to Spiræa, but differing in its follicles being dehiscent on both sutures and in its habit: lvs. crowded, spatulate or oblanceolate, entire: fls. in terminal racemes; sepals and petals 5; stamens 20; pistils 3–5, hairy, style slender, glabrous except at the base: follicles leathery, with few linear seeds. Only the following species has been intro. into cult. and is offered by several European nurseries. It is perfectly hardy and grows best in a rockery in a sunny and well-drained position between rocks; it demands limestone soil. Prop. is by division or by seeds treated like those of spirea, but the young seedlings are particularly impatient of too much moisture. **P. cæspitòsa,** Rydb. (*Spiræa cæspitòsa,* Nutt. *Eriogýnia cæspitòsa,* Wats. *Luètkea cæspitòsa,* Kuntze). Densely cespitose, forming flat patches: lvs. oblanceolate, obtuse or mucronate, 1-ribbed, densely silky, ¼–½in. long: fls. small, white, in dense spikes ½–1¾ in. long on upright stalks 1–4 in. long; petals spatulate, obtuse; stamens exserted. July, Aug. S. D. and Mont. to Calif. and New Mex. M.D.G. 1907:85.
Alfred Rehder.

PETROSELÌNUM (Greek, *rock-parsley*). *Umbelliferæ.* About a half-dozen European chiefly biennial herbs, one of which is cult. for its ornamental and edible herbage. Closely allied to Carum and Apium, with the former of which it is often united and from which it is chiefly distinguished by the greenish yellow fls. and broader incised lf.-segms. Lvs. ternately pinnate-compound, the segms. toothed and cut: fls. in compound umbels with few parts to the involucre and several or many parts to the involucels, the petals with incurved points: fr. ovate and compressed, glabrous. **P. hortènse,** Hoffm. (*P. satìvum,* Hoffm. *Càrum Petroselìnum,* Benth. & Hook. f.). Parsley (which see). Erect, 1–3 ft.: lvs. ternate-pinnate, the lfts. ovate and 3-cleft (much cut in the "curled" garden varieties), the upper ones narrower and nearly entire: fls. yellowish. Old World.—Much cult., and sometimes runs wild about plantations. L. H. B.

PETTÈRIA (after Franz Petter, a Dalmatian botanist; died 1853). *Leguminòsæ.* One species, a shrub, very similar in habit to Laburnum, but with the yellow fls. in upright dense racemes, terminal on leafy branchlets. It is but rarely cult., since it is less showy in bloom than Laburnum or many species of Cytisus. It is hardy as far north as Mass., and requires the same cult. as Laburnum, which see. If grafted, laburnum is to be used as a stock. This monotypic genus differs from Laburnum in its upright racemes, in the tubular calyx, the wings and keel being at the base adnate to the stamens, and in the sessile ovary. It is said to possess the same poisonous properties as that genus.

ramentàcea, Presl (*Cýtisus fràgrans,* Welden, not Lam. *C. Wéldenii,* Vis. *C. ramantàceus,* Sieb. *Labúrnum ramentàceum,* Koch. *L. Wéldenii,* Lavallée). Upright, to 6 ft.: lvs. 3-foliolate, almost glabrous or sparingly pubescent when young, on about 1-in.-long stalks; lfts. cuneate, obovate to oblong, usually obtuse, ¾–2 in. long: fls. fragrant, very short-pedicelled, in 1–3-in.-long dense racemes; calyx 3-lobed, silky; keel silky: pod linear-oblong, sparingly silky, to 1½ in. long. May, June. Dalmatia, Istria. B.R. 29:40. Alfred Rehder.

PETÙNIA (*Petun,* South American aboriginal name, said to have been applied to tobacco). *Solanàceæ.* Petunia. Small herbs, grown for their showy bloom as garden annuals.

Annual or perennial, branching, viscid-pubescent, of weak or straggling growth: lvs. alternate, or opposite above, soft, entire: fls. white or purple, or in shades of reddish, on solitary, terminal or axillary peduncles; calyx deeply 5-parted, the lobes narrow or often foliaceous; corolla funnelform or salverform, the tube long and nearly or quite straight and sitting loosely in the calyx, the limb broad and normally 5-lobed, unequal or

oblique and in some species obscurely 2-lipped; stamens 5, attached in the tube, one of them sometimes sterile; ovary small, 2-celled, the style slender, the stigma dilated and sometimes obscurely 2-lobed.—There are 12 or more species of Petunia, mostly natives of the southern part of S. Amer. One or two grow in Mex. and

2879. Petunia axillaris. (×⅓)

another (*P. parviflora*) is naturalized in the southern parts of the U. S., and is found frequently on ballast about seaports. The genus is closely allied to Salpiglossis, being distinguished by 5 perfect stamens, whereas that genus has 4 stamens and lvs. narrow or usually dentate or pinnatifid.

Garden petunias are small soft plants of straggling or decumbent habit, pubescent and usually more or less sticky, with large showy flowers. The colors are white to light purple, not blue, clear red, nor yellow. They are properly perennial, but are treated as annuals in cultivation. The common kinds are rather weedy in habit, but their great profusion of bloom under all conditions makes them useful and popular. They are particularly useful for massing against shrubbery, for they make a florid undergrowth with almost no care. Some of the modern improved named varieties are very choice plants. Petunias emit a powerful fragrance at nightfall, and sphinx-moths visit them.

The varieties of present-day gardens are considered to be hybrids and modifications of two-stem types. The types were white-flowered in one case and rose-violet in the other, and the flowers were small. In some of the garden strains, the flower is very broad and open, measuring 4 or 5 inches across. There are types with the flowers deeply fringed; others with star-like markings radiating from the throat and extending nearly or quite to the margin of the limb; others with full double flowers.

Petunias should begin to bloom about two or two and one-half months after sowing in the open and continue profusely till killed by hard frost (the first light frosts usually do not injure them). The plants are at first erect, but soon begin to sprawl. The highest blooms of mature but sprawled plants will stand 18 to 24 inches above the ground. There are very dwarf and compact kinds, but they are not much seen in this country.

Varieties or strains naturally fall into the small-flowered and large-flowered classes. The former are singles and are mostly used for bedding or massing. Some of the small lilac-limbed kinds are apparently very closely related to the stem-species, *P. violacea*, possibly direct derivatives of it. Countess of Ellesmere, Rosy Morn, and similar ones are among the best rosy or pink kinds for edgings and hanging-baskets and window-boxes. Large-flowered petunias are double or single, fringed, ruffled, fluted, and otherwise modified, some of them having deep velvety colors of great richness and flowers of much substance. There are marbled, spotted, and penciled flowers among them.

Double forms are produced by crossing the most double flowers that are capable of producing good pollen on the best single strains. Only a part of the seedlings produce doubles, but all the others are likely to produce superior semi-double and single forms. Single flowers carefully pollinated from double flowers will produce seed which will average 25 per cent doubles, and single flowers bearing petaloid anthers similarly pollinated will give an average as high as 40 per cent doubles. The weaker seedlings are most likely to give full double flowers.

Petunias thrive on both ordinary and rich soil, blooming well on land too rich for other plants, and some of the bedding and small kinds doing well even on poor soil with plenty of moisture. They are sun-loving plants, although they bloom well in partial shade. The culture is simple and easy. Seeds may be sown directly in the open, or the plants may be started in flats or pots indoors for early results. The plants are tender and therefore should not be trusted in the open until settled weather comes. The high-bred types require more care in the growing. They would best be started indoors, and be given the choicest positions in the open garden. Extra care should be given to the germination, for every seed that is lost may mean the loss of a form unlike any other; for these high-class petunias are not fixed into definite seed-varieties to any extent. Usually the weakest plants in the lot of seedlings will produce the choicest results among the high-bred single and double strains, the strongest seedlings tending to make weedy plants. Transplanting is recommended for the high-bred fringed and double strains, as well as for early bloom. The seeds are small and should be covered lightly in well-pulverized soil. On ordinary soil, petunias may be thinned or transplanted to 10 or 12

2880. Petunia hybrida. (×⅜)

inches apart each way; but on fertile soil, and particularly with the larger-growing forms, the distance may be as much as 15 to 18 inches. Young petunia plants are very susceptible to frost. It is well to pull out some of the least desirable plants as they grow and begin to crowd. The stronger common strains of petunia are likely to self-sow or volunteer (come up themselves in the spring from seed). Fancy kinds are sometimes propagated by cuttings or slips from plants carried over winter, after the manner of geraniums. The best double strains particularly are often perpetuated by cuttings. There are no special insects or diseases attacking the petunia.

Winter bloom is easy to secure from petunias under glass. Best, or at least quickest, results are secured from cuttings; these may be taken from good shoots in late September or early October from selected outdoor plants, and bloom should be secured by February 1. If plants are grown from seeds, the sowing should take place in late summer, for seedlings grow slowly in the short days of fall and winter; the seedlings should be handled in pots. Sometimes old plants that are not spent are lifted in the fall and cut back, and the new growth will give good winter bloom. Petunias under glass require cool treatment, a night temperature of 45° to 50° suiting them well. A somewhat warmer treatment than that given carnations may be expected to produce satisfactory results.

axillàris, BSP. (*P. nyctaginiflòra,* Juss. *Nicotiàna axillàris,* Lam.). Fig. 2879. LARGE WHITE PETUNIA. Tall and relatively stout, usually growing erect: lvs. large and rather thick, oval-oblong, upper ones nearly or quite sessile and the lower ones narrowed into a distinct petiole: fls. dull white, long-tubed (the tube 3 or 4 times the length of the calyx), fragrant at evening. Argentina. B.M. 2552.—Frequently seen in old gardens, and also escaped.

violàcea, Lindl. VIOLET-FLOWERED PETUNIA. Sts. slender: lvs. oval or ovate, sessile or very short-stalked: fls. smaller, broad-tubed (the tube twice or less the length of the linear calyx-lobes), rose-red or violet, the limb relatively short. Argentina. B.R. 1626. B.M. 3113 (as *Salpiglossis integrifolia*).—This species, or its garden derivatives, sometimes runs wild from gardens.

2881. Petunia hybrida. A double form. (×⅓)

hýbrida, Hort. Figs. 2880–2882. Common petunia, probably a hybrid derivative of the two preceding. For history, see Bailey, "Survival of the Unlike." P.M. 2: 173 (as *P. nyctaginiflora violacea*). B.M. 3556.—This type is remarkably variable, but it differs markedly from either parent: from *P. axillaris* in its broader tube and many colors; from *P. violacea* in its longer tube, wider limb. and many colors; from both in its much larger and multiform fls. and more stocky growth. In some of the strains, the fl. is very broad and open, measuring 4 or 5 in. across. There are types with the fls. deeply fringed; others with star-like markings radiating from the throat and extending nearly or quite to the margin of the limb; others with full double fls. The colors range from white to deep red-purple, and variously striped and barred. There are forms of very dwarf and compact habit. L. H. B.

2882. A modern race of fringed petunia. (×¼)

PEUCÉDANUM (ancient Greek name). *Umbelliferæ.* There are many views as to the limits of the genus Peucedanum, which is equivalent to saying that it has no natural limits. Bentham & Hooker made it a most complex group, comprising about one hundred Old World and New World species, and including such genera as Petroselinum, Anethum, Imperatoria, Polycyrtus, Tommasinia, Pastinaca, Tiedmannia, Lomatium. Coulter & Rose, American monographers ("Monograph of the North American Umbelliferæ," United States Department of Agriculture, 1900), remove the American species and accept Rafinesque's genus Lomatium, where these species may be found (page 1903, Vol. IV). The parsnip has been included in this genus as *P. sativum,* Benth. & Hook., but is here kept distinct under Pastinaca. Various species of Peucedanum may be transferred to grounds in Europe, or the countries where they grow, but they are not known as horticultural subjects.

PEÙMUS (Chilean name). Syn., *Boldòa, Boldèa, Ruìzia. Monimiàceæ.* The Chilean boldo, a small tree of considerable economic interest.

Evergreen tree or large shrub of 1 species, **P. Bóldus,** Molina (*P. fràgrans,* Pers. *Ruìzia fràgrans,* Ruiz & Pav. *Boldòa fràgrans,* Gay): dicœcious: male fls. with 10–12 perianth-lobes, overlapping in 2–3 series, the outer ones herbaceous or membranous, the inner ones more petal-like; stamens numerous; female fls. smaller, the lobes more unequal, after anthesis circumscissile above the disk-bearing base and deciduous: drupes 2–5 or rarely solitary, stipitate on the receptacle; seeds pendulous: the tree attains a height of 20 ft., with lvs. opposite, leathery, very rough and warty, ovate or ovate-elliptic, short-petioled, obtuse. Chile. B.R. 31:57.—The tree has exceedingly hard wood, which is used for making many kinds of implements; it also makes a charcoal said to be prized by smiths above all others. The bark is used in tanning and dyeing. The lvs. are used in medicine. The frs. are edible; they are small berries, sweet and aromatic. Finally it has some ornamental value, being evergreen and fragrant throughout. The fls., which are not very showy, are white, ½in. across, and borne in small panicles, each branch of which is parted into three. It has been advertised in S. Calif.

The male tree has been cult. under glass in Eu., but scarcely outside of botanic gardens and for its economic interest. L. H. B.

PFÁFFIA (C. H. Pfaff, 1774–1852, German chemist). *Amarantàceæ.* Slender perennial herbs from Trop. and extra-Trop. S. Amer., tomentose or villous, rarely glabrate: lvs. opposite, sessile or nearly so, entire: heads or spikes densely fld.; bracts and bractlets transparent: fls. usually in solitary long-peduncled heads, bracteate and with 2 bractlets; perianth 5-parted; staminal tube long, 5-cut to the middle, the anther-bearing teeth ciliate at the margin; stigma discoid or head-like, entire or 2-lobed.—Species about 20, one of which is known more or less in gardens, although it is not certain whether the plants that have been in the trade are properly named.

gnaphaloìdes, Mart. (*Gomphrèna gnaphaloìdes,* Vahl). Perennial, 1 ft.: sts. subshrubby below: lvs. lanceolate, 10–15 lines long, 2–4 lines wide, soft, ashy gray above, woolly beneath: peduncles 5–7 in. long; heads globose, 6–9 lines across; bracts unequal, ovate, mucronate, scarious, the lower one villous, lateral ones longer, glabrous at the base; stigma globose. Brazil, Uruguay.—Recorded as a stove plant in England, but the plant that has been offered in this country was recommended as an outdoor perennial. Wilhelm Miller.

PFEÌFFERA (named for Ludwig Pfeiffer, a distinguished student of cactus). *Cactàceæ.* Epiphytic plants, at first erect but branches usually hanging, mostly 4-angled: areoles bearing small acicular spines: fls. regular, rose-colored, small: ovary and fr. spiny; seeds black. This genus was included in Rhipsalis in Cyclo. Amer. Hort.

ianthothèle, Web. (*Rhípsalis ianthothèle,* Web. *R. cereifórmis,* Foerst. *P. cereifórmis,* Salm-Dyck). Sts. pendent, 1–2 ft. long, branching, less than 1 in. diam., 4- rarely 3-angled: ribs tuberculate: areoles at summit of tubercles short-woolly, soon naked, bearing 6–7 short bristles: fls. with very short tube, but the fl. bell-shaped, purple-red without, pure white within, nearly 1 in. long, little more than half as much wide: fr. the size of a cherry, rose-red, with bristles like those of the st. Argentina. J. N. Rose.

PHACÈLIA (Greek, *cluster;* on account of the crowded flower-clusters of the first described species). *Hydrophyllàceæ.* Annual and sometimes perennial herbs, grown for the blue, purple, or white flowers.

Low or not tall plants, with alternate simple or compound lvs. and infl. in more or less scorpioid cymes or spikes: corolla deciduous as the caps. enlarges, in various shades of blue, purple, or white; tube with or without interval appendages, these when present in the form of 5 or 10 vertical folds or projections, adnate to or free from the bases of the filaments; calyx-lobes commonly narrow, often enlarged upward, especially in fr.; style more or less 2-lobed: seed-coats reticulated or pitted.—Species 114, as defined by Brand in hft. 59 (IV. 251) of Engler's "Das Pflanzenfamilien" (1913), American, mostly from W. N. Amer. The plants are hairy, nearly smooth, or glandular in whole or in part. The herbage of some of the glandular-hairy species has an offensive odor.

The genus includes the old genera Whitlavia, Eutoca, Microgenetes, Cosmanthus, and others. The flowers are mainly of a handsome blue or violet, many species and varieties running through lighter shades to pure white, but not to yellow. The annuals are of easy cultivation, requiring, to bring them to perfection, a soil warm, sunny, and not too moist. Some species like a sandy soil, others a firmer clay. Some are erect and give the best effects when planted thickly; others are more spreading and therefore require considerable space. In height they vary from only a few inches to 2 to 3 feet. The flowers are borne on more or less recurved racemes that straighten as the flowering proceeds. They vary from 1 inch long in some species to less than ¼ inch in others. In addition to those described below there are many other beautiful species of phacelia that should be in the trade. The species best known in cultivation is *P. Whitlavia,* a garden annual known as whitlavia.

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Wrangeliana, 8.

A. *Seeds transversely corrugated, not pitted or reticulated as in the other sections.*

1. **Orcuttiàna,** Gray. Viscid, puberulent, about 1 ft. high: lvs. pinnatifid, somewhat lyrate, the lobes short-oblong and entire: fls. sessile in the at length elongated dense spikes; corolla rotate-campanulate, double the length of the calyx, with limb 3–4 lines broad, white, with yellow eye, nearly or quite destitute of internal appendages: caps. oval, nearly equaling the narrowly spatulate (barely 2 lines long) sepals, 12–14-seeded; seeds oval, obscurely favose-reticulated between the transverse corrugations. Low. Calif.

2883. Phacelia viscida. (×⅓)

AA. *Seeds pitted, punctate or reticulated.*

B. *Corolla without internal appendages.*

2. **fimbriàta,** Michx. (*Cosmánthus fimbriàtus,* Mey.). Weak and diffuse annual, a span high, somewhat hirsute: cauline lvs. 3–7-cleft or -lobed or the lower lyrately divided, the lobes obtuse or roundish: racemes few-fld.; pedicels filiform; calyx-lobes linear-oblong or spatulate; corolla white, only 3–4 lines broad, shorter than the stamens, its lobes fimbriate. Alleghany Mts., Va. to Ala.; April, May.

3. **víscida,** Torr. (*Eùtoca víscida,* Benth.). Fig. 2883. Annual, a foot or 2 high, branching, hirsute at base, very glandular above: lvs. ovate or obscurely cordate, doubly or incisely and irregularly dentate, 1–3 in. long: corolla deep blue, with purple or whitish center, from half to nearly an inch in diam. S. Calif. B.M. 3572. B.R. 1808. R.H. 1851:361. J.H. III. 29:183; 48:302. Var. **albiflòra,** Gray. Fls. white.

BB. *Corolla bearing internal appendages.*

C. *Appendages 5, small and truncate or emarginate and attached to the base of each filament.*

4. **Whitlàvia,** Gray (*Whitlàvia grandiflòra,* Harv.). Whitlavia. California Bluebell. Fig. 2884. An attractive and variable easily grown annual, about 1–1½ ft. high, loosely branching, hirsute and glandular: lvs. ovate or deltoid, incisely toothed: corolla with cylindraceous ventricose tube usually an inch long, thrice

the length of the lobes; appendages to the filaments hairy. S. Calif. B.M. 4813. F.S. 11:1085. G.C. 1854: 679.—A beautiful species and much cult., with fls. an inch long and nearly as wide; sometimes escaped in Eu. Var. **gloxinioides,** Voss (*Whitlàvia gloxinioìdes,* Hort.), has handsome white fls. with blue center. Var. **álba,** Hort. (*Whitlàvia álba,* Hort.), is white-fld.

5. **Párryi,** Torr. Annual, rather slender, 9–18 in. high: lvs. ovate, irregularly and incisely double-toothed or laciniate, or the lowest sometimes pinnately parted; the upper cauline longer than their petioles: corolla cleft beyond the middle, deep violet, 8 lines across; filaments bearded: ovules on each placenta 20–30; seeds 15–20. Calif. B.M. 6842. G.C. II. 24:716. Gt. 34:1207.

6. **campanulària,** Gray. Annual, lower than the last: lvs. subcordate or cordate, less deeply dentate: tube of the truly campanulate corolla ½in. long, expanded at throat, barely twice the length of the lobes; appendages to the filaments glabrous and smaller, otherwise much like No. 4 and almost as showy. S. Calif. B.M. 6735. G.C. II. 20:135; III. 55:173. F. 1883:145. Gn. 31, p. 554; 55:36.—*P. campanulàta,* Hort., is presumably this plant.

CC. *Appendages in corolla 10.*

D. *Ovules numerous, or more than 2, on each placenta.*

7. **lineàris,** Holz. (*Hydrophýllum lineàre,* Pursh. *Eùtoca Ménziesii,* R. Br. *P. Ménziesii,* Torr. *Eùtoca multiflòra,* Douglas). Annual and perhaps perennial, 9–12 in. high, at length paniculate-branched, hispid or roughish hirsute, usually also minutely cinereous-pubescent: lvs. mostly sessile, linear or lanceolate, entire or a few of them deeply cleft, with few or single linear or lanceolate entire lobes: spikes or spike-like racemes thyrsoid-paniculate, at length elongated and erect; corolla bright violet or sometimes white; ovules 12–16: caps. shorter than the calyx; seeds oblong, coarsely favose-reticulated. Calif. to Wash., and east to Mont. and Utah. B.R. 1180. B.M. 3762.—A beautiful species, and easily cult.

8. **divaricàta,** Gray (*Eùtoca divaricàta,* Benth. *E. mexicàna,* Hort.). Diffusely spreading annual, a span high, more or less hirsute and pubescent: lvs. ovate or oblong, mostly longer than the petiole, sometimes 1–2-toothed or lobed at base, the rims curving upward: spikes or racemes at length loose; the pedicels usually much shorter than the calyx; style 2-cleft at apex: ovules 12–20 on each placenta. Calif. B.M. 3706. B.R. 1784. Var. **Wrangeliàna,** A. DC. Fig. 2885. Differs from the type in having the lvs. inclined to be lobed or 1–2-toothed. It is known to the trade as *Eutoca Wrangeliana,* Fisch. &. Mey. P.M. 5:199.

2885. Phacelia divaricata var. Wrangeliana. (×½)

DD. *Ovules only 2 on each placenta.*

E. *Lvs. all simple and entire (except perhaps the lowest).*

9. **hùmilis,** Torr. & Gray. Annual, unbranched or branched from the base, 2–6 in. high, pubescent or infl. often hirsute: lvs. spatulate, oblong or oblanceolate, generally obtuse, the lower rarely with 1–2 ascending lobes: spikes loosely paniculate or solitary; corolla indigo-blue, rather deeply lobed, surpassing the usually linear calyx-lobes; filaments moderately exserted, glabrous or sparingly bearded above. Calif. to Wash. —A pretty little plant.

EE. *Lvs. oblong or narrower, pinnately toothed to compound.*

10. **bipinnatífida,** Michx. Biennial, erect, branched, 1–2 ft., viscid above: lvs. with slender petioles, to 5 in. long, pinnatifid, with 3–7 ovate or oblong dentate or pinnatifid segms.: fls. violet or blue, ½in. or more broad, in loose racemes which are little scirpioid; calyx-lobes linear; corolla rotate-campanulate with conspicuous ciliate appendages in pairs between the stamens. N. C. to Mo. and south.

11. **glandulòsa,** Nutt. (*Eùtoca glandulòsa,* Hook.). Viscid-pubescent and glandular annual, softly if at all hirsute, 9–12 in. or more high: lvs. irregularly and interruptedly 2-pinnatifid, or below divided; the numerous lobes oblong, small, somewhat incised, obtuse: calyx-lobes oblong or spatulate; corolla about 2 lines long, bluish, purplish or white, with lobes shorter than the tube; stamens and 2-cleft style moderately or conspicuously exserted: seeds with the minute reticulations even. Texas to Ariz. and north to Mont.

2884. Phacelia Whitlavia. (×½)

12. **congésta,** Hook. (*P. conférta,* Don). Pubescent and commonly cinereous erect annual, hardly viscid or glandular in the least, a foot or more high: lvs. pinnately 3–7-divided or -parted, and with a few interposed small lobes, the main divisions oblong or oval, incisely pinnatifid or irregularly lobed, the lower ones mostly petiolate and the upper confluent: calyx-lobes linear or somewhat spatulate; corolla blue, 3 lines long, the lobes as long as the tube; stamens more or less exserted: seeds reticulate scabrous, the fine sharp meshes being, as it were, toothed at the junctions. Texas, New Mex. B.M. 3452. V. 5:154; 12:140.

13. **tanacetifòlia,** Benth. (*P. tripinnàta,* Hort.). Erect annual, often cult., roughish hirsute or hispid, not glandular, or above slightly so, 1–3 ft. high: lvs. pinnately 9–17-divided into linear or oblong-linear once or twice pinnately parted or cleft divisions, all sessile or nearly so, the lobes mostly linear-oblong: spikes cymosely clustered, at length elongated: very short fruiting pedicels ascending or erect: calyx-lobes linear or linear-spatulate, not twice the length of the ellipsoidal caps.; stamens and style conspicuously exserted: seeds with very narrow pits bounded by thick walls. Calif. B.M. 3703. B.R. 1696.—Said to be sometimes cult. as a bee-plant. According to Jepson, "Cows fed on it show a marked increase in yield of milk but will not eat it alone at first." Variable. Var. **álba,** Hort., has been offered.

L. F. Henderson.
L. H. B.†

PHÆDRANÁSSA (Greek, *gay queen,* suggested by the beauty of the flowers). *Amaryllidàceæ.* Tender mostly summer-blooming bulbs, with flowers that are tubular in appearance, borne in umbels, generally drooping and usually bright red with green tips.

Bulb tunicated: fls. on a peduncle or scape 10 in. to 2 or 3 ft. long; perianth subcylindrical; segms. 6, equal, regular, spreading only at the tip; stamens inserted at or below the throat of the tube; ovary 3-celled; ovules many, superposed: caps. globose, loculicidally 3-valved; seeds many, small, black: lvs. petioled, oblong or lanceolate, produced after the fls. according to Baker, but this point is doubtful for all species.—Species 4 or 5, in the Andes at 7,000–12,000 ft., except *P. Carmiolii,* a native of Costa Rica, which differs from all other species in having the perianth-segms. much shorter than the tube. Probably the choicest species is *P. chloracra,* the tube of which seems at first sight over 2 in. long; however, the segms. are merely connivent and it is only for a distance of ⅓in. at the base that they are really grown together into a tube. This species has 6–12 fls. in an umbel. *P. gloriosa,* Hort., recommended by some dealers, seems to be unknown to botanists. The species are kept rather dry in winter, and bloomed in the open or perhaps under glass in spring, summer, or autumn; prop. by offsets. They apparently thrive under the treatment afforded by a cool greenhouse.

A. *Tube of perianth much shorter than the segms.*

B. *Fls. chiefly red.*

chloràcra, Herb. (*P. obtùsa,* Herb. *Crìnum quitènse,* Spreng.). Bulb globose, 2–3 in. thick: lvs. produced after the fls.; blade 8–12 in. long, 2–3 in. wide, oblong-lanceolate and acute, the petiole clasping: peduncle 2–3 ft. long, nearly terete, glaucous; fls. scarlet, tipped green, 6–12 in the umbel, usually drooping, 1½–2 in. long. Andes of Ecuador, to 12,000 ft. B.M. 5361. B.R. 31:17.—The name is sometimes erroneously written *P. chloracea.*

BB. *Fls. chiefly green.*

viridiflòra, Baker. Bulb ovoid, 1½ in. thick: lf. solitary, bright green, lanceolate, nearly 1 ft. long; petiole short: peduncle 1 ft. long, terete; fls. about 4 in an umbel, green toward the tip, without any red, passing into whitish toward the base, drooping, the perianth-limb 1¼–1½ in. long. Andes of Ecuador.—Possibly a color variety of *P. chloracra.*

AA. *Tube of perianth much longer than segms.*

Carmiòlii, Baker. Bulb globose, 2–3 in. diam.: lvs. 1–2, equaling peduncle, oblong-lanceolate, acute, bright green, the petiole much shorter than blade: peduncle about 2 ft. long, terete, pale glaucous-green, bearing 8–10 fls. in an umbel; fls. with perianth-limb 2 in. long, the bright red tube cylindrical and 3 times as long as the oblong-lanceolate green pale-edged segms.; stamens exserted. Costa Rica. B.M. 8356, where it is said the plant requires complete rest after the lvs. die down. "The tall fl.-stalk precedes the lvs., which, however, develop while the plant is in flower."

Wilhelm Miller.
L. H. B.†

PHÆDRÁNTHUS (Greek for, *splendent* or *gay,* and *flower,* alluding to the brilliantly colored flowers). *Bignoniàceæ.* Ornamental vine grown for its very showy flowers and also for its handsome foliage.

Evergreen climbing shrub: lvs. opposite, with 1 pair of entire lfts., the terminal lft. usually replaced by a 3-parted or repeatedly 3-parted tendril: fls. in terminal racemes; calyx campanulate, 5–10-nerved, leathery, tomentose, with 5 unequal short teeth; corolla tubular-funnelform, curved; stamens slightly exserted; disk annular, raised; ovary ovoid, tomentose, with many ovules in several rows.—One species in Mex. Formerly usually referred to Bignonia, from which it differs chiefly in the slender filiform tendrils, the leathery tomentose calyx, the exserted stamens and tomentose ovary.—A very handsome strong-growing vine for subtropical regions or in the N. for the cool greenhouse; one of the most showy bignoniads on account of its large brilliantly colored fls. For cult. and prop., see *Bignonia.*

buccinatòrius, Miers (*Bignònia Cherère,* Lindl. *B. Kerère,* Hort., not Aubl. *B. buccinatòria,* Mairet). Tall tendril-climber; branches obtusely angled: lfts. 2, or sometimes 3, elliptic to ovate-oblong, cuspidate or obtuse, thinly coriaceous, glabrous and lustrous above, tomentose beneath while young, later hairy only on the veins, glandular, 2–3 in. long: fls. pendulous, in terminal racemes with erect stout and short rachis; calyx ½in. long; corolla 4 in. long, blood-red, yellow at the base, lobes spreading, emarginate, about ½in. long. Summer. Mex. B.M. 7516. Gn. 26:520. B.R. 1301. R.H. 1898:580.

Alfred Rehder.

PHÆNÓCOMA (*shining hair,* Greek, alluding to the involucre). *Compósitæ.* A South African little shrub, sometimes grown under glass for the showy flower-heads.

Of the Gnaphalium-Helipterum-Helichrysum relation, one species: heads heterogamous, very many-fld., showy because of the brilliant and elongated inner scales of the involucre; florets all tubular and 5-toothed, the marginal female and in a single row, the others male with abortive stigma; receptacle naked; pappus of many rough bristles in a single row, equaling the corolla, somewhat unlike as between the female and male fls. The stiff parts of the involucre make it useful as an everlasting, for which use it is a very showy subject.

These are handsome and distinct evergreen plants. They need a cool airy and shaded house during the summer. They should have plenty of ventilation in the spring and well into the autumn; this will tend greatly to solidify the growth, this causing the greater production of flowers. It is better to place the pots on screened coal-ashes, as this helps to keep the roots cool and moist. They are better if kept by themselves, as they should not be syringed. Watering is a matter of great importance at all seasons. They need some staking and tying so as to keep them in shape. When the weather is cool enough, they should have a temperature

of 45° to 50° at night, with about 10° rise with sunshine. In midwinter the temperature may drop to 40° at night. Any repotting may be done after they are through flowering. Compost used for potting these plants should be loam and fibrous peat in equal parts, left lumpy, and about one-third of silver sand added to the mixture. Give the pots thorough drainage.—They may be increased from cuttings made of the points of some of the moderately strong growths, leaving them about 3 inches long. Place in pans filled with sand. Give them a temperature of about 55°, keeping them moderately close, shaded, and moist. When they show signs of root-formation they may be given more light. When rooted, pot off into small pots using the compost mentioned above, and by shifting and the same culture they grow into good plants in two years. When they get into 8- or 10-inch pots, with plenty of roots, they may have liquid feeding which will help to retain their vigor. These plants are not much seen in this country, but should be more grown. (J. J. M. Farrell.)

prolífera, Don (*Xeránthemum prolíferum*, Linn. *Helichrỳsum prolíferum*, Willd.). An old cult. plant, now little grown: sts. woody, 1–2 ft. high, much branched, short side-branchlets tomentose and with minute closely imbricated scale-like lvs., on the main sts. the lvs. acuminate, rigid, and deciduous: heads terminal, solitary, 1–1½ in. across; involucre with many rows of woolly-based scales, the inner ones being rosy purple as if rays and lanceolate-acuminate. Mountains in the Cape region. B.M. 2365. B.R. 21. Var. **Bárnesii,** Hort., has heads of deep crimson.

L. H. B.

PHÆOMÈRIA (Greek, *dark* and *part*). *Zingiberàceæ*. Perennial herbs from a thick rhizome, grown in the hothouse for their foliage and fls. Flowering sts. separate from the leafy ones; the latter not rarely tall, sometimes gigantic and forming very dense reed-like thickets; the former everywhere smaller although sometimes about 3 ft.: lvs. distichous, often numerous, rather large, provided with a commonly leathery ligule: fls. sessile, in spikes or heads, often large or very large, either broad-pyramidal or subglobose, rarely concave at the top, surrounded commonly by a rather large involucre composed of colored bracts, the flowering bracts smaller and less intensely colored; calyx tubular or subclavate, frequently deeply split on one side, often very short-acuminate or not at all lobulate at the top; corolla-tube narrowly cylindrical, dilated toward the top; the lobes narrow, subspatulate, subequal: caps. or rather berries massed together somewhat resembling a pineapple.—About 16 species. Ceylon, to New Guinea. Phæomeria was formerly included in Amomum but is now considered a distinct genus. *P. magnífica*, Schumann (*Alpínia magnífica*, Roscoe. *Amòmum magnífi-cum*, Benth. & Hook. f.), is described under Amomum. See Vol. I, p. 275.

F. Tracy Hubbard.

PHÆONEÙRON (Greek, *dark nerve*). *Melastomàceæ*. Half shrubby or perennial herbs: lvs. opposite, the opposed pair often differing in size: fls. 5-ranked, medium-sized; calyx obovate, margin entire and not crenate; corolla broad-oval, rather acute; stamens 10, equal or subequal; anther rather thick, linear, connective drawn out behind in a thick almost quadrangular appendage and provided in front with 2 fleshy ball-like thickenings; pistil twice as long as the stamens; ovary 5-celled, the lower half joined to the calyx-tube by the septæ: fr. a fragile apparently unevenly bursting caps.; seeds numerous.—About 4 species, Trop. Afr. *P. Molòneyi*, Stapf. St. herbaceous, terete: branches obtusely tetragonous: petioles and panicles covered with purple furfuraceous pubescence: lvs. 4–6 in. long, ovate or elliptic-ovate, subacuminate, base rounded or subcordate, 5–7-nerved: infl. terminal, lax-fld.; fls. short-pedicelled; calyx hemispheric, mouth truncate, entire; petals obliquely obovate, pale rose-purple within: fr. a globose berry; seeds rhombic-cuneiform, numerous. W. Afr. B.M.7729.—A tropical house plant cult. sparingly in botanic gardens.

F. Tracy Hubbard.

PHAIOCALÁNTHE (compounded from *Phaius* and *Calanthe*). *Orchidàceæ*. A group of orchids established to contain the hybrids between Phaius and Calanthe. *Pc. Còlmanii* (C. Regnieri Stevensii × P. Norman).—*Pc. Coòksonii*. J.H. III. 68:443.—*Pc. grándis* (C. Bryan × P. grandifolius).—*Pc. Schroederiàna* (C. gigas × P. Wallichii). Sepals and petals lilac, the lip claret-colored. G.M. 44:387.—*Pc. Sedeniàna* (C. Veitchii × P. grandifolius). Sepals and petals delicate primrose, flushed at base with pale rose, the lip pale primrose, bright yellow at base and on keels, the lobes flushed with rose

PHAIOCYMBÍDIUM (compounded from *Phaius* and *Cymbidium*). *Orchidàceæ*. A group established to contain hybrids between Phaius and Cymbidium. *P. chardivarénsis*=P. grandifolius × C. giganteum.

PHÀIUS (Greek, *dark;* referring to the color of the flowers). Often spelled *Phajus*. *Orchidàceæ*. Very large orchids with ample foliage and tall clustered stems terminating in racemes of showy flowers.

Sepals and petals similar, spreading or half-spreading; labellum large, with the lateral lobes inclosing the column, usually gibbous or spurred behind; column slender; pollinia 8. Distinguished from Calanthe by the free labellum; from Thunia by the leafless bracted scape which does not terminate the leafy axis.—About 20 species, natives of Trop. Asia, Afr., Austral., China, Japan, and the South Sea Isls.

The genus Phaius includes both epiphytic and terrestrial representatives. The noteworthy epiphytic types are native of Madagascar, including *P. tuberculosus*, *P. simulans*, and *P. Humblotii*. However they are not frequently represented in orchid collections. They enjoy a warm moist atmosphere as for vanda. The potting medium should include chopped peat and moss in equal proportion. When potting, small rafts with the potting medium packed around or sections of fern stems, the latter being preferable, should be placed in the center of the pot or basket. The terrestrial species, especially *P. grandifolius*, are well known, being one of the first orchids put under cultivation. It dates as far back as 1778, when it was imported from China. Various species are native to low-lying swampy places of tropical Asia and Australia, and have also become naturalized in the West Indies. They are of easy culture and will grow in an ordinary warmhouse associated with palms. They delight in moisture throughout the year, in a growing medium of sandy fibrous sod-soil, with plenty of organic fertilizer in a dried state mixed with the soil and also in liquid form when in full growth. The main factor to bear in mind is perfect drainage. Plants are increased readily by the division of the dormant pseudobulbs. Upward of thirty garden hybrids are under cultivation at the present time, including some interesting bigeneric forms. (G. H. Pring.)

A. *Fls. yellow to brown.*

maculâtus, Lindl. Pseudobulbs ovate, 2–5 in. high: lvs. 3–4, broadly lanceolate, plicate, 1½–2 ft. long, variegated with numerous yellowish spots: fl.-sts. about 2 ft. high, bearing a raceme of 10–15 yellow fls. each 2–3 in. diam.; sepals and petals half spreading, oblong, obtuse; labellum erect, with the apex recurved, streaked with orange, wavy and crenate, sides convolute over the column, and the base prolonged into a spur half as long as the ovary. Spring. N. India and Japan. B.M. 2719 (as *Bletia Woodfordii*); 3960. L.B.C. 19:1803.—A good spring bloomer.

Wâllichii, Lindl. (*P. bícolor,* Lindl. *P. grandifòlius,* Lindl., not Lour. *P. grandiflòrus,* Reichb. f.). Fig. 2886. Tall: lvs. broadly elliptic-lanceolate, 3–4 ft. long: fl.-sts. erect, 3–5 ft. high, clothed with scales: fls. 4 in. across, varying in color from chocolate-brown to primrose-yellow; sepals and petals spreading, lanceolate, long-acuminate; labellum with an ample elongate tube; limb oblong, acute or acuminate, recurved, margin

2886. Outline of Phaius Wallichii. (× nearly ½)
To show botanical structure.

crisp; spur slender, incurved. The labellum is less variable in color than the sepals and petals. The base of the tube is yellow, dull reddish beyond, with the throat purple with yellow or red edges on the disk; apex white. Feb.–May. Trop. India, northward to the lower Himalaya. B.M. 4078; 7023. P.M. 6:193. Var. **flavéscens,** Hort. Sepals and petals light yellow, front of lip paler.—**P. Blùmei,** Lindl., is not very clearly distinguished by botanical characters: the sepals and petals are acuminate, tip of lip acute, spur short and thick. Ceylon.

grandifòlius, Lour. (*Blètia Tánkervilliæ,* R. Br.). One of the oldest orchids in cult. It has smaller fls. than *P. Wallichii,* with less acuminate sepals and petals and a shorter obtuse lip and spur; sepals and petals reddish brown, but variable, white on the outside; labellum white at the apex, throat and disk yellow, sides crimson. China, Austral. B.M. 1924. F.S. 7:738. L.B.C. 1:20. G.C. 1872:733; II. 18:565; III. 3:112. Gn. 3, pp. 183, 221. A.G. 20:279.

AA. *Fls. white to rose-color.*

Humblòtii, Reichb. f. Pseudobulbs, lvs. and habit like *P. grandifolius* but smaller: fl.-st. 18–20 in. high, erect: fls. white and rose-colored, tinged and streaked with darker red; sepals oblong-acute; petals twice as wide; labellum spurless, lateral lobes striped with brown on a whitish ground, middle lobe light purple, with a yellow callus. Spring. Madagascar. R.H. 1891:204. G.C. II. 26:173. A.G. 12:161. A.F. 6:609.

tuberculòsus, Blume. Rhizome thick: pseudobulbs small, bearing several lanceolate lvs. 6–9 in. long: fls. 2–3 in. across, in erect spikes; sepals and petals ovate-oblong, white; lateral lobes of the labellum recurved, yellow, almost covered with brownish crimson spots, margin crenately lobed; middle lobe bifid, white, spotted with purple, having 3 thick, yellow keels; margin crisp and crenate. Feb. Madagascar. B.M. 7307. R.B. 18:145. G.C. II. 15:341; 18:565; 21:520; III. 13:237; 29:77. G.M. 44:144. Gn. 67:294.—Difficult to grow, requiring a higher temperature than the other species.

mishmènsis, Reichb. f. St. 2–3 ft. high, leafy above: lvs. 6–10 in. long, elliptic-lanceolate, plicate: scape from the axils of the lower lvs., together with the loose raceme about 2 ft. long; fls. 2 in. across, pale or dark rose-colored; sepals linear-oblong, acuminate; petals narrower; labellum with rounded side lobes and a subquadrate, spotted middle lobe, which is somewhat 3-parted; spur slender, yellow. Himalayas. B.M. 7479.

P. amboinénsis, Blume. Fls. white, with some veining on the lip. Malaya.—*P. Ashworthiànus,* Sander. A garden hybrid (P. Mannii × P. maculatus). Fls. large; sepals and petals clear old gold; labellum large, of the same color, with many radiating chocolate lines, outer surface clear yellow. G.M. 40:551.—*P. callòsus,* Lindl. (Geodorum plicatum, Voigt). Resembling P. grandifolius in habit: sepals and petals dull reddish brown; lip white with tinge of pink, dark purple spot beneath, with yellow on the 2-lobed spur. Malaya.—*P. Chápmannii*=P. Humblotii × P. Phœbe. G.M. 46: 593.—*P. Coòksonæ* (P. grandifolius × P. Humblotii). Sepals and petals nankeen-green, the broad frilled tip yellow at the base with purple-brown markings, the front lobe rose. J.H. III. 46:353.—*P. Coòksonii*=P. simularis × P. Wallichii. G.M. 50:134.—*P. Coòperi,* Rolfe. Sepals and petals bright red-brown in front, pale yellow behind, about 2 in. long: lip funnel-shaped, white at first, soon changing to yellow.—*P. frágrans,* Hort. Belonging to same group as P. tuberculosus, but fls. smaller and more numerous, in color resembling P. Humblotii.—*P. Márthæ* (P. Blumei × P. simulans). Fls. nankeen-yellow, the base of the lip with rose markings and veined light yellow, the front lobe tinged pink. Gt. 53:1530. R.B. 29:73.—*Norman* (P. Sanderianus × P. tuberculosus). Sepals and petals cream to pink, lined, the lip with a reddish purple base, veined yellow and with 3 yellow keels, the midlobe rose, blotched purple and tipped white.—*P. oakwoodiénsis* = P. Cooksonii × P. Humblotii. G. C. III. 28:93.—*P. Opòixi* (P. Wallichii × P. Humblotii.).—*P. Sanderiànus,* Hort. Fls. 6 in. wide or more, the sepals and petals copper-red, the lip with a yellow base, crimson center, and white midlobe.—*P. schroebrunnénsis*=P. grandifolius × P. assamicus.—*P. símulans,* Rolfe. "The epiphytal species known in gardens under the name of P. tuberculosus is not the original plant, and has been renamed P. simulans in allusion to the remarkable resemblance which its fls. bear to those of the original species."

GEORGE V. NASH.†

PHALACRÆA CŒLESTÎNA, Regel: *Ageratum conyzoides.*

PHALÆNÓPSIS (Greek, *moth-like;* suggested by the large white flowers of some species). *Orchidàceæ.* This genus, called by Lindley "the grandest of all orchids," contains some of the most useful species to be found in the orchid family; warmhouse.

Of monopodial growth, having short sts. which increase slowly in length: lvs. few, thick, leathery, often mottled: infl. a raceme or panicle, large, or not longer than the lvs.; sepals spreading, the lateral ones more or less united with the base of the column; petals about as large as the sepals or very much broader; labellum variously shaped but united with the base of the column.—About 50 species natives of the hot regions of India and the Malay Archipelago, growing on trunks of trees and sides of rocks under conditions of high temperature and great moisture. The fls. are remarkably beautiful in form and color. Those of the larger species are borne in graceful drooping panicles on which they usually all face in one direction.

As all phalænopsis are natives of the most tropical regions of the globe, it is essential that they be well supplied with heat and moisture, particularly during the growing season, from March to October. Care should be taken to avoid direct draught on the plants, but air should be admitted on all possible occasions. This is absolutely necessary to keep the plants in perfect condition. During bright sunshine the plants should be shaded, but given all the light possible to insure good tough ripe foliage by autumn, and large branching flower-spikes may be expected in the flowering season. A close moist atmosphere will grow large soft foliage, but small flower-spikes usually result. Plants may be grown suspended from the roof, not too near the glass, or on benches, in pots, in baskets, in pans, or on

blocks or rafts. They are somewhat whimsical, and once a house is found in which they succeed, they should not be moved. During the growing season the temperature should be kept as uniformly as possible between 70° and 75° F., allowing a rise of 10° with sun heat. The minimum night temperature, in winter, should be 60° to 65° F. Good and ample drainage is absolutely necessary, clean potsherds and lumps of charcoal being the best material, and only sufficient peat fiber and sphagnum in equal proportions should be used to keep the plant firmly in position, as the roots will eventually cover the receptacle in which they are growing. When potting, always give the plant its natural inclination, which is invariably sufficient to prevent water remaining in the axils of the leaves, a condition which should be carefully guarded against, either from watering or from drip. Always keep the plant well raised, when potting, to insure quick and perfect drainage. Sponging the leaves occasionally will keep the plants clean and prevent the attack of thrip and red-spider. The propagation of phalænopsis is a very slow process, as the plants rarely afford opportunity for division. Sometimes young plants form on the old flower-stems, and these should be left until they make root, at which stage they may be removed, potted, and carefully watered until root-action begins in the new material. (Alfred J. Loveless.)

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2887. Phalænopsis amabilis. (×¼)

KEY TO THE SPECIES.

A. *Petals much broader than the sepals.*
B. *Labellum with apical appendages; rostellum short.*
C. *Apical appendages cirrhous.*
D. *Middle lobe very narrow* ..... 1. **amabilis**
DD. *Middle lobe trowel-shaped* ..... 2. **Aphrodite**
CC. *Apical appendages short, horn-like.*
D. *Lvs. green* ..... 3. **intermedia**
DD. *Lvs. mottled, at least when young.*
E. *Fls. white* ..... 4. **Stuartiana**
EE. *Fls. rose-purple* ..... 5. **Schilleriana**
BB. *Labellum without apical appendages; rostellum long* ..... 6. **Lowii**
AA. *Petals scarcely or not at all broader than the sepals.*
B. *Claw of the labellum with horn-like appendages below the lateral lobes* .. 7. **Esmeralda**
BB. *Claw of the labellum without appendages.*
C. *Apex of the labellum notched* ..... 8. **amethystina**
CC. *Apex of the labellum entire.*
D. *Rachis compressed: bracts fleshy.*
E. *Middle lobe of the labellum fleshy, rounded* ..... 9. **violacea**
EE. *Middle lobe of the labellum crescent-shaped* ..... 10. **Cornu-cervi**
DD. *Rachis terete.*
E. *Labellum laterally compressed, fleshy* ..... 11. **speciosa**
EE. *Labellum expanded.*
F. *Middle lobe densely hairy* .. 12. **sumatrana**
FF. *Middle lobe pilose* ..... 13. **Lueddemanniana**
FFF. *Middle lobe smooth.*
G. *Labellum crested* ..... 14. **Parishii**
GG. *Labellum not crested, but provided with a fleshy callus* ..... 15. **rosea**

1. amábilis, Blume, not Lindl. (*P. grandiflòra*, Lindl.). Fig. 2887. Lvs. long, pale green: fls. variable in size, sometimes about 5 in. across, pure white with stains of deep yellow and a few purple spots on the labellum and on the column; dorsal sepals ovate to oblong, lateral sepal lanceolate; petals rounded-fan-shaped; lateral lobes of the labellum obliquely cuneate, incurved, middle lobe very narrow with yellow cirrhi. Autumn. Malay Archipelago. B.M. 5184. G.C. 1848: 39; II. 26:213. Gn. 19, p. 305; 24, p. 560; 34, pp. 516, 517. R.H. 1860, pp. 238, 239; 1897, p. 151. A.G. 16:271. A.F. 27:1137; 30:610, 1079. F.E. 33:716. Gng. 15:133. Var. **aùrea,** Rolfe (*P. grandiflòra* var. *aùrea*, Warner). Front half of the lateral lobes of the labellum and the entire middle lobe stained deep yellow. Borneo. Var. **Rimestadtiàna,** Hort. Fls. larger, pure white, the throat bright yellow. G.C. III. 32:316. Gng. 12:405. **P. Hárriettæ,** Rolfe, is a garden hybrid between *P. amabilis* and *P. violacea*. Fig. 2888. Fls. intermediate between the parents, 4½ in. across; sepals and petals pale yellowish white, suffused and dotted with amethyst-purple toward the base; labellum crimson with an orange crest; cirrhi slightly developed. G.C. III. 2:9. Gn. 38:156. J.H. 42:237.

2. Aphrodìte, Reichb. f. (*P. amábilis*, Lindl., not Blume). Lvs. elliptic-lanceolate, 1 ft. or more in length, dark green, obliquely retuse: fls. 3 in. diam., pure white, with the labellum streaked and spotted with yellow and red; sepals elliptic-ovate; petals large, rhomboid; lateral lobes oblong, middle lobe trowel-shaped, with white cirrhi. Fls. at various seasons, but most freely during summer. Philippines. B.M. 4297. B.R. 24:34. P.M. 7:49. F.S. 1:40. G.C. 1848:39; II. 26:213. Gn. 31, p. 273; 35, p. 362; 38, p. 157; 48, p. 484. R.H. 1897, p. 150. A.F. 6:89. Var. **Dayàna.**

Hort. (*P. amábilis* var. *Dayàna*, Hort.), has regular fls. with the lower sepals minutely dotted with crimson, the labellum also being heavily marked with bright crimson. A.G. 21:457. Var. **cásta,** Rolfe (*P. cásta*, Reichb. f.). Lvs. thinly spotted: fls. like the type, with a rosy tint especially at the base of the sepals and petals, and a few spots at the base of the lateral sepals. —Scarcely distinct from the following, but distinct from the type. Var. **leucorrhòda,** Rolfe (*P. leucorrhòda*, Reichb. f.). Lvs. blotched with gray in irregular bands: sepals and petals flushed with rose, the former yellowish outside; callus yellow, spotted with purple. Philippines. F.M. 1875:166. R.H. 1896:500. Var. **Sanderiàna,** Rolfe (*P. Sanderiàna*, Reichb. f.). Fls. suffused with rose; labellum variegated with brown, purple, and yellow. Isl. of Mindanao. Gn. 24:270; 57, p. 44. Var. **gloriòsa,** Hort. (*P. gloriòsa*, Reichb. f.). Fls. white, with a rose-colored spot on the labellum. Gn. 35:362.

3. **intermèdia,** Lindl. A natural hybrid between *P. Aphrodite* and *P. rosea*. Resembles *P. Aphrodite* in habit but the fls. are smaller. Sepals oblong, acute, white; petals rhomboid, much larger, white with few rose spots at the base; labellum small, lateral lobes erect, rose-purple spotted with crimson, middle lobe rich crimson, terminating in 2 short horns. Philippines. G.C. III. 52:453.—The same type has been artificially produced by crossing the two parent species. Var. **Brymeriàna,** Reichb. f. Sepals and petals white, veined pale amethyst-purple, the lateral sepals purple-spotted at base, the petals purple-stained below; front lobe of lip red-purple. G.M. 43:63. Var. **Pórtei,** Reichb. f. (*P. Pórteri*, Hort.). Fls. large, stained with

2888. Phalænopsis Harriettæ. (× about ¼)

rose-purple: lvs. about 1 ft. long, deep green. G.C. II. 5:369, 371. F.M. 1875:162. J.H. III. 30:179; 47:395. Gn. 21:146. G.M. 38:111.

4. **Stuartiàna,** Reichb. f. Lvs. elliptic-oblong, obtuse, about 1 ft. long, mottled when young, becoming dull green above and reddish below: panicle large, branched, drooping; fls. 2 in. across; sepals elliptic, obtuse, white or greenish white, the lateral ones speckled with red; petals rounded but obscurely quadrangular, white with few purple dots at base; labellum golden yellow or orange spotted with crimson, white at the tip, lateral lobes obliquely obovate, obtuse, with a pair of cuneate calli between them; middle lobe orbicular, ending in 2 white cirrhi. Jan., Feb. Philippines. B.M. 6622. I.H. 31:540. F. 1882:49. Gn. 22:118; 45, p. 426. G.C. II. 16:753; III. 4:389. J.H. III. 34:157. F.E. 11:393. G. 30:195.—Very near *P. Schilleriana*, but very different in color. Var. **punctatíssima,** Hort., has the sepals and petals profusely spotted with purplish red.

5. **Schilleriàna,** Reichb. f. Fig. 2889. Lvs. 6–18 in. long, oblong, dark green and mottled with gray above, purple below: panicle drooping, flat, as much as 3 ft. long and nearly as broad, bearing often over 100 fls. each 2½–3 in. across; dorsal sepals obovate, acute, the lateral ones ovate, rich rose-lilac; petals large, rhomboid, colored like the sepals; labellum colored like the rest of the fl. or paler and often spotted with reddish brown and having a yellow callus; lateral lobes rounded-oblong, with 2 quadrangular calli between them, middle lobe oval, ending in 2 divergent horns. Jan.–March. Philippines. B.M. 5530. F.S. 15:1559. I.H. 10:348; 35:56; 43, p. 154. S.H. 2, p. 47. Gn. 3, p. 183; 22:118; 33, p. 615; 35, p. 363; 38, p. 157; 48, p. 484. G.C. II. 12:301; III. 3:529; 17:367; 37:152. F.M. 1877:257. R.H. 1886:396. A.G. 14:65. G.F. 4:390. A.F. 11: 1081. C.L.A. 6:164. F.W. 1876:321. G. 31:19. G.M. 48:151; 52:145. J.H. III. 42:451; 44:551; 52:133.

6. **Lòwii,** Reichb. f. Lvs. 4–5, oblong, fleshy, deep green, tinged with purple: panicle slender, 5–20-fld.; fls. 1½ in. diam., white flushed with purple; dorsal sepals broadly ovate, lateral sepals oblong; petals fan-shaped, with a rounded apex; labellum violet-purple, lateral lobes small, reflexed, middle lobe oblong; rostellum very long-beaked. Flowers during summer months. Moulmein (India). B.M. 5351. F.S. 18:1910. Gn. 9:312. G.C. III. 2:745.

7. **Esmerálda,** Reichb. f. (*P. antennífera*, Reichb. f.). Lvs. oblong, acute, 4–8 in. long, gray-green with few dull purple spots: raceme erect, 6–10-fld., 6–18 in. high; fls. about 1 in. diam., dark or pale purple to white with red streaks; lateral sepals ovate, dorsal sepals obovate; petals obovate; labellum clawed, 3-lobed, lateral lobes ovate to rotund, erect, yellowish; middle lobe broad, obtuse, deep purple; claw with a slender appendage on each side. Cochin-China. B.M. 7196. F.M. 1879:358. R.H. 1877, p. 107.

8. **amethýstina,** Reichb. f. A small species with cuneate-oblong lvs.: fls. small, cream-colored with an amethyst labellum; sepals cuneate-oblong, obtuse; petals subequal or a little smaller; lateral lobes of the labellum cuneate; middle lobe obovate, notched. Malay. G.C. 1870:1731.

9. **violàcea,** Teijsm. & Binn. Lvs. oblong, 8–12 in. long, light shining green: fl.-stalks not longer than the lvs.: fls. few, 2 in. across; sepals and petals broadly lanceolate, yellowish white, changing to rose-violet toward the base; middle lobe of the labellum fleshy, deep purple, with a yellow callus; side lobes small, erect, purple and orange. May–Oct. Sumatra. F.M. 1879:342. G.C. II. 16:145. J.H. III. 42:537.—Plant of dwarf habit. The fls. remain on the plant a long time. Var. **Schroederiàna,** Hort., has the basal half of the segms. bright purple, the color partly broken up into lines. I.H. 32:576. J.H. III. 51:195.

10. **Cornu-cérvi,** Blume & Reichb. f. Lvs. about 9 in. long, leathery, oblong: fl.-st. about as long as the lvs., erect, clavate, bearing 6–12 fls.; fls. yellowish green, barred with reddish brown; sepals and petals fleshy, lanceolate, the latter smaller; labellum whitish, lateral lobes erect on the irregular, fleshy, excavated claw, middle lobe crescent-shaped, apiculate. Summer. Trop. Asia, Java, and Sumatra. B.M. 5570 (as *Polychilos Cornu-cervi*).

11. **speciòsa,** Reichb. f. Lvs. oblong: fls. stellate, in racemes or panicles, white, blotched with rose-madder; sepals oblong; petals narrower; labellum with erect, linear, toothed, yellow side lobes, and a fleshy, purple and white middle lobe ending in a

2889. Phalænopsis Schilleriana. (×⅛)

hairy cushion. Andaman Isls. (Bay of Bengal). G.C. II. 18:745; 26:277.

12. **sumatràna,** Korth. & Reichb. f. Lvs. pointed, about 6 in. long: infl. about as long as the lvs., 6–10-fld.; sepals oblong, pointed, 1 in. or more in length; petals more cuneate; all yellowish white barred, with bands of reddish brown; labellum short, clawed; lateral lobes erect, meeting and each having a short curved tooth pointing backward; middle lobe oblong, fleshy, white, streaked with violet, very hairy in front. Sumatra and Borneo. B.M. 5527. F.S. 16:1644. G.C. 1865:507.

13. **Lueddemanniàna,** Reichb. f. A small plant, with thick, oblong fleshy lvs. 6–8 in. long: infl. about as long as the lvs., with few handsome fls. near the top; fls. 2–3 in. across; sepals and petals oblong-acute, white, marked with transverse bars, those at the base being amethyst, while the upper ones are brown; labellum deep violet, with yellow blotches on the side lobes; middle lobe oblong; side lobes erect, ligulate, deeply 2-toothed. Feb., March. Philippines. B.M. 5523. F.S. 16:1636. R.H. 1872:390. F. 1865:257. G.C. III. 39:259. R.B. 26:169.—The old fl.-sts. of this plant produce young plants by which the species may be easily increased. Var. **ochràcea,** Reichb. f. A form with yellowish fls. and ochre-colored bars. R.H. 1872:390.

14. **Párishii,** Reichb. f. Dwarf: lvs. oblong-lanceolate, acute, 2–4 in. long: fls. in 6–10-fld. racemes scarcely longer than the lvs., crowded; dorsal sepals oblong, lateral broadly ovate, white; petals obovate-spatulate, white; lateral lobes of the labellum small, horn-like, yellow, with purple spots, middle lobe broadly triangular, red-purple, often white on the disk; crest semi-lunar, broken up into subulate filaments in front; the disk has a peculiar appendage ending in 4 long subulate filaments. Burma and Moulmein. B.M. 5815.

15. **rôsea,** Lindl. Lvs. oblong, dark green, obliquely retuse: scape about a foot long, nodding, dark purple, bearing 12–14 fls.; sepals and petals ovate, obtuse, white, tinged with pink in the center; labellum rose-colored, scarcely longer than the sepals; lateral lobes small, lunate, middle lobe ovate. Philippines. B.M. 5212. F.S. 16:1645. G.C. 1848:671. J.F. 3:283.

P. Bértii. Natural hybrid resembling P. amabilis, which is one of its parents.—*P. gigantèa,* J. J. Smith. Habit like that of P. amabilis, but lvs. larger and thicker: fls. in a raceme, whitish, with numerous brown spots. Borneo. G.C. III. 45:306.—*P. Künstleri,* Hook. f. Lvs. up to 4 in. long and 1 in. broad, bright green: raceme loosely 5–8-fld., pendulous; fls. about 2 in. across; sepals and petals similar, spreading, linear to oblong-obovate, yellow, the upper surface marked with brown; lip small, white, streaked with red. Perak. B.M. 7885.—*P. Lísteri,* of doubtful authenticity.—*P. Mánnii,* Reichb. f. Fls. about 2 in. across; sepals and petals yellow, blotched and barred with brown, linear-oblong, acute; lip light yellow, the front lobe anchor-shaped, saccate at base; near the side lobes is a 2-horned slender upright plate and a purplish tooth. Assam. J.H. III. 43:97.—*P. Schilleriàno-Stuartiàna,* see P. Wiganiæ.—*P. Válentinii,* Reichb. f. Plant with habit of P. violacea: sepals purple, cuneate-oblong, the lateral ones white at base; petals like lateral sepals or purple-barred; lip short, clawed, mauve, white and yellow. Malaysia.—*P. Wiganiæ*=P. Schilleriana × P. Stuartiana. G.C. III. 27:83. G.M. 43:63.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

PHALÁNGIUM LILIÁSTRUM: *Paradisea.*

PHÁLARIS (old Greek name for a grass). *Gramíneæ.* Stout hardy ornamental grasses.

Spikelets 1-fld., in heads or spike-like panicles; glumes boat-shaped, awnless; 2 minute sterile lemmas at base of perfect floret.—Ten species, mostly of S. Eu., one native throughout the northern part of N. Amer., a variety of which is ribbon-grass. *P. canariensis,* CANARY-GRASS, which is cult. in Eu. for bird-food or as a cereal, sometimes escapes along roadsides. This annual species, on account of its variegated ovate spikes, is worthy of cult. as an ornamental grass.

arundinàcea, Linn. REED CANARY-GRASS. A tall perennial (2–6 ft.), with flat ½in.-wide lvs. and an elongated spike-like panicle (open in anthesis) of whitish spikelets, native throughout northern Amer. in wet ground, where it is an important forage grass.—Recommended for planting in parks and grounds along the banks of streams or artificial ponds.

2890. Ribbon-grass.—Phalaris arundinacea var. picta.

Var. **pícta,** Linn. (var. *variegàta,* Hort.). RIBBON-GRASS. GARDENER'S GARTERS. Fig. 2890. Lvs. longitudinally striped with white. Commonly cult. for ornament and sometimes run wild about old places.

The name "*P. commutàta,* or TOOWOOMBA CANARY-GRASS," has appeared in recent agricultural literature, as an intro. from Austral. The grass has been identified as P. bulbosa, Linn. (See Kew Bull. Misc. Inf. 1909:289). A. S. HITCHCOCK.

PHALOCÁLLIS (Greek words referring to the delicacy of the cone formed by the crests). *Iridàceæ.* Referred by Baker and others to Cypella. The plant offered as *P. plumbea,* Herb., by Dutch bulb-growers is **Cypélla plúmbea,** Lindl., a South Brazilian species described in Volume II, page 940. B.M. 3710 (flowers chiefly lilac). F.S. 4:395 (chiefly light blue); 14:1466 (*flore striato,* veined and flushed with rich purple shades on a white ground).

PHÁRBITIS: *Ipomœa.*

PHASÈOLUS (ancient Latin name, somewhat altered, of a bean). *Leguminòsæ.* BEAN. The common garden and field beans, and also some species grown for ornament.

Annual or perennial mostly twining herbs, or some of them woody at the base: lvs. mostly pinnately 3-foliolate, stipellate: peduncles axillary, bearing clusters of white, yellow, red, or purplish papilionaceous fls. and more or less compressed (flat-sided) several- to many-seeded 2-valved pods. From its allied genera, Phaseolus is separated by minute characters of calyx, style, and keel. In Phaseolus, the style is bearded along the inner side and the stigma is oblique or lateral, rather than capitate on the end of the style; the keel is coiled into a spiral body, including the 10 diadelphous (9 and 1) stamens.—Many species have been described, mostly of warm countries (*P. polystachyus* is native in U. S., but not cult.), but probably not more than 150 that can be clearly separated as species.

The cultivated species of Phaseolus are all tropical or subtropical in nativity. Therefore they must not be subjected to frosts. Most of them are garden annuals which are planted after the danger of freezing weather has passed and the ground is well warmed. For the culture of the domesticated forms of Phaseolus, see

2891. Phaseolus acutifolius var. latifolius.

the article on *Bean.* See, also *Canavalia, Glycine, Mucuna, Soybean, Stizolobium, Vicia,* and *Vigna.*

Eleven species of Phaseolus are now known to be cultivated to a greater or less extent in various parts of the world. Further explorations in Mexico, Central and South America and in eastern Asia will very probably show that a number of other distinct species not here enumerated have been domesticated locally.

The eleven species here treated fall into two groups, the one perennial, the other annual, at least in the United States.

2892. Phaseolus multiflorus. (×⅛)

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I. PERENNIAL BEANS.

This group includes three species, none of which is now commonly seen in cultivation.

A. *Plant tall-twining, with large, fragrant, showy fls.: root not tuberous.*

B. *Fls. light purple to yellowish, in axillary racemes.*

1. **Caracálla,** Linn. CARACOL. SNAIL-FLOWER. CORKSCREW-FLOWER. Lfts. broadly rhombic-ovate, pointed or acuminate: fls. large and fleshy, very fragrant, the large keel coiled like a snail-shell. Tropics, probably of the Old World. B.R. 341. V. 2, p. 370.—Naturalized in parts of Calif., where it grows 20 or more ft. high, sometimes becoming a nuisance. It is an old-fashioned glasshouse plant in cold climates, but is now rarely seen. P. **Bértonii,** Hort., recently intro. from Paraguay, although a close relative, is probably specifically distinct from *P. Caracalla.*

BB. *Fls. red or light blue, in axillary dense capitate clusters.*

2. **adenánthus,** Mey. (*P. amœnus,* Soland. *P. truxillénsis,* HBK. *P. cirrhòsus,* HBK.). Foliage much

like that of the last, the lfts. ovate and somewhat acute: fls. very showy, red (or light blue?), fragrant: pod 4–6 in. long, usually curved. Tropics.

AA. *Plant low, spreading or trailing, annual above the ground: root tuberous: fls. small, in loose axillary, interrupted racemes.*

3. **retùsus,** Benth. METCALF BEAN. Root very large and fleshy, running deep into the ground: st. roughish: lfts. rhombic to oblong, mostly obtuse and often retuse, rough on both sides, with prominent veinlets, especially beneath: fls. reddish purple: pod flat, short, broadly oblong, somewhat curved. Texas, west and south.—Lately recommended as a forage plant in the dry regions of the S. W. Not promising in Ariz. at elevations less than 4,000 ft. The lvs. are thick and heavy and adapted to dry, hot climates. Sts. grow 8–10 ft. or more long on the mountains where it is a favorite food for deer.

II. ANNUAL GARDEN BEANS.

The species of this group are all annuals with the exception that *P. multiflorus* and *P. lunatus* are perennial in tropical countries. The somewhat thickened roots of the former sometimes live over in the South, but both species are strictly annual in the northern and middle states.

A. *Fls. yellow.*

B. *Lfts. distinctly lobed.*

C. *The lfts. 3–5-cut for one-fourth to one-half their length.*

4. **aconitifòlius,** Jacq. MOTH BEAN. A diffuse trailing plant, 1–2 ft. long with slender sts. loosely covered with rather stiff, brown hairs: lfts. 3–5-lobed at the apex for one-fourth to one-half their length, the lobes narrow; stipules small, narrow, and pointed: fls. very small, yellowish, in heads on the ends of hairy axillary peduncles: pod becoming 2 in. long, nearly cylindrical, glabrous; seeds clay-colored, cylindrical, distinctly elongated, average weight about .03 gram.; hilum less than $\frac{1}{12}$in. (2 mm.) long. India, where it is cult. for human food and for forage, but only rarely seen in collections in this country.

2893. Barteldes Bush Lima. Probably a form of Phaseolus multiflorus. (×½)

2894. Phaseolus multiflorus. White-seeded form. (×½)

CC. *The lfts. shallowly 3-lobed.*

5. **angulàris,** Willd. ADZUKI BEAN. Erect, 1–2 ft. high: sts. slightly furrowed, smooth or with scattered retuse hairs: lfts. ovate, shallowly 3-lobed, smooth or slightly roughened with scattered hairs: fls. yellow, in 2's or 3's on axillary peduncles: pods small, cylindrical; seed red, cream, black or mottled, small, average weight about .07 gram, oblong to nearly round, frequently with square end walls, ratio length to thickness (hilum to back) from 1:1 to 1.5:1; hilum $\frac{1}{12}$in. (2 mm.) long or longer: primary lvs. ovate, their bases truncate or only slightly auriculate, their petioles $\frac{2}{3}$in. (10 mm.) long or longer. Asia.—Cult. in N. China and Japan, where it is eaten boiled with soups or mixed with rice.

2895. Leaf of Phaseolus vulgaris.

2896. Cranberry Pole bean — Phaseolus vulgaris. (×½)

BB. *Lfts. entire.*

C. *One wing rolled completely over keel: bases of primary lvs. cordate, their petioles $\frac{2}{3}$in. long or longer.*

6. **calcaràtus,** Roxbg. RICE BEAN. Annual, erect, 1–2 ft. high, in habit much resembling the preceding species: lfts. broadly ovate: fls. yellow, in 2's or 3's in short axillary peduncles: seed varying in color from reddish brown to pale opaque, small, average weight about .05 gram, strongly elongated, ratio length to thickness (hilum to back) 1.75:1 to 2:1, hilum $\frac{1}{12}$in. (2 mm.) long or longer: primary lvs. narrowly lanceolate. Asia.—Cult. sparingly in China and India, where it is used boiled in soups and with rice.

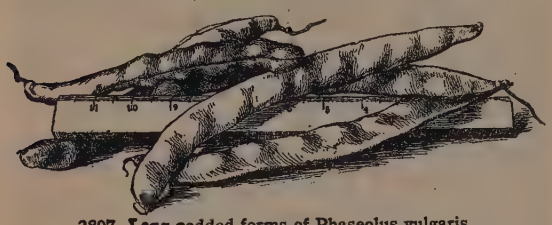
CC *One wing pressed against but not rolled completely over the keel: bases of primary lvs. rounded or tapering, their petioles less than $\frac{7}{25}$in. (7 mm.) long.*

7. **aùreus,** Roxbg. MUNG BEAN. Erect or slightly twining (some varieties strongly twining on rich ground), 1–3 ft. high, with furrowed sts. clothed with long brown hairs: lfts. broadly ovate or nearly rhomboid, orbicular, usually entire, thin, short-acute; stipules large, ovate: fls. rather small, yellowish, in clusters of 5–6 on the end of stout hairy peduncles; keel spurred: pod 3 in. or less long, nearly cylindrical, somewhat curved, bearing 10–15 beans; seeds green or golden, small, nearly round; average weight about .05 gram; hilum less than $\frac{1}{12}$in. (2 mm.) long. Asia.—Cult. in China, where it is used for bean sprouts, vermicelli and gelatine, and extensively in India, also in Persia, Philippines, Japan. The slender pod is hairy at first, but the hairs are deciduous. **P. Múngo,** Linn. (THE URD), a related species, is distinguished by more procumbent habit, long-hairy pods, and oblong blackish seeds.

AA. *Fls. not yellow.*

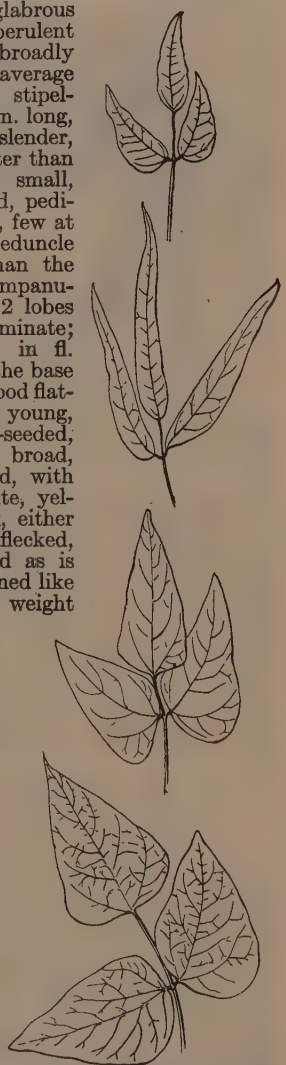
B. *Petioles of primary lvs. less than 2/5 in. (7 mm.) long.*

8. **acutifòlius,** Gray, var. **latifòlius,** G. F. Freeman. TEPARY. Fig. 2891. Annual, erect on poor or



2897. Long-podded forms of Phaseolus vulgaris.

dry land, under more favorable growth-conditions sts. recumbent, spreading or twining, 1½–9 ft. long, glabrous to puberulent: lvs. smooth above with slightly prominent veins beneath, glabrous throughout or slightly puberulent below; lfts. entire, ovate to broadly lanceolate, ⅜–2 in. wide (average width 1½ in.), acuminate, stipellate; stipules lanceolate, 1/12 in. long, striate, appressed; petioles slender, 1–4 in. long: peduncles shorter than the lvs., 2–5-fld.; bracts small, deciduous: fls. medium-sized, pedicellate, white or pale violet, few at the end of an axillary peduncle which is usually shorter than the lvs.; calyx short, broadly campanulate, 4-toothed (the upper 2 lobes united into 1), teeth acuminate; banner broad, emarginate, in fl. more than half reflexed, at the base biauriculate, ⅛–⅖ in. long: pod flattened and coriaceous when young, when mature papery, 2–7-seeded, 2–3½ in. long, ⅛–⅖ in. broad, straight or slightly curved, with prominent beak; seeds white, yellow, brown, or bluish black, either self-colored or variously flecked, round-oval to nearly round as is the navy, to strongly flattened like a diminutive lima; average weight .10–.20 gram. S. W. U. S. and Mex.—Cult. by the Indians and Mexicans of the southwestern desert region. Recently intro. by the Arizona Agric. Exp. Sta. as a very promising drought-resistant dry shell bean for hot semi-arid regions. See *Bean, Tepary,* p. 462; also Ariz. Agric. Exp. Sta. Bull. No. 68 (1912).



2898. Leaves of Phaseolus lunatus. Two upper ones, Willow Leaf, a very narrow-leaved form of the Sieva type; middle one, Potato Lima; lowest one, Large White Lima, the two latter being var. macrocarpus.

BB. *Petioles of primary lvs. ⅖ in. (10 mm.) long or longer.*

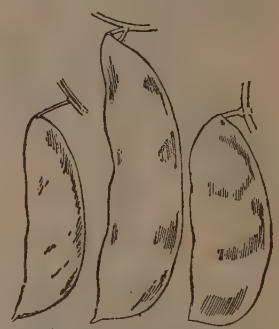
C. *Cotyledons not raised above the ground in the seedling.*

9. **multiflòrus,** Willd. SCARLET RUNNER BEAN. DUTCH CASE-KNIFE BEAN (a white variety). Figs. 2892–2894. Root thickened and tuberous, sometimes perennial in the S., but perishing in the N.: plant tall, twining and slender, minutely pubescent: lvs. large; lfts. thin, terminal lfts. often 3 in. or more wide, rhombic-ovate and acute, scabrous-pubescent: fls. rather large and showy, on long naked racemes, in the Scarlet Runner type red, in the Dutch Case-Knife white, the keel not distinctly projecting: pods long (3–6 in.), with curved slender tip; seeds large (½ in. long or longer), much flattened or nearly cylindrical, less than twice as long as broad, not usually reniform, no conspicuous lines radiating from the hilum, color red or mahogany, and black in the Scarlet Runner, white in many other forms: primary lvs. ovate or cordate, the base deeply auriculate, petioles 1 in. or more long. S. Amer. or Mex., but now widely spread.—The Scarlet Runner form is popular as an ornamental vine for arbors and to cover windows, sometimes being known as Flowering Bean or Painted Lady. The Dutch Case-Knife is a vegetable-garden plant, grown for its beans. Various forms of the plant are grown for food by the Mexicans and these sometimes appear in our western country. Here belong the Aztec or prehistoric beans, now grown sparingly in N. Ariz., which are said to have originated from seed found in caches among the prehistoric cliff-dwellings. Melde's Perennial and Irvine's Hybrid beans are apparently white-fld. forms. The color of fl. and seed seems always to be associated in this species. A dwarf or bush form, probably of *P. multiflorus,* was intro. a few years ago as Bartelde's Dwarf Lima (see Bull. No. 87, Cornell Exp. Sta.). It is not unlikely that more than one species is passing as *P. multiflorus,* some of the Mexican forms being imperfectly understood.

CC. *Cotyledons raised above the ground in the seedling stage.*

D. *Fl.-bracts large, conspicuous, oval.*

10. **vulgàris,** Linn. COMMON BEAN. KIDNEY BEAN of the English. HARICOT of the French. Figs. 2895–2897. Erect or twining (on poor or dry soil many varieties are erect which are twining in more moist or fertile land; some varieties, however, retain the bush form under the most favorable conditions): mature plants more or less pubescent: lfts. rhombic-ovate or ovate, acuminate: peduncles shorter than the petioles, few-fld. at or near the apex: fls. small, white, yellowish or blue-purple: pod slender, somewhat curved, provided with a straight or curved tip, fleshy when young and either green or light yellowish wax-color; length of mature seed less than ½ in., average weight more than .20 gram, no conspicuous lines radiating from the hilum: primary lvs. entire, cordate, deeply auriculate, dull green, slightly rough from fine scattered hispid pubescence, their petioles distinctly pubescent.—Both seed and plant characters very variable. There are probably about 200 distinct types, which include between 400 and 500 named commercial varieties. Here are included all of both bush and running forms of which the pods are used as green snap beans as well as the dry shell-bean type like the Navy, Boston Pea, and California Tree bean. The seven species of common beans (*P. vulgàris,* Savi, *P. compréssus,* Mart., *P. gonospérmus,* Savi, *P. carinàtus,* Mart., *P. oblóngus,* Savi, *P. ellípticus,* Mart., *P. sphæricus,* Mart.) which were separated by George von Martens (Die Gartenbohnen, 1860) according to the shape and size of



2899. Pods of Sieva, Large Lima, Potato Lima. The last two are forms of P. lunatus var. macrocarpus. (×⅓)

the seeds, are now recognized by botanists as different varieties of *P. vulgaris*, Linn. For cult., see *Bean*. For descriptions of commercial varieties see H. C. Irish, "Garden Beans Cultivated as Esculents," Missouri Bot. Garden, 12th Ann. Rept. (1901), pp. 81–165; W. W. Tracy, Jr., "American Varieties of Garden Beans," U. S. Bur. Plant Ind., Bull. No. 109 (1907), pp. 5–173; C. D. Jarvis, "American Varieties of Beans," Cornell Bull. No. 260 (1908), pp. 149–245.

2900. Henderson Dwarf Lima, a form of Phaseolus lunatus. (×½)

DD. *Fl.-bracts small, inconspicuous, lanceolate.*

11. **lunàtus,** Linn. Sieva or Civet Bean. Figs. 2898–2901. Small and slender, usually not climbing very high: lfts. thin, short and broad, ovate pointed (except in special forms as the Willow-leaf): fls. of medium size, wings and keel white or whitish, banner greenish, containing chlorophyl, of different texture from the wings and keel, in axillary racemes: pods small and papery, 2–3 in. long, much curved on the back and provided with a long tip, splitting open when ripe and the valves twisting; beans small and flat, white, brown or mottled, conspicuous lines radiating from the hilum, more than ½in. long: primary lvs. not lobed, in form ovate or cordate, bases deeply auriculate, upper surfaces smooth and somewhat shiny, their petioles almost perfectly glabrous. Trop. Amer.—Widely cult. in warm countries, and prized for its earliness and prolificacy. It gives rise to dwarf or bush forms, as the Dwarf Carolina, Henderson Bush Lima. Common in American gardens Var. **macrocárpus,** Benth. (*P. inamœnus*, Linn. *P. limènsis*, *P. saccharàtus*, *P. fœcíndus*, *P. latisíliquus*, Macfadyen. *P. pubérulus*, HBK. *P. Xuarézii*, Zucc.). Lima Bean. Figs. 2898, 2899. Distinguished from the Sievas by tall, robust growth and late ripening: lfts. large and thick, ovate-lanceolate: pods fewer to the raceme, straight or nearly so, without a prominent tip, not readily splitting at maturity; beans very large, white, red, black, or speckled. S. Amer.—Widely grown in the tropics, and one of the richest of beans. Unreliable in the northern states because of the short, cool seasons. There are 2 forms cult. in the U. S.: Flat or Large-seeded limas, with seeds very flat and veiny and more or less lunate in shape, and very broad flat pods, with a distinct but not prominent point, and broad ovate lfts.; Potato limas, with smaller tumid seeds, shorter and thicker pods, with a very short point, and long-ovate, tapering lfts., with angular base. In both these groups there are dwarf or bush forms,—Burpee Dwarf Lima in the former, and Kumerle Dwarf Lima in the latter. The lima bean is perennial in the tropics. See *Bean, Lima.*

Geo. F. Freeman.

PHAYLÓPSIS (Greek, *worthless*, and *appearance*). Also spelled *Phaulopsis*. Syn., *Micránthus*, Wendl., not Eckl. *Acanthàceæ*. Small shrubs, probably not now in cult.: lvs. often oblique, those in one opposite pair unequal, elliptic, entire, or crenate: infl. in cylindric or ovoid spikes, each broad floral lf. inclosing a contracted cyme of usually 3 fls.; calyx 5-lobed nearly to the base; corolla small, 5-lobed; stamens 4: caps. ellipsoid, compressed, usually 4-seeded. About 15 species, Afr., Mascarene Isls. and India. *P. parviflòra*, Willd. Pubescent: st. 1–2 ft. high, branched: lvs. acuminate at both ends, nearly entire: calyx hairy, 2 anticous segms. linear-ligulate; corolla white or purplish, tube funnel-shaped at the top; ovary glabrous. Trop. and S. Afr., Mascarene Isls., and India. B.M. 2433 (as *P. longifolia*).

PHEGÓPTERIS (Greek, *beech-fern*). *Polypodiàceæ*. Beech, Oak or Sun Fern. A group of ferns like Dryopteris in habit and latterly usually included in that genus, but with no indusia, the sori being entirely naked. There are numerous Trop. American and Sandwich Island species worthy of cult. in warmhouses. There are 3 native hardy species sometimes offered in the trade, the first, second, and fourth in the following list. For cult., see *Ferns*.

A. *Lvs. small or medium-sized, at most tripinnatifid. (Native hardy species.)*

B. *The lvs. bipinnatifid, broadly triangular.*

hexagonóptera, Fée (*Polypòdium hexagonópterum*, Michx.). Lvs. 9–15 in. long, usually broader than long, pale green; lower pair of pinnæ deflexed and set forward; sori marginal. E. U. S.—Suitable for shaded banks with good soil and fair moisture.

polypodioìdes, Fée. Lvs. 5–9 in. long, longer than broad, dark green, slightly hairy beneath; sori nearer the margin than the midrib. Eu. and N. E. N. Amer. G.M. 58:297 (as *Polypodium phegopteris*).—Like preceding in cultural requirements.

BB. *The lvs. tripinnatifid, lanceolate.*

alpéstris, Mett. Lvs. 1–2 ft. long, 6–8 in. wide, with numerous finely cut lanceolate pinnæ, the lobes toothed; thinly herbaceous. Eu. and N. W. Amer.—Habit of *Athyrium* (or *Asplenium*) *Filix-fœmina* and is probably an Athyrium.

BBB. *The lvs. ternately tripinnatifid.*

Dryópteris, Fée. Oak Fern. Lvs. triangular, 3–9 in. each way, the lowest pinnæ nearly equal to the terminal, giving the lf. a ternate appearance Eu. and N. Amer.—Grows in damp places in nearly pure leaf-mold.

AA. *Lvs. several feet long, decompound.*

Keraudreniàna, Mann. Lvs. several feet long, decompound, with light brownish polished stalks and straw-colored rachides; texture herbaceous; sori near the margins of the segms. Sandwich Isls.—A greenhouse species. This species has also been advertised under the name of Polypodium.

L. M. Underwood.
R. C. Benedict.†

PHELLODÉNDRON (Greek, for *cork*, and *tree*, alluding to the corky bark). *Rutàceæ*. Cork Tree. Ornamental trees, grown for their handsome foliage.

Deciduous: winter buds naked, inclosed by the base of the petiole: lvs. opposite, petioled, without stipules, odd-pinnate, with opposite crenulate lfts.: fls. dicœcious, in terminal panicles, or the staminate fls. nearly corymbose; sepals and petals 5–8, ovate-lanceolate; stamens 5–6, longer than petals; ovary 5-celled, with a short thick style: fr. a black drupe with 5 small 1-seeded stones.—Five or 6 closely related species in E. Asia.

2901. Sieva bean.—Phaseolus lunatus. (×½)

The cork trees are usually medium-sized trees with rather stout spreading branches, forming a round broad head, with large leaves of aromatic odor when bruised and turning yellow in autumn, and with inconspicuous greenish flowers followed by black berry-like fruits remaining on the tree a long time after the leaves have fallen. *P. amurense* and *P. sachalinense* are hardy North, while the other species seem somewhat tenderer but have proved hardy as far north as Massachusetts. They are of rapid growth when young and seem to grow in almost any kind of soil. The first-named species has been recommended as a street tree for western cities, as it resists drought and heat in summer and seems not to be attacked by insects. Propagation is by seeds, which are produced freely when both sexes are planted, and by root cuttings dug up in fall and stored during the winter in moist sand or sphagnum; cuttings taken from the tree in July with a "heel" of older wood will root in gentle heat.

A. *Lvs. glabrous beneath or with a few scattered hairs on the midrib, glaucescent or glaucous.*

amurénse, Rupr. Amoor Cork Tree. Tree, to 50 ft.: bark of the trunk light gray, corky, deeply fissured: 1-year-old branchlets orange-yellow or yellowish gray, almost glabrous: lfts. 5–13, ovate to ovate-lanceolate, narrowed or rounded at the base, long-acuminate, minutely crenulate, and ciliate, dark green and lustrous above, glaucescent and glabrous beneath or with a few scattered hairs near the base of the midrib, 2–4 in. long: infl. puberulous: fr. globose, black, about ⅓–½in. across, with a strong turpentine-like odor when bruised, in broad panicles, 2–3½ in. across. June. N. China, Amurland, Japan. S.T.S. 1:93. S.I.F. 2:33. Var. **álbo-variegàtum,** Schwerin. Lvs. variegated with large white blotches.—A hybrid between this species and *P. japonicum* has been observed in the Botanic Garden at Lund, Sweden.

sachalinénse, Sarg. Tree, to 50 ft.: bark of the trunk dark brown, slightly fissured and broken into thin plates, not corky: 1-year-old branchlets reddish brown: lfts. 7–11, ovate to ovate-oblong, acuminate, cuneate or rounded at the base, minutely crenulate and glabrous or sparingly ciliate on the margin, dull green above, glaucescent beneath and glabrous or nearly so, 3–5 in. long: infl. nearly glabrous: fr. black, ⅓in. across or slightly more, in broad panicles 2–3½ in. across. June. Saghalin, Korea, N. Japan, W. China. S.T.S. 1:94.—This is the most satisfactory and hardiest species in cult.; it forms a tall trunk with a broad crown.

AA. *Lvs. pubescent beneath, at least on the veins, and pale green or grayish green.*

B. *Infl. as broad or nearly as broad as high: ovary glabrous.*

Lavallèi, Dode. Tree, to 30 or occasionally to 50 ft.: bark corky: 1-year-old branchlets purplish brown: lf.-rachis puberulous or pubescent; lfts. 5–13, elliptic-ovate to oblong-lanceolate, acuminate, cuneate at the base, minutely crenulate and ciliate, dull yellowish green above, pubescent beneath while young, at maturity often only on the veins, 2–4 in. long: infl. puberulous: fr. black, ⅓in. across, in rather loose broad panicles 2½–4 in. across. June. Cent. Japan. I.T. 5:171 (as *P. amurense*).—Often confused with *P. japonicum* and cult. under that name.

japónicum, Maxim. Tree, to 30 ft., with slightly fissured dark brown bark, not corky: 1-year-old branches reddish brown: lf.-rachis densely villous or tomentose; lfts. 9–13, ovate to ovate-oblong, acuminate, truncate or subcordate and very unequal at the base, minutely crenulate and ciliate, dull green above, villous beneath all over, more densely on the veins, 3–4 in. long: infl. hoary-tomentose: fr. black, nearly ½in. thick, in broad panicles 2–3½ in. across. June. Cent. Japan. S.T.S. 1:95.

BB. *Infl. distinctly higher than broad: ovary pubescent.*

chinénse, Schneid. Tree, to 30 ft.: bark dark grayish brown, slightly fissured, not corky: 1-year-old branchlets purplish brown: lfts. 7–13, oblong-ovate to oblong-lanceolate, acuminate, rounded or broadly cuneate at the base, dark yellowish green above, villous beneath, 3½–5½ in. long: infl. densely pubescent: fr. black, nearly ½in. across, in panicles about 1–2½ in. broad and 2–3 in. long. Cent. China. Var. **glabriúsculum,** Schneid. (*P. sinénse,* Dode). Lfts. pubescent only on the veins beneath. Cent. and W. China. Alfred Rehder.

PHELYPÆA (after Louis and Hier. Phelipeaux). Also spelled *Phelipæa. Orobanchàceæ.* Herbs, puberulent or glabrous, from a thick short few-scaled base: scapes simple, elongated, remotely few-scaled or the elongated peduncles naked, scape-like, always 1-fld., bractless; calyx 5-parted, broad-campanulate, lobes acute, unequal; corolla-tube broadly ventricose, incurved, limb sub-2-labiate, with 5 broadly rounded not very unequal lobes, anterior lip at base gibbous or with 2 broad glandulose-pubescent spots; stamens included; ovary with 4 placentæ: fr. a perfect 2-valved acute, ovate caps.—About 5 species, chiefly in the Orient, but also in N. Afr. and Asia. *P. foliàta,* Lamb. Parasitic leafless herb 1–1½ ft. high: sts. simple, rather stout, glandular-puberulous, reddish: fl. solitary, terminal, ebracteate; calyx campanulate, unequally 5-lobed, usually somewhat 2-lipped, lobes oblong or ovate, deep red or chestnut-brown; corolla ringent, tube widely and obliquely campanulate, orange flushed with red outside, limb 2-lipped, reddish yellow outside, brilliant crimson within, the throat with 2 black hirsute spots: fr. a wide ovate caps. nearly ½in. long. Caucasus. It has been raised in botanic gardens in Eu.

F. Tracy Hubbard.

PHENOLOGY (contraction of *phenomenology;* that is, the science of phenomena) is the study of the relationships between the climate of any place and the annual periods of plants and animals. Plants vegetate, bloom, and ripen fruit at more or less definite seasons, each after its kind; animals mate, bear young, migrate and hibernate each also after its kind; but these recurring events are related to the climate in which these things live: with these inter-relationships phenology has to do. The most complete means of comparing the climate of one year with that of another are the life-events of the animals and plants of the years. Thermometrical readings are the customary measures, but the thermometers record only temperature, whereas local climate is modified by conditions of humidity, cloudiness, the sequence of atmospheric changes, and many subtle agencies which cannot be measured by means of instruments. Living things are the agents that really measure climate. A record of the life-events of living things, therefore, even though imperfect, should contribute to the science of climatology; and incidentally it should contribute much to the science of biology. Records of plant-events are more comparable than those of animal-events, because plants are stationary and have no volition to adapt themselves to inclemencies by means of change of position, diet, or otherwise; therefore, plants emphatically express climatal influence. A record of the first blooming of a given apple tree, for example, during a series of years would give comparable measures of the lateness or earliness of the different seasons. Most so-called phenological observations in this country have been mere records of dates of blooming, leafing, migration of birds, peeping of frogs, and the like, without correlative data respecting the local climate. They are therefore of relatively little consequence to science. In this country the literature of phenology is meager. See Bailey, Essay 17, "Survival of the Unlike," and "Weather Review," Sept. 1896, U. S. Weather Bureau. L. H. B.

PHENOMENAL BERRY: See article on *Loganberry*, page 1900.

PHILADÉLPHUS (named for the ancient Egyptian king, Ptolemy Philadelphus, who reigned from 285 to 247 B.C.). *Saxifragàceæ*. SYRINGA. MOCK ORANGE. Popular ornamental deciduous or rarely half-evergreen shrubs.

Leaves opposite, entire to variously toothed, occasionally slightly revolute, and almost invariably ciliate: fls. often very fragrant, mostly white, a few creamy or with purple or rosy spots at or near the base of the petals, in racemes, or solitary or in cymose groups of 1–6; calyx-lobes, petals, and styles usually 4; stamens numerous: fr. a dehiscent commonly 2-parted 4-valved many-seeded caps.—About 30–35 species have been described. The genus is essentially Asiatic and American. *P. coronarius* is certainly a native of Armenia and the Caucasus, and several varieties of it

2902. Philadelphus coronarius.

extend the range to Japan, and it is wild in Eu., but whether or where it is native is uncertain, because it has undoubtedly sometimes escaped from cult. The genus has 3 roughly defined areas of distribution,—N. Asia and Japan, W. Amer. from Brit. Col. to Calif.), S. Atlantic States, and Mex. It has no well-marked characters which may be used to separate the species, which therefore often resemble each other closely and are sometimes connected by intermediate forms. The latest treatment of the genus is in Schneider's Illustriertes Handbuch der Laubholzkunde, vol. 1, p. 362 (1905). On account of the great confusion of names in the genus, rather more synonymy than usual is given, but the selection is nevertheless of the names more likely to be met with or to cause confusion. The complete synonymy is far larger.

Syringa, the common name of Philadelphus, is identical with the generic name of the lilac. This arises from the use of Syringa by the old herbalists. Thus, in 1597, John Gerarde in his "Herball" gives *Syringa alba*, white pipe, *S. cærulea*, blue pipe, and *S. arabica*, Arabian pipe, the first being *Philadelphus coronarius*, the second *Syringa vulgaris* (lilac), and the third *Jasminum Sambac*. Tournefort, in 1700, selected Syringa for the first, but Linnæus, whom we follow, chose to use it for the second. However, Tournefort's usage prevailed in English speech, while the Germans call Philadelphus either Pfeifenstrauch (=pipe-shrub, like the herbalists' "pipe," above) or Jasmin, perpetuating the third element in the original heterogeneous syringa. The French also use syringa as the common name of Philadelphus, but in the form seringat.

Philadelphus generally blossoms in June; in fact, it is remarkable for the uniformity of the blossoming period, both in cultivation and in its native haunts, throughout the world. Most of the members of the genus are hardy North, except *P. Coulteri*, *P. mexicanus*, and the other Mexican species. They are well adapted to shrubberies and mostly do not grow very high, the tallest being *P. pubescens*, attaining a height of about 20 feet; others, as *P. coronarius*, *P. Zeyheri*, and *P. inodorus*, grow nearly as high, while *P. microphyllus* hardly exceeds 3 feet. If pruning is needed it should be done after flowering, since the flowers appear on the wood formed the previous year. Usually propagation is by hardwood cuttings, or by suckers and greenwood cuttings under glass; also by layers and by seeds, but when several species are growing together they are likely to hybridize.

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A. *Fls. in simple or rarely compound racemes (Nos. 1–20).*

B. *Calyx glabrous without, or with some scattered hairs (except in P. sericanthus and P. incanus).*

C. *Pistils little or not at all exceeding the stamens.*

D. *Styles separating less than half way down (except often in varieties of P. Lemoinei) (Nos. 1–12).*

E. *Lvs. some, generally most, of the mature ones more than 1¾ in. long.*

F. *The lvs. of young succulent shoots and suckers not approaching a circular outline, usually moderately toothed, if at all.*

G. *The calyx essentially glabrous without.*

1. **nepalénsis,** Koehne. Upright shrub to about 5 ft.: lvs. at maturity about 1½–1¾ in. long, ovate-lanceolate, acuminate, evenly and distantly mucronate-denticulate, with white or yellowish tufts of hairs in the axils of lateral veins, especially on lvs. of young succulent shoots and suckers: fls. practically scentless; cup of the calyx and caps. plainly acute to long-pointed at base. June. N.E. Himalayas.

2. **Voie Lactée.** Hybrid between *P. nepalensis* and *P. microphyllus*. Similar to the preceding and superior to it, most readily distinguished by the lvs. of the young succulent shoots and suckers, which are more coarsely toothed, and not so long-pointed: caps. not seen, but probably more rounded at base. June. G.M. 55:554. G.W. 17, p. 103.

3. **pekinénsis,** Rupr. (*P. coronàrius* var. *pekinénsis*, Maxim.). Erect shrub, to 5 ft., closely resembling *P. nepalensis*, but without the characteristic tufts of hairs on lower lf.-surfaces, and usually with purplish petioles. May, June. Mongolia, N. China.

4. **Zèyheri** (*P. Kochiànus*, Koehne. *P. coronàrius Zèyheri*, Schrad.). Hybrid of uncertain origin, probably between *P. coronarius* and *P. inodorus*. Lower than *P. coronarius:* lvs. variable, ovate to ovate-lanceolate, acute to acuminate, with hard-tipped teeth, glabrous or nearly so, or hairy along the veins beneath, those of young succulent shoots and suckers ovate-lanceolate to broadly ovate, sometimes with tufts of hairs on the youngest, as in *P. nepalensis:* fls. white, slightly fragrant or scentless.—A puzzling shrub, at times confusingly similar to *P. coronarius*. June.

5. **Lèwisii,** Pursh (*P. columbiànus*, Koehne. *P. Gordoniànus*, Lindl. *P. califórnicus*, Benth. *P. cordifòlius*, Lange). Upright shrub, to 8 ft., very variable: lvs. about 1–3 in. long, most not more than 2½ in., about ¼–2 (usually not more than 1¼) in. wide: racemes of varying length, generally but not always leafy; fls. white, borne in great profusion, in wild plants very fragrant, but, judging by some printed statements, not always retaining the odor under cult. June, July. Brit. Col. to Calif. B.R. 25:32.—Excellent.

6. **coronàrius,** Linn. (*P. pállidus*, Hayek. *P. coronàrius nivàlis*, Hort.). Figs. 2902, 2903. Shrub, to 10 ft.: lvs. ovate-lanceolate (rarely ovate), generally acuminate, usually rather evenly mucronate-denticulate (exceptionally almost entire), rarely slightly serrate, thickish at maturity, about 1½–4 in. long, ½–2¾ in. broad, slightly hairy beneath: fls. in rather dense racemes, white or more often with a slight creamy tone, very fragrant. May, June. Caucasus, Armenia, and probably S. E. Eu. B.B. 2:186. F.E. 39:75 (habit). J.H. III. 70:471.—This is the common syringa, or mock orange, with less attractive foliage than some, but the delicious fragrance unsurpassed. The following horticultural and 2 wild varieties are cult. Var. **flòre-plèno,** Hort. (*P. coronàrius dianthiflòrus, rosæflòrus*, and probably *primulæflòrus* and *multiflòrus plènus*, and other names), with more or less double fls. Var. **fòliis argenteo-marginàtis,** Hort., lvs. white-margined. Var. **fòliis aùreis,** Hort., lvs. golden yellow. Var. **speciosíssimus,** Hort. (*P. speciosíssimus, P. Zèyheri speciosíssimus*). Generally lower shrub than the species, with rather uniform and smaller lvs., broadly ovate to rotund. Var. **grandiflòrus,** Hort. (*P. grandiflòrus*, Hort.), with larger fls. than in the species, mostly 2 in. or more diam. Not to be confused with *P. inodorus* var. *grandiflorus*, Gray, below. Var. **salicifòlius,** Hort. (*P. salicifòlius* Hort., in part). Lvs. typically narrowly lanceolate, more or less willow-like, but sometimes, probably by reversion, broadly ovate, more coarsely toothed. Var. **nànus,** Schrad. (*P. nànus*, Hort. *P. salicifòlius*, Hort., in part), dense bushy plants, usually not over 1½ ft. high; long cult. and known to flower rarely. Var. **acuminàtus,** A. H. Moore (*P. acuminàtus*, Lange, *P. satsùmi, P. satsumànus, P. yokohàma* or *yokohàmæ* of cult.). Lvs. more acuminate than in the species, the tips often bent to one side, especially in wild specimens, with conspicuous hard-tipped teeth or serrations. Yunnan Province, China, Japan, and Tsu Shima. Var. **tomentòsus,** Hook. f. & Thoms. (*P. tomentòsus*, Wall. *P. nepalénsis*, Lodd.). Shrub, to about 6 ft.: lvs. very hairy beneath. Himalayas and Thibet. Rather unattractive and of uncertain hardiness.

2903. Philadelphus coronarius.—Mock orange. (×½)

GG. *The calyx tomentose.*

7. **sericánthus,** Koehne. Lvs. lanceolate, distantly blunt-toothed or entire, mature ones about 1½–4 in. long, ⅝–2 in. wide, glabrous beneath, or with few scattered hairs: fls. about ⅝in. across. June. Hupeh Province, China.—Larger-lvd. specimens have been distinguished as var. **Rehderiànus,** Koehne.

8. **incànus,** Koehne. Lvs. ovate, more or less abruptly acuminate, dentate, with 5 principal veins, mature ones 1½–4¼ in. long, ⅝in. across. June. Hupeh and Szechuan provinces. China.

FF. *The lvs. of young succulent shoots and suckers very large, ovate-lanceolate to orbicular, very coarsely toothed.*

9. **floribúndus** (*P. verrucòsus floribúndus, P. grandiflòrus floribúndus*, Hort.). Hybrid of uncertain origin, probably with *P. coronarius* as one parent. Shrub resembling *P. coronarius:* lvs. generally hairier than in *P. coronarius*, and with characteristically very large, ovate-lanceolate to more often orbicular, generally coarsely toothed lvs. on young succulent shoots and suckers: fls. in racemes of about 5, about 2 in. across, slightly fragrant.

EE. *Lvs. rarely over 1½ in. long (usually from about ½–1¼ in.).*

10. **Lemòinei.** Hybrid of *P. coronarius* and *P. microphyllus*. Shrub with spreading branches, freely flowering: twigs and little branchlets with short hairs: ordinary mature lvs. ovate to ovate-lanceolate, rather uniform, rather small, glabrous or nearly so, acute to acuminate, with a few minute teeth, those of the young succulent shoots and suckers entire or remotely few-toothed, somewhat larger: fls. 2–9, in dense racemes, having a delicate but charming perfume. G.F. 2:617. G.L. 28:225.—The following horticultural varieties are of interest: Var. **erèctus.** Flowering branches irregularly ascending, forming a more compact bush and less desirable. M.D.G. 1902:383. **Avalanche.** Graceful shrub, taller than other varieties, branches sometimes as long as 6 ft.: easily distinguished from the other varieties by its lanceolate lvs. G.C. III. 21:89. M.D.G. 1896:293; 1907:379. **Bouquet Blanc.** Lower lf.-surfaces and twigs with scattered hairs, distinctly visible: fls. in bouquet-like masses, not very fragrant. G.M. 55:487. G.W. 17, p. 101. **Candelabre.** Very low shrub, approaching *P. microphyllus* in size, hairy as in the preceding, but with a more open candelabra-like infl. M.D.G. 1896:294. **Mont Blanc.** Normally, probably, the most profusely flowering variety, but very variable in this respect. Hairs scarcely visible, a character at once distinguishing it from all the preceding. Exceedingly fragrant. **Manteau d'Hermine.** Twigs nearly or quite glabrous. **Pavillon Blanc.** Profusely flowering shrub: branches rounded or squarish in habit, twigs hairy: lvs. closely covered with silky hairs beneath. One of the most beautiful, and the sweetest scented of all the varieties, the perfume resembling that of *P. microphyllus*. **Gerbe de Neige.** Calyx hairy. **Boule d'Argent.** Fls. double, stamens mostly sterile, about 1¼ in. across, not very sweet-scented; calyx glabrous. Oldest and least desirable of double-fld. sorts. G.C. III. 18:18; 23:331. **Virginal.** Large double fragrant fls., 2½ in. across, or wider. G.M. 54:459. R.H. 1910, pp. 408, 409. **Mer de Glace.** Double fls., similar to preceding. G.W. 17, p. 102. Var. **fimbriàtus** is a distinct variety with large fls., petals twisted and deeply serrate. For other varieties of this hybrid consult list, p. 2582.

11. **phantásia** (*P. Lemòinei Fantaisie*). Hybrid between *P. Coulteri* and an unknown variety of *P. Lemoinei*. Fls. fragrant, white, tinted with pale rose at the center of the fl.; petals fringed at the edge. June. Var. **purpùreo-maculàtus,** Hort. Derivative of *P. phantasia*. Lvs. essentially as in *P. Lemoinei*, but proportionately somewhat broader, with numerous, short, stiff hairs beneath: fls. large, about 1⅜–2 in. across, exquisitely fragrant, with a purple spot at base of each petal; calyx with a few short, silky hairs. B.M. 8193.

12. **Étoile Rose.** Hybrid between *P. phantasia* and *P. purpureo-maculatus*. Lvs. small: fls. delicately fragrant, in rounded panicle-like racemes; petals elongate, rose-purple at base, the color diminishing toward the center of the fl. June.

DD. *Styles separated almost or entirely to the base, especially after flowering.*

13. **Conquete.** Hybrid of unknown origin. Lvs. lanceolate to narrowly ovate-lanceolate, glabrous, about 2–3 in. long, ⅝–1⅛ in. wide, entire, or with a few small teeth, on young succulent shoots and suckers larger, long-acuminate, coarsely toothed: fls. in a more or less compact but not head-like cluster, very large, to 2¾ in. across, sweet-scented; the slender thread-like styles cleft almost to the base, especially after flowering, stigmas generally short and small; calyx glabrous without. May, June. G.W. 17, p. 102.

14. **Nuée Blanche.** Hybrid between *P. microphyllus* and *P. nepalensis*. Lvs. ovate to ovate-lanceolate, glabrous, about 1½–1¾ in. long, ⅝–1⅛ in. wide, entire or nearly so, on young succulent shoots and suckers ovate, acuminate, conspicuously toothed: fls. not over 1½ in. across, sweet-scented; styles moderately slender, gradually broadening into the stigma; calyx glabrous without. May, June.

15. **Rosace.** Hybrid of unknown origin. Lvs. lanceolate, glabrous, about 1½–3¼ in. long, ⅜ to about 1 in. wide, entire, on young succulent shoots and suckers toothed: fls. very large, 1¾–2¾ in. across, sweet-scented; calyx glabrous without. May, June.

16. **Perle Blanche.** Shrub, to about 4¾ ft.: lvs. ovate, medium-sized, toothed, with small stiff scattered hairs beneath: fls. partly double, in head-like clusters, sweet-scented; calyx rather hairy without. May, June.

CC. *Pistils far exceeding the stamens.*

17. **Fálconeri,** Sarg. Fig. 2904. Shrub, to 8 ft., with slender, arching branches: lvs. ovate-lanceolate, 1½–3 in. long, ½–1 in. wide, acuminate, entire or very minutely mucronate-denticulate: fls. in loose racemes of 1–6, fragrant, about 1½ in. across; calyx-lobes very acuminate; petals rather narrow; pistils much longer than the stamens; styles separating as long slender filaments; stigmas scarcely broader than the styles. June. Origin unknown, probably Japanese. G.F. 8:497 (adapted in Fig. 2904). M.D.G. 1899:231. Gng. 8:340.

BB. *Calyx distinctly hairy or glabrate.*

18. **pubéscens,** Loisel. (*P. latifòlius,* Schrad. *P. grandiflòrus,* P. W. Wats., under which name it is often met with, a name commonly also applied to varieties of *P. coronarius* and of *P. inodorus, P. nivalis,* and many other species or supposed species; it is also wrongly called *P. Gordonianus*). Shrub, to 20 ft.: bark of old branches grayish, either cracking when old and not peeling, or peeling in little flakes, so that shreds do not remain, of younger branches generally yellowish or greenish yellow: lvs. ovate to broadly elliptic or ovate-lanceolate, 1½–4½ in. long, ¾–3 in. wide (those of young succulent shoots and suckers may attain dimensions of 7¼ × 6¾ in.), acute to acuminate, almost entire to more or less markedly mucronate-denticulate: fls. in long leafy racemes of 5–10, usually distant, somewhat fragrant. June, July. Tenn., Ala. (last, according to Rydberg). **Souvenir de Billiard** (also cult. under the names *P. Billiárdii* and *P. insígnis*) is a horticultural variety, with ovate lvs. on the average smaller than in the species, about 1¼–2⅜ in. long, erroneously described as a native species. Var. **intéctus,** A. H.

2904. Philadelphus Falconeri. (×⅓)

Moore (*P. intéctus,* Beadle). A natural variety with an externally wholly glabrous calyx, and with lvs. glabrous or nearly so. Tenn.

19. **verrucòsus,** Schrad. A plant of uncertain origin: if hybrid, the parentage cannot be surmised. Similar to preceding, but bark of old branches purplish red or chestnut-brown, often peeling in shreds, of the younger generally brownish or reddish. June, July. Var. **pendulifòlius** is a garden variety with slightly drooping branchlets.

20. **Magdalènæ,** Koehne. Rather lower, spreading shrub, to about 5½ ft.: the calyx generally with fewer short stiff hairs: otherwise closely resembling the preceding, lvs. inclined to be smaller.

AA. *Fls. borne singly or in clusters of 1–6 at the tips of the branchlets, not in racemes, except occasionally in P. mexicanus.*

B. *Pedicels and, externally, the calyx glabrous or nearly so: lvs. glabrous or with few scattered hairs.*

21. **inodòrus,** Linn. (*P. coronàrius* var. *inodòrus,* Martyn. *Deùtzia corymbòsa,* Hort.). Shrub, to about 1 ft., much resembling *P. coronarius* in general appearance: lvs. ovate to ovate-lanceolate, about 1–6 in. long, ½–1¾ in. broad, entire or with very few, usually very small, distant teeth. May, June. N. C. and Tenn. to Ga. and Miss. B.M. 1478. Usually hardy N. Long in cult.; inferior to *P. coronarius.* Var. **grandiflòrus,** Gray (*P. grandiflòrus,* Willd. *P. láxus,* Lindl., also of Lodd. *P. láxus* var. *grandiflòrus,* Loud.). Lvs. generally more elongate, more coarsely toothed, especially on young succulent shoots and suckers. N. C. to Ga. and Fla. (last according to Rydberg), naturalized at Bushkill, Pa.

22. **láxus,** Schrad. (*P. grandiflòrus* var. *láxus,* Torr. & Gray. *P. speciòsus,* Schrad. *P. pubéscens,* Lodd.). Shrub, to scarcely more than 1½ ft.: lvs. narrowly lanceolate, with rarely a few ovate-lanceolate, teeth small, evenly disposed, on young succulent shoots and suckers more or less ovate-lanceolate, more coarsely toothed, sometimes with tufts of hairs in axils of lateral veins: fls. white. April, May. Szechuan Province, China. B.R. 25:39.

BB. *Pedicels and calyx densely hairy to tomentose (sometimes glabrate): lvs. more or less densely hairy to tomentose beneath.*

c. *Fls. white or cream-colored.*

23. **hirsùtus,** Nutt. (*P. hirsùtus* var. *grácilis,* Schrad. *P. inodòrus* var. *hirsùtus,* Wood. *P. trinérvius,* Schrad. *P. inodòrus,* Schrad.). Upright or spreading shrub, to 8 ft.: lvs. lanceolate to ovate-lanceolate, 1–2¾ in. long, ⅜–1½ in. wide, acuminate, regularly serrate (rarely denticulate), usually with more or less numerous short, rough hairs above, closely silvery-gray coated beneath, thin and papery when young. April–June. Rocky river banks, Tenn., N. C., Ga., Ala. Gn. 26, p. 375; 34, p. 138. B.R. 24:14. B.M. 5334.

24. **mexicànus,** Schlecht. (*P. guatemalénsis,* and *P. sempérvirens* applied to this in Calif. are apparently garden names). Evergreen shrub, to about 6½ ft.: lvs. ovate, 1⅜ in. long, ⅜–1½ in. wide, acute to short-acuminate, distantly blunt-toothed, glabrous or sparingly hairy above, scabrous beneath with short stiff, closely appressed hairs, in general pointing toward the apex: fls. occasionally in short leafy racemes (a transition to the first great subdivision of the genus, see A in key on p. 2579), 2 in. across, cream-colored, fragrant. Mex. and, it is said, Guatemala. B.M. 7600. B.R. 28: 37. R.H. 1852:381. G.C. II. 19:753; 34:218.

2905. Philadelphus Coulteri. (×⅜)

25. **microphýllus,** Gray. Erect, to 6 ft. (usually not so tall), or in its native habitat sometimes sprawling, with spreading slender or rigid branches: lvs. oblong-ovate, ⅜–1 in. long, ⅛–½in. wide, acute or subacute (rarely obtuse), entire, scarcely if at all revolute more or less densely covered with silky hairs beneath, glabrous or with short hairs above: fls. ½–¾in. across, white, exquisitely fragrant: caps. ¼–⅜in. long, ⅛–¼in. wide, glabrous or slightly hairy. June, July. Utah and Colo. to Ariz., N. Mex., and Calif. G.C. III. 2:156; 11:86; 51:225. Gn. 40:288. P.G. 5:109.

cc. *Fls. with a purple spot at base.*

26. **Còulteri,** Wats. (*P. mexicànus* var. *Còulteri,* Burb.). Fig. 2905. Shrub, to about 10 ft.: lvs. ovate, 1⅛–2 in. long, ⅜–¾in. wide, obtusely to sharply pointed, on young succulent shoots and suckers, larger toothed, those of both young and old covered with rough hairs above and very white-tomentose beneath, the whole like a rough piece of felt: fls. white, very fragrant; petals with red spot at the base; calyx covered with silvery white silky hair: caps. unusually large, about ½in. long. States of Nuevo Leon and Hidalgo, Mex. G.F. 1:233 (adapted in Fig. 2905). B.R. 14.—Very distinct, desirable for southern latitudes, and one of the most pleasing of the genus.

P. argénteus, Rydb. Low straggling shrub, with handsome silvery calyx, and lvs. silvery beneath. Fort Huachuca, Ariz. Rare plant for southern rockeries or borders. Because of rarity, only one plant, or preferably seeds, should be got, to prevent extermination.—*P. brachybòtrys,* Koehne (P. pekinensis var. brachybotrys, Koehne). Of uncertain standing, allied to P. coronarius. The following variety is of greater merit. Var. *purpuráscens,* Koehne. With purple calyx and pedicels. B.M. 8324 (as P. Delavayi).—*P. chinénsis*=P. coronarius var. acuminatus.—*P. coronàrius* var. *nikoénsis,* A. H. Moore (P. satsumanus var. nikoensis, Rehd.). Related to var. acuminatus, differing in greater pubescence, especially on the veins of lower lf.-surfaces.—*P. coronàrius* var. *semiplènus.* Uncertain, probably=P. coronarius flore-pleno.—*P. coronàrius* var. *tenuifòlius,* Maxim. A variety differing but slightly from the type, of no advantage to horticulture.—*P. Delavàyi,* L. Henry. Chinese, with fragrant fls., and generally more or less fringed petals, often marked with purple on the back. R.H. 1903, p. 13. Var. *melanócalyx,* Hort., is a variety with dark purple calyx.—*P. Dresden.* Hybrid of P. Lemoinei erectus and P. pubescens. Desirable.—*P. flóridus,* Beadle. Desirable shrub, erect, to 6½ ft.; with attractive large, white fls., and calyx appressed silky. Suitable for S.E., and perhaps hardy N., like other southern species of this genus.—*P. Godohòkeri.* Name said to stand for P. hirsutus and P. laxus in gardens.—*P. grandiflòrus aùreus.* Not possible to determine, because of confusion existing in regard to name grandiflorus.—*P. grandiflòrus làxus flòre-plèno.* See note on preceding name.—*P. inodòrus sanguíneus.* Unknown. Name P. inodorus also variously applied.—*P. Lemòinei.* Of many varieties recently produced, but not yet intro. into American trade, the following seem worthy of mention. (See also derivatives of P. phantasia, originally treated as varieties of P. Lemoinei, under the former name.) *Albâre.* Branches more graceful than in the variety Virginal: lvs. smaller: fls. full double as in that variety. *Bannière.* Branches arched with the weight of the fls., which are about 1¼in. across. *Dame Blanche.* Fls. creamy white, very fragrant; petals fringed. *Norma.* Profusely flowering: fls. large, white. *Ophèlia.* Gracefully arching branches: fls. white, fragrant.—*P. magníficus,* Rehd. Garden hybrid of P. inodorus and P. pubescens.—*P. máximus,* Rehd. Garden hybrid of uncertain origin; resembling P. coronarius (perhaps hybrid of that with P. pubescens), but with the lvs. of young succulent shoots and suckers very large, hairy beneath. Not of horticultural merit.—*P. nepalênsis variegàtus.* Name of unknown application.—*P. phantásia.* The following varieties not yet in the American trade are of interest: *Oeil de Pourpre.* Fls. fragrant; petals with black-purple spot at base. *Romeo.* Profusely flowering: fls. creamy white, with a purple blotch. *Sirène.* Fls. large, fragrant, white, with a very slight suggestion of rose in the lower corners of the petals. *Surprise.* Fls. fragrant; petals spotted carmine-purple. *Sibylle.* Shrub with long curved branches, of pretty habit; fls. white, slightly fringed; petals pale pink spotted toward base.—*P. purpuráscens,* Rehd.=P. brachybotrys var. purpurascens.—*P. Schrénkii,* Rupr. Closely related to P. coronarius. Upright: lvs. large and thin: fls. scentless, smaller; style appressed pubescent at base. Var. *Jáckii.* Of uncertain hybrid parentage and doubtful merit.—*P. sempérvirens,* Hort., offered in Calif., is P. mexicanus, described in No. 24; the name appears to have no botanical standing.—*P. serpyllifòlius,* Gray. Closely related to P. microphyllus, than which it is more straggling, and less attractive, although perhaps good for rockeries. The only species with leathery revolute lvs.—*P. spléndens.* Supposed garden hybrid, said to be worthy of cult.—*P. stenopétalus,* Carr. This is a species whose description in important particulars suggests P. Falconeri, for which it may prove to be an older name.—*P. tenuifòlius,* Rupr.= P. coronarius var. tenuifolius, Maxim. Not of horticultural merit.—*P. umbellàtus,* Koehne. Probably hybrid of P. coronarius and P. inodorus: fls. in broad 2–5-fld. panicles, compound of long-peduncled cymes. Parentage unknown.—*P. venústus,* Koehne. Closely related to P. coronarius var. tomentosus. Perhaps distinct.—*P. Wilsonii,* Koehne. New Chinese species of the group of P. incanus. Value unknown.

ALBERT HANFORD MOORE.

PHILAGÈRIA (a name composed from the parent genera). *Liliàceæ.* A hybrid genus between *Philesia buxifolia* and *Lapageria rosea.* A smooth climbing shrub: sts. flexuous, rigid, cylindrical: lvs. alternate, petiolate, leathery, smooth, oblong-acute, 3-nerved: fls. pendulous; sepals glaucous, pale rose-purple; petals imbricate, scarcely open at the apex; anthers 6; ovary free, 1-celled.—One species, a greenhouse hybrid, *P. Veìtchii,* Mast. G.C. 1872:358; III. 55:399. Apparently not in cult. at the present time. See *Lapageria.*

PHILÈSIA (Greek, *lovely*). *Liliàceæ.* An interesting shrub of extra-tropical South America, little grown. See *Lapageria* and *Philageria.*

Species one, a woody plant bearing showy pendulous red lapageria-like fls. about 2 in. long. It is unlike the ordinary lily types with 6 similar perianth-segms., for it has distinct calyx and corolla parts of 3 sepals and 3 petals. It is closely allied to Lapageria, but differs in habit, in the calycine character of the outer perianth and the monadelphous stamens. It is said to live outdoors in the most favored localities of England and Ireland.

Philesia is too slow-growing ever to become very popular. It is a short-jointed hard-wooded shrub, with rather leathery box-like leaves, and will grow to about 4 feet in height in time. The writer's experience with this plant was in a camellia house, in which a night temperature of 45° was maintained, the plants being firmly potted in a light peaty soil. It flowered but

sparingly in the latter part of the summer. The flowers were borne only singly in the axils of the leaves. Cuttings may be rooted when taken from ripened growth, but require careful management in a cool temperature, and are usually several months in rooting. If one tries to grow philesia in a too high temperature, the general result is a good crop of thrips and a case of general debility, much as with *Pernettya mucronata* under similar conditions. Philesia is probably not extraordinarily hard to manage, provided it is kept cool and in a dewy atmosphere, but it will positively rebel against forcing. (W. H. Taplin.)

buxifòlia, Lam. (*P. magellánica*, Gmel.). Much branched, 3–4 ft.: lvs. alternate, linear-oblong, 1–1½ in. long, leathery, evergreen, feather-veined, glabrous, glaucous beneath; margins reflexed; petiole jointed at the junction of the blade: fls. solitary, bright rosy red; petals wavy; filaments united into a tube below the middle, then free; ovary 1-celled, with 3 short parietal placentæ which bear several ovules: fr. a berry. S. Chile to Magellan. B.M. 4738. F. 1854:65. G.C. II. 18:105; III. 55, suppl. June 6. J.H. III. 42:299. G. 36:329. H.F. 4:72. WILHELM MILLER.

PHILIBERTÉLLA: *Philibertia.*

PHILIBÉRTIA (after G. C. Philibert). Incl. *Sarcostémma* and *Philibertélla*. *Asclepiadàceæ*. Climbing shrubs or half-shrubs, white-pubescent or glabrous, sometimes grown under glass or far S. for ornament: lvs. opposite: infl. umbelliform cymes, pedunculate in one axil or rarely sessile; fls. variable in size, often greenish white; calyx small, 5-parted, minutely 5-glandulose within, lobes acute; corolla very broadly campanulate or subrotate, divided slightly to the middle or deeply 5-cleft, with the lobes twisted and narrowly overlapping to the right; exterior crown membranaceous, ring-like, adnate to the base of the corolla, free from the stamen-tube or more or less connate with the median wings of the opposite anther, interior 5 crown-scales adnate with the base of staminal tube, with a variable lamina; stamens affixed to the base of the corolla, the filaments forming a short tube: fr. smooth, acuminate, somewhat thickened follicles.—About 30 species, Trop. and Subtrop. Amer. **P. claûsa,** Schumann (*Philibertélla claùsa*, Vail). Sts. glabrous or minutely pubescent at the nodes: lvs. ovate-oblong or lanceolate-oblong, apex acute or acuminate, base rounded or subcordate, peduncles twice as long as the lvs., or more: fls. many; calyx-lobes oblong-lanceolate, acute, pubescent; corolla white, lobes oblong, fimbriate-ciliate. Fla.—A twining perennial with glossy evergreen lvs. and very sweet-scented fls., which has been offered in the trade-lists. **P. grâcilis,** D. Don (*P. grandiflòra*, Hook.). Twining shrub: lvs. opposite, cordate at base: the umbels borne between the petioles; calyx 5 deep acuminate segms.; corolla rotate-campanulate, more than 1 in. diam., with 5 triangular segms. and a small tooth between them, cream-colored dotted and streaked with purple inside. S. Amer. B.M. 3618. H.U. 2, p. 261. Cult. to some extent in Eu. F. TRACY HUBBARD.

PHILLÝREA (its ancient Greek name). *Oleàceæ*. Ornamental woody plants, grown for their handsome evergreen foliage.

Evergreen shrubs or small trees: lvs. opposite, short-petioled, entire or serrate, quite glabrous: fls. small, in axillary short racemes, dœcious; calyx 4-toothed; corolla 4-lobed, with short tube; stamens 2, with very short filaments; style shorter than tube; ovary 2-celled: fr. a 1-seeded black drupe.—Five species in the Medit. region. The name is sometimes misspelled *Filaria*.

The phillyreas have small, or in one species rather large leaves, and small white flowers, followed by small berry-like purplish black fruits. The species are hardy only South, but *P. decora*, the handsomest of all the species, is probably hardy in sheltered positions as far north as Massachusetts. They may be used in the southern states and California for evergreen shrubberies in drier and more exposed localities. They grow in almost any soil and prefer sunny positions; but *P. decora* seems to grow better if partly shaded. Propagation is by seeds sown after maturity and by cuttings of half-ripened wood under glass in summer or by layers; they are also sometimes grafted on *Ligustrum ovalifolium*.

A. *Lvs. ¾–2 in. long: fr. small.*

B. *Shape of lvs. roundish oval to oblong-lanceolate, usually serrate.*

latifòlia, Linn. Shrub or small tree, to 30 ft., with spreading, somewhat rigid branches: lvs. ovate or oval to ovate-oblong, rounded or slightly cordate at the base, usually serrate, dark green and shining above, pale beneath, ¾–1½ in. long: fr. globose, concave at the apex. May, June. S. Eu., N. Afr. H.W. 3, p. 123. R.F.G. 17:1075. There are several varieties. Var. **lævis,** Ait. Lvs. ovate, almost entire or slightly serrulate. Var. **rotundifòlia,** Arb. Kew. Lvs. broadly ovate or roundish ovate. Var. **spinòsa,** Ait. (*P. ilicifòlia*, Willd.). Lvs. ovate or ovate-oblong, sharply serrate.

mèdia, Linn. (*P. latifòlia* var. *mèdia*, Schneid.). Spreading shrub, to 20 ft.: young branchlets puberulous: lvs. oblong-ovate to ovate-lanceolate, entire or serrate, dark green and shining above, ¾–2 in. long: fr. ovoid, pointed. May, June. Medit. region. N.D. 2:27. G.O.H. 116. R.F.G. 17:1075.—This species seems to be somewhat hardier than the preceding and the following; the most important of the many varieties are the following: Var. **buxifòlia,** Ait., with oblong-ovate, obtusish lvs. Var. **oleæfòlia,** Ait. (*P. oleæfòlia*, Hort.). Lvs. oblong-lanceolate, almost entire: branches erect. Var. **péndula,** Ait. Branches spreading and somewhat pendulous: lvs. lanceolate.

BB. *Shape of lvs. lanceolate to linear-lanceolate.*

angustifòlia, Linn. Spreading shrub, to 15 ft., with glabrous branchlets: lvs. oblong-lanceolate to linear-lanceolate, usually entire, dull green above, 1–2 in. long: fr. globose or ovoid-globose, pointed. May, June. Medit. region. G.O.H. 115. R.F.G. 17:1076. Var. **lanceolàta,** Ait. Lvs. lanceolate, about 1 in. long. Var. **rosmarinifòlia,** Ait., has linear-lanceolate lvs., sometimes over 2 in. long, and erect branches. The 3 preceding species are very closely related to each other and considered by some botanists to be varieties of only 1 species and designated as *P. variábilis*, Timbal & Loret, or *P. vulgàris*, Caruel.

AA. *Lvs. 3–5 in. long: fr. ½in. long.*

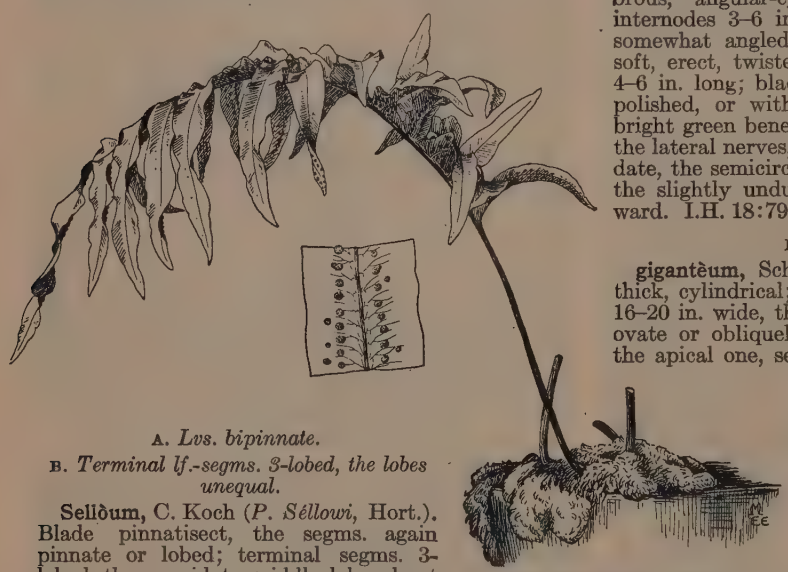
decòra, Boiss. & Bal. (*P. Vilmoriniàna*, Boiss. & Bal. *P. laurifòlia*, Hort. *P. Medwédiewi*, Sred.). Shrub, to 10 ft., with spreading branches: lvs. oblong to oblong-lanceolate, acuminate, usually entire or remotely serrulate, dark green and shining above, yellowish green beneath: fr. oblong-ovoid, purplish black. June, July. W. Asia. B.M. 6800. G.C. III. 4:673; 16:369. R.H. 1889, p. 199; 1895, pp. 204, 205. M.D.G. 1898:349. S.H. 2:523. Gn. 24, p. 490. G. 30:325; 36:657. G.W. 5:259. ALFRED REHDER.

PHILODÉNDRON (Greek compound for *tree-loving*). *Aràceæ*. Shrubby or tree-like ornamental plants, usually climbing, rarely arboreous.

Internodes more or less elongated: lvs. from entire to bipinnatifid: fls. monœcious, on spadices, with no perianth, the sterile with 2–6 stamens united into a sessile obpyramidal body, the pistillate fls. with a 2–10-loculed ovary and some staminodia, the berries inclosed in the involute spathe.—The species are all Trop.

American. They are monographed by Engler in Das Pflanzenrich, hft. 60 (IV. 23 Dd) 1913, who accepts 222 species. Some of them are prominent in tropical plantings.

Only a few philodendrons can be grown to have an ornamental appearance in a small state. One which goes under the name of *P. elegantissimum*, with finely cut leaves, makes a good pot specimen, although it will reach considerable height when suitable opportunities are afforded. The same may be said of *P. Selloum*, a beautiful species with pinnatifid leaves. The arborescent kinds should have a very porous rooting medium and copious supplies of water while in active growth. When climbing, they must have provision made for the roots, which are produced along the stems. Some of the species do well climbing up the stems of tall palms, such as arenga and livistona; otherwise dead trunks of tree ferns make admirable rooting substances for the roots to penetrate and cling to. Propagation is by division of the climbing stems. *P. elegantissimum* is an unidentified trade name.



2906. Phlebodium aureum.

A. *Lvs. bipinnate.*

B. *Terminal lf.-segms. 3-lobed, the lobes unequal.*

Sellòum, C. Koch (*P. Séllowi*, Hort.). Blade pinnatisect, the segms. again pinnate or lobed; terminal segms. 3-lobed, the cuspidate middle lobe about equaling the obtuse lateral ones: spathe slightly cuspidate, its tube longer than the ovate hooded blade, green without, white within. Distinguished from *P. bipinnatifidum* by the very numerous parallel translucent spots, which are visible on both sides of the lf. and are often excurrent on the margin. Brazil to Paraguay. B.M. 6773. G.W. 10, p. 211.

BB. *Terminal lf.-segms. 3–5-lobed, the middle lobe much longer than the lateral ones.*

bipinnatífidum, Schott. Blade pinnatisect, the segms. again pinnate or lobed; terminal segm. 3–5-lobed, the middle lobe ovate-lanceolate, acute, much longer than the obtuse lateral ones: spathe oblong-ovate, its tube scarcely distinct from its blade, purple without, white within. S. Brazil.—Does well in the open in S. Calif.

AA. *Lvs. simple.*

B. *Lf.-blade linear or lanceolate.*

crassinérvium, Lindl. Climbing: lvs. linear to lanceolate-acuminate, the midnerve very thick and inflated: spathe obtuse and hooded, apiculate at the tip. Brazil. B.R. 1958.—**P. nóbile,** Bull, is like this but larger: lvs. long-oblanceolate, large, coriaceous, and shining, obtuse or short-acuminate, narrowed at base: tube of spathe rosy crimson inside and outside, the limb white inside and spotted outside. Guiana.

BB. *Lf.-blade sagittate.*

speciòsum, Schott. St. tall, arborescent: petioles terete at the base, concavo-convex above, twice as long as the midrib; blade triangular-oblong-ovate, bright green, acuminate, deeply sagittate, the basal lobes rhomboidal, obtuse, abruptly narrowed on the inner side above the middle: spathes thick, green with purple margins; spadix finger-shaped, shorter than the spathe. S. Brazil.

BBB. *Lf.-blade oblong to ovate-cordate.*

C. *Color of lvs. milky white above, with reddish veins.*

Sòdiroi, Hort. Lvs. cordate, ovate, milky white with reddish veins above; petiole cylindrical, pink. *P. Sodiroànum,* Engler, is a different plant, apparently not in cult.

CC. *Color of lvs. some shade of green above.*

D. *Petioles tomentose.*

verrucòsum, Mathieu (*P. Cárderi*, Hort. *P. Líndenii*, Hort.). St. long, branching, climbing, ashy gray, scabrous, angular-cylindrical, swollen at the nodes; internodes 3–6 in. long: petioles stout-cylindrical or somewhat angled, bright metallic red, covered with soft, erect, twisted, fleshy bristles and greenish hairs 4–6 in. long; blade glabrous, green above, brilliantly polished, or with paler lines and immersed nerves, bright green beneath with salmon-violet lines between the lateral nerves, 6–8 in. long, 4–6 in. wide, ovate-cordate, the semicircular basal lobes one-third as long as the slightly undulate apical one. Costa Rica southward. I.H. 18:79 (as *P. daguense*).

DD. *Petioles glabrous.*

gigantèum, Schott. Climbing: petioles 3 ft. long, thick, cylindrical; blade cordate-ovate, 24–28 in. long, 16–20 in. wide, the basal lobes slightly introrse, semi-ovate or obliquely semicircular, one-fourth as long as the apical one, separated by a broad parabolic sinus: spathe-tube 2 in. long, oblong, purple; spadix very thick. Trop. Amer.

Ímbe, Schott (*P. Sellowiànum*, Kunth). Branches rusty purple: petioles of young plant semi-cylindrical, terete, sparsely brown-spotted, 1½–2 times longer than the midrib; blade like parchment, cordate-oblong, the oblong basal lobes one-half as long as the apical, separated by a wide parabolic sinus, retrorse or subintrorse; apical lobe cuspidate: spathe green outside, red within, its broadly ovate blade dirty yellow; spadix shaped like a finger. S. Brazil. The Mexican *P. sanguineum* has been called *P. Imbe* in gardens. *P. sanguineum* differs in having more elongated lvs. which are red beneath.

spectábile, Lind. Large, of vigorous habit: lvs. 12–15 in. long, nearly as broad, silky or velvety green.

Andreànum, Devans. Lvs. rather large, cordate-ovate, with short basal lobes, bronzy green. Colombia. R.H. 1886:36. R.B. 13, fig. 30.—Sparingly grown. Looks like a narrow-lvd. anthurium.

P. calophýllum, Brongn. (P. nobile, Bull, in part). Lvs. tufted, 2–3 ft. long, 5–6 in. broad at middle, linear-oblong, acuminate, shining above, the costa very thick at base, with linear depressions: spathe pale yellowish green outside, inside bright carmine with white margin. N. Brazil. B.M. 7827.—*P. cannifòlium*, Mart. Lvs. thick, coriaceous, oblong, shining above, the costa semi-terete: spathe cymbiform, green outside, purple, green and white inside. Brazil.—*P. Corsoniànum*, Makoy. Lvs. 1¼–2¼ ft. long, 11–18 in. broad, shortly pinnatifid, deep green above, beneath purple with green veins: spathe with a purple-crimson spotted tube, the limb light green with red spots outside, the inside carmine with darker spots. Hybrid. B.M. 8172.—*P. Devansayeànum*, Lind., is a scandent species with rather small glossy green lvs. which, even to the petioles, are blood-red when young. Peru. I.H. 42:48.—*P. Duvivièri*, Hort. Lvs. broadly and deeply lobed. Brazil.—*P. erubéscens*, C. Koch. Climbing: lvs. elongated ovate-triangular, 6–8 in. long, 4–6 in. wide: spathe black-purple.—*P. Glaziòvii*, Hook. f., is a climber something like P. crassinervium: lvs. oblong-acute, deep green, 12–18 in. long, 3–5 in. broad: spathe open, yellowish,

crimson within the tube. Brazil. B.M. 6813.—*P. Ilsemanii*, Hort. Lvs. oblong, cordate, dark green, splashed or marbled with white, and sometimes tinged rose-pink. G.C. III. 43:289.—*P. imperiàle* is mentioned in European trade-lists. Engler accounts for only one P. imperiale (of Schott) and that he makes a synonym of P. asperatum, Koch. Sander & Co. advertise P. imperiale var. Laucheana: "a lovely trailing stove foliage plant, which is admirably adapted for growing on pillars or wire shapes. It is quite distinct from and greatly superior to the well-known P. imperiale. The habit is much more graceful, the heart-shaped foliage smaller and more elegant. Down the center, from either side of the broad light green midrib, extend irregular blotches of dark green, projecting into a clear glaucous color, the edges of which are relieved by green blotches. The bases of the petioles bear bright red and green phyllodes." P. asperatum is a short-jointed climbing Brazilian species with cordate-ovate entire dull green lvs.—*P. Mâmei*, André. Lvs. cordate-ovate, acute, variegated with white: spathe partly open above and whitish, the tube blood-red. Ecuador. R.H. 1883, p. 104 and 492; 1897, p. 573. I.H. 43:66.—*P. pertùsum* is Monstera deliciosa.—*P. Simsii*, Kunth. Lvs. coriaceous, elongated triangular-sagittate, long-cuspidate, up to 20 in. long: spathe outside black-purple on the tube, yellowish on the limb. Guiana. B.M. 2643. —*P. tripartìtum*, Schott. (Anthurium insigne, Mast.). Lvs. 3-parted, 6–7 in. long: spathe-tube oblong, the blade whitish, ovate, shortly acuminate. Venezuela.—*P. Warscewiczii*, C. Koch. Lvs. triangular-sagittate, bipinnatifid, primrose, the lateral primary segms. 5–8 in. long. Cent. Amer. G.W. 10, p. 211. Gt. 59, p. 23.

GEORGE V. NASH.†

PHLEBÒDIUM (Greek, *a vein*). *Polypodiàceæ*. A genus of ferns related to Polypodium and sometimes united with it, but differing widely in the venation, which is broken up into ample areoles, each of which contain 2 or more free veinlets which bear the sori on their united tips.

aùreum, R. Br. (*Polypòdium aùreum*, Linn.). Fig. 2906. Rootstocks thick, creeping on surface, densely covered with bright yellowish scales: lvs. 2–4 ft. long, deeply pinnatifid, the lobes 5–9 in. long, ½–1 in. wide, with numerous bright yellow sori. G. 37:405.—A rich ornamental species of easy cult. from Trop. Amer. with glaucous green lvs. It produces, however, but a small number of lvs. to a plant. In Fla. it grows on palmettos. *Polypòdium Mandaiànum* of the trade is a wavy-lvd. form, which originated as a spore sport of the species, *P. aureum*. It develops lvs. of great beauty, which last for a long time on or off the plant. Cut off, they are used for florists' decorations. *Polypòdium Schnèlderi*, Hort., is said to be a hybrid of *P. aureum* and *Polypodium vulgare*.

P. glaùcum var. *Mayii* or *P. Mayii*. See Phymatodes.

L. M. UNDERWOOD.
R. C. BENEDICT.†

PHLÈUM (*Phleos*, an old Greek name for a kind of reed). *Gramíneæ*. Perennial grasses, of great agricultural value, but scarcely horticultural subjects.

Spikelets 1-fld., in a close cylindrical spike-like panicle; glumes 2, persistent, keeled, short-awned; lemma shorter, delicate, awnless.—Species 10, in temperate zones.

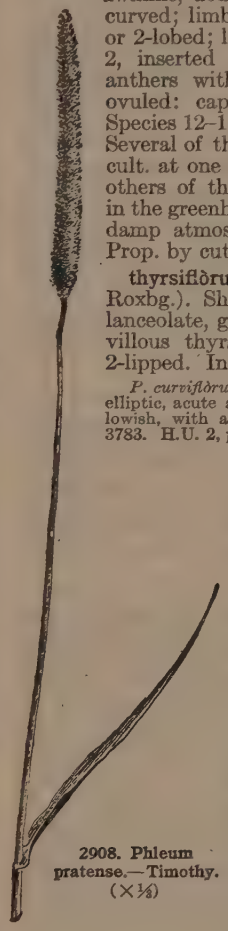
2907. Phleum pratense.—Timothy. To show habit of root and top.

pratènse, Linn. TIMOTHY. HERD'S-GRASS. Figs. 2907, 2908. Commonly cult. for hay and for pastures, either alone or together with red clover or other grasses. It was intro. into Md. about 1720 from Eu., where it is native, by Timothy Hanson, and hence called timothy. The other name is said to come from a man by the name of Herd, who found it growing in N. H. and began its cult. It is better adapted for hay than for pasture, and for the latter is suited to temporary rather than permanent pasture.

A. S. HITCHCOCK.

PHLOGACÂNTHUS (Greek for *flame*, and *acanthus*). *Acanthàceæ*. Glasshouse plants grown for the ornamental flowers.

Tall half-shrubby herbs with entire or somewhat toothed lvs.: fls. white, red or greenish in long terminal or short lateral spikes; calyx 5-parted; segms. linear, awnlike, acuminate; corolla-tube long, broad, curved; limb 2-lipped, upper lip erect, entire or 2-lobed; lower lip 3-parted; perfect stamens 2, inserted on the lower part of the tube; anthers with 2 parallel cells; ovary many-ovuled: caps. round or obtusely 4-angled.—Species 12–15, India, Malaya, to New Guinea. Several of the species have been more or less cult. at one time or another. Used like the others of the family as decorative pot-plants in the greenhouse. They require a rather warm, damp atmosphere and a soil rich in humus. Prop. by cuttings or seeds.



2908. Phleum pratense.—Timothy. (×⅛)

thyrsiflòrus, Nees (*Justícia thyrsiflòra*, Roxbg.). Shrub, 3–7 ft. high: lvs. 7 x 1¾ in., lanceolate, glabrous: fls. orange, in long, dense, villous thyrses; corolla ⅔in. wide, tubular, 2-lipped. India.—Cult. in S. Fla.

P. curviflòrus, Nees. Shrub, 3–6 ft. high: lvs. large, elliptic, acute at both ends, toothed, glabrous: fls. yellowish, with an elongated corolla. Himalayas. B.M. 3783. H.U. 2, p. 259.

HEINRICH HASSELBRING.

PHLÒMIS (old Greek name used by Dioscorides). *Labiàtæ*. JERUSALEM SAGE. Stout mostly tall plants sometimes grown in the open for the dense axillary whorls of rather large yellow, purple or white flowers.

Plants more or less woolly, some of the species conspicuously white-woolly, shrubs or perennial herbs: lvs. all alike, or the uppermost reduced to bracts: whorls many- or few-fld.; fls. sessile; calyx usually plicate, truncate or with 5 equal teeth; upper lip of the corolla (galea) broad and compressed or strongly concave, rarely narrow and falcate; lower lip 3-cleft and spreading; tube usually bearing a woolly ring inside; stamens 4, didynamous, ascending under the upper lip, one pair of filaments often appendaged at base; style 2-lobed: nutlets 4, obovoid or ovoid, triquetrous, glabrous or pubescent.—Medit. region and to China, perhaps 70 species. Perhaps a dozen species have been cult., but they are rather coarse plants except for wild gardening and among shrubbery. They are of the easiest cult. Prop. by seeds, cuttings, and the herbaceous species by division. *P. tuberosa*, Linn., of Eu., has run wild sparingly in the E. It is a vigorous and hardy species, prop. by subterranean tubers.

A. *Fls. yellow.*

fruticòsa, Linn. JERUSALEM SAGE. Shrub, 2–4 ft. high, divaricately much-branched, yellowish tomentose: lvs. ovate to oblong, rounded or wedge-shaped at the base, rugose, green above and white-tomentose beneath: whorls 20–30-fld., one or two at ends of branches; bracts broadly ovate or ovate-lanceolate: fls. yellow, showy. S. Eu. B.M. 1843. Gn. 79, p. 114. G. 7:177; 35:713.—In the E. it blooms from June to July. In S. Calif., it blooms in winter, and has the merit of withstanding drought and heavy sea winds. In New England it needs protection in winter.

lunarifòlia, Sibth. & Smith. Undershrub, erect and branching, green but oppressed-tomentose, 6 ft.: lvs.

oblong or ovate-oblong, obtuse at apex, narrowed at base, paler and almost hoary beneath, the lower ones long-stalked: fls. golden yellow, 1½ in. long, in a showy terminal whorl or head 4 in. across with 2 pendulous floral lvs. beneath; bracts small, or orbicular; calyx ¾in. long, 10-ribbed; corolla with villous 2-keeled galea, and large lower lip with 2 wings or lobes at end. Asia Minor. B.M. 7699.—A striking plant.

Lychnìtis, Linn. Lamp-Wick Plant. Somewhat woody, 2 ft., hoary: lvs. sessile and amplexicaul, oblong-linear, narrowed at both ends, white-tomentose beneath: whorls few-fld., much shorter than the floral lvs.; bracts broad at base; fls. yellow, the corolla twice longer than calyx. S. Eu. B.M. 999.—The specific name Lychnitis refers to the use of the slender radical lvs. as lamp-wicks.

viscòsa, Poir. (*P. Russelliàna,* Benth.). Shrubby, glabrous, but viscid above, with elongated branches: lvs. ovate and oblong-lanceolate, the lower ones petioled and strongly cordate at base; floral lvs. cuneate-lanceolate and acuminate, much surpassing the fls.: whorls many-fld., remote, with lance-linear rigid bracts; corolla yellow, twice longer than calyx, the galea emarginate, lower lip with broad lobe. Asia Minor. B.M. 2542 (as *P. lunarifolia* var. *Russeliana*).

aa. *Fls. purple, or pinkish, at least inside.*

tuberòsa, Linn. Herb, 3–6 ft. high, nearly smooth, with thickened root: lvs. deeply cordate, ovate, petioled, crenate, the lower ones triangular-ovate and 6 in. or more long; floral lvs. 2–3 in. long, 6–8 lines wide, oblong-lanceolate: whorls 30–40-fld., bearing purple fls. that are white-bearded inside. S. Eu., E. and N. Asia. B.M. 1555.—Little planted; known mostly as a weedy naturalized species.

Hérba-vénti, Linn. Much-branched, 1–2 ft., hairy: lvs. oblong-lanceolate, or ovate-oblong, crenate, coriaceous, rounded at base, either canescent or green beneath: whorls 10–20-fld., much surpassed by the long floral lvs.; fls. purplish, tomentose on outside; galea much arched; lower lip short. Medit. B.M. 2449. G. 35:712.—The name Herba-venti means "wind herb." It is recorded that "when exposed to wind and rain, the leaves are apt to lose their softer parts, leaving merely a network of fibers, pervious to the wind, whence the old name of Herba-venti."

cashmeriàna, Royle. Sts. several, stout, terete, densely white-woolly, 2–3 ft. high: lvs. linear-oblong, obtuse, rugose and crenate, cordate at base, pubescent above, the radical ones long-petioled: whorls many-fld., 1–1½ in. diam.; bracts numerous, filiform, ciliate and tomentose; fls. pale purple; galea very large, tomentose but not fringed; lower lip very broad; calyx-teeth spine-like and half length of the tube. Afghanistan, Himalaya. B.R. 30:22. J.F. 3:284.

Sàmia, Linn. Pubescent, 2–3 ft., simple or sparingly opposite-paniculate-branched: lvs. ovate-oblong, cordate and somewhat acute, petioled, rugose and crenate, green above and tomentose beneath: whorls 10–15-fld., bracts many, linear, very acute; fls. hairy, greenish white outside, pinkish and purple-veined inside. Greece, Asia Minor. B.M. 1891. G. 35:711. L. H. B.†

PHLÓX (Greek for *flame,* once applied to species of Lychnis). *Polemoniàceæ.* Showy and popular flower-garden herbs, perennial and annual.

Erect or diffuse, tall or low, mostly perennial, glabrous, pubescent or hairy, a few of them woody at base but mainly herbaceous throughout: lvs. mostly opposite or sometimes the upper ones alternate, entire: fls. in bright colors, blue, red, blue-red, purple, white, in terminal cymes or thyrse; calyx narrow-tubular or sometimes nearly campanulate, 5-ribbed and 5-cleft, the lobes sharp-pointed; corolla convolute in bud, salverform, with a very slender tube and a flat-spreading 5-lobed limb, the lobes obovate or broader and sometimes notched; stamens 5, usually unequal in length or in point of attachment, usually included; ovary 3-celled, oblong or ovoid, the style slender: caps. 3-valved, the seeds 1 or few in each cell, usually 1.—Species 48 as defined by Brand in Engler's Das Pflanzenreich, hft. 27 (IV. 250), 1907, one of which is Siberian and the others N. American, in woods and thickets and on prairies and plains, some of them alpine and arctic.

2909. Cultivated forms of Phlox Drummondii.

From a horticultural point of view, the phloxes may be thrown into five groups: (1) the annual phloxes, *P. Drummondii;* (2) the highly developed summer perennial tall phloxes of nurseries and gardens, *P. paniculata* and *P. maculata;* (3) the moss pinks, *P. subulata* and its variants, useful as carpeters; (4) those useful in alpine and rock-gardening, although little employed for the purpose in America, represented by *P. multiflora* and the cespitose Rocky Mountains set which seems not to be in the lists; (5) the early blooming perennial woods and plains species not yet much domesticated but often naturalized in grounds, as *P. pilosa, P. divaricata,* and others. As a group, phloxes are amongst the most satisfactory of garden plants. Their neat habit, bright-colored flowers, profuseness of bloom, and ease of culture make them favorites everywhere. Most of the domesticated kinds are summer bloomers, but *P. subulata* is spring-flowering.

The annual phloxes, derivatives of *Phlox Drummondii,* of Texas, have risen to first place as garden annuals. This species has been much modified by domestication, so that the named garden varieties are numbered by dozens. These garden forms differ in stature, color, size and shape of flower. Some are semi-double. An effort has been made to produce a yellow flower, but apparently a true yellow has not yet been secured. The colors run to the cyanic series, in many interesting variations. *Phlox Drummondii* is of the easiest culture. This fact, together with the profusion and long season of its bloom, is an important reason for its popularity. It blooms all summer and until frost if the stock and conditions are good. It needs a warm sunny place. It will grow even in poor soil, but in order to develop to its highest perfection it must have good soil and the individual plants must be given room (say 1 foot apart each way). Seeds are usually sown in the open as soon as the weather is settled; sometimes they are sown indoors, but the plants bloom so young that this is rarely practised. If the ground is poor and dry, the plants usually cease blooming by midsummer, but if plant-food and moisture are abundant they may be expected to continue their bloom until late autumn. To attain this result most perfectly, the old flower-

cluster should be removed; the plant is an end-bloomer, and when the terminal flower-cluster has matured the other shoots continue the growth and thereby provide a succession of bloom. This phlox has now varied so much under domestication that packets of mixed seed are likely to give tall and dwarf, large-flowered and small-flowered forms, with very unsatisfactory results. If mixed colors are desired, pains should be taken to secure seed that will produce plants of similar height and season. Some of the cheap seed may produce very disappointing plants even under the best conditions.

The summer perennial phloxes of gardens are of several races. They are probably the issue of *P. paniculata* and *P. maculata*, although their origin and characteristics need to be worked over. This group of plants is amongst the most showy of garden herbs. The terminal panicles have become 1 foot long in some forms, and as densely filled as a hydrangea. They are specially desirable when color display is sought in connection with formal or semi-formal designs, as on terraces and by balustrades. The colors are most frequent in reds, but there are many purple, white, salmon, and parti-colored varieties. The summer perennial phlox should have a rich and rather moist soil if it is to be grown to perfection. It should never suffer for moisture or food. Let each clump have a space, when fully developed, of 2 to 3 feet across. The plants as purchased from nurseries usually do not come into full floriferousness until their third year. For the highest satisfaction in blooms, the plants should be relatively young or at least often renewed by dividing the clump. The stool gradually enlarges outward. From the young vigorous shoots on the outside of the clump the new plants should be reared, if one desires to propagate the variety to any extent. Old stools should be taken up every year or two, and divided and transplanted. This work is performed in the fall, after the growth has ceased. By this process, the plants do not become weak and root-bound. Inferior and vigorous seedlings are often allowed to grow about the old plant, causing the named varieties to "run out." The modern varieties should not remain undisturbed for more than three or four years. One of the requisites is to secure in the first place stock that is strong and healthy. Phloxes usually bloom in early summer and midsummer, but if the tips of the shoots are pinched out once or twice in early summer, the bloom may be delayed until late summer or autumn. Named varieties are propagated by side shoots and by cuttings of well-maturing shoots. Seeds give new and often interesting forms.

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A. *Species annual, pubescent: upper lvs. often alternate.*

1. **Drúmmondii,** Hook. Figs. 2909, 2910. Erect branching annual, more or less villous and viscid, 6–18 in. tall: lvs. alternate, oblong-acute or lanceolate, the upper ones more or less clasping: fls. showy, in broad mostly flat-topped cymes, the calyx-lobes long and narrow and spreading or recurving in fr., the corolla-lobes broad-ovate. Sandy soils. Texas. B.M. 3441. B.R. 1949.—This is the original of the common annual garden phlox, now cult. in numerous varieties. The seeds were received in England in the spring of 1835, from Texas, having been collected by Drummond. In Oct. of that year it was described and figured in B.M., by W. J. Hooker, as *Phlox Drummondii*. The fl. was described as "pale purple without, within, or on the upper side, of a brilliant rose-red or purple, varying exceedingly on different individuals in intensity, and in their more or less red or purple tinge: the eye generally of an exceedingly deep crimson." Lindley described and figured it in B.R., for 1837, describing the fls. as "either light, or deep carmine, on the inner surface of their corolla, and a pale blush on the outside, which sets off wonderfully the general effect. A bed of this plant has hardly yet been seen; for it is far too precious and uncommon to be possessed by any one, except in small quantities; but I have had such a bed described to me, and I can readily believe that it produced all the brilliancy that my informant represented."

The annual garden phloxes are now of many kinds and races. They may be thrown into two groups: Var. **rotundàta,** Voss, with petals large, broad, and entire or nearly so, making a circular outline; var. **stellàris,** Voss, the star phloxes, the petals narrow, cuspidate or variously fringed or cut. To the former belong such races or forms as *Heynholdii, Deppei, Isabellina, formosa, splendens, hortensiæflora* or *verbenæflora, grandiflora.* With the latter (var. *stellaris*) may be classed *cuspidata, fimbriata* or *laciniata, stellata.* There are also dwarf and intermediate races of annual phloxes as well as semi-double forms. For a discussion of the heredity of color in *Phlox Drummondii,* see Gilbert, Journ. Agr. Research, July, 1915.

There are several annual phloxes in Texas, some of them perhaps to be regarded as variants of *P. Drummondii.* **P. villosíssima,** Small (*P. Drúmmondii* var. *villosissima,* Gray), is very villous and viscous, the fls. large and more scattered, the lvs. mostly opposite and the blade thick and bristly: corolla pale lavender, the

2910. Quedlinburg or star phlox. A horticultural form of Phlox Drummondii. (Natural size)

limb ½–1 in. broad, lobes broad-obovate and often abruptly pointed. **P. tênuis,** A. Nelson (var. *ténuis,* Gray) is small and slender, not villous, glabrous or slightly pubescent: lvs. mostly alternate, the blades thin and linear or linear-lanceolate: fls. lavender, small, the limb about ½in. across, lobes rhombic-ovate and acute. **P. áspera,** A. Nelson. With short rigid hairs: lvs. opposite, the blades thick, narrow-lanceolate to linear: calyx and pedicels glandular, the calyx-lobes awned; corolla violet, the tube glandular-pubescent; lobes cuneate-obovate, about ½in. long, mucronate. **P. Roemeriàna,** Scheele. Glabrate or somewhat hirsute: lvs. mostly alternate, spatulate-oblong or lanceolate, sessile, usually acute or acuminate: fls. solitary or few, pink or rose-colored; corolla-tube not surpassing the calyx (in this differing from the other annual Texan phloxes); limb of corolla less than 1 in. across, the lobes roundish obovate and entire; ovules 4 or 5 in each cell.

AA. *Species perennial, of various habit, either pubescent or glabrous.*

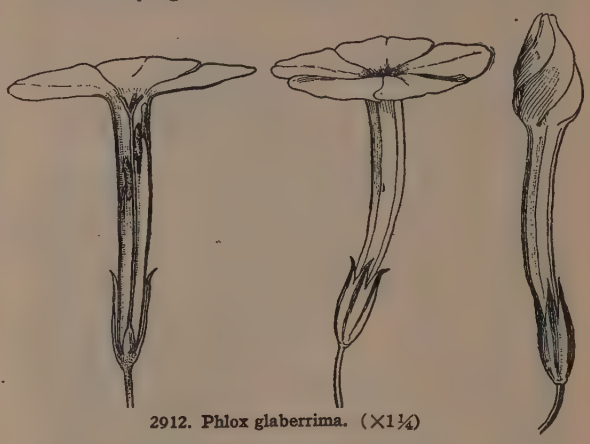
B. *Flowering st. erect and usually stiffish (Nos. 2–9).*

C. *Plant mostly glabrous, at least below (exceptions in variety of No. 5).*

D. *Infl. large and thyrse-like: plants tall.*

2. **paniculàta,** Linn. (*P. decussàta,* Hort. *P. acuminàta,* Pursh. *P. cordàta,* Ell. *P. undulàta,* Ait.). Summer Perennial Phlox of gardens, in many forms. Fig. 2911. Plant stout and erect, 2–4 or 6 ft., glabrous: lvs. thin, oblong-lanceolate and mostly tapering at the base, acute or acuminate: calyx-teeth awl-like. Woods, Pa., west and south. Summer. B.M. 1880.—The parent of the greater number of perennial phloxes of gardens, although some of these may be hybrids with the next. "Fls. pink-purple, varying to white," according to Gray. In cult. varying much in color. This plant, in several forms, persists about old homesteads and sometimes becomes naturalized. **P. amplifòlia,** Brit., with st. villous, glandular above, lvs. broader, ranging from Ind. to Tenn. and Mo., is considered by some to be a form of *P. paniculata.*

2911. Summer perennial phlox, of the P. paniculata and P. maculata group.



2912. Phlox glaberrima. (×1¼)

3. **maculàta,** Linn. (*P. pyramidàlis,* Smith. *P. refléxa* and *P. penduliflòra,* Sweet). Summer Perennial Phlox. Slenderer, and mostly less tall, usually with purple-spotted st.: lvs. very smooth and usually thicker than those of the above, the upper ones usually clasping: calyx-teeth short: fls. as in above. Range of the last, and in cult., but less important horticulturally than *P. paniculata.* Summer. Var. **suavèolens,** Brand (var. *cándida,* Michx. *P. suavèolens,* Ait. *P. tardiflòra,* Penny. *P. longiflòra,* Sweet. *P. álba,* Moench). St. glabrous, not spotted: fls. sweet-scented, white.

The foregoing treatment of the synonymy of the two species entering into the origin of the summer perennial phloxes is essentially that of Gray. Brand removes a number of these names into a separate category comprising a range of hybrids, and accounts for other old horticultural names, as follows:

3*a*. **paniculàta × maculàta,** Brand. *P. pyramidàlis,* Smith; *P. decussàta,* Lyon; *P. refléxa, P. excélsa, P. Wheeleriàna, P. Shéperdii, P. penduliflòra,* Sweet; *P. missoùrica,* Salm-Dyck; *P. omniflòra, P. atrocaùlis, P. Ingramiàna, P. pulchélla, P. Vernoniàna,* Hort.; *P. Youngii, P. Coldryàna,* Court.; *P. speciosíssima,* Maund; *P. Bridgesii, P. Broùghtonii,* Marn.; *P. Van Hoùttei, P. Mariánna,* Lindl.; *P. insígnis,* De Jonghe; *P. Oldryàna,* Walp. Several other old Latin names are also referable to this hybrid group.

DD. *Infl. small and loose or flat-topped: plants lower.*

4. **ovàta,** Linn. (*P. carolìna,* Linn. *P. triflòra,* Maund). A foot or two tall, the sts. erect from a short decumbent base, glabrous or very nearly so: lvs. narrow-ovate to oblong-lanceolate, the lower ones tapering to base and the upper ones somewhat clasping: fls. pink or light red, about 1 in. across, the straight or slightly curving tube twice or more longer than the rather short and broad calyx-teeth. Pa. to Ala., mostly in elevated regions. B.M. 528. Gn. M. 2:168.

5. **glabérrima,** Linn. Fig. 2912. Differs in somewhat taller growth, linear-lanceolate to narrow-lanceolate taper-pointed firm nearly veinless lvs. which have revolute margins, and in the narrow very sharp-pointed calyx-teeth. Va. to Wis., and south to Fla.

Var. **suffruticòsa,** Gray (*P. suffruticòsa,* Vent. *P. nítida,* Pursh). Stiffer, sometimes pubescent above: lvs. considerably broader: fls. varying to flesh-color. Ga. and Tenn., south and west. B.M. 1344 (as *P. carolina*), and B.R. 68.

2913. Phlox divaricata (×½).

CC. *Plant distinctly hairy or pubescent (exceptions in No. 9).*

D. *Sterile, prostrate or running shoots arising from the base of the plant.*

6. **divaricàta,** Linn. (*P. canadénsis,* Sweet). WILD SWEET WILLIAM. Fig. 2913. Sts. slender, pubescent, 10–18 in. tall: lvs. varying from linear-oblong to ovate-lanceolate, mostly acute: fls. in small cymes terminating short branches, 1 in. across, blue or pinkish blue, handsome and somewhat fragrant, the corolla-lobes often notched, the calyx-lobes narrow and subulate. Woods and copses, in lowish grounds. Que., west and south, to Fla. and La. B.M. 163. G.F. 7:256 (reduced in Fig. 2913). Gn. 60, p. 251; 76, p. 45. G.L. 18:335. G.W. 2, p. 555. R.B. 24:185. Gn.W. 23:433. Gn.M. 2:167.—A very attractive early spring fl., often coloring the floor of woods. Prefers rich soil. Var. **Lâphamii,** Wood. Lvs. ovate: fls. bright blue; petals obtuse and entire. This name is listed abroad; plant said to be stronger-growing and with longer-blooming season than the species. G.M. 55:556.—*P. divaricata* has received considerable attention from cultivators abroad.

7. **stolonífera,** Sims (*P. réptans,* Michx.). Low and weak, the flowering sts. reaching 6–12 in., the sterile ones long and prostrate, the plant thinly glandular-hairy: lvs. short-ovate or obovate, more or less obtuse: fls. few in each cyme, purple or violet, the lobes mostly entire, the calyx-lobes narrow and subulate. Pa. and Ky. to Ga., mostly in the upper regions. B.M. 563. Var. **vérna,** Hort. (*P. vérna,* Hort.), has rose-colored fls. with dark purple throat; a garden form.

DD. *Sterile prostrate shoots none.*

8. **amœ̀na,** Sims (*P. Wálteri,* Chapm. *P. involucràta,* Wood). Sts. 6 in. or less high from a decumbent base, pubescent or hairy: lvs. numerous, mostly in rosettes at the base, few on the flowering sts., small, oblong-lanceolate to linear-oblong, mostly obtuse but sometimes nearly or quite acute: fls. numerous for size of plant, purple, pink or white, lobes usually entire, calyx-lobes narrow and sharp-acute. Dry lands, Va. to Ky. and south. B.M. 1308. G.M. 56:157. Var. **foliis variegàtis,** Hort., with lvs. variegated, is listed.

9. **pilòsa,** Linn. (*P. aristàta,* Michx. *P. cuspidàta,* Scheele). Sts. slender but erect, 2 ft. or less tall, pubescent or hairy (nearly glabrous forms occur): lvs. small, linear or linear-lanceolate, widest near the base, acuminate: fls. numerous in rather loose cymes, varying through purple, pink and white, the lobes entire, the calyx-lobes awn-like. Dry fields, woods, Ont. and Man. to Fla. and Texas, growing as far east as N. J. B.M. 1307. L.B.C. 1251, 1731. G.L. 27:117. Gn.W. 23:495.

BB. *Flowering sts. diffuse and branching, often creeping, low, sometimes cespitose: plants of more or less tufted habit.*

C. *Corolla-lobes 2–3-parted or very strongly notched.*

10. **bífida,** Beck. Low, the sts. stiff and sometimes almost woody and often 1 ft. long and rising 3–8 in. from the ground, minutely pubescent: lvs. linear and rigid, 2 in. or less long: fls. scattered, violet-purple, the lobes 2- or 3-cleft as far as the middle or farther into narrow spreading segm. Prairies, Mich. to Mo. and Tenn.—Rarely cult.

11. **Stellària,** Gray. Fig. 2914. Stellaria-like: glabrous: lvs. linear, sparingly ciliate toward the base: fls. scattered, usually long-peduncled, pale blue to whitish, the lobes cleft only at the apex into short oblong parts. Lexington, Ky., to S. Ill. and Tenn. G.F. 1:257 (adapted in Fig. 2914).—How much, if any, of the *P. stellaria* of the trade is this species and how much is forms of *P. subulata,* is to be determined.

2914. Phlox Stellaria (×⅓).

CC. *Corolla-lobes shallow-notched or entire.*

D. *Peduncles usually bearing few to several slender-pedicelled fls.*

12. **subulàta,** Linn. (*P. setàcea,* Linn.). GROUND PINK. MOSS PINK. Fig. 2915. Tufted or matted species, in many forms, the depressed sts. more or less

pubescent: lvs. crowded or fascicled (except on the flowering sts.), narrow-linear to linear-lanceolate, very sharp and usually stiff, ciliate: fls. nearly 1 in. across, light blue, pink or white, in small clusters standing 2–6 in. above the ground, the lobes obcordate or entire. Dry banks and fields, N. Y., west and south, reaching Fla.; run wild in patches along many roadsides, in cemeteries, and elsewhere. B. M. 411 and 415. Gn. 67, p. 218; 71, p. 166; 75, p. 29. F. W. 1878, frontis. Gn. M. 2:167. G.L.22: 358.—A much-prized old garden plant, useful for colonizing where it is desired to cover the earth with a mat. It blooms profusely in spring. The garden forms are many, as: Var. **nivàlis,** Hort. (*P. nivàlis,* Lodd.), white-fld., style short; ovules commonly 2 or 3 in each cell. L. B.C.8:780. Var. **aristàta,** Hort. (*P. aristàta,* Lodd.), has fls. pure white, sometimes lilac-tinted; ovules 1 in each cell. L.B.C. 18:1731. Var. **Nélsonii,** Hort., (not *P. Nélsonii,* Brand), white, with rose-red eye; compact. G.W. 15, p. 430. Gn. 75, p. 275. Var. **Héntzii,** Voss (*P. Héntzii,* Nutt.), lobes entire or nearly so, white, lavender or purple. Southern states. Var. **annulàta,** Hort., whitish blue, with purple ring. Var. **atropurpùrea,** Hort., rose-purple with crimson ring. Var. **grandiflòra,** Hort., fls. large, red; plant dwarf. Var. **stellàris,** Hort., with star-like white fls. in profusion. Var. **cæruléscens,** Hort., with bluish fls. Var. **pállida,** Hort., large-fld., rose-colored shaded lilac. Var. **frondòsa,** Hort., vigorous form; fls. pink with dark center. Var. **lilácina,** Hort., compact, lilac-fld. G.C. III. 41:383. G.M. 55:283.—Some of the foregoing forms are described or listed as if derived from *P. Stellaria;* but whether from the species *P. Stellaria,* Gray, or the race of *stellaria* or *stellaris* of *P. subulata,* is not always clear.

2915. Phlox subulata. (×¾)

2916. Phlox adsurgens. (×½)

DD. *Peduncles chiefly axillary and mostly 1- to 3-fld., or the fls. nearly sessile.*

E. *Lvs. crowded or fascicled: plant forming a mat or tuft.*

13. **Doúglasii,** Hook. Very low and densely tufted, pubescent or nearly glabrous: lvs. very narrow, pointed, the margins at base often ciliate: fls. small and short-stalked, purple, lilac or white, about ½in. across, the lobes obovate and entire, the tube little exceeding the calyx. Utah and Mont., west. Gn.M. 2:168.

14. **multiflòra,** A. Nelson. Somewhat similar in habit to *P. subulata,* producing large fls. in spring so freely as to hide the foliage: cespitose, the branching prostrate base woody, the herbaceous nearly erect shoots 2–4 in. high, the branches simple and 1-fld.: lvs. broad-linear, glabrous, opposite or fascicled: fls. rose, lilac or lavender, fragrant; tube of corolla exceeding calyx, the lobes ⅔in. long, obovate and entire. Foothills Colo. to Mont.—Offered in the W.

EE. *Lvs. little if at all fascicled: plant only loosely tufted.*

F. *Style nearly or quite equaling the corolla-tube.*

15. **adsúrgens,** Torr. Fig. 2916. Sts. 3–6 in. long, diffuse and ascending, glabrous except the peduncles and calyx: lvs. ovate-lanceolate or ovate, acute, less than 1 in. long: fls. rose-colored or whitish, nearly or quite 1 in. across, the obovate lobes entire, the tube nearly twice longer than calyx. Ore., in Cascade Mts. G.F. 1:66 (adapted in Fig. 2916).

FF. *Style very short.*

16. **speciòsa,** Pursh. Variable in size, sometimes ascending to 3 ft., more or less glandular above: lvs. 2 in. or less long, linear to lanceolate, the uppermost broad at base: fls. rose-pink or whitish, in corymbs, the lobes obcordate, the tube little surpassing the calyx. Ariz. and Calif. to Wash., in many forms.

17. **nàna,** Nutt. (*P. triovulàta,* Thurb.). Fig. 2917. Only a few inches high, glandular-pubescent: lvs. 2 in. or less long, linear, sometimes alternate: fls. light red or rose to white, scattered or somewhat corymbose, about or nearly 1 in. across, the lobes usually entire and roundish, the tube somewhat surpassing the calyx. Texas to Ariz. G.F. 1:413 (adapted in Fig. 2917).

Many other species may be expected to appear in the lists of dealers, and there are many Latin names of domestic forms of P. Drummondii, P. paniculata-maculata, P. subulata.—*P. Árendsii,* Hort. A summer-flowering dwarf perennial phlox originating with G. Arends, Germany, said to be hybrid of P. divaricata (P. canadensis) and P. paniculata (P. decussata). Sts. stiff and wiry, about 2 ft. high: fls. lavender, mauve and violet, in flattish or rounded heads.—*P. Brittonii,* Small. Of the P. subulata set, growing on dry mountain slopes in Va., W. Va., N. C.: corolla-lobes deeply emarginate rather than shallowly emarginate or entire as in P. subulata: upper part of plant glandular: fls. mostly white, with 2 magenta spots at base of lobes: lvs. numerous, subulate or nearly so.—*P. cárnea,* Sims. Probably a hybrid of P. maculata and P. glaberrima: 1½–3 ft., erect, st. not spotted: lower lvs. narrow-lanceolate to linear, the upper ones oblong: fls. rose-colored to purplish, in terminal corymbs, on very short pedicels. Southern states. B.M. 2155. L. B.C. 8:711.—*P. critèrion,* Miell. Like P. Drummondii, but peren-

2917. Phlox nana. (×½)

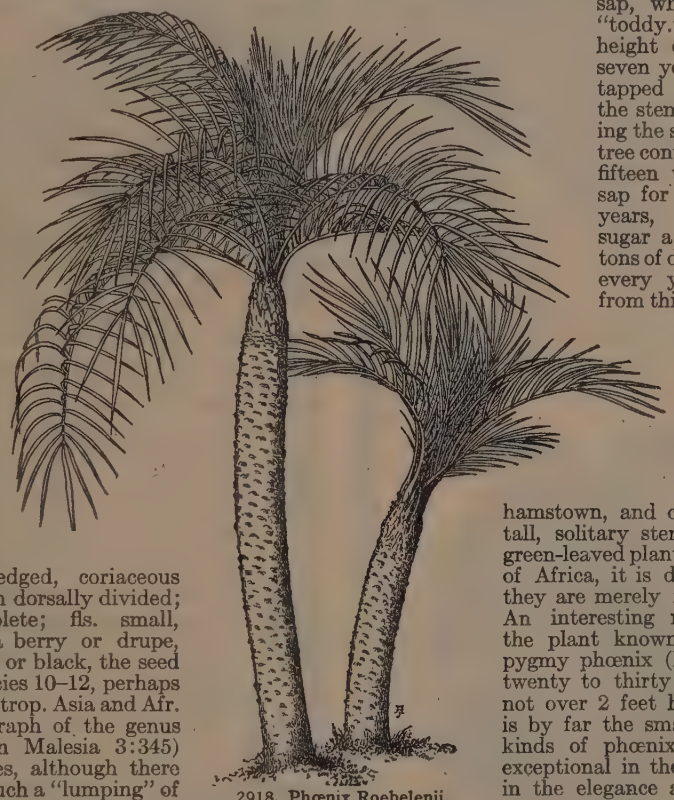
nial: perhaps hybrid of P. paniculata and P. Drummondii. F.S. 8:800.—*P. Lindsayana*, Hort., apparently of the P. subulata group, said to be a hybrid and useful for rockery and border.—*P. sibirica*, Linn. The one Asian species, occuring also in Alaska: a low loosely cespitose species, 6–9 in. high, white-fld., mostly villous-pubescent: lvs. narrow-linear: corolla-lobes obcordate or emarginate.

L. H. B.

PHŒNICOPHÒRIUM: *Stevensonia.*

PHŒNIX (Theophrastus gave this name to the date palm, perhaps thinking of Phœnicia, where the Greeks were supposed first to have seen it, or of the Phœnician purple, or of the fabled bird of Egypt). *Palmàceæ.* A distinct and exceedingly useful genus of palms, planted for fruit, ornament and shade.

Palms with sts. spineless (in many species the lower lfts. are reduced to long stout spine-like processes), without trunks, or with stout or slender, short or long, erect or inclined trunks, often cespitose, clothed above with the persistent bases of the lvs.: lvs. terminal, spreading, recurved, unequally pinnate; segms. somewhat fasciculate or almost equidistant, elongated-lanceolate or ensiform, acuminate, rigid, inserted by the wide base; margins entire or folded on their entire length; rachis laterally compressed, convex on the back; petiole plano-convex, usually spiny, with very short rigid pinnæ; sheaths short, fibrous: spadices usually many, erect or nodding in fr., or pendent, appearing among the lvs.: peduncle strongly compressed: branches usually somewhat umbellate: spathe basilar, entire, long, compressed, 2-edged, coriaceous ventrally and at length dorsally divided; bracts usually obsolete; fls. small, leathery, yellow: fr. a berry or drupe, oblong, orange, brown or black, the seed always grooved.—Species 10–12, perhaps more, in Trop. and Subtrop. Asia and Afr. The botanical monograph of the genus Phœnix by Beccari (in Malesia 3:345) admits only 10 species, although there are about 60 names. Such a "lumping" of species is very unwelcome to the horticulturist, and it is probable that nearly all the synonyms cited below represent forms that are abundantly distinct for horticultural purposes. The following account of the genus is adapted from the work of Beccari, especially the Asiatic species. A good horticultural appreciation of Phœnix is that by William Watson, of Kew, in G.C. III. 9:234, 298, from which liberal extracts are made below. Phœnixes differ from all other pinnate-lvd. palms in having the lvs. folded upward and lengthwise, and in the peculiar form of the seed, as seen in the date stone. The plants are either male or female.



2918. Phœnix Roebelenii.

The fruits of only one species are used for food; viz., *P. dactylifera.* (For date-culture, see *Date.*) In England, only *P. rupicola* ranks among popular decorative plants. Of all palms, the cultivated species of Phœnix are the most difficult to define. Many hybrids have been raised in the gardens of the Riviera, where several species flower and fruit every year. It is almost impossible to keep these pure. Kerchove records the wonderful fecundity of a phœnix; *P. reclinata* at Nice fertilized with pollen from *P. tenuis, P. reclinata* and *P. pumila* produced 20,000 seeds. The raising of phœnixes from seed is done on a large scale on the Riviera. The seeds are sown in beds in the open and the seedlings transplanted into shallow trenches like celery, so that the trenches may be regularly flooded during the summer drought. Next to the coco-palm, the date is one of the most useful trees in the world. *P. canariensis* is the noblest of all phœnixes, and one of the most majestic palms in cultivation. Its rate of growth is astonishing: a tree supposed to be only ten years old had a trunk 4 feet high, 3 feet in diameter at the base, with about one hundred leaves forming a head 25 feet across. Another specimen of about the same size bore eight bunches of fruit, each weighing about fifty pounds. *P. sylvestris* is the wild date of India, where it is cultivated for its sap, which yields sugar and "toddy." The trunk attains a height of about 4 feet when seven years old, and it is then tapped by cutting a notch in the stem at the top and catching the sap as it runs out. The tree continues to yield annually fifteen to eighteen gallons of sap for twenty to twenty-five years, or eight pounds of sugar a year. Many thousand tons of date-sugar are produced every year in Bengal alone from this and other palms. "*P. reclinata* and *P. spinosa* are united under the former name by Beccari. Taking the dwarf, cespitose, shiny-leaved elegant plant found in Caffraria as far south as Grahamstown, and comparing it with the tall, solitary stem, huge-headed, gray-green-leaved plant of the tropical regions of Africa, it is difficult to believe that they are merely forms of one species." An interesting novelty in phœnix is the plant known as *P. Roebelenii,* the pygmy phœnix (Fig. 2919.) Specimens twenty to thirty years old have stems not over 2 feet high. Watson says: "It is by far the smallest of all the many kinds of phœnix known, and is also exceptional in the form of its stem and in the elegance and soft texture of its bright green leaves." Watson adds that it deserves to rank with *Cocos Weddelliana* and *Geonoma gracilis* for usefulness in a small state. This palm suckers freely and in a wild state grows in clumps. *P. Roebelenii* is often treated as a variety of *P. humilis;* but Watson and others think that it is a distinct species and that in the form and texture of its leaves it resembles *P. rupicola* more than any other species. Because of its distinctness horticulturally and the general uncertainty in the genus, it is advisable to keep *P. Roebelenii* distinct for the present at least. It is native in the Laos region of Indo-China, where it was discovered by Mr. Roebelin, who went there regularly every year and exported the seed to Europe by way of Bangkok. It is specially abundant in the Nam Ou River Valley, and occurs also toward Pac Lay.

The botany of Phœnix is much confused, and no one knows what is planted in this country under the different names. The species hybridize freely, and it is probable that most of the cultivated forms are hybrids

of various mixtures. While some of the garden names are considered by botanists to be synonyms, they may represent distinct plants to the horticulturist. Any treatment of Phœnix as represented in North America must now be tentative.

Cultivation of phœnix.

In Florida.—In moist land no special care is necessary in setting out these palms. All they require is shade after the planting of small specimens, and a mulch of old grass or stable-manure. They must be frequently tilled and fertilized. Always use a fertilizer rich in ammonia while they are making their growth. In autumn, a fertilizer containing 10 or 12 per cent of potash should be used, with a good addition of phosphoric acid. This will make the plants more hardy to endure occasional cold spells. On high dry pineland, holes 3 to 5 or 6 feet deep and wide should be dug for the large-growing species, and these holes should be filled with old stable-manure, bones, muck, and clay. Plant in a saucer-like depression about a foot deep in the center, and apply a heavy mulch of old stable-manure after the plant has been set out. If stable-manure is not at hand, old leaves and grass may be used instead. Small plants should be well shaded for a year or so, and they also should be kept constantly moist during the dry season. All hardy palms should be set out in November, December, and January. One is not likely to be successful in transplanting them in the dry season from March to June.—In Florida, experience has been had with plants under the following names: *P. canariensis* is the most beautiful as well as the most massive of the tall-growing single-stemmed species. The trunk in young specimens is immense. It is a fast grower in rich moist soils, but very slow and unsatisfactory in high dry sandy lands. It is excellent

2919. Phœnix Roebelenii of horticulturists, considered by some botanists to be a form of P. humilis.

as a single specimen on lawns, or for streets. Its dense immense crown of elegantly curving pinnate leaves, each often 15 feet long and of a very pleasing green color, and its stately and rapid growth, combine to make this species an ideal avenue tree for central Florida, along with *Sabal Palmetto*, *Washingtonia robusta* and *Phœnix sylvestris*. Farther south *Cocos plumosa* and *Oreodoxa regia* must be added. There are hybrids of this species and *P. sylvestris* and *P. dactylifera*. Seeds from the Riviera and Italy seldom produce plants true to name because the plants evidently are pollinated by the species mentioned. It is necessary to import the seeds from the Canary Islands, if plants true to name are desired. *P. tenuis* is only a more slender form of it. *P. canariensis* is easily distinguished by its greenish yellow leaf-stalks and spines.—*P. sylvestris* is a very stately and beautiful palm with light bluish green leaves, growing well on high pineland but doing best on rich moist soils. There are hybrids between this species and *P. canariensis*.—The date palm, *P. dactylifera*, is common in many gardens, the product of seeds taken from the commercial dates bought in the shops. Most of the real date palms do not look beautiful. They are rather coarse, but a few of them show a dense crown of deep bluish green leaves. It often produces large bunches of orange-yellow juicy but rather bitter fruit. The mocking-birds are very fond of it. The foregoing three phœnixes are hardy as far north as Jacksonville. The remainder are all more tender.—*P. reclinata* is a most beautiful palm with slender stem and a dense crown of reclining leaves. Great confusion exists concerning this fine palm, as quite a number of the species having more massive stems and much broader and more spiny leaves are labelled with this name. The true *P. reclinata*, as understood in Florida, has soft leaves, and the leaflets are scarcely spiny. Although it suckers, the offsets are not so abundant or so vigorous as in the plant known as *P. spinosa*. It is really a one-stemmed species. The trunk is very slender, scarcely more than 4 or 5 inches in diameter. It grows as well on high dry pineland as in moister and richer soil, but the growth is much more rapid in good soil.—*P. spinosa*, from a horticultural standpoint, is very distinct from the last. The leaves are very vigorous, deep green and each leaflet terminates in a very sharp spine. The foliage is so extremely spiny that it is very difficult to trim the plants. This palm always grows in clumps of five or six or more stems, and it attains a height of 25 to 30 feet. The trunks are rather rough and massive, 9 or 10 inches in diameter, and the leaves are recurving, as in the last.—*P. farinifera*, or the palm grown in Florida under this name, is similar in growth to *P. spinosa*, but the leaves are lighter green with a slight glaucous hue, and the spines on the leaflets are even more formidable. The leaves, particularly at their lower end, are covered with a fine mealy substance.—*P. zeylanica* is one of the most beautiful and distinct of all the phœnixes, with the color of the Colorado blue spruce. If single stems are desired, the suckers should be removed as soon as they appear. This species thrives on high and low land.—*P. leonensis*, by botanists referred to *R. reclinata*, grows in large dense clumps 10 to 12 feet high, scarcely forming trunks. The leaves are deep green, rather soft to the touch and not spiny. Only the petioles are provided, as in all these palms, with formidable spines. It blooms in spring, and fruits abundantly in winter. It grows evidently best on high pineland.—*P. paludosa* forms large clumps, and massive trunks from 1 to 1½ feet in diameter and 15 to 25 feet high; a strong grower but rather coarse in appearance. It grows well on high and low lands.—*P. acaulis* does not form trunks. It is a low, very rigid little palm. The leaves are so spiny that it is difficult to walk among the clumps.—*P. rupicola* (*P. cycadifolia*) is the most elegant and beautiful of all the phœnixes in central Florida. Specimens 6 to 7 feet high look extremely beautiful. The leaves are glossy green and very smooth, suggesting the foliage of some species of Cycas. They are elegantly curving to all sides, and as the leaflets are all arranged horizontally in one plane, well-grown specimens form objects of great beauty. It grows well only in rich moist soil and half shade.—*P. Roebelenii* is a dainty little phœnix now represented in many Florida gardens, but it grows well only in rich moist soil and in half-shady spots. It excels all other small palms in grace, elegance, and beauty. (H. Nehrling.)

In California.—The number of species and varieties of phœnix grown in California is a problem so complex

that one dares not attempt a solution. The nursery trade recognizes the following names: *P. canariensis*, *P. cycadifolia*, *P. dactylifera*, *P. leonensis*, *P. Roebelenii*, *P. reclinata*, *P. rupicola*, *P. sylvestris*, and *P. tenuis*. Occasionally other names are met with in private collections, but no others appear in California plant catalogues. All are considered hardy except the dwarf *P. Roebelenii*. Specimens of *P. dactylifera* grow as high as 100 feet. Some specimens grown from seed saved from commercial dates have made 50 feet of trunk in thirty years, while others of the same seeding have made but 8 feet. Either there are numerous hybrids in California or else some species that no one knows. Specimens are known in all shades of green and glaucous-green, all habits of growth, stiff and upright, pendulous and soft, narrow leaves and broad ones, slim-folded and wide-spreading, the latter like an inverted leaf of *Jubæa spectabilis*. No one has attempted to straighten them out. The only species easily recognized everywhere and by everyone is *P. canariensis*, the gem of the genus. This is regarded by one eminent Californian nurseryman as a garden hybrid, but it always produces fertile seeds, and seedlings from it do not vary, which cannot be said of any other phœnix here. Next in popularity comes *P. reclinata;* the others are found only in collections. *P. canariensis* is most easily removed from the ground, and the best time is August and September, the hottest weather, as then they recuperate faster. The only other time to remove is in the early spring, before growth, and then if the weather turns cold it is dangerous. (Ernest Braunton.)

In the North.—Although phœnixes cannot be considered to be as decorative subjects as the howeas and chrysalidocarpus, they are among the hardiest of palms. For any unfavorable situation where any palm can be expected to thrive, recommend a phœnix. Outdoors they endure the hottest sunshine without losing a particle of color, whether placed in jars, vases, or beds. As house-plants they are unequaled for resistance to neglect. They also bear the tying and untying and the crowding and wear and tear of public decorative work better than any other palms. The date palm is not quite so graceful as *P. rupicola; P. leonensis*, or *P. spinosa*, is slightly stiffer than *P. rupicola*, but very handsome. Other kinds useful to the florist are *P. canariensis*, *P. farinifera*, *P. pumila*, and *P. tenuis*. (This paragraph has been adapted from an article in Scott's "Florists' Manual" which embodies the experience of Mr. Scott and of the undersigned. (W. H. Taplin.)

2920. Phœnix palm.— An unusually straight-trunked specimen of the P. dactylifera group.

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(Various other names will be found in horticultural literature, but the following comprise those known to the American trade.)

acaulis, 8.
Andersonii, 1.
canariensis, 10.
cycadifolia, 1, 12.
dactylifera, 12.
excelsa, 12.
farinifera, 4.
Hanceana, 6.
humilis, 6.
Jubæ, 10.
leonensis, 2.
Loureirii, 7.
macrocarpa, 10.
melanocarpa, 2.
paludosa, 3.
pumila, 9.
pusilla, 4, 5.
reclinata, 2.
Roebelenii, 7.
rupicola, 1.
senegalensis, 2.
spinosa, 2.
sylvestris, 11.
tenuis, 10.
zanzibarensis, 2.
zeylanica, 5.

A. *Texture of lfts. flaccid.*

1. rupícola, T. Anders. (*P. Andersonii*, Hort. Calcutta. *P. cycadifòlia*, Hort.?). St. 15–20 ft. by 8 in., solitary, slender, naked: lvs. 10 ft., glabrous, bright green: petiole compressed; segms. 1½ ft., 2-ranked, not fascicled, flaccid, bright green: fr. oblong, shining yellow. Sikkim, Himalaya. G.C. II. 8:45. F. 1887, p. 165. I.H. 25:318. F.R. 1:143. A.G. 13:141. A.F. 4:569. Gn.M. 6:288. G.Z. 22, p. 97. R.H. 1912, p. 150. G.W. 1, p. 35.—A form with some of the lfts. white is figured in I.H. 34:3.

AA. *Texture of lfts. rigid.*

B. *Arrangement of lfts. 2-ranked.*

C. *Form of lfts. lanceolate.*

2. reclinàta, Jacq. (*P. leonénsis*, Lodd. *P. senegalénsis*, Van Houtte. *P. spinòsa*, Schum. & Thom. *P. zanzibarénsis*, Hort.). St. to 25 ft. or more: lvs. 2-ranked, bright green, obliquely arcuate-recurved toward the apex; lfts. rigid, approximate, strict, 12 in. long, 1 in. wide, lanceolate, acuminate, pungent, the terminal 9 in. long, slightly bifid, the lowest spinescent. Trop. and S. Afr. F. 1871, p. 135. A.F. 4:568. A.G. 13:141; 14:410; 16:346. G. 10:409. Gt. 51, p. 623. Gn. 39, p. 140. R.B. 37, p. 334. R.H. 1911, p. 103.—*P. melanocárpa*, Naudin, has black edible frs.; found in garden at Nice. It is "supposed to be a variety of *P. senegalensis*," or by some a hybrid of *P. dactylifera*. R.H. 1894, pp. 493, 496, 497.

CC. *Form of lfts. ensiform, with filiform tips.*

3. paludòsa, Roxbg. In groups in the wild state, almost tree-like: trunks 8–25 ft. high, 3–4 in. diam., often reclining, annulate: lvs. 8–10 ft.; lfts. 1–2 ft.,

opposite and alternate, 2-ranked, ensiform, with filiform tips, whitish or mealy beneath; petioles 3–5 ft. long, slender, scurfy, with many long spines; sheath fibrous: fr. black-purple. Along rivers and bays. Trop. Asia. R.H. 1912, p. 423.

BB. *Arrangement of lfts. 2–4 or many-ranked.*

C. *Position of lfts. equidistant.*

D. *Color of lvs. dark green.*

4. pusílla, Gaertn. (*P. farinífera,* Roxbg.). Shrubby: caudex at most 4 ft., thickly clothed with old lf.-sheaths: petiole with 1 or 2 pairs of spines; lfts. subopposite, 4-ranked, ensiform, rigid, pungent, dark green: fr. black. Ceylon and S. India.—The caudex is said to have a farinaceous pith, and the foliage to be so spiny that it is impossible to walk through clumps of it.

DD. *Color of lvs. light green.*

5. zeylánica, Hort. (*P. pusílla,* Becc., not Gaertn.). St. 8–20 ft. high, rarely much shorter: lvs. rather short; lfts. very many, subequidistant, 7–10 in. long, bright green, quadrifariously inserted, linear-lanceolate: fr. obovoid-oblong, red at length violet-blue, ½in. long. Ceylon.—Fr. edible.

CC. *Position of lfts. grouped or fascicled.*

D. *St. bulbiform: lvs. short.*

E. *Lfts. scattered, irregularly fascicled.*

6. hùmilis, Royle. Sts. short, tufted, bulbiform, rarely elongated: lvs. subglaucous; lfts. scattered, interruptedly fascicled. Very close to *P. acaulis,* but distinguished by the very long-peduncled, fruiting spadix. Hilly districts of India. Var. **Hanceàna,** Becc. (*P. Hanceàna,* Hort.), from China, is cult.

7. Roebelénii, O'Brien. Figs. 2918, 2919. Lvs. 1 ft. or more long; lfts. 5–7 in. long, shining, dark green, soft, curved, subglaucous, often approximate, mostly falcate, not spinous at the tip. Assam to Cochin-China. G.M. 38:80; 53:996. A.G. 15:201. G.C. III. 6:475; 11:731. G.F. 3:273 (adapted in Fig. 2918). A.F. 38:284. G. 22:147; 37:377. Gn. 65, p. 309. Gn.M. 6:289. J.H. III. 64:76. Gt. 61, p. 392.—This dwarf palm, like a date palm but only about 2 ft. high, is variously understood. Beccari, in Webbia, vol. 3 (1910), treats it as a valid species; but Blatter subsequently, in Journ. Bombay Nat. Hist. Soc., makes it a synonym of *P. humilis* var. *Loureirii,* Becc.

EE. *Lfts. in nearly opposite fascicles.*

8. acaùlis, Buch. Caudex bulbiform, 8–10 in. diam., densely clothed with sheaths and bases of spiny petioles: lvs. 2–6 ft.; lfts. in subopposite fascicles, many-ranked, ½–1½ ft. long, very rigid, somewhat glaucous, marginal nerve very strong; petiole 1 ft. or more, with many spines: fr. bright red to blue-black. India.

DD. *St. erect: lvs. long.*

E. *Lvs. very slender.*

9. pùmila, Hort. St. slender, graceful, 6–10 ft.: lvs. 10–16 ft. long, recurved, drooping; lfts. 8–12 in. long, 4-ranked. Gt. 20, p. 173 (desc.).

10. canariénsis, Hort. (*P. ténuis,* Versch. *P. Jùbæ,* Webb). Resembling *P. dactylifera,* but more slender and graceful in all its parts: lvs. more numerous. Canary Isls. R.H. 1888:181; 1893, pp. 126, 127; 1912, p. 77. G.C. III. 15:405; 32:81; 54:433. V. 19:51. Gng. 5:215; 12:657. Gn. 57, p. 255. A.F. 22:659. G.W. 8, pp. 26, 28. G. 3:379 (as *P. tenuis*). J.H. III. 68:446. Var. **macrocárpa** is cult. in Florida.

EE. *Lvs. more robust.*

F. *Foliage glabrous.*

11. sylvéstris, Roxbg. St. solitary, stout, 25–40 ft. high, clothed with persistent petiole-bases, the crown very large: lvs. 10–15 ft., glabrous, grayish green; petiole spiny; lfts. 1–2 ft., fascicled, 6–18 in. long and ¾–1 in. broad, 2–4-ranked, rigid: fr. orange-yellow, the seed rounded at both ends, pale brown. Very close to *P. dactylifera* and perhaps the origin of that plant. India. I.H. 10:351. V. 16:101. F. 1872, p. 29. Gn. 54, p. 117. G.C. III. 10:105. G. 1:248; 9:116. R.H. 1912, p. 149. —A hybrid of *P. sylvestris* and *P. canariensis* secured by E. H. Hart is highly praised.

FF. *Foliage glaucous.*

12. dactylífera, Linn. (*P. cycadifòlia,* Hort.). Date Palm. Fig. 2920. St. erect, to 100 ft. and more: lvs. glaucous, arcuate-ascending; lfts. linear-lanceolate, acuminate, 8–16 in. long, strongly complicate, the lower 4-ranked, the upper 2-ranked, irregularly and remotely aggregate: fr. cylindrical-elliptical, 1–2 in. long. Arabia, N. Afr. R.H. 1893, p. 127; 1912, p. 109. G.W. 11, p. 24. Var. **excélsa,** Hort., is cult. in Fla. See *Date.*

P. andamanénsis, Hort. Similar to P. rupicola, but more elegant, differing from those in cult. by the regularity of its pinnæ and narrowness of the terminal one. Andaman Isls.—*P. dumòsa,* Hort. Saul, 1893. Of "dwarf habit." Seems unknown to botanists. —*P. natalénsis* and var. *variegàta* are offered, but no description is available.—*P. paradènia* is advertised.—*P. Sanderiàna.* Presumably intro. within recent years by Sander & Co., St. Albans, England.

Wilhelm Miller.
Jared G. Smith.
N. Taylor.†

PHOLIDOCÁRPUS (Greek, *scale* and *fruit:* the fruit is covered with a scaly coat). *Palmàceæ.* A palm of the oriental tropics. Trunk tall: lvs. orbicular, 4–5-parted; petiole spinous: fr. globose or ovoid with a tessellated pericarp; seed laterally inserted. About 5 species, Malaya, all very imperfectly known. One species, *P. Ìhur,* Blume, is sometimes grown in the warmhouse and may be suitable for outdoor growth in S. Calif. This has lvs. similar to those of *Borassus flabellifer,* the petioles are armed with stout spines, the spadix loosely branched and the drupe ovoid, about as large as a fair-sized hen's egg, the rind rugose and tessellated and has 3–4 seeds. Malaya.

PHOLIDÒTA (Greek, *scale* and *ear;* the scales of the unopened raceme are said to recall the rattle of a snake). *Orchidàceæ.* Orchids with the habit of Cœlogyne, to be grown in a warmhouse, 55° to 65°.

Rhizomes creeping: pseudobulbs consisting of a single internode: fls. small, short-pedicelled, in slender racemes, each with a large bract; sepals and petals short, broad; labellum excavated or sac-like; column very short, winged around the top.—A small genus containing about 20 species, natives of India, S. China, and the Malay Archipelago. For cult., use strong light rich potting material, broken pots, old dry cow-manure, plenty of drainage. Do not allow to become very dry.

imbricàta, Lindl. Pseudobulbs oblong sulcate: lvs. oblong-lanceolate, plicate, 6–12 in. long: raceme long-peduncled, 3–8 in. long; fls. small, rather crowded on the raceme, white or yellowish, with a shade of violet. Feb.–May. India. B.R. 1213; 1777. L.B.C. 20:1934.

chinénsis, Lindl. A small creeping epiphyte: pseudobulbs cespitose, 1–2-lvd.: lvs. oblong-undulate, acuminate: fls. greenish white, in drooping racemes not more than 2–3 in. long; sepals ovate; petals linear; labellum oblong, recurved.—This plant has long been known from Chinese drawings.

Heinrich Hasselbring.

PHORADÉNDRON (Greek, *tree thief*). *Loranthàceæ.* The mistletoe of E. N. Amer. is *P. flavéscens,* Nutt. (*Viscum flavéscens,* Pursh), Fig. 2921. It is parasitic on deciduous trees as far north as N. J. and S. Ind. and extending southward to Fla. and Texas; also Calif. F.R. 3:590. It makes dense bunches 1–3 ft. across, with thick oval or obovate yellowish green evergreen lvs. The forking twigs are terete, and break easily at the base. The fls. are diœcious, borne in very

short spikes or catkins: berries amber-white, globular, small. It is collected for Christmas greens (see *Greens, Christmas*). The Old World mistletoe is Viscum; see also *Loranthus*. (Trelease, Phoradendron, 1916.)

The phoradendrons are not cultivated. There are about 100 species of them, all American, largely tropical, but a few in the western states. The oak mistletoe of California is *P. villosum*, Nutt. A related genus is Arceuthobium (or Razoumofskya), extending across the continent of North America, but too small, or even minute, to have decorative value.

2921. American mistletoe.—Phoradendron flavescens. (×⅓)

PHÓRMIUM (Greek, *basket;* referring to one use to which this fiber plant is put). *Liliàceæ.* NEW ZEALAND FLAX. Very stout rigid perennial herbs prized in subtropical gardening, and in New Zealand used for fiber.

Leaves all radical from a short and stout branched fleshy-rooted rhizome, long-ensiform, equitant, yielding an exceedingly tough fiber: scape tall and leafless, with caducous bracts, short-branched toward top: fls. dull red or yellow, in a terminal panicle, on jointed pedicels; perianth tubular and curved, of 6 segms. connate at base, the 3 inner ones long and spreading at tip; stamens 6, exceeding the segms.; ovary oblong and 3-angled and 3-celled, bearing a slender declinate style: caps. oblong or narrower, loculicidal, bearing many compressed black seeds.—Species 2, in New Zeal. and Norfolk Isl. These plants are popular outdoor subjects in Calif. and climates of like mildness, making very bold lawn clumps. In regions of cold winters, they are known as greenhouse tub-plants or as subjects for planting out in summer in subtropical bedding. They are prop. by seeds or division; if by the latter method, it is well that they be planted outdoors in sandy soil in May and divided in September.

For certain combinations and in places where it can have plenty of moisture, *Phormium tenax* is a valuable plant, having a very distinct and unusual character all its own. The type is easier of cultivation than the variegated kinds. Much better results can be secured by raising the typical form from seeds than by division. Seed sown in February and grown on rapidly will make good plants for bedding purposes the spring of the following year. The seedlings may be either planted out or grown in pots: in the latter case, give a rich compost and plenty of water after the plants have taken hold. With good treatment one may expect at the end of a year and a half a well-furnished specimen 3 to 3½ feet high in a 6-inch pot. If one can afford room in a warmhouse, so much the better. The variegated forms require partial shade and uniform moisture; they do not come true from seed. (J. F. Cowell.)

A. *Lvs. to 9 ft. long (in the wild), deep green, glaucous beneath, usually margined with a colored line.*

tènax, Forst. NEW ZEALAND FLAX. Fig. 2922, Robust: lvs. attaining 9 ft., 2–5 in. wide, flat above, dark green, margin and keel bright red or brownish: scape 5–10 or even 15 ft. high, terete and glabrous, reddish purple, bearing numerous fls. which are usually dull red but varying almost to pure yellow; perianth 1–2 in. long: caps. stout, erect or inclined, 2–4 in. long. B.M. 3199. Gn. 26, p. 397; 50, p. 369; 70, p. 99; 73, p. 123. G. 33:553; 36:554. F.E. 18:288. G.L. 27:219. A.F. 13:748. R.H. 1848:5. V. 13:340. Var. **atropurpùreum,** Hort., has reddish purple foliage. R.H. 1877, p. 389. Var. **atropurpùreum variegàtum,** Hort., a "veritable fountain of white, purple and rose-color." Var. **atropurpùreum nànum,** Hort., is a dwarf form. Var. **nìgro-pìctum,** Hort. (*P. purpùreum nìgro-limbàtum,* Hort.). Lvs. deep green, with a narrow margin of blackish purple, which becomes broader and more distinct toward the base, making in mature plants a zigzag line which outlines the 2-ranked habit of the lvs. Var. **variegàtum,** Hort., lvs. striped creamy yellow and white. R.H. 1878, p. 86. G.C. III. 29:169. Var. **Veitchiànum,** Hort. (var. *Veìtchii* and *P. Veitchiànum,* Hort.), broad creamy white stripes on a light green ground. A.F. 5:39. The type and varieties all have the red margin. Var. **Powerscoùrtii,** Hort., differs from the type in narrower and more rigid lvs.; said to be hardier and freer-blooming. G.W. 1907, p. 3.—*P. tenax* is a most useful fiber plant in New Zeal., ranking in economic importance in the native flora only below the main timber trees.

AA. *Lvs. to 5 ft. long, pale green, seldom glaucous or margined.*

Cookiànum, Le Jolis (*P. Colénsoi,* Hook. f. *P. Forsteriànum,* Col. *P. Hoòkeri,* Gunn.). A smaller plant and less rigid: lvs. 2–5 ft. long, the apex usually much less split than in *P. tenax:* scape 3–7 ft. high, more slender, green, with smaller panicle: perianth 1–1½ in. long, yellower than the above: caps. long, pendulous, terete and twisted, 4–7 in. long. Var. **variegàtum,** Hort., has yellowish white stripes. F.M. 1874:112. G.Z. 19:113. *P. flàccidum,* Hort., is presumably a form of this species.

WILHELM MILLER.
L. H. B.†

2922. Phormium tenax.

PHOTÍNIA (Greek, *photeinos,* shining; alluding to the shining foliage). Including *Heterómeles* and *Pourthièa. Rosàceæ,* tribe *Pòmeæ.* Ornamental woody plants, grown for their attractive flowers and fruits and the evergreen species also for their handsome foliage.

Deciduous or evergreen shrubs or trees: lvs. alternate, short-petioled, stipulate, usually serrate: fls. in corymbs or short panicles; petals 5, orbicular; stamens 10–20; styles 2, rarely 3 or 4, connate at the base: fr. a small, 1–4-seeded pome with persistent calyx and with the top of the fr. rounded and hollow.—About 30 species, nearly all in E. and S. Asia, only 2 in Calif. and Mex.

Closely allied to the Aria group of Sorbus, which differs chiefly in the top of the fr. being solid and pointed.

The photinias in cultivation are shrubs, rarely trees, with rather large evergreen or smaller deciduous leaves turning scarlet or deep red in fall and with white flowers in many-flowered or sometimes few-flowered corymbs followed by very attractive red or scarlet fruits. The evergreen species are tender in New England, and bear only a few degrees of frost; but the deciduous *P. villosa* is hardy as far north as Massachusetts, and is very conspicuous in fall by the scarlet coloring of the foliage and afterward by the numerous scarlet fruits, which retain their bright color until midwinter and are not eaten by birds. Of the evergreen species, *P. arbutifolia*, which is very similar to *P. serrulata* and also to *P. glabra*, is the best known; it is a very striking object in winter, with its large clusters of bright red fruit ripening in December and contrasting well with the glossy dark green foliage. The photinias are not very particular as to soil, but thrive best in a rather light sandy loam, and the deciduous ones prefer sunny positions. Propagation is by seeds or by cuttings of half-ripened wood under glass and by layers; also by grafting on hawthorn or quince.

A. *Lvs. deciduous: fls. in corymbs or umbels.* (*Pourthiæa.*)

villòsa, DC. (*P. variábilis,* Hemsl. *Pourthièa villòsa,* Decne. *Sórbus terminàlis,* Hort.). Upright shrub, to 15 ft., with slender spreading or upright branches, or small tree: lvs. short-petioled, broadly obovate to oblong, cuneate, acuminate, sharply serrate, dark green and glabrous above, more or less pubescent beneath when young, 1½–3 in. long: fls. white, in 1½–2-in.-broad, glabrous or villous corymbs terminal on short lateral branchlets: peduncles warty: fr. about ⅓in. long, bright scarlet. June; fr. in Oct. Japan, China. G.F. 1:67. S.I.F. 1:49.—A very variable species. Var. **lævis,** Dipp. (*P. lævis,* DC. *Pourthièa argùta,* Hort.), Fig. 2923, has narrower lvs., only sparingly pubescent when young and soon glabrous, glabrous infl. and somewhat larger fr. G.F. 4:377 (adapted in Fig. 2923). Var. **sínica,** Rehd. & Wilson. Shrub or tree, to 30 ft.: lvs. thinner, elliptic or elliptic-oblong, sparingly pubescent at first, soon glabrous: infl. an umbel-like 5–8-fld. raceme, rarely corymbose, to 15-fld., loosely villous. Cent. China.

subumbellàta, Rehd. & Wilson. Slender-branched shrub, 3–10 ft.: lvs. very short-stalked, elliptic-ovate to rhombic-ovate, acuminate, broadly cuneate or rounded at the base, sharply serrulate, glabrous, bright green above, pale or glaucescent beneath, 1½–2½ in. long: fls. in umbel-like 2–9-fld. glabrous racemes subtended by 2–3 crowded lvs.; pedicels slender, ½–1 in. long: fr. ovoid, nearly ½in. long, scarlet. May, June; fr. in Oct. Cent. China.

AA. *Lvs. evergreen: fls. in broad panicles.*

B. *Stamens 20.* (*Euphotinia.*)

C. *Petioles longer than ½in.: lvs. usually 4–6 in. long.*

serrulàta, Lindl. (*P. glàbra* var. *chinénsis,* Maxim. *Cratægus glàbra,* Sims, not Thunb.). Shrub, to 20 ft., quite glabrous: winter buds about ⅛in. across, ovoid: lvs. with about 1-in.-long petioles, oblong, usually rounded at the base, acuminate, serrulate, dark green and shining above, yellowish green beneath, 5–7 in. long; petioles about 1 in. long: panicles 4–6 in. broad, with thick sh and slightly angular branches; fls. ¼in. across: fr. globose, ¼in. across, red. May–July. China. B.M. 2105. L.B.C. 3:248. L.D. 8:554 (all as *Cratægus glabra*). G.W. 15, p. 247.—Stands fairly well in Washington, D. C.

Dàvidsoniæ, Rehd. & Wilson. Tree, to 45 ft.: winter buds minute, acutish: branchlets appressed-pubescent while young: lvs. oblong-lanceolate or oblong, acuminate or acute cuneate at the base, serrulate, lustrous and bright green above, paler beneath and pubescent on the veins at first, soon glabrous, 3–5 in. long; petioles about ¾in. long: panicles 4–5 in. broad with slender terete branches, sparingly pubescent; fls. nearly ½in. broad: fr. subglobose, orange-red, ⅓in. across or slightly more. May: fr. in Oct. Cent. China.—One of the handsomest evergreen trees of Cent. China; recently intro.; probably as hardy as the preceding species.

CC. *Petioles shorter than ½in.: lvs. usually 2–3 in. long.*

glàbra, Maxim. (*Cratægus glàbra,* Thunb. *Sórbus glàbra,* Zabel). Shrub, to 8 ft.: lvs. on nearly ½in.-long petioles, elliptic or obovate to oblong-obovate, cuneate at the base, acuminate, serrulate, 2–3½ in. long: panicles 2–4 in. across; fls. ⅓in. across: fr. subglobose, red. May–July. China, Japan. S.I.F. 1:47.

BB. *Stamens 10.* (*Heteromeles.*)

arbutifòlia, Lindl. (*Heterómeles arbutifòlia,* Roem. *H. salicifòlia,* Abrams. *Cratægus arbutifòlia,* Ait., not Lam.). Toyon. Tollon. Shrub or small tree, to 20 ft.:

2923. Photinia villosa var. lævis. (×⅔)

young branches and infl. usually tomentulose: lvs. oblong to oblong-lanceolate, acute at both ends, sharply serrate, shining above, 2–4 in. long: fls. white, in 2–5-in. broad panicles; stamens 10: fr. bright red, ⅓in. across. June, July; fr. in Nov.–Feb. Calif. S.S. 3:193. B.R. 491.—Called Christmas berry in Calif., where the frs. are much used for Christmas decoration.

P. amphidóxa, Rehd. & Wilson (Stranvæsia amphidoxa, Schneid.). Shrub, to 10 ft.: lvs. deciduous, elliptic to oblong, serrate, loosely tomentose at first, soon glabrous, 2–3½ in. long: fls. 3–6; calyx densely tomentose: fr. subglobose, scarlet, ½in. across. Cent. China.—*P. argùta,* Wall. (Pourthiæa arguta, Decne.). Closely allied to P. villosa: lvs. longer and narrower, firmer, densely white-tomentose beneath when young: corymbs larger. Himalayas.—*P. Beauverdiàna,* Schneid. Shrub or small tree, to 20 ft.: lvs. deciduous, oblong or obovate-oblong, densely serrulate, glabrous, 2½–4 in. long: corymbs 2 in. across: fr. subglobose, scarlet, ¼in. across. Cent. China. Var. *notábilis,* Rehd. & Wilson (P. notabilis, Schneid.). Lvs. elliptic to obovate-oblong, 3–5 in. long: corymbs loose, 3–4 in. across: fr. ovoid, ½in. long. Cent. China.—*P. elliptica,* Nichols., is Eriobotrya elliptica, Lindl., a Himalayan species not in cult. in this country.—*P. japónica,* Nichols.=Eriobotrya japonica.—*P. parvifòlia,* Schneid. Shrub, to 6 ft.: lvs. elliptic, long-acuminate, serrulate, nearly glabrous, 1½–2 in. long: fls. 2–3 on filiform stalks 1–2 in. long: fr. ovoid, scarlet, ⅓in. long.

Alfred Rehder.

PHOTOGRAPHY, HORTICULTURAL. As a means of description and of record, photography is of great importance to horticulture in all its branches. A reference to newspapers, magazines, and to trade catalogues of the day shows an almost universal use of the "half-tone" engraving process; and these engravings are merely photographs transferred to a copper plate, and by means of minute chemically-etched dots given a printing surface for the typographic press. Many other illustrations—notably many in this Cyclopedia—are adapted from or drawn directly from photographs, being then engraved by another photographic etching process on hard zinc. Other processes are now employed, as yet principally for newspaper use, which transfer much of the beauty of the photograph through the photogravure method. As will be noted farther on in this article, there is also actual photography in colors now available. To a limited and decreasing extent, photographs are also printed on the prepared surface of boxwood blocks, and used in lieu of a drawing as a sketch for the wood-engraver.

Every experiment station and agricultural college finds in photography an indispensable adjunct both to its records and to its descriptive work. For the botanist, photography provides both an uniquely accurate means of recording plant details, and of portraying the appearance of the growing plant in its habitat. A photographic herbarium is an excellent supplement to the usual dried specimens of the botanist. Some of the larger nursery and seed establishments are also coming to maintain photographic equipments, in order that they may readily preserve views of the varieties which it is desired to advertise.

In horticultural journalism, photography is of prime importance. In advanced collegiate institutions and at the meetings of various progressive horticultural societies and institutes, the presentation of photographs by means of the stereopticon is found to be of enormous advantage, and the teaching or entertainment is made more efficient through this means. Recently, the motion-picture camera, through the use of which in connection with suitable projecting apparatus, operations in the field are presented a close simulation of actual life, has been availed of to advantage. For example, a "film" of considerable length records all the operations attendant upon the planting, cultivation and marketing or preserving of asparagus in the large areas devoted in California to the culture of that vegetable. A drama has been "staged" at a great gladiolus farm, and one rather grotesque film ingeniously recorded the seemingly accelerated growth of an unfolding lily and of a rose in the process of opening. Therefore, all branches of horticultural activity are concerned with photography, and the progressive instructor dealing with horticultural problems in an educational institution, or handling the government's money in the experiment-station work, must be able to practise at least some one photographic method with a fair degree of proficiency, if he is to accomplish the best results.

As horticultural photography differs essentially from the line of work in which the ordinary portrait photographer is engaged, some special skill and certain items of equipment are desirable for the tradesman, or experimenter, or teacher who wants to make his illustration effective. Those who deal with many photographs from many "artists," come to know the thoroughly inadequate work of the ordinary professional, who is fitted both as to equipment and skill only for the picturing of the human face and form. Not once in twenty times does satisfactory and efficient horticultural photographic work come from the professional; and, therefore, the horticultural instructor or tradesman is best served by taking up photography in an independent manner, if he gives the subject adequate attention.

Apparatus.

For views outdoors of trees, plants, and the like, any view camera of the regulation or of the "folding" type will answer, although, as it is often desirable to obtain relatively large details of fruits or flowers or plants *in situ*, a bellows of more than the usual focal capacity or length is preferred. The modern "long-focus" cameras are suitable, and the size most used by horticulturists is that taking a plate 5 by 7 inches in dimensions. For such size a rectilinear lens with a focal length of 7 or 8 inches is advisable; and if one of the two lenses forming the combination is available as an objective of about double the focal length of the combination, and the camera is provided with a bellows which draws out several inches beyond the focal length of this single lens, much facility in operation is provided. Any of the modern high-class view lenses are suitable, and those of the anastigmatic type, which are not only rectilinear but also render views in a flat and correct perspective, are preferable. It need not be assumed, however, that the very highest-grade lens is essential, for in the hands of a thoughtful and reasonably skilful operator, an ordinary rectilinear lens, costing, for the size mentioned, but $15 or $20, will often do satisfactory work. Whatever lens is used, it should be fitted into a quick-working shutter, as outdoor exposures, with modern rapid plates, must be made in small fractions of a second. The shutter, it may be explained to the unacquainted reader, is merely a convenient device for opening and closing the lens to the light for the interval of time desired by the photographer.

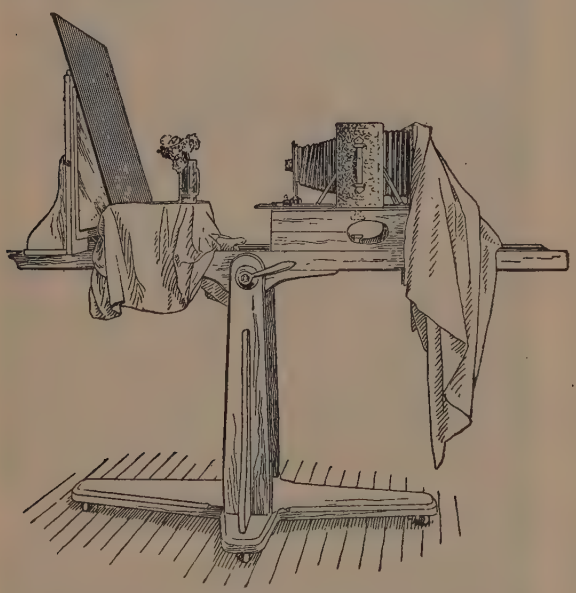
As there is frequent misconception of the work done by a lens, it may not be amiss to suggest to the inquiring horticultural photographer an investigation on his own account. The Photo-Miniature No. 140, "Lens Facts You Should Know," is a brief, clear, and concise statement of the principles, properties, and construction of lenses, which may be consulted to advantage. The focal length of any lens, in connection with the size of the plate upon which it is to be used, determines the angle and amount of view included. The human eye is a lens of about 16 inches focal length, and to have a photograph render perspective as seen by the average eye, an objective of the same focal length is required. Thus, on a 5 by 7 plate, a lens of 8 inches focal length will include twice as much in the view, and show it in half the size as seen by the eye. This forced perspective is sometimes desirable and sometimes unpleasant. If the 8-inch lens is composed of two elements on what is known as the symmetrical plan, the rear element may usually be used alone (by screwing out the front lens), and it will have approximately double the focus of the combination. This will give about the perspective seen by the human eye, and will need to be used in connection with a bellows of at least the same length or "draw" as the focal length of the lens. Some of the high-grade lenses are now made on what is termed the "convertible" plan, each of the two elements being of a different focal length. Thus a certain lens which as a whole is of 7½ inches focus, includes one element of 12 inches focus and one element of 18 inches focus. Either of these single lenses, or the combination, may be used separately, so that from a given position three views, including proportions differing as 5, 8, and 12, may be made.

To photograph an object in natural size, the double lens is preferable. If the lens is of 8 inches focus, it will give natural size when placed equidistant between the object and the ground-glass focusing-screen of the camera, at double its focal length. Thus the bellows would need to be drawn out so as to have 16 inches between the ground-glass and the lens, while the object to be photographed should be maintained in position 16 inches from the lens.

A tripod, capable of adjustment as to height, and of

sufficient rigidity to sustain the camera in a moderately high wind, is easily obtained. The cheaper forms are fairly efficient, but the photographer who has much traveling to do finds it preferable to obtain one of the more expensive and carefully fitted types, which fold into a smaller compass.

For indoor work, including the making of photographs of fruits, flowers, or plants in large detail, a special form of camera-stand is very desirable. One arranged so that the camera may be maintained in an inclined or nearly vertical plane, while the object to be photographed rests on a plate-glass exposing-stand in front of the lens, gives great facility and ease of operation, and does away with many difficulties of illumination. A few experiment stations possess devices of this kind. A form which has been found exceedingly satisfactory in practice is described in an out-of-print number of The Photo-Miniature, "Photographing Flowers and Trees," and is here reprinted by permission in Figs. 2924 and 2925, showing the camera-stand both as arranged for horizontal and for vertical work.

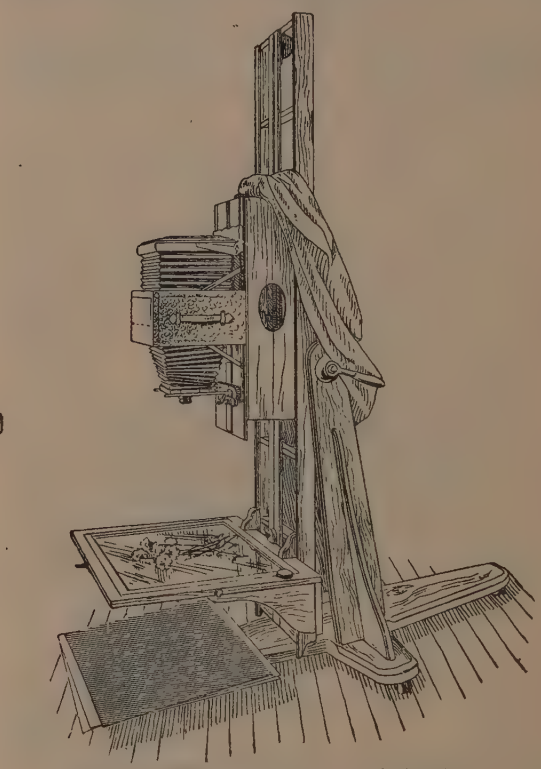


2924. Adjustable camera-stand, horizontal position.

In operation with this device the flower, fruit, or plant to be photographed is laid upon or placed in front of the plate-glass stand, and the camera, fastened by its tripod screw upon a movable bed, is adjusted as a whole, or through its bellows, until the desired size and focus are secured. The background may be varied as desired by cardboards or cloths placed out of focus in relation to the plate-glass stand. The camera-stand is mounted on casters, so that it may be readily moved about to secure the most favorable lighting. Objects which can best be handled on a horizontal plane may be disposed somewhat as shown in Fig. 2924. For work of this sort a north side-light is found vastly preferable to the conventional sky-light. A greater mistake in the equipment of a studio for horticultural work could not be made than to provide the sky-light deemed essential by old-fashioned professional photographers, although now happily abandoned by the more progressive workers for a "single-slant" light, which gives far better results. There should be provided in the workroom of the horticultural photographer several good reflecting surfaces, so that the side of the object opposite the main source of light may be properly illuminated.

All the apparatus above mentioned is applicable to color-photography by the Lumière method, as hereinafter sketched; but motion-picture photography requires apparatus peculiar to itself.

Under certain conditions, the use of the "flashlight" methods may be advantageous in horticultural photography; as, when an outdoor object must be obtained at night, or indoors where a flower may wilt under prolonged exposure. Flashlight processes depend upon the explosion or the rapid combustion of certain metals—as magnesium—which, either alone or in combination with oxygen-giving chemicals, produce a light of great brightness and high actinic power for an instant. Further information upon flashlight may be found in



2925. Adjustable camera-stand, vertical position.

The Photo-Miniature No. 135, "Flashlight Photography."

The horticultural photographer also requires an outfit for developing and printing; but as this may be conventional, it is not deemed necessary to discuss it here.

Plates and color-values.

As practically all horticultural photography has to do with the tints of growing things, the well-known color inaccuracy of the ordinary dry-plate is a serious disadvantage. The ordinary plate responds most actively to the rays at the blue end of the spectrum, and is very sluggish in taking an impression from green, yellow and red, the latter color, indeed, being rendered practically the same as black. Yellow, which in actual color-value is on a par with light blue, and sometimes to the eye seemingly more intense than white, is rendered by the ordinary plate as a dark color, as all operators who have photographed yellow roses, yellow apples, yellow plums, and the like, will have observed. Fortunately, there are available photographic plates, known as isochromatic or orthochromatic plates, which, to a certain extent, correct these difficulties;

and the skilful operator may, by the use of the proper plate and in some cases a suitable ray-filter, give approximately correct values to all the colors of the spectrum. For all ordinary horticultural uses, when blue and yellow are not found in the same subject, the commercial orthochromatic or isochromatic plates of the most rapid speed are satisfactory. These give to yellow its proper value, at the same time improving the rendering of the green foliage and slightly increasing the truth of representation in pink, lavender, and the lighter red shades.

It is very much better, then, for the photographer who has to do with horticultural work to confine himself exclusively to these plates for all his work. If he has a subject including blue flowers, the especial activity of the blue rays, which otherwise would render the photographic impression as intense as if the object was white, can be restrained by a suitable ray-filter, which is applied in front of the lens. This ray-filter is either a glass cell filled with a 1 per cent solution of potassium bichromate, or a piece of plane optical glass covered with a suitably stained collodion film sealed with another optical glass and provided with a convenient mounting for slipping on the lens. (Such ray-filters may be commercially obtained at small cost, but ought to be known to be adequate for the particular plate to be used.) With this ray-filter and the plate before alluded to, the yellow is slightly over-valued, but the blue is given its proper relation. The beauty of outdoor photographs is vastly increased by the use of the plate and ray-filter mentioned, because a proper color-value is given to the sky, and the cloud-forms are preserved in all their attractiveness. If the subject is a heavily loaded peach tree, for example, the accentuation of the yellow, brought about by the use of the ray-filter, will give a needed slight exaggeration of color-value to the fruit, which, under treatment by an ordinary plate, will be almost indistinguishable from the mass of foliage. With the usual ray-filter the exposure required is practically trebled. In this Cyclopedia, advantage has been taken of orthochromatic plates in photographing many of the subjects. The carnations, Plate XXII, Vol. II, show a variety of shades properly rendered by the means indicated. The grapefruit, Plate L, Vol. III, is an example of the use of the ray-filter also to obtain the full color-value of the fruit.

A difficulty known in photographic practice as halation must also be counteracted if the fine detail of subjects involving much light is to be preserved. Halation is caused by the reflection of brilliantly lighted objects from the back of the glass plate carrying the sensitive emulsion. Light possesses enormous velocity, and there is an almost inconceivably rapid play back and forth between the two surfaces of the glass plate, which is covered only on its face by the sensitive photographic emulsion. This results in a thickening of all the finer lines which should be rendered in the positive as white. It may be counteracted by "backing" the plate with a composition which will absorb all the rays of light that pass through the emulsion on the face; but in current practice a slightly less adequate and much more convenient prevention of halation is secured in the use of what are known as "double-coated" plates. A "slow" emulsion, first coated on the plate, is covered by a "fast" emulsion, with the effect of absorbing into the under-coating, in exposure, the overplus of light. These plates, incidentally, also give greater latitude of exposure, and their use is recommended, with the provision that both coatings should by all means be orthochromatic.

Even with the aid of the isochromatic plate and the ray-filter, the photography of shades of red is difficult, because of the lack of actinic or chemical quality in the red rays of the spectrum. In practice it is found necessary to give a very much prolonged exposure to objects containing red, and then to restrain the over-exposure upon development by means of a suitably compounded developing solution.

Lantern-slides.

A lantern-slide is a positive on glass, and therefore is made from a negative. It is made preferably on a special plate, much slower than the regular photographic dry-plate, because coated with silver chloride rather than a silver bromide emulsion. The slide is usually faced with a paper mask, so as to include only the desired portions of the picture, and protected by a cover glass. Negatives of any size may be used if a suitable arrangement is provided for reduction. This can readily be arranged by an adaptation of the camera-stand illustrated in Fig. 2924. A pair of light bars is added, running from the top of the plate-glass frame to a support at the other end of the stand, and a piece of heavy muslin or light canvas thrown over this serves to exclude the excess of light. A ground-glass frame is added back of the plate-glass, which latter is removed to give place to a turn-table arrangement, made to take and hold negatives of various sizes. In practice, the ground-glass end is turned toward the strong light, the negative to be used is adjusted in the turn-table, and the image focused in the camera as usual. The 5 by 7 size largely used by horticulturists is in just the right proportion for the ordinary lantern-plate of American practice, which is 3¼ by 4 inches. Slides may also be made by contact, if the negative to be used is of suitable size. The familiar 4 by 5, 3½ by 3½, and 3¼ by 4¼ hand-camera films are often so used, being placed in contact with a lantern-plate in an ordinary printing-frame, and given a short exposure to an artificial light. Such slides are seldom of good quality.

If it is required to make lantern-slides from diagrams, engravings or any positive material, a negative is first prepared, for making which the vertical position of the camera-stand (Fig. 2925) is very convenient. For many diagrams and for most "reading slides," there is much advantage in making the slide directly without the intervention of a negative, with the result that the letters or lines are shown as clear glass. The audience sees only the message or object, the background being dark; and the excessive light reflection, tending to tire the eyes, is avoided.

In making lantern-slides, it is important to learn the proper exposure, for errors in exposure cannot be corrected in development to any great extent. The careful worker will expose several plates upon the same subject, give all the same development, and act upon the experience thus gained. The standard all too often accepted by those who use lantern-slides is unfortunately low. Manufacturers competing wholly on the lowest price basis have accustomed even thoughtful persons to think their productions adequate, instead of which they are unfortunate, because they belie rather than reproduce the object to be shown.

Lanterns for projecting these slides are now simple, convenient, and cheap. One form, available wherever access may be had to an electric-light socket, can be carried in a small case and set up for use in less than ten minutes. It perfectly projects an image up to 6 or 8 feet in diameter, and is without complications. Built of aluminum, it is solid and durable, and its cost is but one-fourth that of former apparatus.

Colored lantern-slides.

The value of a good lantern-slide is increased more than tenfold if the slide is so colored as to show upon the screen the object or scene in natural hues. It is not difficult, with suitable knowledge and sufficient practice, so to tint the lantern-slide as to accomplish this object, and there are a number of notably successful colorists whose work has given information and pleasure to thousands.

In practice, if a lantern-slide is to be colored, it is

usually made slightly less dense or "contrasty" than if it is to be shown without color. A photographer's retouching stand, which excludes light from the eyes of the worker and reflects light through the ground-glass and also through the slide to be colored, is needed. Coloring is effected by means of the use of dyes and stains of various characters, usually obtainable in the market. The color is applied by the use of brushes of varying sizes. The capable worker constantly compares the result of his efforts, either with standard slides of high quality or through projection upon a screen by means of a small lantern.

One reason why colored lantern-slides are so much more effective than those uncolored is in their exclusion of excessive light, which tends to dazzle and weary the eyes of the spectator, as previously suggested. Thus, a sky is blue and agreeable rather than white and dazzling.

Transparent colors must be exclusively employed, inasmuch as the effect to be obtained on the screen through projection is wholly that of transmitted light, and not by reflection.

The use of lantern-slides in general and of colored slides in particular for educational purposes has been greatly fostered by the action of several states in establishing departments of visual instruction, in which are grouped collections of carefully made lantern-slides upon various subjects, frequently available to residents of the particular states without other charge than transportation and a responsibility for damage. Pennsylvania, New York, Washington, Illinois, and Kansas are known to maintain such departments.

Motion-picture photography.

Reference has been made to the recent development of motion-picture photography. Motion-pictures are at present being viewed by many millions of persons daily in the various centers of population in the United States, but as yet little organized effort has been put forth for preparing motion-pictures primarily for educational purposes. Through the federal government, and in the Department of the Interior, the national parks are brought into notice by means of motion-picture films; and it is probable that a motion-picture outfit, both for the making of the exposures and for the proper display of the result, will shortly become an essential factor in connection with any modern educational institution. Particularly in reference to horticulture is it probable that the motion-picture will show to advantage orchard and planting operations and the growing of great crops (as before mentioned in connection with asparagus, for example), and similarly will teach quickly and entertainingly many things now less adequately presented.

Photography in natural colors.

Many investigators have worked on this problem, but without what might be called reasonable and available success, until, in 1907, the Lumière brothers, acute opticians and plate manufacturers at Lyons, France, painstakingly developed what is known as the autochrome process. This process uses the known but unappreciated fact that color is not an inherent property of matter, but a sensation of the eye relating wholly to the character of light reflected from any object. Exceedingly minute particles of nearly transparent starch, colored to three primary hues, are intermingled and spread in a single layer over the surface of a glass plate, and upon this layer there is coated a sensitive and so-called panchromatic photographic emulsion. These minute starch particles, averaging about 5,000,000 to the square inch, serve when the prepared plate is exposed glass side to the object (contrary to the usual practice) to separate or screen out the reflections from the object transmitting certain intensities relating to the colors then expressed in that particular light. Thus, from a red rose with green leaves, light is reflected through these dots to the effect that the underlying photographic emulsion is suitably affected for the purpose in mind. After exposure there occurs a process of development and re-development which removes most of the photographic emulsion save such as marks out the delineation of the object as depicted by the lens, and as will serve to obscure the colors not wanted.

Under favorable conditions, the effect is an actual photograph in color upon a glass plate or transparency, which must be viewed as such by transmitted light suitably reflected from a white cloud or a white surface. If the light used in reflection has a differing spectrum from that used in the making of the view, the colors will not be seen as they were when the photograph was taken.

As yet no means have been devised for adequately duplicating these transparencies on glass, which, therefore, while very beautiful when properly made and viewed, serve rather as color memoranda or records than for the reproductive purpose conceived of an ordinary photograph.

In this book use has been made of the autochrome for obtaining the color records upon which the various color plates have been produced. For example, Plate VIII, Vol. I, showing the York Imperial apple, is a successful reproduction of an autochrome, as also is Plate XX, showing hardy bulbs in full color, and Plate XXV, celery, showing current commercial practice in exact color.

These autochromes are relatively expensive to make, but require only a special ray-filter in addition to the ordinary camera equipment. With autochrome plates the careful worker is able to obtain many important and delightful records.

Inasmuch as the autochrome is viewed with success only by transmitted light, it early occurred to those working in this method to propose the autochrome as a means of obtaining a perfectly colored lantern-slide. Several collections have been made which show in an exceedingly beautiful manner great scenery, portraits, and the like, but the disadvantages encountered are to the effect that inasmuch as the autochrome is much less transparent than the average lantern-slide, it cannot be shown with success in connection either with an uncolored or a colored lantern-slide. If autochrome lantern-slides are grouped together and shown in a relatively small image with a very intense light (preferably that of the electric arc only), the result is excellent.

Other methods said to accomplish color photography spring up from time to time. So far, however, not one of them has been found to be of a permanently valuable and desirable character, or in any sense equal to the autochrome, which in itself is rather inadequate.

The use of photography in relation to horticultural education and merchandising is merely in its infancy. It is probable that greatly improved methods of reproduction will permit of the more extensive and more effective use of photographs, and it seems certain that the moving-picture will assume a much greater importance in educational, philanthropic, and commerical practice. Acquaintance with photography is, therefore, likely to prove of increasing value to the horticulturist.

J. HORACE MCFARLAND.

PHOTOSYNTHESIS. Green plants exposed to sunlight at a growing temperature are able to manufacture organic food substances, that is, carbohydrates. The term photosynthesis, derived from Greek words signifying "light" and "putting together," is applied to this process of food manufacture. Green plants manufacture not only their own food carbohydrates but also are the sources of practically all of the organic matter which may eventually furnish food for both plants and

animals. It may be said, therefore, that life today is dependent upon the green leaf. The first carbon-containing compound made is a relatively simple substance, but the first recognizable material is sugar. The crude materials out of which organic substance is made in the cells of the green tissues are CO_2 (carbon dioxide) and water. The leaf green, chlorophyl, and the protoplasm of the cell may be regarded as the important mechanism, while the source of energy for the chemical change induced is radiant energy, light. Air ordinarily contains about .03 per cent of CO_2, yet the ordinary green plant obtains all of its carbon for the making of organic matter from this extremely small quantity in the atmosphere. The chlorophyl is important inasmuch as it absorbs the radiant energy which is directly or indirectly responsible for the process. Chlorophyl is distributed within the cells in definite granules, or small bodies, protoplasmic in nature, commonly ovoidal in form. The light absorbed is largely from the red or red-orange portion of the spectrum. It is possible that the energy so derived is first transformed into electrical energy, yet little is known upon this point. It is certain, however, that green plants are unable to utilize energy derived, for example, from the absorption of heat. The process may be briefly pictured in the following manner: The cell-sap absorbs the CO_2 which diffuses into the tissues from the air. By means of the energy absorbed by the chlorophyl bodies, within the cells, the CO_2 is supposed to be reduced to CO (carbon monoxide), and the same means resolves the water into its constituents. The products of these molecular changes form new substances, perhaps formaldehyde (CH_2O) and oxygen (O_2). The formation of formaldehyde is still somewhat uncertain; but in any case sugar is soon recognized. In all probability the formaldehyde molecules are immediately condensed to sugar ($C_6H_{12}O_6$). It will be noted that the surplus oxygen is in reality a by-product and during active photosynthesis it is produced in such quantity as to be actively eliminated from the plant by diffusion. The usual test for photosynthesis is carried out by counting the bubbles given off from the cut stem of a water plant exposed to sunlight in a well-aërated vessel of spring-water. The content of oxygen in these bubbles is greater than that of normal air, and the rate of bubble-production is a fair estimate of the rate of photo-synthesis.

As a rule the sugar formed in the leaf does not accumulate to any large extent, but is transformed into starch. Some of the sugar, however, may be immediately diffused to other cells or "transported," supplying the needs of this substance in growth. The starch which is deposited is in the form of insoluble granules, and the formation of these bodies on exposure of the green leaf to sunlight is so rapid as to make it possible in some cases to use starch formation as an index to rate of photosynthesis. During the night, when no photosynthesis occurs, the transformation and removal of the starch usually goes on rapidly, so that within an interval of twelve hours most of that formed during the day seems to have disappeared from the leaf. It is, in fact, changed to sugar prior to transportation but may be removed to other organs of the plant, as, for example, to fleshy roots or tubers, where it may again be converted into starch, accumulating at times to a very considerable extent.

Photosynthesis is most rapid under those conditions of temperature which are favorable for growth. Under strong light and favorable temperature, however, a slight increase in the amount of CO_2 gives a higher rate of starch-production. The presence in the leaf or stem of other color bodies, such as browns and reds, is no indication that chlorophyl is absent. As a matter of fact, chlorophyl is generally present in such cases, but may be veiled by the more prominent color. In showy flowers, however, chlorophyl seldom occurs. Photosynthesis is inhibited by any condition affecting the general health of the plant, and it is low during cold and dark weather. The larger number of plants are most active in the brightest sunlight, but certain shade-loving species are injured by such exposures, and are adjusted to conditions of half-shade, such as obtain in the shade of trees or bushes.

B. M. Duggar.

PHRAGMÌTES (Greek, *growing in hedges*, apparently from its hedge-like growth along ditches). *Gramíneæ*. Large grasses, useful for planting in wet places.

Tall stout perennials with long running rootstocks, strong culms and terminal panicles with the aspect of Arundo: spikelets 3–7-fld. Differs from Arundo chiefly in having glabrous sharp-pointed not bifid lemmas, the long hairs confined to the rachilla-joints, and in that the lowest floret is staminate.—Species 3, 1 in Trop. Asia, 1 in S. Amer. and 1, our species, cosmopolitan.

commùnis, Trin. (*P. vulgàris*, BSP). Common Reed. Culm usually 8–10 ft. high: lvs. 1–2 in. wide. Marshes and along edges of ponds. Dept. Agric., Div. Agrost., Bull. No. 20:126. Gn. 31, p. 33.—The ornamental feathery drooping panicles appear in late summer or autumn. A form with variegated lvs. is sold under the name *P. commùnis variegàta*, or spire-reed.

A. S. Hitchcock.

PHRAGMOPÈDILUM (Greek, *phragmos*, a fence, alluding to the divisions of the ovary). *Orchidàceæ*. Terrestrial or epiphytic glasshouse orchids, formerly included (with Paphiopedilum) in Cypripedium.

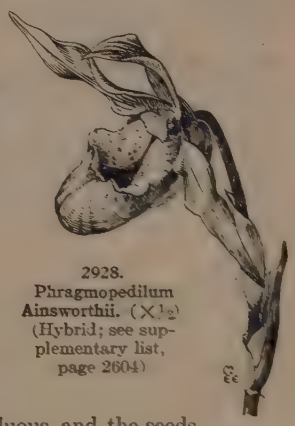
Flowers numerous, deciduous, in a raceme or panicle; sepals 3, the lateral united into one organ located beneath the lip, the other back of the column known as

2926. Phragmopedilum Schlimii. (×⅓)

the dorsal sepal; petals 3, the lateral similar, the other widely different, forming a pouch or sac known as the lip, the margins all around the orifice reflexed or turned in; column short; stamens 2; ovary cylindric, 3-celled, the walls thick, the ovules borne on placentæ on the divisions.—About 11 species (Pfitzer, in Engler's Pflanzenreich, hft. 12 [iv. 50], 1903), Trop. Amer. from Panama south. The species here considered were contained in

Selenipedium in Cyclo. Amer. Hort. The genus Selenipedium is still retained by botanists, however, with which Phragmopedilum agrees in the 3-celled ovary but from which it differs in habit, conduplicate coriaceous strap-shaped lvs., the fl. being articulated above the ovary and deciduous, and the seeds being fusiform. The orthography of the name is somewhat confused. The word was originally spelled Phragmopedilum as a section of Paphiopedilum, and this form is adopted by Pfitzer and by Index Kewensis. Rolfe, the English authority, at first wrote it Phragmipedium and more recently Phragmipedilum. (See discussion by him in Orchid Review, 9, 174, 175.)

2927. Phragmopedilum Sargentianum. (×⅓)



2928. Phragmopedilum Ainsworthii. (×⅓) (Hybrid; see supplementary list, page 2604)

All phragmopedilums enjoy plenty of heat and moisture in the growing season, March to November (65° to 90°). Give good drainage. Use chopped sphagnum with broken clinkers from the furnace, and the addition of a little leaf-mold, raising the material as high above the rim of the pot as possible. This material is especially to be recommended for the young and divided plants. Give slight shade, and grow on raised benches near the glass. Water sparingly until growth begins. The four species, *P. Dominianum*, *P. Sedenii*, *P. Schlimii* and *P. Sargentianum*, should not be overpotted. Fill pots three-fourths full of drainage, then place a thin layer of coarse fern-root, which will fill pot to level of the rim. Place the plant on top of this and then fill 2½ to 3 inches with chopped sphagnum and leaf-mold mixed with coarse sand or pulverized coal-clinkers. Keep the moss in a growing condition. (Wm. Mathews.)

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A. *Petals similar to the dorsal sepal; stigma 3-angled-pyramidal*..... 1. Schlimii
AA. *Petals narrower and longer than dorsal sepal.*
B. *Fls. appearing successively; petals not caudate, not over twice as long as sepals.*
C. *Lip without horns between sac and claw.*
D. *Lvs. narrowly yellow-margined: petals linear.*
E. *Scape branched, many-fld.: petals but little longer than sepals*..... 2. Lindleyanum
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E. *Dorsal sepal broadly ovate, lined*..... 8. longifolium
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BB. *Fls. appearing simultaneously; petals caudate, many times longer than sepals*..... 10. caudatum

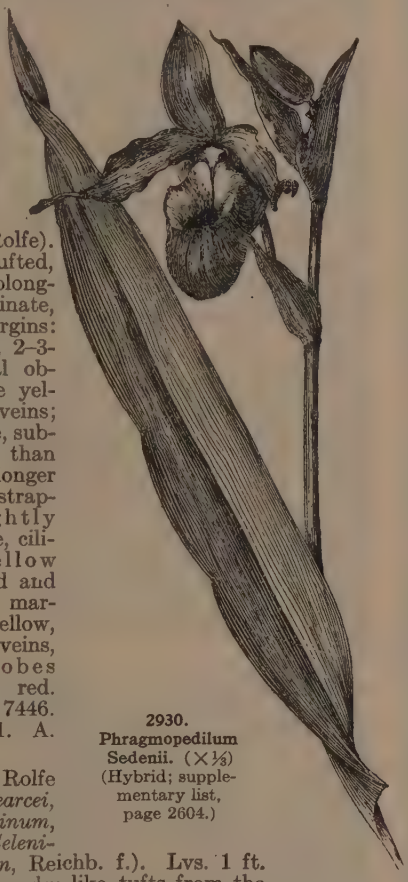
1. **Schlimii**, Rolfe (*Cypripèdium Schlimii*, Lind. *Selenipèdium Schlimii*, Reichb. f.). Fig. 2926. Lvs. 4–6, ligulate, leathery, sharp-pointed, 9–12 in. high: scape longer than the lvs., hirsute, often branched, 2–8-fld.: sepals less than 1 in. long, ovate obtuse, the lower a little larger than the upper and concave, white or spotted with crimson on the inner side: petals like the sepals; labellum an elliptic bag with a contracted opening, white with a large crimson blotch in front; staminodium yellow. Late summer. Colombia. B.M. 5614. F.S. 18:1917. Var. **albiflorum**, Hort. Fls. white, except the yellow staminodium and a

2929. Phragmopedilum Dominianum. (×⅓) (Hybrid; supplementary list, page 2604)

suffused blotch on the labellum. I.H. 21:183. Vars. **gigantèum** and **supérbum** are also advertised.

2. **Lindleyànum,** Rolfe (*Cypripèdium Lindleyànum*, Schomb. *Selenipèdium Lindleyànum*, Reichb. f.). Lvs. 15–20 in. long, leathery, deep green, with yellow margins: scape many-fld., pubescent, 2–4 ft. high: upper sepal ovate-oblong, undulate, light green with brownish veins; petals 2 in. long, deflexed, green with brown veins, ciliate; labellum olive-green, with brown veins and much spotted on the side lobes. Guiana. G.W. 13, p. 570.

3. **Sargentiànum.** Rolfe (*Selenipèdium Sargentiànum*, Rolfe). Fig. 2927. Lvs. tufted, 6–8 in. long, oblong-lanceolate, acuminate, with golden margins: scape 6 in. high, 2–3-fld.: dorsal sepal oblong, acute, pale yellow with red veins; lower sepal ovate, subacute, shorter than the lip; petals longer than the sepals, strap-shaped, slightly twisted, undulate, ciliate, pale yellow streaked with red and with bright red margins; labellum yellow, with pale red veins, deflexed side lobes speckled with red. Brazil. B.M. 7446. G.C. III. 15:781. A.G. 21:423.



2930.
Phragmopedilum Sedenii. (×⅓)
(Hybrid; supplementary list, page 2604.)

4. **carícinum,** Rolfe (*Cypripèdium Pèarcei*, Hort. *C. carícinum*, Lindl. & Paxt. *Selenipèdium carícinum*, Reichb. f.). Lvs. 1 ft. long, springing in sedge-like tufts from the long creeping rhizome: scape longer than the lvs., 3–6-fld.: fls. mostly pale greenish, with the segms. bordered with white and having purple tips; sepals broadly ovate, waved, as long as the lip; petals more than twice as long, pendent, narrow, and much twisted; labellum oblong, the upper margins flat; staminodium provided with 2 hairy processes. Peru. B.M. 5466. F.S. 16:1648.

5. **Klotzschiànum,** Rolfe (*Cypripèdium Schomburgkiànum*, Klotzsch. *Selenipèdium Klotzschiànum*, Reichb. f. *S. Schomburgkiànum*, Debois). Lvs. linear, 6–12 in. long, scarcely ½in. wide, rigid, keeled: scape longer than the lvs., hirsute, purple, 2–3-fld.: dorsal sepal ovate-lanceolate, pale rose-colored, with reddish brown veins, the lower ovate, boat-shaped, colored like the uper one; petals 3½ in. long, linear, twisted, colored like the sepal; labellum greenish yellow, the inflexed side lobes whitish, spotted. British Guiana. B.M. 7178. G.C. III. 15:625.

6. **vittàtum,** Rolfe (*Cypripèdium vittàtum*, Vell. *Selenipèdium vittàtum*, Reichb. f.). Lvs. 1 ft. long, linear-ligulate, acute, margined with yellow: sts. few-fld., 12–18 in. high: dorsal sepal oblong, subacute, greenish striped with red; lower sepal about twice as broad as the upper, green; petals linear, pendent, undulate, reddish brown, striped with green and green toward the base, longer than the sepal; labellum shorter than the sepals, brown, greenish spotted with reddish brown inside. Brazil. I.H. 23:238.

7. **Hártwegii,** Pfitz. (*Cypripèdium Hártwegii*, Reichb. f. *Selenipèdium Hártwegii*, Reichb. f. in part). Lvs. broadly ovate, much attenuated at apex: scape glabrous, many-fld.: dorsal sepal oblong, acute, pale green, with rosy veins and whitish margin; petals linear-ligulate, from a somewhat cordate base, velvety-glandulose on the inside toward apex, pale yellow-green with rose-pink border; lip yellowish green, tinged brown in front, the infolded margins dotted with rose. Peru.

8. **longifòlium,** Rolfe (*Selenipèdium Roèzlii*, Reichb. f. *S. Hártwegii*, Reichb. f. in part. *Cypripèdium longifòlium*, Warscz. and Reichb. f. *C. Roèzlii*, Regel). Lvs. tufted, 8–12 in. long, narrowly strap-shaped, tapering to point, strongly keeled: scape 2 ft. high, purplish, sparingly pubescent: fls. large; upper sepals ovate-lanceolate, pale yellowish green, faintly streaked with purple; lower sepals ovate, obtuse, shorter than the lip; petals 3½ in. long, spreading, narrowly lanceolate, twisted, pale yellow with rose-colored margins and with a white line on the edge; labellum 2 in. long, green shaded with dull purple or brown in front, side lobes yellow, spotted with pale purple. Costa Rica. B.M. 5970, 6217. I.H. 20:138. R.H. 1873, p. 416; 1893, pp. 18, 19. F.M. 1874:119. F. 1871:126.—*S. Roezlii*, sometimes considered as a distinct species, is of more robust habit, having lvs. 2 ft. long and green scapes. Var. **magniflòrum,** Hort. (*Cypripèdium magniflòrum*, Hort.), has the petals margined with white. A.F. 7:707. The following varieties also are distinguished in cult.: **grandiflòrum, latifòlium,** and **ròseum.**

9. **Boissieriànum,** Rolfe (*Cypripèdium reticulàtum*, Reichb. f. *C. Boissieriànum*, Reichb. f. *Selenipèdium Boissieriànum*, Reichb. f.). Plant of vigorous habit: lvs. about 3 ft. long, acuminate: scape few-fld. or sometimes paniculate, 3–7-fld.: fls. of peculiar light green tints, with a few sepia-brown and green blotches on the whitish inflexed part of the lip and with some brown spots on the margins of the sepals; ovary dark brown, with green apex and ribs; upper sepals ligulate-lanceolate, very crisp; lower sepals oblong, about equal to the labellum, crisp; petals spreading, long-linear, twisted and very crisp on the margins. Peru. G.C. III. 1:143; 21:54, 55. G.F. 4:605. J.H. III. 55:51.

10. **caudàtum,** Rolfe (*Cypripèdium caudàtum*, Lindl. *C. Lindeni*, Van Houtte. *C. Warscewicziànum*, Reichb. f. *Selenipèdium caudàtum*, Reichb. f.). Lvs. strap-shaped, rather stiff upright, about 1 ft. long: scape 12–24 in. high, about 4-fld.: dorsal sepals 5–6 in. long, lanceolate, pale yellow, verging on creamy white and veined with greenish, lower sepal similar; petals pendent, twisted, often attaining a length of nearly a yard, yellowish, shaded with brown on the outside and becoming brownish crimson toward the tips. Peru. F.S. 6:566. R.H. 1857, p. 318; 1883, p. 351; 1885, p. 472. G.C. II. 3:211; 26:269. Gn. 3, p. 313; 26, p. 72; 32, p. 301; 46, p. 85. A.F. 3:132; 6:859; 35:479. R.B. 24:25. Gng. 5:265. G.M. 31:557; 33:795; 35:489.—One of the largest of the genus and remarkable on account of the extremely long petals. Peloric forms with the third sepal (labellum) resembling the other two have passed under the name of *Uropedium Lindeni*, Lindl. Var. **ròseum,** Hort. (*Selenipèdium caudàtum* var. *Warscewiczii*, Godfroy.). Sepals yellow, with orange veins; petals deep purple; labellum deep yellow in front, green behind. I.H. 33:596. Var. **Wállisii,** Hort. (*Selenipèdium Wállisii*, Reichb. f. *Cypripèdium Wállisii*, Hort.). Lvs. paler green: fls. pale, and in every way more delicate than the type. Gn. 49, p. 140. G. 19:34. Numerous other varieties of this species are distinguished in cult. The following names occur in trade lists: **aùreum, luxemburgénse, rùbrum, supérbum, Seègerii, spléndens, nigréscens,** Hort.

P. Àinsworthii, Rolfe & Hurst. (Cypripedium Ainsworthii, Reichb. f. Selenipedium Ainsworthii, Reichb. f.). Fig. 2928. Hybrid between P. longifolium×P. Sedenii. Lvs. ligulate, acuminate, 1½ ft. long: scape shorter, pubescent, few-fld.; upper sepal oblong, acutish, undulate, whitish or yellowish green with a pale purple border; lower sepal very broad and concave with a reflexed margin, shorter than the lip; petal broad, purple, with a green midvein and a pale area near the base; side lobes of the lip yellow, with numerous spots.—*P. albopurpùreum*, Rolfe & Hurst. (Cypripedium albopurpureum, Reichb. f. Selenipedium albopurpureum, Reichb. f.)=P. Dominianum×P. Schlimii. Fls. larger than those of P. Sedenii; sepals oblong, acute, whitish with a purplish tinge on margins; petals 5–6 in. long, pendent, twisted, purplish, lip purplish on borders, the white infolded margin purple-spotted. Gn. 21, p. 332. J.H. III. 52:69.—*P. Bròwnii*=P. longifolium×P. Sedenii.—*P. Bròwnii leucoglóssum.*—*P. Brysa.*=P. Boissierianum ×P. Sedenii.—*P. Calùrum*=P. longifolium×P. Sedenii. Fls. large, about 5 in. across petals; dorsal sepal oblong-ovate, pale green, with longitudinal purplish ribs, flushed red on outside; petals lanceolate, undulate, pale green in the center and at the base, margins rose-red; labellum oblong, rose-red tinted with brown in front; side lobes deeply inflexed, cream-white, with irregular spots of purple. G.Z. 29:241. F. 1884:145.—*P. cardinàle*, Reichb. f. (Cypripedium cardinale, Reichb. f.)=P. Schlimii×P. Sedenii. Lvs. long, straight: dorsal sepal blush-white, slightly streaked with green; petals broad, ovate-oblong, undulate, white tinged with rose-purple near the base; labellum intense purple: staminodium white. Gn. 27:520.—*P. Chlorops*=P. caricinum×P. longifolium.—*P. Cleola*=P. Boissierianum×P. Schlimii.—*P. conchíferum*=P. caricinum×P. longifolium.—*P. Coppinìanum*=P. conchiferum×P. Sedenii.—*P. Cunia.*—*P. Dominiànum*, Reichb. f. (Cypripedium Dominianum, Reichb. f.)=P. caricinum×P. caudatum. Fig. 2929. Lvs. numerous, about 1 ft. long, acuminate: fls. yellowish green, with copper-brown shades and markings; labellum deep reddish brown, reticulated in front and yellowish green behind. Gn. 3, p. 491. F. 1874, p. 57.—*P. Dominiànum rubéscens*=same.—*P. Geralda*=P. caudatum×P. Lindleyanum.—*P. Go tiànum*=P. caudatum×P. macrochilum.—*P. grânde* (Cypripedium grande, Reichb. f.)=P. caudatum×P. longifolium. Lvs. dark green, over 2 ft. long: scape over 3 ft. high, with several large, shining fls.: sepal long, oblong-lanceolate, yellowish white, veined with green; petals long, pendent, yellowish green above, becoming rose-pink; labellum large, greenish yellow in front, whitish behind; side lobes white, spotted with crimson. G.M. 32:87. A.F. 11:1349. G. 27:239; 28:297. Gn.W. 4:389. Var. *atràtum*. A hybrid between P. longifolium, P. Roezlii and P. caudatum roseum. G.C. III. 15:692.—*P. leucorrhòdum*=P. longifolium×P. Schlimii. J.H. III. 47:119.—*P. macrochìlum*=P. caudatum×P. longifolium. A.G. 22:763.—*P. macrochìlum gigantèum*=P. caudatum×P. grande. J.H. III. 53:543.—*P. Mrs. W. A. Roebling*=P. caudatum×P. Sedenii.—*P. nitidíssimum*=P. caudatum×P. conchiferum.—*P. Penclans*=P. Calurum×P. caudatum.—*P. Perseus*=P. Lindleyanum×P. Sedenii.—*P. porphỳreum* (Cypripedium porphyreum, Reichb. f.)=P. longifolium×P. Sedenii. Lvs. broadly strap-shaped, acute, about 1 ft. long: fls. mostly purple, resembling those of *P.* Sedenii, but without protuberances on the open sides of the lip. The sepals and petals are oblong and more acuminate.—*P. Saundersiànum*=P. caudatum×P. Schlimii.—*P. Schroèderæ* (Cypripedium Schroederæ, Hort. Veitch, ex-Reichb. f.)=P. caudatum ×P. Sedenii. Plant of the habit of P. Sedenii, with fls. resembling those of P. albo-purpureum but larger: upper sepals nearly ocher-colored, with purple veins; lower sepals very broad, ocher-colored, with purple veins; petals long-lanceolate, undulate, pendent, 4 in. long, greenish white in the middle, crimson-purple around the margin; labellum purple outside, inflexed lobes yellow, with brown blotches.—*P. Sèdenii* (Fig. 2930)=P. longifolium×P. Schlimii. Lvs. numerous, crowded, 12–18 in. long, tapering to a point: scapes 12–18 in. high, about 4-fld. but often sending out secondary flowering branches from the axils of the bracts after the first fls. have fallen: fls. 3½–4 in. across the petals; lower sepal oval, greenish white, upper sepal oblong, acute, with faint purplish green veins; petals lanceolate, twisted, purple shading to greenish white at the base; labellum rich crimson-purple shading to paler purple behind, spotted inside. A very luxuriant free-flowering plant. F.M. 1876: 206; 1878:302. R.H. 1879:470. G.Z. 21:1. O. 1910, p. 88. Var. *candìdulum*, Reichb. f. Sepals white; petals white tinged with rose; labellum darker rose. The following names are also in the trade: *grandiflòrum, sanguíneum, supérbum.*—*P. tenéllum*=P. longifolium magnificum×P. Schlimii.—*P. Titanum*=P. Lindleyanum×P. longifolium.—*P. Uranus*=P. grande×P. Lindleyanum.—*P. urgándæ*=P. Lindleyanum×P. longifolium.—*P. Weidlichiànum*=P. longifolium×P. Schlimii. G.M. 34:274.

GEORGE V. NASH.

PHRỲMA (one of the many names which Linnæus never explained). *Phrymàceæ*. One genus and one species comprises the family. It is a hardy perennial herb of little horticultural value.

Erect, divaricately branching, with coarsely toothed ovate lvs. and small purplish or rose-colored opposite small fls. borne in long slender terminal spikes. It seems to have been rarely cult. in Eu. and offered in America by dealers in native plants. Phryma has been considered an outlying member of the verbena family. This is because its ovary is 1-celled, while others of the Verbenaceæ, as a rule, have a 2- or 4-celled ovary. There is some evidence for regarding it as a 2-celled verbenaceous plant in which only half the ovary develops. This plant has the infl. of the verbena tribe and the habit of Priva. Ovule solitary, erect, orthotropous, laterally affixed at the base; seed without albumen; cotyledons convolute; radicle superior; stamens 4, didynamous; style slender and stigma 2-lobed.

Leptostàchya, Linn. LOPSEED. Height 2–3 ft.: lvs. 3–5 in. long, thin, the lower long-stalked: fls. at first erect, soon spreading, and the calyx in fr. closed and abruptly deflexed against the axis of the spike, the teeth long, slender, and hooked at the tip. June–Aug. Common in moist and open woods, New Bruns. to Man., south to Fla. and Kans.; also E. Asia.—This very widespread and relatively unattractive plant has stimulated considerable speculation on the problem of the distribution of plants. Horticulturally, it may be worthy a place in the wild-garden for its botanical interest. The mature calices adhere to clothing, like a bur, by the hooked tips of the teeth. L. H. B.

PHRỲNIUM (from Greek word for toad, because the plant inhabits marshes). *Marantàceæ*. Maranta-like plants with creeping rootstocks and large oblong showy radical leaves.

The genus is closely allied to Calathea and Maranta and is often confused with them. The Marantas are New World plants with 1 seed-bearing locule in the fruit, whereas Calathea and Phrynium have 3-seed-bearing locules, or at least a 3-celled ovary. In Calathea, the fl.-cluster is terminal on a leafy st. or rarely on a leafless scape arising directly from the rhizome; in Phrynium, the cluster is lateral from the sheathing petiole. In Calathea the corolla-tube is usually slender; in Phrynium it is usually short.—Species 14 and a few others of doubtful position are admitted to the monograph by Schumann in 1902 (Engler's Das Pflanzenreich, iv. 48), and other species have been described since then; they are native in India, Malasia to New Guinea.

Phryniums are grown the same as calatheas and marantas (which see). **P. variegàtum,** N. E. Br., is probably a variegated form of *Maranta arundinacea*. It is a stove plant of dwarf habit with ovate-lanceolate acuminate green lf.-blades which are marked with cream-white or white stripes and bands. I.H. 33:606. F.R. 3:469. Gt. 46, p. 581. J.H. III. 28:27; 61:560. It is a worthy plant, now coming to be popular. **P. Micholítzii,** Hort. Lvs. broadly oblong, about 10 in. long, acute, green and broadly white-striped above from the midrib outward, paler beneath, midrib claret-red, petiole red. New Guinea. G.C. III. 33:suppl. April 18. R.H. 1903, p. 226. *P. floribúndum*, Lem., is *Calathea violacea*, Lindl., a tall species with oblong or oblong-lanceolate lvs. green above and purplish and glaucescent beneath and violet-colored fls., from Brazil. B.R. 961. L.B.C. 12:1148. For *P. eximium*, see *Calathea eximia*. L. H. B.

PHYGÈLIUS (Greek, *sun flight*, because it was said to love the shade). *Scrophulariàceæ*. Small South African shrubs, hardy South and useful in greenhouses, something like pentstemon.

Plants erect, glabrous or nearly so: lvs. opposite, stalked, crenate-dentate: fls. many, long and tubular, scarlet, with exserted stamens in 2 pairs, and a long, filiform declined style; calyx 5-parted; corolla trumpet-shaped, the limb with 5 short nearly equal blunt lobes: fr. a many-seeded caps.—Species 2.

capénsis, Meyer. CAPE FUCHSIA. Fig. 2931. Two to 3 ft., becoming woody at the base, glabrous, the st. with 4 angles or narrow wings: lvs. ovate to ovate-lanceolate, rounded at the base, firm and veiny, bluntly small-toothed: fls. slender, 2 in. long, somewhat curved, 2-lipped, purple-scarlet, 1–4 together on the ends of straight-spreading peduncles, drooping. Cape of Good

Hope. B.M. 4881. R.H. 1857, p. 599; 1886, p. 473. F.S. 11:1111. R.B. 25:36. G. 4:607; 35:591. Gt. 7:168. G.W. 13, p. 91.—A fine subshrub blooming in summer and hardy in protected places as far north as Philadelphia. In the N. it is known as a greenhouse plant. It is excellent for planting out, enduring heat and dry weather as well as geraniums, or even better. It is prop. by seeds and also by cuttings. The cuttings may be taken from the late autumn shoots of outdoor plants. Phygelius is a showy plant, deserving to be better known.

P. æquàlis, Harv. Infl. closer, the pedicels much shorter; calyx-segms. lanceolate or nearly oblong rather than ovate or oblong-lanceolate; corolla-tube nearly straight, about equal rather than oblique at apex: described as a handsome shrub with habit of a fuchsia. Transvaal to the eastern region of S. Afr., whereas P. capensis is more of the coast and central region, although reaching the Kalahari. Apparently not in cult.

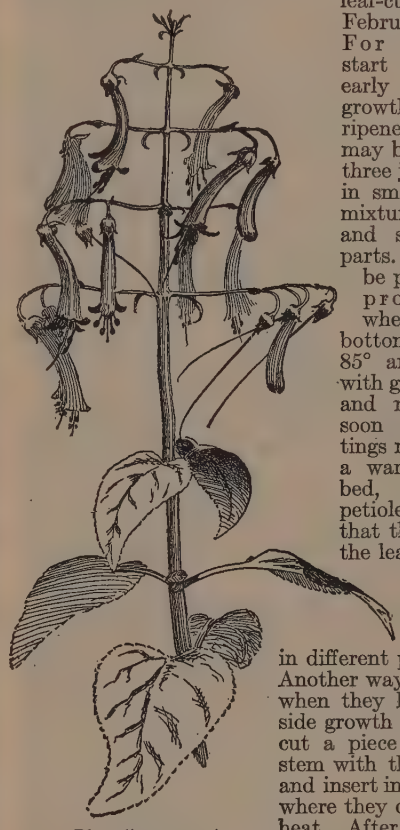
L. H. B.

PHÝLICA (old Greek name, now transferred to these plants). *Rhamnàceæ*. Evergreen shrubs, rarely trees: lvs. alternate, crowded, ovate, lanceolate or linear: fls. small, axillary or in dense crowded heads or spikes; calyx obconical, urceolate or cylindrical, 5-cleft, its limb persistent; petals wanting or bristle-like or cucullate; stamens 5; ovary 3-celled: fr. inferior, crowned by the permanent calyx. S. Afr. Prop. by cuttings of half-ripened shoots. *P. plumòsa*, Thunb. Branches and twigs pubescent: lvs. linear-lanceolate, smooth above, tomentose beneath with revolute margins: spike oblong or roundish; bracteoles villous, twice as short as the tubular minutely pilose calyx, hairs of the tube reversed, appressed, segms. ovate-lanceolate. S. Afr. G.W. 10, p. 306. *P. ericoìdes*, Linn. Branches fastigiate; twigs thinly pubescent: lvs. short-petioled, spreading or erectish, linear or linear-subulate: infl. terminal heads on the rather umbellate twigs; fls. small; involucre hemispherical, its scales ovate, foliaceous, cuspidate; calyx turbinate, smooth, longer than the very villous bracteoles, segms. ovate, acute, hirsute; petals concave, cucullate: fr. a smooth caps. S. Afr. G.W. 10, pp. 305, 306.

PHYLLÁGATHIS (Greek, probably alluding to the involucrate head). *Melastomàceæ*. Greenhouse woody plants, with ornamental foliage and attractive flowers.

Plants with short thick sts.: lvs. opposite or the terminal solitary, large, petioled, roundish, cordate at the base, entire or denticulate, prominently nerved: fls. crowded into a short-peduncled sometimes involucrate head, rosy, about ½in. across; petals 4, rarely 3; stamens 8, rarely 6; ovary 4-celled, rarely 3-celled: caps. top-shaped, 4-valved.—Species a half-dozen and more, Malay Archipelago and China. The lvs. of *P. rotundifolia* are praised for their colors, both above and below, their venation, their plaited character, and their strong shadows and reflected lights. The lvs. are glossy green above, tinted along the curved nerves with metallic blue and purple; beneath they are a rich coppery red, with the prominent nerves of a brighter color. For the general cult. of melastomaceous plants, consult *Melastoma* and *Medinilla*.

These are very ornamental stove perennials. Their cultural requirements from March to the end of summer call for a high temperature. From the end of February and through March the night temperature should stand at 65°; this may be gradually increased until it reaches 70° to 75° the middle of May. This high temperature should be held until the autumn, when it may be gradually reduced until the plants are held at about 60° for December and January. As the temperature is raised and the days become longer, increase the syringing, which will provide a moisture that greatly benefits this class of plants. In the spring and summer, they will require plenty of water at the roots. Give ventilation, to keep the temperature at the right mark, but not so as to cause cold drafts to strike the plants, otherwise they may be seriously injured. In the spring and summer, the plants will need shading, but not too heavy as it will make the foliage soft. Late in autumn and winter they will stand full sun. Any renewing of the earth or compost or repotting should be done about the middle of February. A good compost to use is a fibry loam four parts, fibry peat one part, well-decayed cow-manure one part, and a moderate quantity of sand to make it open.—The plants may be increased by half-ripened wood or by leaf-cuttings taken in February or March. For wood cuttings, start a few old plants early and when the growth shows half-ripeness the cuttings may be taken off with three joints and placed in small pots, using a mixture of loam, peat, and sand in equal parts. These pots may be placed in a warm propagating-bed, where they have a bottom heat of 80° to 85° and by covering with glass, kept shaded and moist, they will soon root. Leaf-cuttings may be placed in a warm propagating-bed, inserting the petiole in the sand; see that the under part of the leaf lies flat on the sand. Keep shaded and moist and they will show growth in different parts of the leaf. Another way to root them is when they have pushed out side growth of 2 or 3 inches, cut a piece of the woody stem with the young growth and insert in pots and plunge where they can have bottom heat. After they are rooted and potted, place them where they will get a fair amount of light, and keep the atmosphere moderately humid, shading when the sun becomes too strong. Grown on by shifting until they are in 8- or 10-inch pots, they will produce good and satisfactory plants. (J. J. M. Farrell.)



2931. Phygelius capensis. (×⅓)

rotundifòlia, Blume. St. short and thick, rooting at intervals, 4-sided, dark purple: lvs. 6 in. or more by 4½ in., roundish ovate, abruptly acuminate, denticulate, 10-ribbed lengthwise, plaited above: floral parts in 3's or 4's, in a many-fld. head: fls. reddish, subtended by dark purple scales. Sumatra. B.M. 5282.

P. gymnántha, Korth. St. short: lvs. cordate-ovate, glossy green, ciliate, 7-nerved: fls. pink, in a close head; petals lobed. Borneo.—*P. hirsùta*, Cogn. Differs in floral characters: calyx-lobes very short and broadly rounded; petals obovate and rounded; ovary adherent to calyx: lvs. cordate-ovate or broader, with 3 pairs of curving lighter-colored side veins and also banded crosswise: infl. standing higher than the handsome lvs. Borneo. I.H. 41:3.

WILHELM MILLER.
L. H. B.†

PHYLLÁNTHUS (Greek for *leaf-flower*, the flowers of some species being apparently borne on leaves). *Euphorbiàceæ*. Mostly shrubs, some herbs or trees, often cultivated in greenhouses for their graceful or curious foliage; some species have economic uses for which they are cultivated in tropical lands.

Leaves small, alternate, entire, usually 2-ranked on

the small lateral branches which then resemble pinnate lvs., such as walnut or sumach, and even fall like lvs., leaving conspicuous scars on the main branches; several species have the branches flattened into lf.-like organs with fls. and rudimentary lvs. on the margins: fls. axillary, apetalous, monœcious or dicœcious, in small clusters or singly; sepals 4–6, imbricate; disk present but no rudimentary pistil in the staminate fls.; stamens 2–6 (or more), usually 3; styles slender; ovary 3-celled, 2 ovules in each cell.—About 500 species, mostly in tropical regions. Related to Breynia, Glochidion, and Securinega. Some of the species commonly cult. under the name of Phyllanthus belong more properly to Breynia or Glochidion. The genus has not been thoroughly studied since Mueller monographed it in D.C. Prod. 15, II; 274, where it is divided into 44 sections, some of which, as Emblica, Cicca, Bradleia and Xylophylla, have been considered separate genera.

Most of the species here included are grown as ornamental shrubs in the greenhouse. *P. acidus* (*P. distichus*) is often cultivated, especially in the gardens and lowlands of Jamaica and the West Indies for the fruit which is pickled or made into preserves; it is acid and astringent; the root is an active purgative and the seed is also cathartic. *P. Emblica* is also grown in the tropics for the edible fruit. *P. nivosus* is often used in greenhouses and for bedding out in summer, and in the warmer parts of Florida for permanent hedges.

In general, phyllanthus is propagated from greenwood cuttings from the larger side shoots rooted in sand in the hothouse. They are usually taken in August or before. Some leaves are left on the cutting and the sand is kept just moist but not allowed to dry. The snow-bush grows readily from root cuttings. *P. acidus* and *P. Emblica* and some other species are often grown from seeds; the latter is difficult to propagate vegetatively except by layering.

A. *Branches terete or angled: lvs. well developed.*

B. *Lvs. not distinctly distichous, often variegated.*

nivòsus, Bull (*Breỳnia nivòsa,* Small). Snow-Bush. Shrub of loose habit, with dark, wiry, somewhat zigzag branches: lvs. 1–2 in. long, broadly ovate-elliptical, obtuse, white and green variegated, or sometimes all white at the tips of the branches: fls. small, greenish, hanging by long pedicels from the lf.-axils. S. Sea Isls. F.M. 1874:120. I.H. 25:332. G.Z. 18:145. Var. **ròseo-píctus,** Hort. Lvs. mottled with pink and red as well as green and white. Gn. 10, p. 261. F. 1878, p. 13. Var. **atropurpùreus,** Hort. (*P. purpùreus,* Hort.?). Lvs. dark purple. Forms of this species are commonly planted in the tropics.

Ferdinándi, Muell. Arg. Lvs. thick, oblong-ovate, 1–1½ in. wide, 2–3 in. long, bluntly acuminate: fr. about ½in. thick. Austral.—A good foliage shrub, hardy in S. Calif.

BB. *Lvs. distichous on lateral branches, resembling pinnate lvs.*

C. *Stamens 6–10, filaments united, anthers not opening vertically.*

grandifòlius, Linn. (*P. juglandifòlius,* Willd. *P. verrhoæfòlius,* Hort.). Foliage branches 1–2 ft. long, leaving large scars on the thick main branches when they fall: lvs. thick, oblong-lanceolate, rounded or cordate at base, 1 in. wide, 4–5 in. long: fr. large, 3-celled. W. Indies to S. Amer.—Tall and symmetrical growing, foliage with a metallic luster; hardy in S. Calif.

CC. *Stamens 2–4.*

D. *Sepals of staminate fls. 5–6; anthers opening vertically; filaments connate.*

Émblica, Linn. Emblic. Myrobolan. A much-branched shrub or small tree: foliage branches 3–12 in. long, with 100 or more linear-elliptical, obtuse lvs. close together and about ½in. long: fls. small, short-pedicelled, in the axils of the lower lvs: styles connate, caps. baccate, ¾–1 in. diam. Trop. Asia. L.B.C. 6:548. —Fr. used raw or preserved: foliage handsome, resembling fir or hemlock: lvs. and bark rich in tannin.

longifòlius, Lam. Low shrub: lvs. ½–1 in. long, linear: fls. small, short-pedicelled, axillary; styles nearly free. Mascarene Isls.—Hardy in S. Calif.

DD. *Sepals of staminate fls. 4; anthers not opening vertically.*

ácidus, Skeels (*Averrhòa ácida,* Linn. *Cícca dísticha,* Linn. *P. distichus,* Muell. Arg. *P. Cícca,* Muell. Arg. Otaheite Gooseberry. West India Gooseberry Star Gooseberry. Jimbling. Fig. 2932. Shrub or small tree, up to 20 ft. high, main branches stout and marked by scars of fallen foliage-branches: lvs. ovate, acute, 1–2 in. long: fls. usually on separate branches below the foliage, sometimes in the lf.-axils: fr. ¾in. long, thick, fleshy. India and Madagascar.

2932.
Phyllanthus acidus—
Otaheite gooseberry.

púlcher, Wall. (*P. pallidifòlius,* Muell. Arg. *Rèidia glaucéscens,* Miq.). Small shrub, foliage branches straight, with 25–40 lvs.: lvs. ½in. long, ovate-elliptical, apiculate, pale green above, glaucous beneath: fls. small, red and yellow, drooping on pedicels 1 in. long. Malay region. B.M. 5437. G.F. 4:161. Gn. 67, p. 83.

AA. *Branches flattened into lf.-like organs, with the fls. and rudimentary lvs. along their margins.*

speciòsus, Jacq. (*P. Arbúscula,* Gmel. *P. latifòlius,* Hort. *Xylophýlla latifòlia,* Sims). Seaside Laurel. Small shrub: floriferous branches lanceolate, striate, crenate, ½–1 in. wide, 2–4 in. long: fls. whitish, striate, pedicels slender. Sept. Jamaica. B.M. 1021.

angustifòlius, Swartz (*P. elongàtus,* Steud. *Xylophýlla elongàta. X. montàna,* Sims). Similar to *P. speciosus,* the floriferous branches narrower, ¼–½in. wide, 3–6 in. long: fls. red. July. W. Indies. B.M. 2652. L.B.C. 1091.

P. acumináta, Vahl, related to P. distichus. Trop. Amer.—*P. caroliniénsis,* Walt., an infrequent low weed from Pa., south.—*P. Chantrièri,* Andŕé, related to P. pulcher. Cochin-China. R.H. 1883, p. 537.—*P. epiphyllánthus,* Linn., related to P. angustifolius, the flat branches curved. B.R. 373.—*P. falcàtus,* Swartz=P. epiphyllanthus.—*P. glaucéscens,* HBK., related to P. pulcher. Trop.

Amer.—*P. isólepis*, Urban, similar to P. speciosus, but the flat branches tend to be rhomboid.—*P. linearis*, Swartz, related to P. angustifolius. W. Indies.—*P. mucronàtus*, HBK.=P. acuminatus. —*P. Niruri*, Linn. A tropical weed with lvs. like P. Emblica.—*P. salvifòlius*, HBK., related to P. pulcher. S. Amer. R.H. 1883, p. 176.—*P. Seemanniànus*, Muell. Arg. Fiji Isls.—*P. turbinàtus*, Sims =Breynia turbinata.—*P. zeylánicus*, Muell. Arg.=Glochidion zeylanicum, A. Juss, which is a small tree of Malaya, with coriaceous elliptic-oblong or oblong-lanceolate lvs., and depressed caps. often nearly 1 in. long.

J. B. S. NORTON.

PHYLLAÙREA: *Codiæum.*

PHYLLÌTIS (Greek, *a leaf*, from the simple foliage). *Polypodiàceæ*. A group of ferns, including several or only the following species, according to different fern students. Lvs. simple, strap-shaped, with the sori almost at right angles to the midrib, grouped in pairs on contiguous veins, the indusia facing together.

Scolopéndrium, Newman (*Scolopéndrium vulgàre*, Smith. *S. officinàrum*, Hort.). HART'S TONGUE. Lvs. 10–15 in. long, cordate at base or sometimes long-eared, 1–2 in. wide, herbaceous, in tufts sometimes of 50 or more lvs. Probably the rarest wild fern in Amer., growing only in three localities in Tenn. and N. Y., and near Owen Sound, Ont. Its usual habitat in Cent. N. Y. is on steep rubble limestone slopes, where it roots among loose stones, usually hidden by jewel-weed. In England it is a common wall fern, and has given rise to more than a hundred varieties, some of the commonest of which are listed below. One or two American dealers offer the species for sale. The differences between the numerous English forms depend mainly on differences in the crispiness and forking of the lvs. and on combinations of these two features. The following varieties are offered commonly in England under *Scolopendrium vulgare:* vars. **Drúmmondæ supérba, críspum, críspum multífidum, críspum muricàto-fimbriàtum, râmo-cristàtum, Dædàlea, sagítto-grándiceps,** Hort.

R. C. BENEDICT.

PHYLLOCÁCTUS: *Epiphyllum.*

PHYLLÓCLADUS (Greek, *leaf branch*, referring to the phyllodia which are characteristic). *Taxàceæ*. Trees or shrubs: branches often whorled; branchlets flattened and expanded into rigid and coriaceous toothed or lobed lf.-like cladodia: true lvs. reduced to linear scales: fls. monœcious or dicœcious, the male fls. fascicled at the tips of the branchlets, the female fls. sessile on the margins of the cladodia or on pedunclelike divisions of the same: ovuliferous scales 1 or several, thick and fleshy, free.—Six species, Malaya to the Philippines and New Zeal. *P. rhomboidàlis*, L. C. Rich. (*P. asplenifòlius*, Hook. f.). Tree up to 60 ft., or shrub on mountain tops: persistent branches more or less reticulate, cladodia or deciduous lf.-like branchlets cuneate or rhomboidal: lvs. very small, subulate: male catkins 2 or 3 together; female catkins globular, with 1, 2, or 3 fertile scales surmounted by 1 or 2 barren ones. Austral. Occasionally seen in Calif. gardens and eastern conservatories. The following species have also been cult.: *P. glaùcus*, Carr., New Zeal., *P. hypophýlla*, Hook. f., Borneo, and *P. trichomanoìdes*, D. Don., New Zeal.

PHYLLÓDOCE (after Phyllodoce, a sea-nymph mentioned by Vergil). *Ericàceæ*. MOUNTAIN HEATH. Ornamental low shrubs grown for their handsome flowers.

Evergreen prostrate and ascending shrubs: lvs. alternate, crowded, linear: fls. in terminal umbels, or axillary, nodding on slender pedicels; calyx 5-parted, small; corolla urceolate or campanulate, 5-lobed; stamens 10: fr. a many-seeded caps., dehiscent into 5 valves.—Six species in arctic regions of N. Eu. and N. Asia, in N. Amer. in the Rocky Mts. south to Calif. Often united with Bryanthus, which is easily distinguished by its 4-cleft rotate corolla.

The mountain heaths are heath-like, with small leaves and handsome delicate flowers often appearing in great profusion. They are perfectly hardy, but do not thrive under ordinary conditions; they are best grown in a rockery in peaty and moist soil shaded from the mid-day sun and they like cool and moist air. The hybrid *P. erecta* is more vigorous and less particular; it is therefore better known in cultivation than the true species. Propagation is by seeds in spring in peaty soil or cut sphagnum and kept moist and shady, also by cuttings in August under glass or by layers.

A. *Corolla urceolate (urn-shaped).*

cærùlea, Babington (*Menzièsia cærùlea*, Swartz. *Bryánthus taxifòlius*, Gray. *B. cærùleus*, Dipp.). To 6 in. high: lvs. slightly glandular while young, later glabrous, ¼–⅓in. long: fls. 2–6; calyx pubescent; corolla oblong-urceolate, ⅓in. long, glabrous, purple, turning bluish in drying. June–Aug. N. Asia, N. Eu. and boreal N. Amer. L.B.C. 2:164. S.B.F. (ed. 3) 6:886. G.W. 17, p. 261.

AA. *Corolla campanulate (bell-shaped).*

empetrifórmis, Don (*Bryánthus empetrifórmis*, Gray. *Menzièsia empetrifórmis*, Smith). Five to 8 in.: lvs. glabrous, ¼–½in. long: fls. 6 or more; pedicels slender, glandular; calyx glabrous; corolla campanulate, rosy purple, about ¼in. long. May–July. Brit. Col. to Calif. B.M. 3176. C.L.A. 21, No. 11:41. Var. **amábilis,** Rehd. (*P. amábilis*, Stapf). Fls. smaller, broadly campanulate, whitish or pinkish; anthers short. B.M. 8405. Var. **álba,** Hort. Fls. white. Var. **polifòlia,** Hort. Taller: fls. purple.

erécta, Drude (*Bryánthus eréctus*, Lindl. *Phyllothámnus eréctus*, Schneid.). Hybrid between the preceding species and *Rhodothamnus Chamæcistus*. Six to 10 in.: lvs. slightly serrate, glabrous, ½in. long: fls. 2–10, corolla rotate-campanulate, rosy pink, ½in. across. F.S. 7:659. J.F. 1:58.—Originated about 1845 in the nursery of Cunningham & Fraser, at Comely Bank, Edinburgh.

P. Brèweri, Heller (Bryanthus Breweri, Gray). Allied to P. empetriformis. Corolla larger, divided to the middle; stamens exserted; fls. axillary, forming terminal spikes. Calif. B.M. 8146. —*P. glanduliflòrus*, Howell (Bryanthus glanduliflorus, Gray). Allied to P. cœrulea. Lvs. glandular: fls. ovate-urceolate, sulfur-yellow, pubescent outside. Ore. to Alaska and Sitka.

ALFRED REHDER.

PHYLLÓSTACHYS: *Bamboo.*

PHYLLOTÆNIUM: *Xanthosoma.*

PHYMATÒDES (Greek, *a close network*). *Polypodiàceæ*. A group of stove ferns allied to Polypodium and sometimes united with that genus, but differing in the fine copious irregular areoles formed by the anastomosing veinlets and the free included veinlets spreading in every direction. For culture, see *Fern*.

A. *Lvs. simple.*

Swártzii, Underw. (*Polypòdium Swártzii*, Baker). Lvs. 2–4 in. long, ¼–1 in. wide, narrowed gradually toward both ends: sori in a single row each side of the midrib. Fla. Keys and Trop. Amer.

musæfòlium, Blume. Lvs. 1–3 ft. long, 3–4 in. wide, with an acute point, the lower part winged to the base; main veinlets very distinct, forming rectangular meshes, with numerous small sori almost covering the whole surface. E. Indies.—Known also as *Drynaria* and *Polypodium musæfolium*.

AA. *Lvs. deeply pinnatifid.*

nigréscens, Blume (*Polypòdium nigréscens*, Blume). Lvs. 2–3 ft. long, 1 ft. or more broad, cut nearly to the rachis into numerous entire lobes 1–2 in. wide; surfaces naked, dark green; sori in a single row nearer the midrib than the edge, sunk in deep cavities which are prominent as wart-like projections on the upper side. India to Polynesia.

glaùcum, Kunze (*Polypòdium glaùcum,* Kunze). Lvs. 12–18 in. long, 6–8 in. broad, cut down to a winged rachis into entire lobes ½in. or more wide, both sides naked, glaucous; veinlets indistinct: sori forming a single row close to the midrib. Philippine Isls.—*Phlebòdium Màyii,* Hort. (A.G. 19:455. F.E. 10:600), is a horticultural form with crinkly lvs. G.C. III. 23:328, fig. 121. L. M. UNDERWOOD.

PHÝSALIS (Greek for *bladder,* because the thin calyx enlarges and incloses the fruit). *Solanàceæ.* HUSK TOMATO. GROUND CHERRY. Herbs of warm and temperate countries grown somewhat for the edible fruits and also for the ornament of the great colored fruiting calyx of some species.

Annual and perennial plants, sometimes lightly woody at base, straggling or diffuse in growth, glabrous or pubescent, summer-flowering: lvs. alternate (often opposite or subopposite on short shoots), mostly angled and distinctly petioled, usually soft in texture: fls. not showy, usually on axillary or extra-axillary peduncles, mostly blue or yellowish or whitish; calyx 5-toothed or -cleft, becoming large and bladder-like and inclosing the 2-celled globular yellow or greenish often more or less viscid berry; corolla rotate or short bell-shaped, usually with purplish spots in the center, plicate, short-tubed and mostly 5-toothed; stamens 5; style slender, the stigma somewhat 2-lobed. —Probably 75 species, mostly American, but a few in Eu. and Asia. The species are variable and therefore confusing to the systematist. The genus is allied to Nicandra, and more remotely to Capsicum, Lycopersicum and others.

Most of the species are of little consequence horticulturally, although *P. Alkekengi* and *P. Franchetii* are much prized for the glowing red very large calices, and *P. pubescens* and *P. peruviana* are grown for their edible fruits. Several of the species are known for their fruits where they grow in a wild state, and they may sometimes be transferred to gardens. In most parts of the United States and Canada one or more species grow about gardens, in fields, and in waste places. These species are popularly known as "ground cherry." The fruits are often made into preserves, although they are sometimes eaten raw. The common cultivated species are annuals, or are usually treated as such in this country. They require no extra care. The seeds are sown indoors in the North, in order to secure as much of the crop as possible before frost. Most of the

2933. Physalis ixocarpa in its cultivated form. (Fruits ×⅓)

cultivated species are long-season plants, and therefore need to be forwarded in the spring. The high colors of *P. Alkekengi* and *P. Franchetii* do not develop until the fruit is ripe; give a warm, sunny exposure; the plants do not withstand frost; let the plants stand 1 to 2 feet apart in the row.

A. *Plants with large red calices in fr.*

Alkekéngi, Linn. ALKEKENGI. STRAWBERRY TOMATO. WINTER CHERRY. BLADDER CHERRY. Diffuse grower, usually with zigzag mostly simple angled setose pubescent sts.: lvs. ovate, with broad base, angular,

2934. Physalis pubescens. (Fruits ×⅓)

the petiole widening at the top: fls. whitish, the anthers yellow: fr. red (sometimes eaten), the ripe large calyx blood-red and very showy. Seems to be native from S. E. Eu. to Japan, but now adventive or naturalized in many parts of the world; it represents a variable group, from which different forms may be separated. Gn. 41, p. 577; 49, p. 233; 57, pp. 28, 432. —The strawberry tomato is an old garden plant, grown for its highly colored bladders. The plant grows 12–18 in. tall. Of easiest cult. In the N., plants are usually started indoors. It is a perennial, the root withstanding much frost if protected, but it is usually grown as an annual. Not hardy in the northern states.

Franchétii, Mast. (*P. Alkekéngi* var. *Franchétii,* Hort.). CHINESE LANTERN PLANT. Differs from *P. Alkekengi* chiefly in its greater size, making a plant 2 ft. tall, glabrous, petioles shorter, and bearing calices 2 in. diam.: originally described as an annual, by others said to be sometimes biennial, but apparently perennial; probably variable in duration. Japan. G.C. III. 16:441. Gn. 48, p. 435; 49:232; 57, p. 28; 58, p. 196. G.M. 37:626. J.H. III. 29:343. R.H. 1897:376, and p. 35. R.B. 22:61; 23, p. 91. Gt. 45, p. 636; 46, p. 193. G.W. 4, p. 196. A.G. 18:81. F.R. 1:426.—One of the most profusely advertised novelties of recent years. It is a most striking and showy plant. It was brought to England from Japan by James H. Veitch, and first described with a name by Masters in 1894. In 1879, however, it had been described by Franchet, of the Jardin des Plantes, Paris, as a form of *P. Alkekengi,* but without name. The frs. are very brilliant orange-red in autumn. The berry is said to be edible. It is very likely a variant of *P. Alkekengi.* The plant called *P. Búnyardii,* Hort., is a very free-fruiting form, not so robust as *P. Franchetii,* with glowing calices; probably a form of this species or by some suggested as a hybrid with *P. Alkekengi.*

AA. *Plants with green or yellow or at most only red-veined calices. Mostly grown for the edible berry.*

B. *Sts. glabrous or very nearly so.*

ixocárpa, Brot. TOMATILLO. Fig. 2933. Erect annual, 3 or 4 ft. tall, bearing smooth branches and lvs., the latter thin, ovate or lance-ovate and variously toothed or notched: fls. large and open (¾in. or more across), the border bright yellow and the throat bearing 5 black-brown spots; anthers purplish: husk or enlarged calyx purple-veined and entirely filled by the

large round, purplish sticky berry, and is sometimes torn open by it. Mex., and intro. northward to the northern states.—The form in cult., described here, is probably *P. capsicifolia*, Dun., now regarded by some as a form of the cosmopolitan *P. angulata*. The writer prefers, however, to refer the plant to *P. ixocarpa*, although there is doubt as to the identity of the cult. plant with this species. Although the cult. plant is sometimes sold as *P. edulis* (erroneously), the frs. are usually too mawkish to be eaten from the hand (at least as grown in the N.). It is a very vigorous and productive plant and is of some consequence as an ornamental, but it is too weedy to be of much value. The fr. is larger than in the native *P. angulata*. The plant figured by Carrière as *P. violacea* (R. H. 1882:216) is the one here described. In Mex., the frs. are said to be used in the making of chilli sauce and as a dressing for meats, usually under the name of "tomatoes." The Mexican forms are confused.

BB. *Sts. pubescent or hairy.*

pubéscens, Linn. STRAWBERRY TOMATO of vegetable-gardens. DWARF CAPE GOOSEBERRY. HUSK TOMATO. GROUND CHERRY. Fig. 2934. Low annual, trailing flat on the ground, or sometimes ascending to the height of a foot: lvs. rather thin and nearly smooth, more or less regularly and prominently notched with blunt teeth: fls. small (⅜in. or less long), bell-shaped, the limb or border erect and whitish yellow, the throat marked with 5 large brown spots; anthers yellow: husk smooth or nearly so, thin and paper-like, prominently 5-angled and somewhat larger than the small yellow sweetish and not glutinous fr. N. Y. to the tropics.—The plant is very prolific, and the frs. are considerably earlier than in the other species. When ripe the frs. fall, and if the season is ordinarily dry they will often keep in good condition on the ground for 3 or 4 weeks. The frs. will keep nearly all winter if put away in the husks in a dry chamber. They are sweet and pleasant, with a little acid, and they are considerably used for preserves, and sometimes for sauce. The plant is worthy a place in every home-garden. It is grown more or less by small gardeners near the large cities, and the frs. are often seen in the winter markets. The chief objection to the plant is its prostrate habit of growth, which demands much ground for its cult. In good soil it will spread 4 ft. in all directions, if not headed in. The plants are set in rows 3 or 4 ft. apart and 2 or 3 ft. apart in the row. This physalis has been long in cult. It was figured by Dillenius in 1774, in his account of the plants growing in Sherard's garden at Eltham, England. In 1781–6 it was figured by Jacquin, and by him called *Physalis barbadensis*, from the island of Barbados, whence it was supposed to have come into cult. In 1807, Martyn also described it under the name of Barbados winter cherry, or *Physalis barbadensis*, and says that it is a native of Barbados. None of these authors says anything about its culinary uses. Dunal, in 1852, described it as var. *barbadensis* of *Physalis hirsuta*, but later botanists unite Dunal's *P. hirsuta* with Linnæus' *P. pubescens*, of which this common husk tomato is but a cult. form.

peruviàna, Linn. (*P. edùlis*, Sims). CAPE GOOSEBERRY. Fig. 2935. As compared with *P. pubescens*, this is a much stronger grower, the plant standing partially erect and attaining a height of 1½–3 ft.: lvs. thicker, less regularly toothed, more pointed, heart-shaped at the base, and very pubescent or fuzzy: fls. larger (½–⅝in. long), open-bell-shaped, the limb or border widely spreading and light yellow, the interior of throat blotched and veined with 5 purple spots, the anthers blue-purple: husk thicker and larger than in the last, somewhat hairy, and has a much longer point. Tropics. B.M. 1068. R.H. 1913, p. 85 (as var. *edulis*).—This species is too late for the northern states. The berry is yellow, not glutinous, and much like that of *P. pubescens* in appearance, but it seems to be less sweet than of that species. This plant has been cult. for two centuries, probably. It was described and figured by Morison in 1715 in England. In 1725, Feuillée gave a description of its cult. in Peru, saying that it was then cult. with care and was greatly esteemed as a preserve. The particular form of the species cult. in our gardens is that described and figured by Sims in 1807 as *Physalis edulis*, the "edible physalis." Sims' account says that "this plant is a native of Peru and Chili, but is cult. at the Cape of Good Hope, in some parts of the E. Indies, and more especially at the English settlement of New

2935. **Physalis peruviana.** (Fruits ×½)

S. Wales, at which latter place it is known by the name of Cape gooseberry, and is the chief fr. the colonists at present possess; is eaten raw, or made into pies, puddings or preserves." The plant is rarely sold by American seedsmen.

L. H. B.

PHYSÀRIA (Greek, a *pair of bellows*, alluding to the didymous fruit and slender style). *Cruciferæ*. Perennial herbs, low, canescent: sts. many and spreading: lvs. mostly entire: fls. yellow; calyx inflated, arched, net-veined; petals spatulate to oblong, entire: fr. strongly didymous with a narrow partition; cells inflated, membranaceous, nerveless, several-seeded. Four species, N. W. Amer. *P. didymocárpa*, Gray. Very canescent, about 3 in. high: radical lvs. petiolate with roundish toothed angled or entire blade or oblanceolate and more or less sinuately toothed below; cauline lvs. mostly entire, spatulate: racemes dense; fls. variable in size; sepals lanceolate, surpassed by the rather narrow pale yellow petals: fr. strongly didymous, rather deeply notched above, entire or more or less cordate at base. This species has been intro. abroad, in botanic gardens.

PHYSIÁNTHUS (Greek, *bladder flower*, referring to the base of the corolla-tube). *Asclepiadàceæ*. The plants known to gardeners as Physianthus are species of Araujia, Physianthus now being referred to that genus. They are twiners with showy flowers, grown under glass or in the open in summer.

Including Physianthus and Schubertia (as is done by Bentham & Hooker), Araujia comprises a dozen or more species in the warmer parts of Amer., all with opposite lvs. and whitish or rosy fls.: corolla-tube short or long, inflated at the base; lobes 5, very wide or narrow, overlapping toward the right in the bud; crown with 5 scales attached to the middle of the tube or lower, flat and erect or convex and appressed to the staminal tube: seeds long, bearded. Schubertia and Physianthus should perhaps be considered as subgenera, the former containing the hairy plants with somewhat funnel-shaped fls.; the latter nearly glabrous plants

with somewhat salver-shaped fls. Schumann, in Engler & Prantl, separates Schubertia from Araujia, with more than half the species of the combined groups. Under this disposition, *A. graveolens* is transferred from Araujia. See *Schubertia.*

The species of Araujia resemble in superficial characters the popular stephanotis, having the same large white waxy fragrant 5-lobed fls. *A. graveolens,* in particular, has been suggested as a rival to the stephanotis, especially as it requires less winter heat, but its foliage when bruised emits a strong and offensive odor, especially with young plants. *A. sericofera* has considerably smaller fls. and is one of the several plants advertised as "cruel plants," because they entrap insects, though they may not digest their dead bodies as in the case of nepenthes. These "cruel plants" are mostly members of the milkweed and dogbane families, which have essentially the same kind of floral structure—a highly complicated and specialized type adapted to cross-fertilization by insects. In Fig. 398 of this work, an insect is seen struggling in the clutch of a common milkweed, with a pair of pollen-masses (*a*), like saddle-bags, which he may extract with one of his legs. *Araujia sericofera* catches moths in a slightly different fashion. See G.C. III. 20:523. For other "cruel plants," see *Cyananchum* and *Vincetoxicum.*

When well grown, araujias or physianthuses bloom freely throughout September and October. They seem to have no special soil requirements and may be flowered outdoors from seed sown indoors in early spring, or they may be kept permanently in a cool greenhouse and grown from cuttings. It is seldom that *A. graveolens* is seen grown well in greenhouses, the plants being usually sickly and infested with mealy-bug. As a summer vine in the open it makes vigorous growth, and after midsummer it usually blooms profusely. The flowers are larger than those of stephanotis. Cuttings make the best flowering vines. These may be taken from the ripe wood before cool weather. Seeds are freely produced, and germinate well soon after being sown. Araujias are considered hardy in the most favored parts of England, and are grown outdoors in California. *A. graveolens* can be flowered in pots, but the border of the greenhouse is better. (G. W. Oliver.)

The two species likely to be met with in cult. may be characterized as follows: *Araùjia gravèolens,* Mast. (*Physiánthus gravèolens,* Hort. *P. auricomus,* R. Graham. *Schubértia gravèolens,* Lindl.) Stout, woody climber, densely covered with harsh spreading yellow hairs: lvs. 3–4½ x 2–2¾ in., obovate, acuminate, greatly narrowed and cordate at the base, hairy on both sides: fls. funnel-shaped, i. e., swollen at the throat, 2–2½ in. across, umbellate. S. Brazil. B.M. 3891. B.R. 32:21. G.C. III. 4:271. See discussion under Schubertia.—*Araùjia sericófera,* Brot. (*A. álbens,* Don. *Physiánthus álbens,* Mart.). Name originally spelled, by Brotero, *sericofera,* in description and on plate, but usually now written *sericifera.* Nearly glabrous: lvs. 3 x 1¾ in., oblong-acuminate, wide and square at the base, minutely pubescent below: fls. salver-shaped, i.e., not swollen at the throat, pale rose in the bud and only faintly odorous, 1 in. across, cymose. S. Brazil. B.M. 3201. B.R. 1759. G.C. III. 2:653; 20:523. R.H. 1857, p. 89; 1883, p. 488. Gn. 24, p. 409; 34, p. 397. Mn. 6, p. 206. G. 6:363. The plant as above described is the *Physianthus albens* or *Araujia albens* of the trade. *A. hortòrum,* Fourn., is probably a form of this species.

WILHELM MILLER.
L. H. B.†

PHYSIC NUT: *Jatropha Curcas.*

PHYSOCÁRPUS (Greek, *physa,* bladder, and *karpos,* fruit; alluding to the inflated capsules). Syn., *Opulàster. Rosàceæ,* tribe *Spiræeæ.* NINEBARK. Ornamental shrubs, grown for their white flowers, the attractive inflated pods and the bright green foliage.

Deciduous: bark peeling off in thin strips: lvs. alternate, petioled, stipulate, serrate and more or less lobed: fls. in umbel-like racemes; calyx-tube cup-shaped; sepals 5, valvate; petals white or rarely pinkish, spreading; stamens 20–40; pistils 1–5, more or less united at the base: follicles inflated, opening along both sutures; seeds 2–4, yellowish shining.—Thirteen species have been distinguished in N. Amer. and one in N. E. Asia. Formerly usually referred to Spiræa, from which it is easily distinguished by the stipulate lvs., by the inflated follicles and the long glossy seeds; sometimes united with Neillia, which differs chiefly in the not inflated pods dehiscent only along the ventral suture, the campanulate or tubular calyx-tube, and in the elongated inflorescence.

The ninebarks are hardy, small or medium-sized spreading or upright shrubs with usually 3-lobed leaves and with umbel-like heads of whitish or sometimes pinkish flowers appearing late in spring, and followed by clusters of small pods, inflated in some species and often assuming a bright red color late in summer. They are well adapted for shrubberies and grow in almost any soil. They propagate easily by either hardwood or greenwood cuttings, also by seeds.

A. *Carpels 4–5, rarely 3.*

B. *Pods glabrous.*

opulifòlius, Maxim. (*Spiræa opulifòlia,* Linn. *Opulàster opulifòlius,* Kuntze. *Neillia opulifòlius,* Brew. & Wats.). NINEBARK. Fig. 2936. Shrub, to 10 ft. high, with wide-spreading and recurving branches: lvs. roundish ovate, usually cordate at the base, 3-lobed, with the lobes crenately dentate, 1–3 in. long, usually glabrous beneath: corymbs 1–2 in. broad, many-fld.; pedicels and calyx glabrous or pubescent: pods 3–5, inflated, twice as long as the calyx-lobes. June. Que. to Ga., west to Man. and Kans. B.B. (ed. 2) 2:244. R.H. 1912, p. 221. Var. **lùteus,** Kirchn. (var. **aùreus,** Hort.). Lvs. bright yellow at first, changing to golden bronzy yellow. Var. **Debrichyànus,** Schneid. (var. "*De Brichy,*" Simon-Louis). Lvs. elongated, irregularly lobed, yellowish variegated. Var. **nànus,** Kirchn. Dwarf form with smaller, less lobed, dark green lvs.

2936. Ninebark.—Physocarpus opulifolius. (×¼)

BB. *Pods tomentose.*

amurénsis, Maxim. (*Spiræa amurénsis,* Maxim. *Opulàster amurénsis,* Kuntze. *Neillia amurénsis,* Nichols.). Similar to the former, higher and of more vigorous growth: lvs. 3–5-lobed, with acute or acuminate, doubly serrate lobes, usually pubescent beneath, 2–5 in. long: fls. large, with grayish tomentose pedicels and calyx: pods only one-third longer than calyx-lobes. June. Amurland. Gt. 14:489.

intermèdius, Schneid. (*Opulàster intermèdius,* Rydb. *O. Ramàleyi,* Nelson). Shrub, to 5 ft.: lvs. orbicular in outline, 3-lobed with rounded lobes, doubly crenate, usually sparingly hairy beneath or glabrous, 1–2½ in. long: corymbs dense; pedicels and calyx finely pubescent: pods 3–5, inflated, one-third longer than the calyx-lobes. June. Ill. and Mo. to Colo. and S. D.

AA. *Carpels 2, turgid, tomentose.*

B. *Pedicels and calyx pubescent.*

bracteàtus, Rehd. (*Opulàster bracteàtus,* Rydb. *O. Ramàleyi,* Nelson, partly). Shrub, to 6 ft.: lvs. broadly ovate in outline, rounded or subcordate at the base, 3-lobed, doubly crenate-serrate, obtuse or acute at the apex, glabrous or nearly so, 1–3 in. long: corymbs many-fld.; bracts obovate or spatulate, often foliaceous, persistent: fls. nearly ½in. across, white: pods 2, united about half. June. Colo.—Plant more compact and fls. larger than in *P. opulifolius.*

BB. *Pedicels and calyx glabrous or nearly so.*

monógynus, Coult. (*Opulàster monógynus,* Kuntze. *Spirǽa monógyna,* Torr. *Neillia Tórreyi,* Wats.). Fig. 2937. To 3 ft. high: lvs. smaller, ¾–1½ in. long, incisely 3–5-lobed, with incisely serrate lobes, usually glabrous: corymbs rather few-fld.; bracts lanceolate, caducous; pedicels usually only sparingly pubescent: pods 1–2. Colo. to Calif. G.F. 2:5 (adapted in Fig. 2937).

2937. Physocarpus monogynus. (×⅔)

glabràtus, Rehd. (*Opulàster glabràtus,* Rydb.). Shrub, 2–4 ft.: lvs. orbicular-ovate, truncate or cordate at the base, 3–5-lobed, doubly crenate-serrate, obtuse or rounded at the apex, glabrous, about 1 in. long: corymbs rather small, but numerous; bracts small, caducous: fls. about ⅓in. across, white or pink: pods 2, united to above the middle. June. Colo.—Very floriferous.

P. capitàtus, Kuntze (Spirǽa capitata, Pursh. Opulaster capitatus, Kuntze. S. opulifolia var. mollis, Torr. & Gray). Closely allied to O. opulifolia. To 20 ft.: lvs. somewhat larger, with serrate, more elongated lobes, tomentose beneath: pedicels and calyx tomentose. Ore. to Calif.—*P. malvàceus,* Kuntze (Neillia malvacea, Greene. Opulaster pubescens, Rydb. Spirǽa pauciflora, Nutt.). To 5 ft.: lvs. slightly 3-lobed, with crenately and obtusely toothed lobes, usually pubescent: corymbs rather few-fld.: pods 2–3, not inflated, tomentose, about as long as sepals. Wyo., Idaho. B.M. 7758 (as Neillia Torreyi).

ALFRED REHDER.

PHYSOCHLÀINA (Greek, *bladder, outer garment,* having reference to the inflated calyx). Also spelled *Physochlæna. Solanàceæ.* Erect, nearly glabrous herbs: lvs. petioled, subentire: infl. a terminal corymb; calyx campanulate, lobes 5, short, elongated in fr., overtopping the caps.; corolla elongate, lobes 5, short-imbricate in bud; stamens attached at the middle of the tube; ovary 2-celled: fr. a 2-celled caps.—About 5 species. Cent. Asia. *P. prælta,* Hook. (*P. grandiflòra,* Hook.). Perennial: sts. 2–4 ft., corymbose upward: lvs. 4–6 in. long, 3 in. broad, irregular, base cuneate or cordate on the same branch: fls. all pedicelled; calyx-lobes lanceolate; corolla tubular-funnel-shaped or sometimes shorter-funnel-shaped in wild examples, in cult. examples wider sub-campanulate: fr. a caps. ½in. diam. Himalaya region. B.M. 4600.

PHYSÓPTYCHIS (Greek, *bladder fold*). *Crucíferæ.* Perennial plant, felty with stellate hairs: fls. yellow, short-peduncled; calyx not saccate: fr. spherical, valves net-veined; seeds without wings. Formerly included in Vesicaria, but now separated chiefly by the membranaceous not crustaceous siliques.—One species, Persia. *P. gnaphalòdes,* Boiss. (*Vesicària gnaphalòdes,* Boiss.). Half shrub: sts. simple with basal lvs.: lvs. elliptic-lanceolate, obtuse, with prominent nerves below: fr. a short silique with deciduous style, 4-celled. Persia. A small alpine plant which in general appearance resembles an aubrietia, but its foliage is grayer and its fls. are of a bright citron-yellow color. Sparingly in cult. in Eu.

PHYSÓSIPHON (Greek, *bladder tube*). *Orchidàceæ.* Tufted epiphytes: sts. in the form of creeping rhizomes, at the end 1-lvd., 1–2 sheaths below the lf., not pseudobulbous: lf. coriaceous, narrow at base: infl. an elongated raceme; fls. small, short-pedicelled, secund; sepals joined at the base in an ovoid or urceolate tube, above free, spreading; petals dwarfed in the base of the tube, fleshy, obovate-cuneate; labellum small, articulate with the base of the column, oblong-cuneate, concave, midlobe shortly exceeding the others; column below elevated, footless or produced in a short foot, clinandrium short, often obtuse, 3-lobed; anthers terminal, deciduous, pollinia 2, waxy, ovoid. About 15 species, Mex. to Brazil. *P. Loddigèsii,* Lindl. Lf.-stalks 1–2 in. high, sheathed with a brown membrane: lvs. fleshy, about 4 in. high: scapes erect, 6–9 in. high, 12–15-fld., produced from the junction of the lf.-stalk and blade; scapes are produced by the same lf. in successive years: fls. small, petals and lip minute, hidden in a green, 3-sided tube formed by the connate bases of the sepals, free part of sepals orange-brown. Mex. J.H. III. 48:71. A coolhouse orchid sometimes offered in trade-lists. *P. asaroìdes,* Kränzl. Rhizome long and slender: sts. very short, almost none: lvs. 3-cornered, thick, lanceolate, up to 1¼ in. long, usually reddish: fls. solitary or in pairs, very shortly stalked, green-spotted and suffused with purple outside, dark purple inside; tube of sepals 1 in. long; petals and lip 1–1½ in. long. S. Brazil. Said to be in cult. in Eu.

F. TRACY HUBBARD.

PHYSOSTÈGIA (Greek, *bladder* and *covering,* referring to the inflated fruiting calyx). *Labiàtæ.* FALSE DRAGON-HEAD. Hardy herbaceous perennials, native to America, with spikes of gaping flowers of purple, rose-color, or white; useful in borders and particularly in wild-gardens.

Smooth erect herbs with slender and wand-like sts.: lvs. opposite, sessile, mostly lanceolate or oblong and usually serrate or dentate: fls. showy, pink to purple and varying to white, in separate or panicled spikes; calyx bell-shaped, swollen and remaining open in fr., membranous, 10-nerved; teeth 5, equal; corolla 2-lipped, inflated above; upper lip concave, rounded, entire or nearly so; lower lip 3-lobed, the middle lobe commonly notched; stamens 4, didynamous; anther-cells parallel. —A few species, N. Amer., mostly along stream banks and in wet grounds, but thriving under good upland garden conditions; sometimes named under Dracocephalum. *P. austriaca* of lists is probably *Dracocephalum austriacum.*

virginiàna, Benth. (*P. virgínica,* Hort. *Dracocéphalum virginiànum,* Linn.). Sts. mostly simple, to 4 ft., producing large clumps in. cult.: lvs. lanceolate, oblong-lanceolate to linear-lanceolate, 3–5 in. long, finely or rather coarsely serrate, the lvs. prominent up to the infl.: fls. an inch long, ranging from purplish red through rosy pink and lilac. Que., west and south. B.M. 467. Mn. 7:81. F.R. 5:55. Gn.M. 1:121. F.E. 15:322. Var. **álba,** Hort., is a white-fld. form. R.H. 1898:336. G.W. 7, p. 458. Var. **speciòsa,** Gray, is a tall form with very acutely serrate lanceolate lvs. and dense-panicled spikes. A Texan form with erect, imbricated fls. B.M. 3386 (*P. imbricata*). Var. **gigantèa,** Hort., is advertised as a giant form, 6–7 ft. tall, with large deep rose fls. *P. virginiana* is a hardy vigorous plant of the easiest

cult., blooming in midsummer and later. The clumps should be frequently divided.

denticulàta, Brit. (var. *denticulàta,* Gray. *Dracocéphalum denticulàtum,* Ait.). A lower and more slender plant with crenulate denticulate or obscurely serrate lvs. and more slender or loosely fld. spikes: lvs. few near the infl., so that the latter is as if long-peduncled. Pa. to Ill. and far south. B.M. 214. WILHELM MILLER. L. H. B.†

PHYSOSTÉLMA (Greek, *bladder girdle,* referring to the shape of the scales of the crown). *Asclepiadàceæ.* Twining glabrous shrubs: lvs. opposite, leathery, shining: fls. large, umbelled; sepals small, narrow; corolla cup-shaped, lobes very short; coronal processes 5, very large, ovoid-oblong, obtuse, adnate to the anthers; column tips inappendiculate: fr. long, smooth follicles; seeds comose.—About 5 species, India, Malaya.

Wâllichii, Wight (*Hòya campanulàta,* Blume). Lvs. 3–5 in. long, elliptic-oblong, acuminate; nerves reticulate; petiole ¼in. long: cymes globose, 3–4 in. diam.; peduncle stout; corolla pale yellow, lobes apiculate. India, Malaya. B.M. 4545. J.H. III. 49:461. J.F. 1:70.—Cult. in Great Britain. The treatment given to hoyas is suitable for this plant.

PHYSÙRUS (Greek, *bladder* and *tail;* from the purse or pouch-like spur). *Orchidàceæ.* Of the type of Goodyera and Anœctochilus, and cultivated for the foliage. By late authors, the name Erythrodes is used for these orchids for nomenclatorial and botanical reasons.

Stem simple, erect, leafy: lvs. petiolate, ovate to lanceolate: fls. small, in a terminal raceme; petals and dorsal sepals cohering, galeate; lateral sepals free; labellum spurred, strongly concave above the entrance of the spur and abruptly contracted, middle lobe spreading or recurved; column short.—About 40 species, native of the warm regions of Asia and Amer. The American species have their lvs. mostly spotted.

quercetícola, Lindl. (*Goodyèra quercícola,* Chapm.). St. ascending, 6–12 in. high: lvs. ovate or oblong-ovate, thin, on slender petioles, spotted with silver-gray: spike densely fld.; sepals and petals oblong, obtuse; labellum concave, ending in a broadly ovate, acuminate and recurved point; spur pouch-like. Aug. Low shady woods, Fla. and westward. Under the new nomenclature this species becomes *Erythrodes querceticola,* Ames.

P. válidus, Rolfe. Lvs. elliptic-lanceolate, about 5 in. long: scape stout, bearing an elongated dense spike about 6 in. long: fls. small, whitish. Peru. HEINRICH HASSELBRING.

PHYTÉLEPHAS (Greek, *elephant plant;* referring to the hard white seeds which can be worked like ivory). *Palmàceæ.* Low unarmed pinnate palms.

Stems stout, erect or prostrate and rooting: lvs. terminal, elongate, pinnatisect; segms. numerous, the upper opposite, the lower alternate or fascicled, linear-lanceolate, acuminate, midrib strong: spadices peduncled, scaled, male pendulous, female erect; spathes 2, complete, elongate: fls. dioecious; male minute, perianth lacking, stamens numerous; female very large, sepals 3, petals 5–10, 2–3 in. long, rather fleshy, staminoids many, ovary subglobose: fr. a collection of 4–6 drupes, forming a large cluster.—About 15 species, S. Amer.

macrocárpa, Ruiz & Pav. IVORY-NUT PALM. Caudex about 6 ft. high, creeping, rooting: lvs. 15–20 ft. long, erect, beautifully arched, pinnate, rich dark green; the pinnæ very long. Colombia and Venezuela. B.M. 4913, 4914. Gn. 24, p. 468. G.M. 57:9.—This species furnishes the "vegetable ivory" of commerce. Sometimes known as "negro's head."

F. TRACY HUBBARD.

PHYTEÙMA (old Greek name, meaning simply "a plant," used by Dioscorides for some mignonette-like herb). *Campanulàceæ.* HORNED RAMPION. Hardy herbaceous perennials, used for borders and alpine gardens; not much known in this country except by fanciers and those who grow rock-garden plants and alpines.

Low or tall, with st.-lvs. alternate, and radical lvs. larger and long-petioled, sometimes very narrow and grass-like: fls. mostly blue or purplish, varying to white, usually in dense terminal heads or spikes, sometimes somewhat umbellate, the fl.-bud long and curved; corolla opening more or less with 5 very narrow segms.

2938. Phyteuma comosum. A tufted alpine plant growing in a crevice. (×⅓)

(sometimes remaining closed); stamens 5, free from corolla, filaments more or less dilated at base, anthers free and distinct; styles 2–3-cleft, often protruding, the lobes very narrow: fr. a caps. crowned by the calyx-teeth, laterally dehiscent.—Species about 40, Eu. and adjacent Asia, mostly in the mountains, sometimes at great elevations.

The flowers in phyteuma are mostly shades of blue, more or less purple, rarely white. There are two forms of inflorescence, the globular and the long-and-narrow, the former being the more interesting. The showy feature of *P. comosum,* at first glance, seems to be a group of colored and much elongated pistils; but these pistil-like bodies are really corollas which usually show slits at their inflated base and are narrowed above into a very slender tube from which the style and stigmas are much exserted. In this species the corolla does not open, but in the others it finally splits at the top, making a spreading or wheel-shaped flower. The plants usually seed freely and may also be propagated by division, which is best performed in spring after growth begins. They thrive in ordinary garden soil in either rock-garden or border. In an account of the cultivated species, Correvon (Gn. 63, pp. 39–41, 58) distinguishes three cultural groups: (1) the mural or wall species, comprising only *P. comosum;* (2) the rock-loving species, comprising *P. Carestiæ, P. Charmelii, P. confusum, P. globulariæfolium, P. hemisphæricum, P. humile, P. pauciflorum, P. serratum, P. Sieberi, P. Scheuchzeri;* (3) the open-ground species, as *P. austriacum, P. betonicæfolium, P. canescens, P. Halleri, P. limonifolium, P. Michelii, P. orbiculare, P. scorzonerifolium, P. spicatum.* The rock-loving species (2) require rock fissures in full sun, without damp, little soil and that only of leaf-mold and sand. The open-ground species (3) are those of woods and pastures and are easy to grow in gardens.

The botanical account following is mainly derived from DC. Prod. 7:450 and Koch, Syn., Flor. Germ., with considerable additions in descriptions from Correvon. There is likely to be some confusion in the species and the forms known in cultivation.

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A. *Infl. a raceme or panicle.*

1. **canéscens,** Waldst. & Kit. Scabrous, grayish green: st. unbranched: lvs. sessile; lower ones ovate, crenate-serrate, narrowed at base; upper ones nearly entire: fls. blue, short-peduncled, solitary, sparse. Hungary, Caucasus.—The plant described by Correvon under this name is said to have fls. in close spikes.

AA. *Infl. a compact umbel.*

2. **comòsum,** Linn. Fig. 2938. The only species in the genus with umbellate infl., and in which the corollas are not finally split at the apex. A decumbent unbranched glabrous plant, 3–6 in. high, native to the Alps: fls. pale lilac below, darker purple above: roots thick and fleshy, stoutly lodged in the fissures of rocks: lvs. cordate-ovate or those on the st. lanceolate, coarsely toothed: the 2-lobed styles are long-protruded. B.M. 6478. G.C. II. 14:177. Gn. 18, p. 245, copied in Gn. 28, p. 91; 44, p. 554, and R.H. 1882, p. 452. Gn. 63, p. 39. J.H. III. 52:364. G.W. 8, p. 597. G.C. II. 26:81, copied in I.H. 34:11.—Said by Correvon to demand a fissure in a wall or face of lime-rock. A handsome species.

AAA. *Infl. a spike or head.*

B. *Fruiting spikes long and narrow, cylindrical.*

C. *Flowering spikes roundish or oval.*

D. *Stigmas 2.*

3. **scorzonerifòlium,** Vill. Fig. 2939. This and *P. betonicæfolium* should probably be regarded as botanical varieties of *P. Michelii,* but for clearness and for horticultural purposes they may be considered as distinct species. A native of the Alps with long-spiked fls. of sky-blue (B.M. 2066, erroneously as *P. betonicæfolium*) or purplish blue (B.M. 2271): lvs. polymorphous.

4. **Michélii,** All. This may also be distinguished from *P. scorzonerifolium* and *P. betonicæfolium* by having the calyx pilose at the middle, it being glabrous in the other two. A native of Mt. Cenis in Sardinia, with lvs. ovate-lanceolate or narrow, not cordate: color of fls. deep blue, in lengthening spikes.

DD. *Stigmas 3.*

5. **betonicæfòlium,** Vill. Rather tall: root-lvs. cordate-lanceolate, long-stalked: bracts fewer than in *P. Michelii* and probably not reflexed: spikes lengthening toward end of season, on st. nearly 20 in. high: fls. blue. Eu. Not B.M. 2066, which is *P. scorzonerifolium.* Gn. 63, p. 57.

CC. *Flowering spikes oblong or nearly so.*

D. *Spikes dense.*

6. **spicàtum,** Linn. Woodland plant: lvs. ovate-elliptical, serrate, often brown-blotched at base, the lower ones long-stalked and cordate: fls. in a close spike, white or blue, greenish at tips. Eu. B.M. 2347. Gn. 63, p. 57. G.W. 8, p. 596.

7. **Hálleri,** All. Tall and stout: lvs. ovate-orbicular, doubly and coarsely serrate, long-stalked: fl.-st. 2–2½ ft.; spike ovoid-oblong, long and close subtended by 2 long drooping bracts: fls. dark violet to white. Mountains in Eu. Gn. 63, p. 58.

DD. *Spikes loose.*

8. **limonifòlium,** Sibth. & Smith. Fig. 2939. Tall, fl.-st. 20–28 in. high and branching: fls. light blue, open, in a long narrow spike: this may be distinguished by the st.-lvs., which are few and pass into bracts; radical lvs. lanceolate, long-petioled, sparingly toothed. Asia Minor. B.M. 2145 (as *P. stricta*). L.B.C 7:667 (as *P. virgata*).

BB. *Fruiting spikes little elongated, merely oval.*

C. *Number of fls. about 5.*

9. **pauciflòrum,** Linn. Very dwarf, said by Correvon to be the smallest and most tufted of the genus, about 3 in. high: lvs. entire or toothed at obtuse tip; root-lvs. short, obovate-lanceolate: bracts ciliate, entire or subdentate at base, never dentate at apex: fls. few in heads with ovate-orbicular bracts, violet-blue. W. Alps, Carpathians and Pyrenees. Gn. 63, p. 40.

CC. *Number of fls. about 12.*

10. **globulariæfòlium,** Sternb. & Hoppe. Probably a variety of *P. pauciflorum* with larger sts. and lvs. widened in the upper part and toothed, and by more globular heads: root-lvs. 2–4 lines longer and thrice as wide, and the bracts always entire at the base: fls. violet. Austrian Alps.

2939. Phyteuma limonifolium and P. scorzonerifolium, showing loose-spiked and dense-spiked forms of inflorescence.

11. **hemisphæricum,** Linn. Small plant with grass-like foliage, forming large tufts: lvs. erect; root-lvs. subentire, linear or lanceolate-linear, much or little shorter than the st.: bracts ciliate, subentire, ovate-lanceolate: fls. blue, white or yellowish. Granitic Alps.

12. **hùmile,** Schleich. Root-lvs. linear-lanceolate, narrowed at the base, upper ones remotely denticulate, larger than those of *P. hemisphæricum:* bracts narrowly lanceolate from an ovate base, sharply toothed: fls.

violet-blue, in globular heads. High Alps.—*P. Carèstiæ*, Biroli, is a thick-set form of *P. humile*. Probably *P. serràtum* is also a form of this species with larger st., somewhat wider lvs., and calyx glabrous rather than minutely ciliate. Gn. 28:90; 63, p. 40.

13. **Sièberi,** Spreng. (*P. Charmélii*, Sieb., not Vill.). Lvs. cordate, ovate or ovate-lanceolate to ovate-orbicular, crenate: bracts ovate, acuminate, sharply serrate: fls. deep violet-blue, in globular heads. S. Alps and Apennines.

CCC. *Number of fls. 15 or more.*

14. **orbiculàre,** Linn. (*P. confùsum*, Kerner. *P. austrìacum*, Beck). Rootstock mostly thick, the sts. simple and usually erect, ½–2 ft. tall: lvs. crenate; root-lvs. cordate or ovate; upper st.-lvs. linear: bracts subserrate, spreading or reflexed: fls. purple. Eu. B.M. 1466 (as *P. cordata*). L.B.C. 2:122.—A very variable species, and widely distributed, from England to mountain pastures on the continent. Correvon keeps *P. austriacum* distinct, the basal lvs. having blades longer than petioles, upper lvs. ovate-lanceolate, and specially by the erect fl.-bracts; also *P. confusum*, from granitic rocks of the Tyrol, which seems from his description to be a very different plant, with long and grass-like lvs. and deep violet fls.

15. **Charmélii,** Vill., not Sieb. Rootstock thick and brittle: sts. 6–12 in.: lvs. soft and coarsely serrate: bracts linear-lanceolate: fls. dark blue, in globular heads. Probably a botanical variety of *P. Scheuchzeri*. Alps. Here probably belongs the cut-lvd. *P. comosum* in Gn. 19, p. 419; 44, p. 554; and *P. orbiculare*, Gn. 28, p. 90.

16. **Scheùchzeri,** All. Sts. slender and flexile, 4–16 in. tall: lvs. ovate-elliptical, serrate, the upper ones long and narrow: bracts 18–24 lines long, reflexed or spreading: fls. deep violet-blue, in rounded heads, the bracts exceeding the head. S. Eu., in mountains. B.M. 1797. Gn. 63, p. 40.

WILHELM MILLER.
L. H. B.†

PHYTOLÁCCA (a hybrid name: Greek, *phytos*, plant, and French *lac*, or Italian *lacca*, lake; referring to the crimson berries). *Phytolaccàceæ*. Ornamental herbs and woody plants; some of them yield edible parts of minor value.

Shrubs, herbs, or trees, sometimes climbers, with angled or subterete branches, glabrous or nearly so: lvs. alternate, sessile or mostly petiolate, acute or obtuse, entire; stipules none: fls. small, borne in erect or nodding racemes on spikes which are at first terminal but by further growth of the st. may come opposite the lvs.; calyx of 4 or 5 persistent rounded sepals; stamens about 5–30; ovary of 5–16 distinct or connate carpels: fr. a fleshy berry; seeds 1 in each cell.—Twenty-six species as defined by Walter in Engler's Das Pflanzenreich, hft. 39 (IV. 83), published in 1909, distributed in tropical and subtropical regions, mostly in Amer., and a few in Asia and Afr., one species extending to Canada. They are plants of simple requirements in the regions where they grow, and are prop. readily by seeds. *P. dioïca* is a very useful tree for ornament and shade in S. Calif. The common pokeweed (*P. americana*) is a familiar wild plant in E. N. Amer.; it is a plant of good habit, vigorous growth, and ornamental berries, and is sometimes placed in back borders and wild-gardens. Related genera in cult. are Ercilla, Rivina, Agdestis.

A. *Stamens and carpels 10.*

americàna, Linn. (*P. decándra*, Linn.). POKE. SCOKE. GARGET. Tall stout bushy perennial herb, reaching 10–12 ft. high, the sts. soft or semi-succulent and smooth, glaucous, and the maturer parts purple-tinged: lvs. oval-oblong or oblong-lanceolate, gradually narrowed both ways, acuminate, the petiole more or less margined: fls. purplish or greenish white, in peduncled simple racemes and borne on stout bracted pedicels; ovary 10-carpelled and green, ripening into a wine-purple berry. Maine through Ont. to Minn., and far southward; naturalized in Eu.; often a weed, particularly in clearings and new lands. B.M. 931. Gn. 21, p. 179. G. 7:667. Mn. 1, p. 53.—A robust plant with heavy odor, but of good habit and clean. This species, the common pokeberry, is offered by dealers in native plants and its young asparagus-like shoots are sometimes used as a pot-herb. Its flattish berries yield a crimson juice of a very distinct hue, but it has never been fixed for dyeing purposes. Children sometimes make red ink from the berries for amusement. The berries have been used to give color to pale wines, but its use for this purpose is injurious and in Portugal has been prohibited by royal decree. The roots are emetic, purgative, and somewhat narcotic. The word "poke" is supposed to come from the American Indian word *pocan*, which apparently referred to any plant yielding a red or yellow dye, as pokeweed or bloodroot. In President Polk's campaign his followers wore lvs. of pokeweed. In collecting young shoots for greens, care must be taken not to include any portion of the root, as this would give a bitter taste and might cause serious illness, as the roots contain powerful drastic principles. Small pieces of the root eaten by mistake for horse-radish or turnip are reported to have caused serious and in some instances fatal cases of poisoning. The seeds are also poisonous. Directions are given in some of the older writings for the cult. of poke for the young shoots, which are eaten early in the season as a substitute for asparagus; but the wealth of other pot-herbs renders this plant unnecessary. It may be increased by seeds or by division of the thick roots. A variegated form once cult. for ornament is shown in R.H. 1887, p. 16, the lvs. light green above often shaded rose and more or less margined white, beneath pale rose to violet.

AA. *Stamens and carpels less than 10, usually 8.*

esculénta, Van Houtte (*Pircùnia esculénta*, Moq. *Phytolácca Kaémpferi*, Gray. *P. pekinénsis*, Hance). Somewhat woody, suberect, the sts. thick, green and glabrous: lvs. short-petioled, broad-elliptic or ovate, the apex somewhat acute or blunt: infl. suberect, loosely racemose, not surpassing the lvs., the peduncle and rachis glabrous: fls. pedicellate; calyx white, the parts rounded; stamens commonly 8, with white filaments and rose-colored anthers; style recurved: fr. with 8 free carpels. China, Japan.—Cult. for the edible lvs. This name is catalogued in England as "American grape."

acinòsa, Roxbg. Much like the last: peduncles and rachis scabrous: filaments and anthers white; style suberect; calyx-parts green at middle, white on margin, apex acute: lvs. ovate-oblong, acuminate at apex. China and Japan; spontaneous in India and said to be cult. for its lvs. which are edible when cooked.

AAA. *Stamens 20–30; carpels 7–10: fls. diœcious.*

dioïca, Linn. (*Pircùnia dioïca*, Moq. *Phytolácca populifòlia*, Salisb. *P. arbòrea*, Hort.). Evergreen tree, attaining great thickness of trunk and spread of top: branchlets glabrous: lvs. slender-petioled, glabrous, elliptic or ovate, mostly broadly acute at apex, the midnerve extending at the tip: infl. racemose, scarcely surpassing the lvs., suberect or pendulous: male fls. with 20–30 stamens, and calyx-parts elliptic and obtuse, white-spotted; female fls. with about 10 staminodia, the calyx parts broad, the ovary globose and 7–10-carpelled: fr. berry-like, the carpels connate at base and free at top. S. Amer., the "umbú" and "bella sombra" of Spanish-speaking people.—This species was intro. into Santa Barbara some 40 years ago, and is now well distributed in S. Calif.; there are trees with spread of top of 50 ft. and trunk 6 ft. diam., with buttresses 2 ft. high. It is a tree of astonishingly rapid growth, soon

making a good shade. In a recent freeze, it is reported that trees have lost their lvs. but the growth remained uninjured. L. H. B.†

PIARÁNTHUS in part: *Caralluma.*

PÌCEA (ancient Latin name derived from *pix*, pitch). *Pinàceæ.* SPRUCE. Ornamental trees, grown for their evergreen foliage and regular pyramidal habit; many species are valuable timber trees.

Evergreen trees with usually whorled spreading branches: lvs. usually 4-angled with white lines formed by numerous stomata arranged in rows and on all 4 sides, or compressed and stomatiferous only on the upper or ventral side which, on the lateral branchlets, by twisting of the lf.-stalk appears to be the lower one, sessile and jointed at the base to a short stalk projected from a prominent cushion called a pulvinus: fls. monœcious, catkin-like, terminal or axillary; the staminate yellow or red, consisting of numerous spirally arranged anthers with the connective enlarged at the apex and scale-like; the pistillate greenish or purple, consisting of spirally arranged scales each subtended at the base by a small bract and bearing 2 ovules at the inner side: cones pendulous or spreading, with persistent scales not separating from the axis after shedding the seeds, which are provided with a large and thin obovate or oblong wing.—Thirty-eight species in the colder and temperate climates of the northern hemisphere from the arctic circle to the high mountains of the temperate regions. They are all mentioned below and all of them except 4 are in cult. The names Picea and Abies are often exactly transposed by horticulturists and others.

The spruces are usually tall trees of pyramidal habit, sometimes dwarfed in horticultural varieties or in alpine forms, with spreading usually whorled branches clothed densely with acicular spirally arranged leaves. The catkin-like flowers appear in spring and are often very conspicuous by their bright red color. These are followed by usually pendent cones, green or purple before ripening and light to dark brown at maturity. The spruces are not only highly ornamental, but also very valuable forest trees, and as inhabitants of cooler climates they are especially adapted for cultivation in northern regions. Almost all are hardy North, except *P. sitchensis*, *P. Smithiana* and *P. spinulosa*, but they do not resist heat and drought well; some, however, as *P. pungens*, *P. canadensis*, *P. Omorika*, *P. orientalis*, *P. excelsa*, and some of the recently introduced Chinese species grow better in a drier climate than most others. For ornamental park planting the spruces belong to the most valuable evergreens on account of the symmetrical habit and rapid growth of most species. Only a few, like *P. orientalis*, *P. obovata*, *P. Omorika*, and *P. polita*, are of slower growth and therefore well suited for smaller parks and gardens; and so are the numerous horticultural forms, which are mostly dwarf and slow-growing and sometimes more interesting and curious than beautiful. The spruces are often planted as shelters and windbreaks, and also used for hedges, especially *P. excelsa*, which makes a very dense and durable hedge when regularly trimmed. *P. polita* is also recommended as a good hedge plant and seems well adapted, with its rigid spiny leaves. The spruces thrive best in moderately moist sandy loam, but will grow in almost any kind of soil provided it contains enough moisture; wet and dry soils are equally unfavorable. Slopes of northern aspect are well suited for spruces, and they thrive better in shady positions than most other conifers. As the roots mostly spread horizontally near the surface, the spruces will grow in shallow soil and are easily transplanted even as rather large plants; they may be moved with success at any time of the year except when the young shoots are growing, but if possible avoid transplanting shortly before dry weather is expected to set in.

Spruces are propagated by seeds, which ripen in fall and are usually kept dry and cool during the winter and sown in spring outdoors in prepared beds or in frames or boxes. The young seedlings should be shaded and watered in dry weather and may remain a year or two before being transplanted in nursery rows when not sown too thickly. Varieties and rarer kinds are often increased by layers or by grafting on seedling stock of *P. excelsa*. *P. canadensis* is used for forms of this species and for *P. mariana* and *P. rubra*. Veneer-grafting in spring or August in the greenhouse is usually employed; less commonly cleft-grafting with half-hardened wood. The dwarf forms grow readily from cuttings under glass in August or fall and given slight bottom heat in early spring; also most other forms and species, especially those with thinner and finer branches, can be raised from cuttings.

The spruces are important timber trees. The soft and light straight-grained wood is much used for construction, the interior finish of houses and for fuel, also for ship-building; but it is not durable in the ground. The bark of some species is used for tanning leather, and the resinous exudations are sometimes employed in medicine. From the red and black spruce, spruce beer is made by boiling the branches with honey. Spruces are often known in nurseries, especially in this country, under the name of Abies.

The grafting of piceas. (E. P. Drew.)

In the writer's experience, *P. canadensis* is a good stock on which to graft the finer varieties of spruce or those having four-sided leaves. Pot the stock the last of August, keep in shaded frame, syringe till danger of wilting is over and harden gradually. Be careful not to keep the earth in the pots too wet, as roots are liable to rot. Place the stocks in greenhouse after light frosts, and graft as soon as roots have started—about last of January generally. Do not wait until buds have made much growth, for then the sap will be running strongly to the upper buds, leaving the cion to remain dormant. When stock and cion are of same size, the veneer-graft may be used. In large stocks, use slit- or side-graft. Be sure that the knife is sharp enough to shave dry wood. Cut the cion in elongated wedge-shape; place it in the cleft by twisting the stock with left hand, fitting the cion exactly with the right. Be careful to wax well, as a hole the size of a pin left on the cut surface will be fatal to the cion. Place the grafted plants in a close frame until the cion is well started. Syringe from two to three times a day, shading when too hot. Give air gradually until well hardened. Do not cut back the stock for one year, as the cion may make second growth and winter-kill. If cion should die, do not use the stock again until after a year's rest, as two consecutive pottings will usually ruin the plant; this holds good only with Tsuga and *P. canadensis*. The above method can be used with equal success on Pinus, Abies, Juniperus, and other evergreens propagated by grafting.

2940. Cone of Norway spruce.— Picea excelsa. (×⅛)

Ornamental value of spruces. (Thomas H. Douglas.)

The piceas embrace some of the most useful as well as ornamental trees of the conifer family. They cover a great variety of forms, from the stiff-branched sturdy and rugged *P. pungens* to the lithe graceful and drooping *P. Breweriana*. The American species comprise

P. mariana, P. canadensis, P. rubra, P. pungens, P. Engelmannii, P. Breweriana, and *P. sitchensis.* The grand and towering Douglas spruce and the graceful hemlock spruce, so called, are not true spruces and will not be noticed in this article.

The white spruce, *Picea canadensis*, is a native of the northern parts of America and is justly thought to be one of our best conifers, a compact and upright grower of great longevity; trees growing at Waukegan, Illinois, of mature age, are well branched at the bottom, retain their pyramidal form, and annually make an upward growth. It is the most aromatic of the piceas; in fact, this odor is often used to identify it while young from the Norway spruce or Engelmann's spruce. It grows on a great variety of soils, bears crowding well and also will stand severe pruning; hence it is used for windbreaks and hedges. Seedlings vary considerably in color, some of them fairly rivaling the blue form of the *P. pungens.* This tree, being a native of a cold climate, is subject to the ravages of the red-spider in a warm climate and should not be planted south of Philadelphia or St. Louis. There is a variety of *P. canadensis* found in the Black Hills that stands extreme drought better than the northern form and is largely planted on the dry prairies of Nebraska and the Dakotas. It does not, however, do so well in northern Illinois or farther east as the northern variety.

2941. Shedding of the leaves of Norway spruce.—Picea Excelsa.

The picture shows the extremities of a limb that is eight years old. The part between the tip and *A* is last season's growth; between *A* and *B* it is two years old; and beyond *B* is a part that grew three seasons ago. The section beyond *C* is six years old; from *C* to *D* is seven years of age. The four years' growth of this limb not shown in the drawing was as densely covered with foliage as is the part shown in the upper figure; but there are not many leaves between *C* and *D* (seven years old) and none on the eight-year-old wood (except those on the branchlets, and these are younger). This shows that the leaves persisted six or seven years.

Picea Engelmannii, one of the gems of Colorado, resembles *P. canadensis* more than it does its near neighbor, *P. pungens*, being of finer foliage and not so stiff-branched as the latter. It is one of the few conifers that will stand the extreme cold of Petrograd, Russia, but on our western prairies it soon loses its lower branches, as it seems to be unable to withstand the hot and drying winds of that section in late summer and early autumn. In the eastern states, however, it does not have this fault, as the cooler and more humid air seems better to agree with it.

Another Colorado conifer, *P. pungens* (the blue form being called by some the "queen of the piceas"), is a striking and noble tree, seeming to be hardy wherever tested and on all varieties of soil. Strong, sturdy, and upright in growth, its form alone would make it a striking figure in any landscape. Its beautiful color varies from a light silvery hue in some specimens to a dark blue, almost purple in others. In some specimens the branches are in distinct and regular whorls, resembling *Araucaria excelsa.* Undoubtedly the oldest and finest specimens of this grand tree are found on the former grounds of the late Robert Douglas, at Waukegan, Illinois. These trees are now 35 to 40 feet high and show no signs of weakness anywhere, being one mass of foliage from the ground upward. The green form of *P. pungens* is an excellent tree, but is not so much appreciated by planters and lovers of trees as it should be, as it is always compared to its more striking variety, the blue spruce. There is a fine specimen growing on the above grounds, even larger than the blue form, which does not suffer in comparison with its near neighbors, *Abies concolor, A. Fraseri, Picea Engelmannii, Tsuga canadensis* or hemlock spruce, *Pseudotsuga Douglasii* or Douglas spruce, and *Pinus Strobus*, all large and fine specimens, equal to any in the Middle West.

Picea mariana, or black spruce, is undoubtedly the poorest tree of the genus from a landscape gardener's point of view. It has very short needles and is greatly disfigured by its cones, which hang on for several years. It begins seeding when very young and is an exceedingly slow grower. Some good specimens of it are found, however, in the East, but in very restricted localities. *P. rubra*, long thought to be a variety of the preceding, is a much better tree in every respect, resembling *P. excelsa* in color and form. It seems to be a short-lived tree, especially in the West. This tree is undoubtedly the least known of the American piceas. *P. sitchensis* of the Pacific Coast strongly resembles *P. pungens;* in fact, when the latter was first introduced it was thought to be a variety of *P. sitchensis.* It has much finer branches and needles than *P. pungens*, varies in coloring as much as the latter, and, where hardy, makes a very fine tree. Unfortunately it is not hardy in any of the northern states. Unlike *P. pungens*, it will not stand close planting, as the needles fall off badly where the branches are rubbed together by the wind or strike other objects.

Without doubt the most graceful and elegant picea is *P. Breweriana*, or weeping spruce, a native of the Siskiyou and Coast Ranges of mountains in northern California and Oregon. It has the true spruce form, tall and symmetrical, with horizontal branches and a beautiful dark green color. In its general features it resembles a well-grown specimen of the Norway spruce, but its distinguishing beauty is in the long pliant pendulous branchlets which hang straight down from the branches to a length of 6 to 8 feet and no larger around than a lead pencil. It has a stately grace in calm weather, but its characteristic impressiveness is seen only when the long flexible branches are undulating in a light breeze or streaming before a gale. The bark is smooth and reddish in color, adding to its beauty where glimpses of it can be seen through the green foliage. It grows only at high elevations in its native habitat and on the northern slope of the mountains where the annual fall of snow is 15 to 25 feet. The cones are from 2½ to 3½ inches long, of a purplish color, and as they grow only on the tips of the branches they add greatly to its beauty. Unfortunately this beautiful tree has not proved satisfactory. Out of over 300,000 seedlings raised in 1893, only one plant is now alive; it is growing on the Douglas grounds and is scarcely 5 feet tall, having cost over $100 a

LXXXVIII. Picea canadensis (or P. alba).—A golden variety.

foot, and this is doubtless one of the largest specimens in cultivation.

Of the foreign piceas, *P. excelsa* is most popular; in fact is the best known and most largely planted of any of the genus. It makes a large fine-looking tree, grows in a great variety of soils, is hardy throughout most of North America, is the most rapid grower of any of the piceas, and stands close planting very well. It is used more than any other tree for windbreaks and shelter-belts. It bears pruning well. Hedges of this species and *P. canadensis* that have been planted more than forty years are growing on the Douglas grounds that are now 8 feet high, and 9½ feet across the base. One fine specimen tree on these grounds measures about 63 feet high and 64 feet from tip to tip of its lower branches. Other foreign species, but not so well known nor so thoroughly tested as the preceding, are *P. obovata*, a close compact-growing tree dark green in color. *P. Smithiana* or *P. Morinda* is one of the handsomest of the piceas, but is not hardy in the northern states, plants from seed collected at an elevation of 8,000 feet on the Himalaya Mountains not proving hardy. Fine specimens of this tree are found in California, where it is justly prized. *P. Omorika* from southeastern Europe is one of the best of the hardy foreign piceas; it does well in the eastern states and forms a narrow pyramid with slender branches clothed with dark glossy foliage. There are several species of Picea from China and Japan that will doubtless prove hardy in the eastern states. Of these *P. jezoensis* var. *hondoensis* has proved one of the best in the eastern states; also *P. bicolor*, which forms a handsome pyramidal tree of rapid growth with dark green foliage, has proved perfectly hardy. All piceas will stand the pruning-knife, but this should be used not later than July 1 in the northern states and earlier farther south. They are propagated from seed the same as larix; and their varieties, of which there are a great number, are either grafted or raised from cuttings over bottom heat.

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KEY TO THE SPECIES.

A. *Lvs. quadrangular, all 4 sides with stomata.*
B. *Scales of cone obovate or orbicular, rounded, closely appressed before ripening.*
C. *Cones 2½–6 in. long.*
D. *Length of lvs. ¾–2 in.: young branchlets glabrous, more or less pendulous.*
E. *Lvs. spreading, sometimes 2 in. long: winter buds acute.* 1. **Smithiana**
EE. *Lvs. pointing foward, not over 1½ in. long: winter buds obtuse.* 2. **Schrenkiana**
DD. *Length of lvs. ½–1 in.*
E. *Lvs. spreading, rigid, sharply pointed: branchlets glabrous, pale yellow.* 3. **polita**
EE. *Lvs. pointing forward.*
F. *Young branchlets pale yellowish gray, pubescent: petioles very prominent, often recurved.* 4. **asperata**
FF. *Young branchlets brown, puberulous or glabrous.*
G. *Cones 4–6 in. long, or shorter in some varieties with stiff scales: branchlets glabrous or sparingly hairy.* 5. **excelsa**
GG. *Cones less than 4 in. long, with flexible scales: branchlets puberulous.* 6. **obovata**
DDD. *Length of lvs. less than ½in.: lvs. bright green, lustrous, obtusish: branchlets pubescent, light brown.* 7. **orientalis**
CC. *Cones ¾–2 in. long.*
D. *Young branchlets pubescent.*
E. *Color of lvs. dark green, lustrous: cones ovate-oblong, very short-stalked, deciduous; scales entire or denticulate.* 8. **rubra**
EE. *Color of lvs. dull, usually bluish green: cones ovate, distinctly stalked, persistent for many years; scales erose or dentate.* 9. **mariana**
DD. *Young branchlets glabrous, light brownish yellow.* 10. **canadensis**
BB. *Scales of cone oblong or rhomboidal, erose at the margin and usually striate and undulate, thin, very loosely appressed or slightly spreading.*
C. *Winter buds with appressed scales: branchlets pubescent: lvs. pointing forward, rather flexible.* 11. **Engelmannii**
CC. *Winter buds with loose scales revolute at the apex: branchlets glabrous: lvs. spreading, rigid.* 12. **pungens**
AA. *Lvs. more or less compressed, with 2 white lines above, green below or sometimes with few stomata.*
B. *Cone-scales rhomboidal, erose-denticulate, flexible, loosely appressed.*
C. *Cones brown at maturity: lvs. flattened.*
D. *Bracts visible between the scales of the cone: lvs. rigid, pungent; mature branchlets orange-brown: winter buds ovate.* 13. **sitchensis**
DD. *Bracts not visible: lvs. not pungent: mature branchlets greenish to light reddish brown: winter buds conical.* 14. **jezoensis**
CC. *Cones purple: branchlets orange-yellow, setose: lvs. quadrangular, somewhat compressed.* 15. **purpurea**
BB. *Cone-scales orbicular or obovate, closely appressed before maturity.*
C. *Branchlets glabrous, only leading shoot more or less hairy or all pubescent: lvs. quadrangular, somewhat compressed* 16. **bicolor**
CC. *Branchlets always pubescent: lvs. much compressed.*
D. *Lvs. keeled, ⅛–½in. long: branchlets short.* 17. **Omorika**
DD. *Lvs. nearly rounded on both sides, ½–1 in. long: branchlets long, drooping.* 18. **Breweriana**

Section I. Eupicea, Willk.

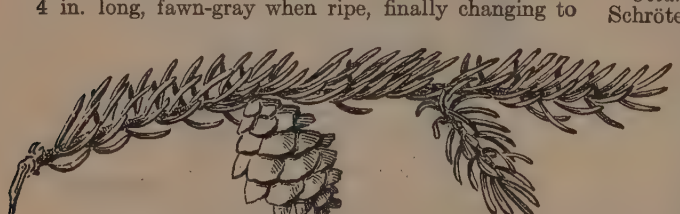
Lvs. quadrangular, with stomata on all 4 sides: scales of cone closely appressed before maturity, broad and entire or nearly so.

1. **Smithiàna,** Boiss. (*P. Morìnda,* Link. *P. Khùtrow,* Carr.). Tree, to 150 ft., with wide-spreading branches and slender pendulous branchlets: lvs. crowded, usually thicker than broad, acute, bright or dark green, ¾–2 in. long: pistillate fls. purple: cones 5–7 in. long, dark brown and glossy; scales suborbicular, with entire margin, firm. Himalayas. G.C. II. 24:393; III. 35:325; 38:395. Gn. 19, p. 359; 35, p. 599; 39, p. 72. C.L.A. 7:364. F.E. 16:705.—One of the most graceful spruces; hardy as far north as N. Y. The young growth starts very early and is liable to be injured by frost in spring, especially when planted in warm and damp situations.

2. **Schrenkiàna,** Fisch. & Mey. (*P. obovàta* var. *Schrenkiàna,* Carr.). Tall pyramidal tree, with pendulous branchlets, somewhat similar to *P. excelsa:* lvs. equally 4-sided, acute, somewhat dull green, ¾–1½ in. long, on young plants often slightly shorter: cones cylindric-ovate, 3–4 in. long; scales with entire margin. Siberia to N. China.—Similar in habit to the preceding species but branchlets not so long and lvs. shorter. A very desirable and hardy spruce. Var. **globòsa,** Schelle. About 6 ft. high, globose in shape.

3. **polìta,** Carr. (*P. Toràno,* Koehne. *P. bicolor,* Hort., not Maxim.). Tree, to 90 ft., forming a dense, broad pyramid, with rigid stout branches when young, older trees with the habit of *P. excelsa,* with somewhat pendulous branches: young branches thick, glabrous, yellowish brown: lvs. rigid, thicker than broad, often falcate, shining dark green, ½–1 in. long: pistillate fls. green, staminate yellowish: cone oblong, 4–5 in. long, brown, glossy; scales with finely denticulate margin. Japan. S.Z. 2:111. G.C. II. 13:233; III. 21:251. Gn. 13, p. 239. S.I.F. 2:2.—One of the most distinct spruces; of very striking appearance with its rigid spiny lvs. spreading in all directions from the stout branches, but usually of rather irregular habit.

4. **asperàta,** Mast. Tree, to 100 ft., with grayish brown bark peeling off in thin flakes: branchlets pale yellowish gray, pubescent: lf.-cushions with often spreading or recurved petioles: lvs. quadrangular, curved, ½in. long or slightly longer, acute or acutish and beveled at the apex: cones cylindric-oblong, 3¼–4 in. long, fawn-gray when ripe, finally changing to



2942. Picea mariana (×½). No. 9.

chestnut-brown; cone-scales usually rounded and entire at the apex. W. China.—A valuable timber tree. Var. **notàbilis,** Rehd. & Wilson. Lvs. ½–¾in. long: cones 3½–5 in. long; scales rhombic-ovate, narrowed toward the apex. Var. **ponderòsa,** Rehd. & Wilson. Bark thicker, brownish gray: branchlets nearly glabrous, yellowish: cones 5–6 in. long.

5. **excélsa,** Link (*P. Àbies,* Karst. *P. rùbra,* A. Dietr. *Pìnus Àbies,* Linn. *Pìnus Pìcea,* Dur.). Norway Spruce. Figs. 2940, 2941. Tree, to 150 ft., with spreading branches and usually pendulous branchlets: bark reddish brown: young branches brown, glabrous or pubescent: lvs. quadrangular, acute, dark green and usually shining, ½–1 in. long: staminate and pistillate fls. bright purple: cones cylindric-oblong, 4–7 in. long, light brown; scales obovate, with erose-denticulate margin. N. and Cent. Eu. Em. 1:102. Mn. 4, p. 185; 6, p. 85. F.E. 15:350, pl. 50. H.W. 1:1, pp. 54–61. C.L.A. 11:311. G.W. 2, p. 535; 6, p. 322.—Though *P. Abies* is the correct name for this species according to the rules of priority, we have retained here the name *P. excelsa,* because *Picea Abies* and *Abies Picea* might be easily confused and are certainly somewhat perplexing. It seems therefore advisable to take the next oldest names which are *Picea excelsa* for the Norway spruce and *Abies alba,* Mill., for the silver fir.—This tree is extensively planted as an ornamental tree in the northern and eastern states; it is of rapid growth and is a handsome tree, with its graceful habit and dark green dense foliage, but, like many spruces and firs, loses much of its beauty when it grows old, and usually after 30 years it becomes thin and ragged in the top. It is one of the best conifers to plant for shelters and windbreaks. The Norway spruce is very variable, and a great number of garden forms are in cult. Some of the more important are the following:

Pendulous or sparingly branched forms of P. excelsa: Var. **virgàta,** Casp. (var. *denudàta,* Carr.). Sparingly branched, with long and slender branches destitute of branchlets, spreading, usually the lower ones pendulous and the upper ones ascending. R.H. 1854, p. 102. G.W. 3, p. 523; 6, p. 607. M.D.G. 1894:31. H.W. 1, p. 63. *P. excélsa* var. *elàta,* Hort., is probably a seedling of this variety and an intermediate form varying toward the type. Var. **monstròsa,** Beissn. (var. *monocaùlis,* Nördl. *Àbies excélsa monstròsa,* Loud.), is an extreme form of the preceding and is destitute of all branches; it consists only of a single st. clothed with thick rigid lvs. Var. **viminàlis,** Casp. Branches in remote whorls, almost horizontal, with very long and slender branchlets without or with very few lateral branchlets. G.W. 3, p. 433; 9, p. 411. M.D.G. 1902:257; 1906:557. Gt. 38, p. 136. H.W. 1, p. 64. Var. **péndula,** Jacq. & Herincq (var. *refléxa,* Carr.). With pendulous branches and branchlets; whorls of branches often irregular. Gt. 48, pp. 618, 619; 50, p. 315; 52, p. 434. G.W. 6, p. 213. R.H. 1890, p. 259. Var. **invérsa,** Beissn. (*Àbies excélsa invérta,* Gord.). Similar to the preceding, but branches more closely appressed to the st., more densely branched, with thick lustrous lvs. Gng. 6:100. F.E. 22:765. G.M. 54:976. Gn.M. 2:24. G.C. III. 22:369; 29:263. Gt. 50, p. 317. B.H. 10, p. 300.

Columnar forms: Var. **pyramidàlis,** Carr. (var. *erécta,* Schröter). With branches ascending at an acute angle, forming a narrow, nearly columnar pyramid. Var. **columnàris,** Carr. With very short, horizontal much ramified branches, forming a narrow column. M.D. 1911, p. 260. Var. *cuprés-sina,* Thomas, is similar. M.D. 1907, p. 252.

Dwarf and dense, pyramidal, subglobose or prostrate forms: Var. **cònica,** Carr. A dense conical pyramid with ascending branches and slender branchlets: lvs. thin and pointed. Var. **Remóntii,** Beissn. A dense ovate or pyramidal form with short and dense branches. G.M. 54:222. F.E. 16:491. M.D.G. 1906:557. Var. **Clanbrasiliàna,** Carr. (*Àbies excélsa Clanbrasiliàna,* Loud.). A compact roundish or broadly conical form with short and crowded branches: lvs. short and thick. M.D. 1906:222. G.M. 57:634. Var. **compácta,** Beissn. A subglobose dense form with slender branchlets and acute short lvs. F.E. 16:585, pl. 65. Var. **Gregoryàna,** Beissn. (*Àbies excélsa* var. *Gregoryàna,* Gord.). A compact subglobose form densely branched, with short thickish pungent lvs. Var. **pygmæa,** Carr. A very dense, small, pyramidal form with ascending branches and bright green lvs. Gn.M. 2:23. Var. **nàna,** Carr. A depressed subglobose form with dense horizontally spreading branches and short sometimes monstrous branchlets. Var. **tabulifórmis,** Carr. A low flat form

with horizontally spreading branches. Var. **procúmbens,** Carr. A prostrate form with numerous short branchlets and dense short and pointed lvs. Var. **dumòsa,** Carr. Similar to the preceding, but less densely branched and lvs. more distant. Var. **rèpens,** Simon-Louis. A creeping form.

Low, irregularly branched monstrous forms: Var. **Bârryi,** Beissn. With vigorous thick branches and few short branchlets, dark green. Var. **Ellwangeriàna,** Beissn. A broad growing form with crowded slender branchlets and small and thin, acute lvs. Var. **capitàta,** Carr. Dwarf bushy form, with numerous short branchlets in dense heads at the end of the branches. R.H. 1889, p. 393. Var. **Máxwellii,** Beissn. A low flat dense form, the young branches brown, often with short fascicled branchlets: lvs. bright green, rigid, pointed.

Variegated forms: Var. **finedonénsis,** Beissn. (*Àbies excélsa finedonénsis,* Gord.). Lvs. pale yellow at first, becoming bronzy brown and finally green. Var. **argénteo-spicàta,** Hesse. Young shoots whitish. Var. **aûrea,** Carr. Lvs. golden yellow on the exposed side; does best in a partly shaded situation. Var. **mutábilis,** Carr. Young shoots yellow, changing soon to green. G.W. 3, p. 556.

The most important of the geographical forms are: Var. **fénnica,** Rupr. Similar to *P. obovata:* cones not more than 3 in. long. N. Eu. and N. Asia. Var. **mediôxima,** Nyland. Small tree or sometimes shrubby: lvs. thickish, shorter, lustrous, green: cones to 3 in. long. Resembles somewhat *P. orientalis.* N. Eu. Var. **alpéstris,** Brügg. Slow-growing compact tree: young branchlets velutinous: lvs. shorter, usually obtusish, dull yellowish or grayish green: cones 3–5 in. long. Resembles in habit and foliage somewhat *P. canadensis.* In the Alps at high altitudes.—There are two forms of the common Norway spruce differing in the color of the young cones: Var. **chlorocárpa,** Purk. Young cones green: lvs. obtusish, more appressed; leafing later. Var. **erythrocárpa,** Purk. Young cones violet-purple: lvs. more spreading, pointed; leafing earlier.

6. **obovàta,** Ledeb. (*P. excélsa* var. *obovàta,* Koch). Tree, to 100 ft., similar in habit to the following, with somewhat pendulous branchlets: young branches brown, glabrous or slightly pubescent: lvs. quadrangular, acute, dull or bluish green, ⅛–¾ in. long: pistillate fls. purple: cone oblong-ovate, light brown, about 2½ in. long; scales with entire margin. N. Eu. to Kamchatka and Manchuria. Gn. 20, p. 91. R.H. 1894, p. 274. Mn. 5, p. 189.—Of slower growth than *P. excelsa* and more graceful.

7. **orientàlis,** Carr. Tree, to 120 ft., with ascending and spreading branches and somewhat pendulous branchlets: young branches brown, pubescent: lvs. thick, obtuse, dark green and shining, crowded and more or less appressed to the branches: fls. carmine: cone cylindric-ovate, 2½–3½ in. long, less than 1 in. thick; scales orbicular, entire at the margin. W. Asia, Caucasus. G.C. II. 21:308; 25:333; III. 3:754. A.G. 19:649. Mn. 5, p. 189. V. 20:185. C.L.A. 11:311. Gn.M. 2:25. G.W. 16, p. 261.—A very graceful spruce with dark, glossy foliage; of slow growth and therefore valuable for smaller gardens. It holds its lower limbs for many years. Var. **nàna,** Carr. Low form of broadly pyramidal habit, with wide-spreading branches. Var. **aûreo-spicàta,** Beissn. Young shoots yellow. Var. **nûtans,** Niemetz. With graceful hanging branches. Var. **semivirgàta,** Schwerin. Branches with few lateral branchlets, which gives the plant a loose slender appearance.

8. **rûbra,** Link, not A. Dietr. (*P. austràlis,* Small. *P. rùbens,* Sarg.). Red Spruce. Tree, to 80 ft., or occasionally to 100 ft., with short and slender branches forming a narrow pyramidal head, with red-brown bark: young branches reddish brown: lvs. quadrangular, acute or mucronate, dark or bright green, shining, about ½in. long: fls. purple: cones oblong, 1¼–2 in. long, green while young, later light reddish brown, glossy; scales obovate, rounded and entire or slightly erose at the margin. From Canada to N. C., along the Alleghany Mts. S.S. 12:597.—Handsome tree, but requires cool and moist situation and is less drought-enduring than most others. Var. **virgàta,** Rehd., is a sparingly branched form with long and slender branches destitute of branchlets, very similar to *P. excelsa* var. *virgata.* G.F. 8:45.

9. **mariàna,** BSP. (*P. nìgra,* Link. *P. brevifòlia,* Peck). The native Black Spruce. Figs. 2942, 2943. Tree, usually to 20–30 ft. or occasionally to 100 ft., with slender, often pendulous branches forming a narrow,

2943. Cones of piceas. Largest one, P. pungens; lowest one, P. canadensis; upper right hand, P. mariana. (×½)

irregular head: bark gray-brown: young branches brown or yellowish brown: lvs. quadrangular, obtusish, dull dark or bluish green, bloomy especially on the upper side, ¼–¾in. long: fls. purple: cones oval-oblong, globose-ovate when open, dark purple while young, later dull grayish brown, ½–1½ in. long; scales rounded and finely denticulate at the margin. From Canada to Va., Minn. and Brit. Col. S.S. 12:596. —Very variable in habit; cone-bearing trees often only a few feet high when growing in swamps. The most ornamental garden form is var. **Doumétii,** Schneid. (*P. nìgra Doumétii,* Carr.), with ascending crowded branches forming a dense conical pyramid. A similar form, somewhat broader at the base with more light bluish green foliage, is var. **Beissneriàna,** Rehd. (*P. nìgra mariàna,* Beissn.). G.C. III. 11:80. Var. **fastigiàta,** Rehd. (*P. nìgra fastigiàta,* Carr. *Àbies nìgra pùmila,* Knight). A columnar form with ascending branches and short, acute lvs. Var. **nàna,** Rehd. (*P. nìgra nàna,* Beissn.). A dwarf subglobose form with light bluish green lvs. Gt. 50, p. 193.

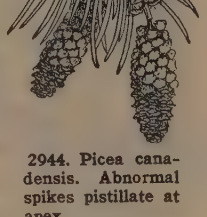
10. **canadénsis,** BSP. (*P. álba,* Link. *P. láxa,* Sarg.). The native White Spruce. Figs. 2943, 2944. Tree, usually 60–70 ft., with ascendent branches and usually pendent branchlets: bark light brownish gray: lvs. slightly curved, acute or acutish, more or less bluish green, ⅛–¾in. long, of a strong, aromatic odor when bruised: fls. pale red or yellowish: cones cylindric-oblong, light brown and glossy, 1½–2 in. long; scales orbicular, with usually entire margin, thin and flexible, From Labrador to Alaska, south to Mont., Minn., and N. Y. S.S. 12:598. G.F. 8:223 (adapted in Fig. 2944); 9:355. F.S. 21:2251. C.L.A. 11:311. F.E. 29:81. Gn. M. 4:19. M.D.G. 1899:80.—A decorative species of dense habit when young and with rather light bluish green foliage; it endures heat and drought much better than the two preceding species. The most important garden form is var. **cærùlea,** Schneid. (*P. álba cærùlea,* Carr. *P. álba argéntea* and var. *glaùca,* Hort. *Àbies rùbra violàcea,* Loud.). Of dense habit with light bluish green or almost silvery white lvs. Var. **péndula,** Schneid. (*P. álba péndula,* Beissn.). With pendulous branches. An important geographical variety is var. **albertiàna,** Rehd. (*P. albertiàna,* S. Br. *P. álba albertiàna,* Beissn.). Tree, to 100 or occasionally 150 ft., of narrow pyramidal habit: branchlets sometimes minutely pubescent: lvs. more crowded: lf.-cushions longer: cones shorter with more rigid rounded scales. Alberta. M.D.G. 1905:117 (as *P. alba*).

Section II. Casicta, Mayr.

Lvs. quadrangular or more or less compressed: scales of cone loosely appressed before maturity, rhombic and usually elongated, erose-denticulate, and more or less wavy on the margin.

11. **Engelmannii,** Engelm. (*P. columbiàna,* Lemmon). *Àbies commutàta,* Murr.). Engelmann Spruce. Tree, to 150 ft., with slender spreading branches in closely arranged whorls, forming a dense and narrow pyramid in young trees: winter buds with brownish yellow usually appressed or little spreading scales: young branches pale brownish yellow, pubescent: lvs. slender, straight or slightly incurved, acute, bluish green to steel-blue, ½–1 in. long, without resin canals, of a strong aromatic odor when bruised: fls. purple: cones oval- to cylindric-oblong, light brown, 1½–3 in. long; scales rhomboidal, narrowed and truncate or rarely acute at the apex. From Alberta and Brit. Col. to Ariz. and New Mex. S.S. 12:599. Gn.M. 2:26. F.E. 27:39. M.D.G. 1905:121, 122.—A very ornamental tree, varying in the color of foliage. Var. **glaûca,** Beissn., has bluish or steel-blue, and var. **argéntea,** Beissn., silvery gray foliage. M.D.G. 1906:557. *P. pseudopúngens,* Dieck, seems not to differ from typical *P. Engelmannii.* The latter is said to be sold for *P. pungens.* It is more common, and its seeds are therefore more readily secured.

12. **púngens,** Engelm. (*P. Parryàna,* Sarg. *Abies Ménziesii,* Engelm., not Lindl.). Colorado Spruce. Fig. 2943. Tree, 80–100, or occasionally to 150 ft., with horizontal stout branches in rather remote whorls, forming a broad, regular pyramid: winter buds with brownish yellow usually reflexed scales: young branches glabrous, bright yellowish brown: lvs. rigid, incurved, spiny-acuminate, bluish green to silvery white or rarely dull green, ¾–1⅕ in. long, with 2 resin canals: cones cylindric-oblong, light brown and glossy, 2½–4 in. long; scales rhomboidal, narrowed and erose at the apex. Wyo. to Colo. and Utah. S.S. 12:600. G.C. II. 20:725; III. 10:547. Mn. 7, p. 51. Gng. 7:49. S.H. 2:273. F. 1884, p. 5. G.M. 40:35.—A very handsome and very hardy tree of symmetrical habit, with light, sometimes almost silvery white foliage. According to the different shades of color of the foliage, the following varieties are distinguished: Var. **glaûca,** Beissn. With bluish green lvs. Gn. 63, p. 280. G.M. 50:121. Gn. M. 2:26. G.W. 1, p. 355; 14, p. 14. R.B. 32, p. 106. Var. **cærùlea,** Beissn. With bluish white foliage. G.W. 1, p. 357. Var. **argéntea,** Beissn. With silvery white foliage. Gt. 53, p. 493. G.W. 2, p. 295; 8, p. 481; 10, p. 48. M.D.G. 1901:178. Var. **Kósteri,** Beissn. With silvery white foliage and of very regular pyramidal habit. G.W. 15, p. 467. F.E. 16:461; 18: 82. Var. **glaûca péndula,** Beissn. With bluish foliage and pendulous branches. R.H. 1901, p. 183. F.E. 32:1173. G.W. 6, p. 399; 9, p. 543; 16, p. 79. M.D.G. 1901:133. Var. **víridis,** Regel (*P. commutàta,* Hort.), is the form with green lvs. Var. **compácta,** Rehd. A dwarf compact form; originated at the Arnold Arboretum. Var. **aùrea,** Niemetz. With golden yellow foliage. Var. **flavéscens,** Niemetz. With whitish yellow foliage. Var. **Mœrheimii,** Rujis. Grows more compact and foliage deeper blue.



2944. Picea canadensis. Abnormal spikes pistillate at apex.

13. **sitchénsis,** Carr. (*Àbies Ménziesii,* Lindl.). Tideland Spruce. Sitka Spruce. Tree, usually 100 ft., occasionally 200 ft. high, with slender horizontal branches, forming a broad pyramid in young trees; in old trees the upper branches short and ascending, the lower ones slender and spreading, clothed with slender branchlets: bark bright or dark red-brown: young branches rigid, light brownish yellow, glabrous: lvs. bright green, shining and rounded on the lower side, flat, slightly ridged and silvery white on the upper side, sharply acute or acuminate, ½–1 in. long: staminate fls. red: cones cylindric-oval, pale yellowish or reddish brown, 2½–4 in. long; scales rounded at the apex and erose. Alaska to Calif. G.C. II. 25:728, 729. S.S. 12:602. G.F. 4:211 (erroneously named Douglas fir). M.D.G. 1896:403; 1905:123.—A very ornamental tree, especially attractive by the contrasting colors of the foliage, but it can hardly be grown successfully in the eastern states; it does not stand the hot summers well, and is probably not hardy farther north than Mass. Var. **speciòsa,** Beissn., is of slower growth and more compact habit, with more ascending branches and shorter, more rigid lvs.

14. **jezoénsis,** Maxim. (*P. ajanénsis,* Fisch. *Àbies jezoénsis,* Sieb. & Zucc. *Àbies Alcockiàna,* Veitch, partly). Tree, 100–150 ft., or occasionally higher, with horizontally spreading slender branches: bark dark gray: young branches glabrous, shining, yellowish brown or yellowish green: lf.-cushions slightly swollen, with usually recurved petioles: lvs. slightly curved, acute, slender, slightly ridged on both sides, dark green and shining below, silvery white above, ½–¾in. long: fls. carmine: cones oblong, light brown, 1½–3½ in. long; scales oval-oblong, erose. E. Siberia, Amurland, Saghalin, N. Japan. G.C. II. 13:115, 212; III. 3, p. 53. J.H.S. 26, p. 104. S.I.F. 2:3. Gt. 38, p. 217, figs. 2–5. Var. **hondoénsis,** Rehd. (*P. hondoénsis,* Mayr. *P. ajanénsis* var. *microspérma,* Beissn., not Mast.). Tree, to 100 ft.: branchlets light reddish brown with much swollen lf.-cushions: lvs. shorter, more obtuse, dull green below. Cent. Japan. B.M. 6743. J.H.S. 26, p. 103, R.H. 1903, p. 341, and G.W. 1:358 (as *P. ajanensis*). S.I.F. 1:5.—The type is rarely cult; it does not grow well in the eastern states and suffers sometimes from late frosts, owing to its early leafing. The variety is much more satisfactory; it is not likely to suffer from frost, as it leafs later, and is a highly ornamental perfectly hardy tree.

15. **purpùrea,** Mast. Tree, to 60 ft. with wide-spreading branches: branchlets orange-yellow, hispid: winter buds broadly ovoid: lvs. quadrangular, more or less compressed, curved, obtuse or acutish, with 2 white bands above, green beneath, sometimes with a few stomata, ⅓–½in. long: cones cylindric-oblong, 2–2½ in. long, purple, even more or less so at maturity; scales rhombic-oblong, contracted, narrowed from about the middle, erose-denticulate, acutish or truncate at the apex. W. China.—Very handsome with its numerous purple cones.

Section III. Omorika, Mayr.

Lvs. more or less compressed, with glaucous lines above, green below: scales of cone closely appressed before maturity, broad and entire or nearly so on the margin.

16. **bícolor,** Mayr (*P. Alcockiàna,* Carr., partly. *P. Alcockiàna nòva,* Hort. *Àbies bícolor,* Maxim.). Tree, 80–150 ft., with rather stiff, spreading branches: bark grayish brown: young branches dull yellowish brown, glabrous, usually only leading shoots pubescent: lvs. somewhat curved, with 2 bluish lines above, dark green beneath, sharply acuminate, ½–¾in. long: cones oblong, brown, purple before ripening, 3–4 in. long; scales obovate, finely denticulate and slightly wavy at the often recurved margin. Japan. G.C. II. 13, p. 213. C.L.A. 11:311. Gn.M. 2:24. R.H. 1903, p. 340. S.I.F. 1:4.—Handsome tree, with less slender branches than *P. jezoensis* and of more rapid growth. Var. **aciculàris,** Shirasawa (*P. aciculàris,* Maxim. *P. japónica,* Regel). Branchlets finely pubescent: lvs. curved, acute, bluish white above: cones light reddish

brown, with entire not wavy scales. Cent. Japan. M.D. 1914:257. Var. **refléxa,** Shirasawa. Branchlets pubescent, light brown: lvs. more or less curved, acute, bluish white above, about ½in. long: cones light reddish brown; scales nearly entire, not wavy, at the apex slightly attenuate and recurved. Cent. Japan. M.D. 1914:257.

17. **Omórika,** Bolle (*Pìnus Omórika,* Pancic). Tree, to 100 ft. or higher, with rather short spreading and ascending branches forming a narrow pyramidal head: young branches brown, pubescent: lvs. compressed, ridged on both sides, obtuse and mucronulate, dark green and shining below, with whitish lines above, ⅓–½in. long: fls. purple: cones ovate-oblong, cinnamon-brown, glossy, 1½–2½ in. long; scales almost orbicular, with finely denticulate margin. S. E. Eu. G.C. II. 21:308; III. 21:153. Gt. 47, p. 177. R.H. 1905, p. 239.—Handsome tree of rather slow growth, forming a dense and narrow pyramid when young; very hardy.

18. **Breweriàna,** Wats. Tree, 80–120 ft. high, with the branches at the top slightly ascending, the lower ones horizontal or pendulous, with whip-like pendulous branchlets often 7 or 8 ft. long, furnished with similar, slender lateral branchlets; young branches reddish brown, pubescent: lvs. straight or slightly curved, obtuse, rounded and dark green at the lower surface, almost flat and with white lines above, ¾–1 in. long: staminate fls. purple: cones oblong, 2½–5 in. long, light orange-brown; scales obovate, with entire margin. Siskiyou Mts. in Ore. and N. Calif. S.S. 12:601. G.F. 3:66, 67; 5:595. G.C. II. 25:497. M.D.G. 1905:123.—One of the most distinct spruces, but does not seem to do well in the eastern states.

The Roman figure indicates the section to which the species belongs: *P. asc*é*ndens,* Patschke. (Section III.) Tree, to 80 ft.: branchlets pale brown, glabrous: lvs. about ¾in. long, compressed, with 2 white lines above: cones 3–4 in. long, with obovate truncate scales. W. China.—*P. aurantìaca,* Mast. (I.) Allied to P. asperata. Tree, to 40 ft., with pale gray bark: branchlets orange, glabrous: lvs. quandrangular, about ½in. long: cones 4–5 in. long, brown, with broad, rounded, slightly erose scales. W. China.—*P. Balfouriàna,* Rehd. & Wilson. (II.) Allied to P. purpurea. Tree, to 120 ft.: branchlets villous, yellowish: lvs. ⅓–½in. long, compressed, whitish above, acute or obtusish: cones purplish, 2–3½ in. long, with rhombic denticulate scales. W. China.—*P. brachytỳla,* Pritz. (P. pachyclada, Patschke). (III.) Tree, to 70 ft.: branchlets brown, nearly glabrous: lvs. ½in. long, compressed, white above: cones 3–4 in. long, with obovate scales entire at the margin. W. China.—*P. complanàta,* Mast. (III.) Tree, to 80 ft., with gray bark: branchlets orange-brown, pubescent or sometimes glabrous: lvs. flattened, acute, white above, ¾in. long: cones reddish brown, 5–6 in. long, with broad rounded or truncate scales. W. China. G.C. III. 39:147.—*P. Glèhnii,* Mast. (III.) Tree, to 150 ft.: branchlets brown, pubescent: lvs. ¼in. long, obtusely quadrangular, whitish above, green beneath: cones brown, violet-purple while young, 1½–2 in. long, with broad rounded erose scales. Amurl., Saghalin, N. Japan. G.C. II. 13:301. S.I.F. 2:3.—*P. heterólepis,* Rehd. & Wilson. (I.) Allied to P. asperata. Tree, to 80 ft.: branchlets brownish, glabrous: lvs. quadrangular, thick, pungent, ½–¾in. long: cones 3½–5½ in. long, pale brown, with rigid rhombic-obovate scales, emarginate or bifid at the apex. W. China. —*P. Koyàmai,* Shirasawa. (III.) Allied to P. Glehnii. Tree, to 30 ft.: branchlets bright reddish brown, glabrous: lvs. quadrangular, ⅓–½in. long, acutish, bluish white above: cones light brownish green, 1½–2½ in. long; scales broadly obovate, rounded, entire. Cent. Japan. M.D. 1914:257.—*P. likiangénsis,* Pritz. (II.) Tree, to 80 ft.: branchlets light yellow-gray, sparingly hairy: lvs. quadrangular, slightly compressed, ½in. long, white above: cone about 2 in. long with rhombic-ovate, erose, flexible scales. W. China.—*P. Màstersii,* Mayr=P. Wilsonii.—*P. Maximowiczii,* Regel (P. Tschonoskii, Mayr. P. excelsa var. obovata japonica, Beissn.). (I.) Allied to P. obovata. Small bushy tree: branchlets reddish brown, glabrous: lvs. rigid, pointed, spreading, about ½in. long: cones 1¼–2 in. long, lustrous brown, with broad rounded scales. Japan.—*P. Mèyeri,* Rehd. & Wilson. (I.) Allied to P. asperata. Medium-sized tree: branchlets cinnamon-brown, hairy: lvs. quadrangular, slightly compressed, curved, obtusish, ⅓–¾in. long: cones 2–2½ in. long, lustrous brown, with rounded or truncate scales. N. China.—*P. montìgena,* Mast. (II.) Tree, to 100 ft.: branchlets pale brown, hairy: lvs. quadrangular, ½in. long, curved, acutish: cones brown, 3–4 in. long, with rhombic-ovate, flexible, erose scales. W. China. G.C.III. 39:146 (except the cone).—*P. morindoides,* Rehd.= P. spinulosa.—*P. Mòseri,* Mast. (P. jezoensis ×P. mariana Doumetii). Branchlets smooth, olive: lvs. quadrangular, acute, ½–¾in. long, glaucous above, green below. Garden origin. J.H.S. 26:105.—*P. pachyclàda,* Patschke=P. brachytyla.—*P. retroflèxa,* Mast. (I.) Tree, to 120 ft.: branchlets glabrous, rarely slightly hairy, bright yellow, rarely brownish orange: lvs. quadrangular, pungent, ½–1 in. long: cone lustrous brown, 3–4½ in. long, with obovate, rounded, stiff scales. W. China.—*P. Sargentiàna,* Rehd. & Wilson. (III.) Tree, to 70 ft.: branchlets yellow or orange, glandular: lvs. compressed, acutish or obtuse, about ½in. long, white above, lustrous green beneath: cones 2½–5 in. long, brown, with obovate, rounded or truncate scales. W. China.—*P. spinulòsa,* Griff. (P. morindoides, Rehd.). (III.) Tree, with spreading branches and slender pendulous branchlets: lvs. 1–1½ in. long, pungent, slightly compressed, glaucous above: cone 3–4 in. long, yellowish brown, with rhombic obovate scales minutely denticulate. E. Himalayas. B.M. 8169. G.C. III. 39:218, 274. R.H. 1908, p. 517. G.M. 51:47. S.T.S. 1:48. Tender.—*P. Tschonóskii,* Mayr=P. Maximowiczii.—*P. Watsoniàna,* Mast. (I.) Tree, to 40 ft.: branchlets glabrous: lvs. quadrangular, slender, ½ in. long, bright green: cones 2–2½ in. long with obovate, rounded scales. W. China.—*P. Wilsonii,* Mast. (P. Mastersii, Mayr). (I.) Tree, to 80 ft.: branchlets glabrous, pale gray: winter buds ovoid, dark brown, lustrous: lvs. quadrangular, curved, acute, ½in. long: cones cylindric-oblong, 1½–2 in., brown; scales suborbicular, entire, finally recurved at margin. Cent. China. G.C. III. 33:133.

Not in cult. are the following species: *P. gemmàta,* Rehd. & Wilson, *P. hirtélla,* Rehd. & Wilson, *P. Neoveitchii,* Mast. (G.C. III. 33:116), from China, and *P. Morrisonícola,* Hayata, from Formosa.

ALFRED REHDER.

PICKEREL-WEED: *Pontederia.*

PICOTEE: *Carnation.*

PICRÁSMA (Greek, *pikrasmos,* bitterness; referring to the bitter bark and wood). Including *Picrèna. Simarubàceæ.* Trees and shrubs, with alternate odd-pinnate lvs., yellowish green fls. in axillary long-peduncled loose cymes, and subglobose dry berry-like fr. About 8 species in S. and E. Asia and W. India. **P. quassioìdes,** Bennett (*P. ailanthoìdes,* Planch. *P. japónica,* Gray), seems to be the only species in cult. It is an upright shrub or small tree to 30 ft., almost glabrous except the tomentulose infl.: lvs. with 4–8 pairs of lfts.; lfts. ovate or oblong-ovate, acuminate, crenately serrate, 2½–3½ in. long: fr. pea-sized, bright red, with 1 seed. Himalayas, China, Japan. S.I.F. 1:53. This is probably the hardiest species of the genus, and has proved hardy at the Arnold Arboretum in favorable positions but needs protection while young. Its chief ornamental value consists in the handsome foliage turning orange and scarlet in fall and in the bright red frs. Wood and bark are exceedingly bitter. The wood of some species, especially *P. excelsa,* Planch., from W. Indies, is used in medicine like that of Quassia.

ALFRED REHDER.

PIE-PLANT: *Rhubarb.*

PIÈRIS (a mythological name). Including *Portùna. Ericàceæ.* Ornamental shrubs, grown chiefly for their handsome white flowers.

Evergreen or deciduous shrubs or rarely small trees: lvs. alternate, short-petioled, entire or serrulate: fls. in often panicled racemes or in axillary clusters forming terminal racemes; calyx-lobes valvate or distinct; corolla globose or urceolate, with 5 short lobes; stamens 10; anthers obtuse, with a pair of awns near the base or the filaments 2-toothed below the apex: caps. with 5 dehiscent valves; seeds linear-oblong, not winged, with membranaceous testa.—About 10 species in N. Amer. and in E. Asia south to the Himalayas. Often included under Andromeda. Closely allied to Lyonia, which is distinguished by its awnless anthers, and to Zenobia, which has the anthers 4-awned at the apex. The foliage of some species is said to be poisonous to cattle.

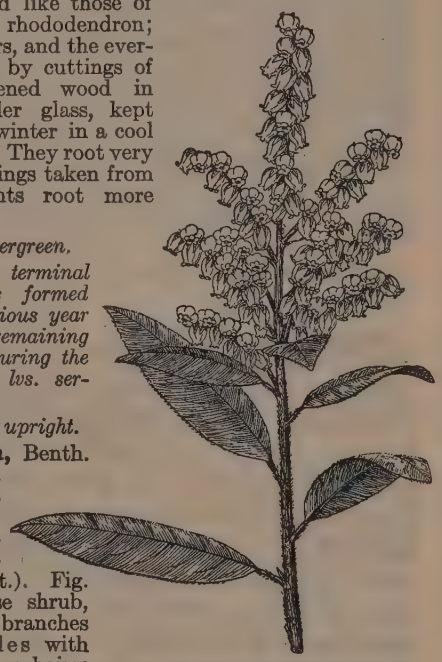
The pieris are handsome shrubs with medium-sized oval to lanceolate leaves and with rather small white flowers in large terminal panicles or in racemes. The evergreen *P. floribunda* and the deciduous *P. mariana* are hardy North and, like the other species, are valuable for the earliness of their flowers. The most beautiful are *P. japonica* and *P. formosa;* the first thrives still in Massachusetts in sheltered positions, but the flowers are usually winter-killed, while *P. formosa* can be grown only South. They are easily forced, and *P. japonica* especially may be recommended for this purpose; it makes a very handsome and graceful pot-plant for

inside decoration with its slender racemes of pure white flowers hanging over the glossy bright green foliage. The species of Pieris, like other Ericaceæ, grow well in a moderately moist well-drained and porous soil, but dislike limestone and heavy clay; a partly shaded situation suits them best. Propagation is by seeds treated like those of azalea or rhododendron; also by layers, and the evergreen kinds by cuttings of almost ripened wood in August under glass, kept during the winter in a cool greenhouse. They root very slowly; cuttings taken from forced plants root more readily.

A. *Lvs. evergreen.*

B. *Fls. in terminal panicles formed the previous year and remaining naked during the winter: lvs. serrulate.*

C. *Panicles upright.*



2945. Pieris floribunda. (×½)

floribúnda, Benth. & Hook. (*Andrómeda floribúnda,* Pursh. *Portùna floribúnda,* Nutt.). Fig. 2945. Dense shrub, 2–6 ft. high: branches and petioles with strigose brown hairs: lvs. ovate to oblong-lanceolate, acute, minutely serrulate and setosely ciliate, otherwise glabrous, 1½–2½ in. long: fls. nodding, in terminal dense upright panicles 1½–4 in. long; corolla ovate, strongly 5-angled, white, ¼in. long. April, May. Va. to Ga., in the Alleghany Mts. B.M. 1566. B.R. 807. G.C. III. 45:408. Gn. 31, p. 612. Gn.M. 6:280. Mn. 5, p. 132. M.D.G. 1898:333.—Very desirable evergreen shrub for its hardiness and earliness of the fls.

CC. *Panicles drooping.*

japónica, D. Don (*Andrómeda japónica,* Thunb.). Fig. 2946. Shrub, with spreading branches or sometimes small tree to 30 ft.: branches glabrous: lvs. crowded at the ends of branches, obovate-lanceolate or oblanceolate, crenately serrulate, narrowly cuneate at the base, glabrous, 1½–2½ in. long: fls. in pendulous panicles, 2½–5 in. long; corolla ovate, not angled, ¼in. long. April, May. Japan. R.B. 11:10. B.H. 21:19. Gn. 12:98, and p. 424; 50, p. 307; 57, p. 399. G.C. II. 17:797. M.D.G. 1898:544. G.W. 9, p. 354. J.H. III. 51:109. G.M. 55:199. G. 24:141; 27:182; 31:593. S.I.F. 1:78. Var. **álbo-marginàta,** Rehd. Lvs. with whitish margin and smaller. Var. **pygmæa,** Maxim. Dwarf form with small linear-oblanceolate lvs. Japanese botanists speak of a variety with the racemes a foot and more long; this form seems to be not yet intro. *P. japonica* is one of the most graceful early-blooming evergreens.

formòsa, D. Don (*Andrómeda formòsa,* Walt.). Shrub or small tree, to 20 ft.: branchlets glabrous: lvs. crowded at the end of the branchlets, elliptic-oblong to lanceolate, acuminate, broadly cuneate at the base, finely serrulate, glabrous, lustrous above, 2–5 in. long: fls. in terminal drooping or spreading panicles, to 6 in. long; corolla urceolate, white or tinged with pink, ⅓in. long. April, May. E. Himalayas. B.M. 8283. G.C. II. 15:569. Gn. 54, p. 77. G. 27:183; 35:425, 427. I.H. 5:162.—Very similar to the preceding species, but larger in every part; less hardy.

BB. *Fls. in axillary clusters, forming terminal leafy racemes: lvs. entire.*

lùcida, Rehd. (*P. nítida,* Benth. & Hook. *Andrómeda lùcida,* Jacq. *A. nítida,* Bartr. *A. coriàcea,* Ait. *Lyònia nítida,* Fern. *L. lùcida,* Koch). Fetter-Bush. Shrub, 2–6 ft. high, with triangular branches, quite glabrous: lvs. obovate or broadly elliptic to oblong, narrowed at both ends, bright green and shining above, entire and slightly revolute at the margin, 1½–3 in. long: corolla cylindric-ovate, white to pink, ¼–⅓in. long: caps. ovoid-globose, with ridges at the sutures. March–May. N. C. to Fla. and La. B.M. 1095. Var. **rùbra,** Rehd. (*Andrómeda coriàcea rùbra,* Lodd.). Fls. deep pink. L.B.C. 7:672.

AA. *Lvs. deciduous or half-evergreen, entire: fls. in racemes.*

mariàna, Benth. & Hook. (*Andrómeda mariàna,* Linn. *Lyònia mariàna,* D. Don. *Leucóthoë mariàna,* DC.). Stagger-Bush. Fig. 2947. Deciduous shrub, 2–4 ft. high, glabrous or nearly so: lvs. oval to oblong, obtuse or acute, usually cuneate at the base, entire, 1–3 in. long: fls. nodding, in axillary clusters on leafless branches of the previous year, forming 2–5-in.-long racemes; corolla cylindric-campanulate, white or pale pink, almost ½in. long: caps. ovate-pyramidal. April–June. R. I. to Fla. B.M. 1579. Mn. 2:47. G.O.H. 113. A.G. 10:281 (adapted in Fig. 2947).—The foliage is said to poison lambs and calves.

ovalifòlia, D. Don (*Andrómeda ovalifòlia,* Wall.). Half-evergreen or deciduous shrub or tree, to 40 ft.: branchlets glabrous: lvs. coriaceous, ovate or elliptic to ovate-oblong, short-acuminate or acute, usually rounded at the base, glabrous or hairy on the veins beneath, 2–6 in. long: fls. in simple lateral racemes with a few lvs. at the base, 2–6 in. long; sepals ovate to triangular-lanceolate; corolla oblong-urceolate, white, slightly pubescent outside, ⅓in. long. May–June. Himalayas. Var. **lanceolàta,** Clarke (*P. lanceolàta,* D. Don). Lvs. elliptic-oblong to elliptic-lanceolate, narrowed at the base, smaller: sepals greenish, oblong to lanceolate. Himalayas, China. Var. **ellíptica,** Rehd. & Wilson (*P. ellíptica,* Sieb. & Zucc.). Lvs. thinner,

2946. Pieris japonica. (×½)

deciduous, elliptic-ovate to ovate-oblong. Japan, China. S.I.F. 2:60. This variety is hardier than the type.

P. phillyreæfòlia, DC. Evergreen shrub, 1–2 ft., glabrous: lvs. oblong, serrulate near the apex, 1–2 in. long: racemes axillary, 4–12-fld.; corolla ovoid, white. Feb., March. W. Fla. B.R. 30:36. H.I. 2:122.

Alfred Rehder.

PIGAFÉTTA (derivation not known). *Palmàceæ.* Tall palms: sts. stout, aculeate above, remotely annulate below, creeping at base: lvs. terminal, pinnately

divided; segms. opposite and alternate, lanceolate, acuminate: spadix paniculate, much branched, pendulous: fls. polygamous-monœcious; male calyx obconic, truncate or obscurely 3-toothed; petals 3, free, lanceolate, valvate; stamens 6, filaments short, thick; ovary an inconspicuous rudiment: fr. globose or oblong, 1-celled. About 5 species, Malaya. *P. elàta*, Wendl. (*Hyospàthe elàta*, Hort. *Metróxylon elàtum*, Mart.). Trunk of very hard wood, erect, naked: lvs. spreading

2947.
Pieris mariana.

and drooping, similar to those of Cocos; petioles thick and having long bristles which become spiny with age: infl. long, spadices with pendulous branches: fr. with a solitary blackish seed.—Celebes. Cult. occasionally abroad; for treatment, consult article *Palm*.

PÌLEA (*pileus*, a Roman cap: one of the segments of the perianth in the first described species covering the achene). Syn., *Adìcea*. *Urticàceæ*. Mostly weedy plants, but forms of one or two species are grown in greenhouses for their compact fern-like sprays and for the interesting phenomenon of forcibly discharging the pollen, whence the name "artillery plant."

Annual or perennial herbs, glabrous or pubescent: lvs. opposite, usually strongly 3-nerved: fls. monœcious or dicœcious, mostly very small and in axillary clusters; stamens 3–4, and the sepal-lobes in the staminate fls. of the same number; sepal-lobes of pistillate fls. 3, the ovary 3-angled and erect and bearing a sessile tufted stigma, with 3 scale-like staminodia: fr. an achene, ovate or nearly orbicular, compressed, more or less invested in the perianth.—There are 150 or more species of Pilea in the tropics, chiefly of Amer., and few extra-tropical; one, *P. pumìla*, is a small nettle-like but stingless plant growing in the northern states.

The artillery plants of the gardens are small branchy half-succulent herbs, usually grown in pots and allowed to reach a foot or so in height. The gracefully curving fronds of small ovate or obovate shining leaves are much prized. They are easy to grow, being propagated by cuttings. They thrive best when given an abundance of water. Sometimes they are used as edgings in orchid houses, to screen the pots with green, and they also tend to equalize the moisture conditions and thereby contribute to the welfare of the orchids. When the staminate flowers open, the pollen is usually discharged forcibly and visibly. If a plant is put in a sunny place when the pollen is ripe, it may set up a vigorous bombardment, particularly if the foliage is sprayed. (See I.H. 1, p. 64, 1854, for an account of this phenomenon.) The artillery plant is seen in nearly every greenhouse, but whether there is more than one species in common cultivation it is not easy to determine, for specific characters are difficult to draw. The leaves, although opposite, are unequal. Usually the branchlets develop alternately on the branch. The species are confused.

muscòsa, Lindl. (*P. microphýlla*, Liebm.? *P. callitrichoìdes* of some authors). Monœcious: small, rather weak plant: lvs. less than ¼in. long as a rule, sometimes very small: fl.-clusters mostly sessile or nearly so. Mex., W. Indies, S. Amer.—Whether the plant in cult. is really the *P. muscosa* originally described by Lindley is in question. The plants are variable and characters apparently not well understood. *P. microphylla*, Liebm., is reported in Fla.

serpyllifòlia, Wedd. (*P. muscòsa*, Hort., in part. *P. callitrichoìdes* of some). Fig. 2948. Dicœcious: plant usually stronger and more upright: lvs. usually ¼in. or more long, and fl.-clusters more peduncled. Mex.—Seems to be the commoner species, but it is difficult to determine them. L. H. B.

PILOCÁRPUS (Greek, *pilos*, a cap, and *karpos*, a fruit, from the shape of the fruit). *Rutàceæ*. Shrubs or small trees, sometimes attaining 10 feet.

Leaves pinnately compound, of 1–4 pairs and a terminal lft.; lfts. opposite, but the lvs. usually alternate: fls. in elongated racemes; petals 4–5, valvate; stamens 4–5; ovary 4–5-lobed, not tubercled.—Seventeen species, natives of Trop. Amer., principally Brazil. The plants of the genus form the source of the alkaloid "pilocarpine," and together with plants of several other genera, the source of the drug "jaborandi."

pennatifòlius, Lem. Branchlets glabrous or puberulent: lvs. alternate, 1–1½ ft. long; lfts. 2 or 3 pairs, besides the terminal one, 3–9 in. long, oblong; apex rounded or emarginate, coriaceous, yellowish green:

2948. Artillery plant.—Pilea serpyllifolia.
(Left-hand spray about natural size)

raceme spike-like, many-fld. (about 100): rachis stout, pedicels stout, horizontal, with 2 small greenish tooth-shaped bracts at their bases: fls. reddish brown, rotate. Brazil. B.M. 7235. J.F. 3:263.—Intro. into Calif. and said to be hardy in the open wherever the lemon can be successfully grown.

racemòsus, Vahl. A small tree or shrub, 6–15 ft. high: lfts. 1–5, lance-elliptic to oval or obovate, retuse at the apex, cuneate or somewhat rounded at the base,

entire, coriaceous, pellucid-punctate: petals ovate or oblong-ovate, acute; filaments subulate: fr. a dark brown or blackish follicle; seeds glabrous. W. Indies. —Intro. into Calif.

P. Jaborándi, Holmes, has been described as P. pennatifolius, by Bentl. & Trim., but is distinguished from it by shorter lvs. and lfts., stiffly pubescent branchlets and sts., more openly fld. racemes, with slender rachis and pedicels, and the presence of 2 inconspicuous bracteoles above the middle of the fl.-pedicels. B.M. 7483.

ARNOLD V. STUBENRAUCH.
F. TRACY HUBBARD.†

PILOCÈREUS of the "Cyclopedia of American Horticulture" is mostly *Cephalocereus*. *P. Celsiànus*=Cleocereus. *P. chrysomallus* and *P. Colúmna-Tràjani*=Pachycereus. *P. Daùtwitzii*=Oreocereus. *P. Houllètii*, Auth.=Cephalocereus Sartorianus. *P. Schóttii*=Lophocereus. *P. Straùsii*=Oreocereus Celsianus.

PILÓGYNE: *Melothria.*

PILULÀRIA (Latin, *a little ball*, alluding to the shape of the involucres). *Marsileàceæ*, one of the fern allies. Small aquatic plants, sometimes used in ponds: rootstock filiform, creeping, rooting at the nodes: barren fronds reduced to filiform stipes, few or clustered at the nodes: involucres solitary at the nodes, sessile or shortly stipitate, globular: sori 2–4, vertically adnate.—About 6 species, Eu., W. Asia., Austral., New Zeal., and N. Amer.

globulífera, Linn. Rootstock creeping under water, often to a considerable extent: barren fronds filiform, bright green, like the lvs. of Isoetes, 1–3 in. long, usually few together at the nodes: involucre about the size of a pea, slightly hairy, sessile or borne on very short erect or recurved stipes. Eu., W. Asia, and Austral.

PILÚMNA: *Trichopilia.*

PIMÈLEA (Greek, *fat*, referring to the fleshy seeds). *Thymelæàceæ*. RICE-FLOWER. Mostly shrubs, fitted for greenhouse culture, although reported to be hardy in the open wherever the lemon can be grown successfully.

Woody, or rarely herbaceous, with small opposite or alternate, always simple and entire lvs.: infl. usually a terminal head or cluster, never umbellate, often with an involucre of 4 or more bracts at the base: fls. hermaphrodite or functionally dicœcious, white, pink or reddish, small but showy in the clusters and the bracts are often colored; perianth tubular, with a spreading (rarely erect) 4-lobed limb, the throat sometimes folded or thickened but without scales; stamens 2, inserted in the throat opposite the 2 outer perianth-lobes; ovary 1-celled: fr. a small drupe, included in the base of the perianth.—Austral. and New Zeal. Of the 80 or more species, only 3 or 4 (as *P. ferruginea*, *P. ligustrina* and *P. spectabilis*) are much known in cult. here, but there are other very showy species, some of which are grown in the Old World.

These fine evergreen shrubs may be increased readily from cuttings of the young half-ripened shoots in March. Make these cuttings 2 to 3 inches long and place in pans, leaving about an inch between the cuttings. The pans should be filled with a mixture of loam, peat and silver sand in equal parts. See that the pans are well drained. Place where they may have a temperature of 55° to 60° and keep covered with glass. See that they are shaded and moist, and they will soon root. When they have made a fair amount of roots, they may be potted up into small pots, using a mixture of fibrous loam, fibrous peat, and leaf-mold in equal parts, with enough of sand to keep the compost open. Be sure that each pot has plenty of drainage as this is necessary for their welfare. They should be grown in a house where they will get a fair amount of ventilation in the summer and be shaded. The atmosphere should be kept moist by damping down, and the plants should have a good syringing every bright day. In the summer they should have the tops pinched. The pots may be placed on ashes, and this will help to keep them moist. They are slow-growing plants, and therefore will need but one shift during the summer. When they have filled the pots with roots, they may be shifted into 3- or 4-inch pots, using the same mixture. When the autumn comes, they should be given more ventilation, to ripen up whatever wood they have made. In autumn they may have a temperature of about 50° at night with about 10° rise with sun heat. They will do well in about 45° for a winter temperature, with about 55° to 58° on bright days. In winter, give great care to watering so they will not become too wet, just keeping in a nice moist state. By February they may have any necessary potting, using a mixture of fibrous loam four parts, fibrous peat one peat, leaf-mold and well-decayed cow-manure one part each, and enough clean sharp sand to make it porous. Pot firmly. They may now be given a temperature of 50° during the night with about 65° on bright days and by April they should be standing 5° to 8° more. They will now need a shift into 5- or 6-inch pots, and give them a pinch back when they have made a little growth. In summer they may have the strongest growths tied out in a horizontal position. Give the same culture as advised for the previous summer and by the next spring the plants should flower. For established plants, they will require heading in after they are through flowering and encouraged to make growth freely during the summer. Give these plants plenty of syringing as they are liable to be affected with red-spider; their treatment year after year will be similar to that mentioned before, only with larger shifts and to be assisted by weekly applications of liquid manure to give them renewed vigor. (J. J. M. Farrell.)

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ferruginea, 14.
filamentosa, 8.
glauca, 7.
graciliflora, 9.
humilis, 7.
hypericina, 4.
imbricata, 3.
incana, 13.
intermedia, 7.
involucrata, 8.
ligustrina, 5.
linifolia, 8.
longiflora, 1.
nivea, 13.
paludosa, 8.
piligera, 3.
rosea, 11.
spathulata, 16.
spectabilis, 15.
suaveolens, 6.
sylvestris, 12.

A. *Involucral lvs. absent.*

1. **longiflòra,** R. Br. Sts. 4 ft. or more high, slender, erect, very leafy: lvs. sometimes alternate, linear, hairy: fls. pure white, hairy externally, long and slender; heads globose, many-fld.; perianth silky; anthers yellow, not exserted. W. Austral. B.M. 3281.

AA. *Involucral lvs. reduced to 2 small bracts.*

2. **drupàcea,** Labill. A straggling shrub 6–8 ft. high or lower: branches leafy: lvs. ovate to oblong-elliptical or oblong-linear, glabrous above, slightly silky hairy beneath, distinctly penniveined: fls. white or tinged with pink, silky hairy; anthers yellow, hardly exserted: heads sessile, few-fld.: fr. a red or black drupe. Victoria, Tasmania. L.B.C. 6:540.

AAA. *Involucral lvs. 8, or usually more than 8.*

3. **imbricàta,** R. Br. Small erect shrub, much branched, from less than ½–1½ ft. high, usually clothed with long, silky hairs, but sometimes glabrous: lvs. usually crowded, alternate or opposite, oblong-lanceolate to linear; involucral lvs. similar to stem-lvs., much shorter than fls.: fls. white, outside hairy; tube cylindrical, heads terminal, globular, many-fld. W. Austral. B.M. 3833 (as *P. nana*, and which is included under var. *piligera* in Fl. Austral.).

AAAA. *Involucral lvs. 4–8.*

B. *Lvs. distinctly penniveined.*

C. *Fls. white.*

4. **hyperícina,** A. Cunn. St. erect, slender, to 8 or 10 ft. high: branches not very leafy: lvs. opposite,

elliptic-oblong, smooth: fls. white, hermaphrodite and female on distinct plants, very hairy externally; hermaphrodite fls. longer and more slender: heads many-fld. and crowded.—Very similar to *P. ligustrina*, in fact placed as a variety of it in Flora Australiensis; distinguished in having more involucral lvs. much shorter than the fls. and silky pubescent or hoary. Austral. B.M. 3330.

5. **ligustrìna,** Labill. Erect, 5–6 ft. high: lvs. opposite, ovate to oblong or elliptical; involucral lvs. 4, very rarely 5 or 6, as long as the fl.-tubes, glabrous: fls. sometimes female only, silky hairy, white, in rather large globular heads. Austral., Tasmania. B.R. 1827.

cc. *Fls. rose-colored or yellowish.*

6. **suavèolens,** Meissn. Erect, often less than 1 ft. high, sometimes branching at base only, reaching 2–3 ft.: branches very leafy: lvs. opposite, ovate-lanceolate to oblong-linear; involucral lvs. 4–8, usually as long as the fls. and ciliate: fls. yellowish when fresh, usually hairy; heads globular, very large and many-fld. W. Austral. B.M. 4543 (as *P. macrocephala*).

bb. *Lvs. not penniveined or very obscurely so.*

c. *Color of involucral lvs. green.*

d. *Fls. white.*

7. **glaùca,** R. Br. (*P. hùmilis*, Lindl., not R. Br. *P. intermèdia*, Lindl.). Erect, much branched, ½–1½ ft. high, glabrous below: lvs. opposite, ovate to oblong-lanceolate or almost linear, small and short; involucral lvs. usually 4, shorter than fls.: heads globular, not many-fld., the fls. silky-hairy, white. Austral. and Tasmania. L.B.C. 17:1611. B.R. 1268, 1439.

8. **linifòlia,** Smith (*P. filamentòsa*, Rudge. *P. involucràta*, Banks. *P. paludòsa*, R. Br.). Erect, 1–3 ft. high: branches slender, bark ferruginous, not very leafy: lvs. opposite, very short-petioled, linear-lanceolate to linear or oblong; involucral lvs. 4, nearly as long as fls.: heads terminal, globular, erect, bearing white fls. Austral., Tasmania. B.M. 891. L.B.C. 17:1668.

9. **graciliflòra,** Hook. Erect, slender, 2½ ft. high: lvs. lanceolate, dotted above; involucral lvs. 6, shorter than fls.: fls. long, slender, glabrous.—Very similar to *P. sylvestris*, and described as the same in Fl. Austral.: distinguished from it by narrower lvs. dotted above, and more slender pure white fls. B.M. 3288.

10. **arenària,** A. Cunn. Small, erect shrub, dichotomously branched, to 2½ ft.: lvs. opposite, ovate, obscurely downy above, silky hairy beneath; involucral lvs. not different from st.-lvs.: fls. silky on outside, white; anthers and style not protruded beyond perianth-tube: heads few-fld. and sessile. New Zeal. B.M. 3270.

dd. *Fls. mostly rose-colored (varying to whitish and bluish).*

11. **ròsea,** R. Br. Erect, small: branches sparsely leafy: lvs. opposite, linear-lanceolate or linear, glabrous both sides, margins revolute; involucral lvs. 4, as long as fls., ciliate on margins: fls. pink or whitish, with long spreading hairs on lower portion of tube, silky on upper portion. W. Austral.—Very closely allied to *P. ferruginea*, but fls. larger and bracts more acuminate. B.M. 1458; 3721 (as *P. Hendersoni*). L.B.C. 1:88.

12. **sylvéstris,** R. Br. Shrub, 2–3 ft. high, copiously branched: lvs. opposite, lanceolate or oblong-lanceolate, glaucous; involucral lvs. 4–6, smaller than st.-lvs., shorter than fls.: fls. quite glabrous, blush, in globular heads; stamens and style very much protruded: heads large and many-fld. W. Austral. B.M. 3276. B.R. 1582. L.B.C. 20:1965.

ddd. *Fls. white and pink in same head.*

13. **nívea,** Labill. (*P. incàna*, R. Br.). Erect, bushy or straggling, 6 ft. or more high: branches and under side of the lvs. white, with a dense tomentum: lvs. ovate or orbicular, glabrous above; involucral lvs. 4–6, larger than st.-lvs.: fls. white or pink, tomentose or silky: heads globular, terminal, many-fld. Tasmania. B.R. 24:24. F.C. 1:9.

cc. *Color of involucral lvs. pink or red, or tinged only at margin.*

14. **ferrugínea,** Labill. (*P. decussàta*, R. Br. *P. diosmifòlia*, Lodd. *Heterolæna decussàta*, C. A. Mey.). Short much-branched shrub, 1–3 ft. high: lvs. opposite and usually crowded, ovate or oblong, firm, with margins revolute; involucral lvs. 4, orbicular, glabrous, shorter than the fls.: heads terminal, globular, rose-colored; fls. hairy, lower portion hispid, upper silky. W. Austral. L.B.C. 13:1283; 18:1708. B.M. 8574.

15. **spectâbilis,** Lindl. Erect, 3–4 ft. high, glabrous: lvs. crowded, mostly opposite, linear-oblong or lanceolate; involucral lvs. 4–6, ovate or ovate-lanceolate, half as long to nearly as long as the fls., usually tinged only at margins: fls. white after expansion, hairy outside: heads very large, globular, many-fld. W. Austral. B.R. 27:33. B.M. 3950. R.B. 26:157. G.W. 3, 414. F.E. 16:610.—A very handsome, showy plant, now probably the most popular species.

16. **spathulàta,** Labill (*P. cérnua*, R. Br.). Much branched, 2–3 ft. high: lvs. linear to linear-oblong; involucral lvs. ovate, glabrous, sometimes not colored: fls. silky hairy, much resembling *P. linifolia:* heads large, globular, many-fld. and nodding. Austral., Tasmania. F.C. 2:72.

ARNOLD V. STUBENRAUCH.
L. H. B.†

PIMÉNTA (from the Spanish *pimento*, allspice). *Myrtàceæ.* Highly aromatic trees, one species of which is the allspice.

Leaves large, leathery, feather-veined, long-stalked, black-dotted beneath: fls. numerous, small, white; borne in terminal or axillary, trichotomous cymes; calyx-tube top-shaped; petals 4–5; stamens numerous: drupe 1–2-seeded.—Five or six species, native of Trop. Amer. As a genus Pimenta is distinguished from its near allies (Eugenia, Myrtus) by the circular or spiral embryo and the 2-celled ovary with 1–6 ovules pendulous from the apex of each cell.

2949. Allspice.—Pimenta officinalis. (×⅓)

Allspice is the unripe berry of *P. officinalis*, which is gathered and dried in the sun. Its name comes from the idea that allspice combines the flavors of clove, cinnamon, and nutmeg. Allspice is common in the wild in Jamaica, inhabiting limestone soil. It is more extensively cultivated or run wild in Jamaica than anywhere else. It is cultivated up to 4,000 feet. The plant is not

2950. Flowers of allspice. (×2)

offered in the American trade, but there seems no reason why it could not be cultivated in Porto Rico.

officinàlis, Berg. (*Eugènia Piménta*, DC.). ALLSPICE. PIMENTO. Figs. 2949, 2950. Distinguished from the other species by the oblong lvs., 4-lobed calyx and globose drupe. Tree, 30–40 ft. high: lvs. 2–6 in. long; petiole ½in. long: fls. 3 lines long: drupe 3 lines thick. Cuba, Jamaica, Mex., Cent. Amer. B.M. 1236 (as *Myrtus Pimenta* var. *longifolia*).

P. àcris, Kostel., the bayberry or bay-rum tree is by some separated in the genus Amomis (A. caryophyllata, Krug & Urb.), a shrub or small tree in the W. Indies, Venezuela, and Guiana, from the dried lvs. of which (and probably also from other myrtaceous plants) the bay oil or oil of myrica is distilled: bark separating in shreds or plates: lvs. shining above, very aromatic.

L. H. B.

PIMPERNELL: *Anagallis.*

PIMPINÉLLA (possibly from Latin *bipinnula*, bipinnate). *Umbellíferæ*. About 75 species of herbs, one of which has been described under *Anise*. *P. integérrima*, Gray (see *Tænidia*), has been offered by one dealer in hardy native plants. It differs from Anise in being a perennial plant with lvs. 2–3-ternate and segms. entire. B.B. 2:526. *P. màjor*, Huds. (*P. mágna*, Linn.). Sts. 1–2 ft., angularly striate: lvs. pinnate, lfts. all ovate-serrate, somewhat cut, the terminal one 3-lobed. Eu. Probably not in cult., but a form listed as *P. mágna ròsea*, Hort., with rose-colored fls. is cult. in England as a border and rock-work plant.

PINÁNGA (Malay name). *Palmàceæ*, tribe *Arèceæ*. Slender spineless bamboo-like palms from India and the Malay Archipelago.

Stems erect: lvs. terminal, unequally lobed or pinnatisect, or simple and bifid at the apex; segms. plicate, many-nerved, the lower ones acuminate, the upper confluent, the margins not thickened, recurving at the base; rachis acute above, convex below; petiole convex above; sheath elongated: spadix usually small, very simple: peduncle short: branches in groups; spathe 1, symmetrical, swollen or compressed and 2-winged: fls. rather small, the staminate one on each side of a pistillate, thus differing from Areca in which the pistillate fls. are solitary: fr. ovoid or elliptical, orange or red, with a membranous husk.—About 40–50 species. For cult., see *Palms*.

Kùhlii, Blume. Fig. 2951. Sts. tufted, 20–30 ft. high, slender: lvs. 3–4 ft.; lfts. many, 1–2 ft., falcate-linear to linear-lanceolate, finely acuminate, strongly 2–3-ribbed, upper confluent; petiole variable in length, somewhat scurfy: fr. ½in. long, shortly apiculate. Sumatra, Java. G.C. III. 31:104. G.W. 12, p. 209. Known also as *Ptychosperma* and *Seaforthia Kuhlii*.

grâcilis, Blume (*Arèca grácilis*, Roxbg.). Sts. 6–20 ft. high, 3–4 lines diam., thickening upward, usually gregarious: lvs. 3–4 ft. long, sparingly pinnate; petiole and sheaths scurfy; lfts. inserted by a very broad base, 1 ft. or more long, the lower ones 2–3-ribbed, finely acuminate, the upper 3–5 in. wide, many-ribbed: fr. ½in. long, scarlet or orange, smooth, tapering to the tip. Himalayas, Burma.

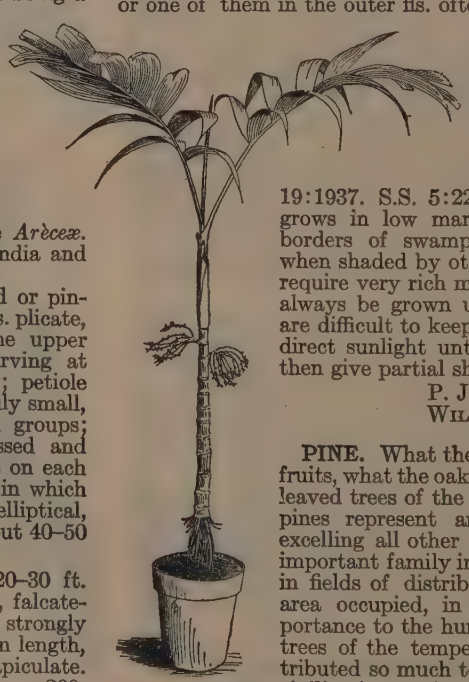
P. maculàta, Porte. A dwarf slender palm with apparently permanently variegated lvs.: lvs. elliptic, bifid nearly to the middle: spadix below the lvs., recurved: fls. showy, scarlet. Philippine Isls. B.M. 8011. Not in cult. in Amer.—*P. malaiàna*, Scheff. St. slender, 8–12 ft. high: lvs. 5–8 ft. long; lfts. numerous, linear acuminate: spadix 6 in. long, blood-red in fr.: fr. 1–1½ in. long, blackish purple. Malaya.—*P. Micholitzii*, Hort. Sander is a plant exhibited at Ghent in 1908, from Sumatra. G.C. III. 43:259.—*P. ternatènsis*, Scheff. (Areca gigantea, Hort.) Lvs. 12 ft. long, with 30–40 lanceolate segms., the largest 3 ft. long: branches of spadix spirally disposed. Ternate Isl.

N. TAYLOR.†

PINCKNÈYA (Charles Cotesworth Pinckney, of South Carolina, 1746–1825, distinguished statesman and general of the American Revolution). *Rubiàceæ*. This includes the fever tree or Georgia bark, a tall shrub or small tree with fls. in large terminal or axillary cymes, native to the marshy banks of streams in the pine barrens from S. C. to Fla. Its showy fl.-cluster attains a breadth of 4 in. and depth of 3 in., with as many as 20 fls., each 1 in. long, tubular, white, speckled red, with 5 revolute lobes. But the distinctive feature of the fever tree, both botanically and horticulturally, is the presence of 5 or more large showy colored floral lvs. These are 2 in. long, 1–1¾ in. wide, oval or roundish, acute, narrowed at the base, and peach-yellow margined with rosy red. The interesting feature of these floral lvs. is that they are not bracts, but modifications of one of the calyx-lobes, which are normally small and awl-shaped. Only one other species of this genus is described, *P. ionantha* from Colombia. The fever tree has been cult. in Eu. under glass, but it is rarely successfully cult. in Amer.

pùbens, Michx. GEORGIA BARK. FEVER TREE. BITTER BARK. Attains 25 ft.: lvs. oval or oblong, acute, 4 x 1½ in.; midrib rosy: calyx 5-lobed; lobes deciduous or one of them in the outer fls. often transformed into a showy floral lf.; corolla hairy; stamens 5, exserted, stigma obtuse: caps. globose, papery, 2-celled; seeds numerous, in 2 rows, horizontal, winged. F.S. 19:1937. S.S. 5:227, 228.—*P. pubens* grows in low marshy woods and on borders of swamps. It thrives best when shaded by other trees. Seedlings require very rich moist soil and should always be grown under shade. They are difficult to keep alive if exposed to direct sunlight until 4 or 5 feet high; then give partial shade.

P. J. BERCKMANS and WILHELM MILLER.



2951. Pinanga Kuhlii.

PINE. What the apple is among the fruits, what the oak is among the broad-leaved trees of the temperate zone, the pines represent among the conifers, excelling all other genera in this most important family in number of species, in fields of distribution, in extent of area occupied, in usefulness and importance to the human race. No other trees of the temperate zone have contributed so much to the building up of civilization, and no other, it may be predicted, will continue longer to fill

the important place in the household of civilized men; for not only do they furnish in a number of species the most satisfactory qualities of wood for structural purposes, but their frugality in regard to soil conditions will preserve them a place as wood-producers in many of the poor sites, when the lands fit for agricultural use have all been turned over to food-production.

Among the seventy or more well-distinguished species —over 600 species and varieties of Pinus have been described—all inhabitants of the northern hemisphere, ranging from the arctics through plains and mountains to near the equator, occurring in the tropics at least on high mountains, a variety of adaptation, of form, of usefulness, may be found to satisfy every requirement; and since more than half the number of species (about forty) are indigenous to North America or the United States, it is hardly necessary to go out of this general region for plant material.

For economic importance, as well as for a combination of points of excellence in all directions, ornamental as well as useful, rapidity and quantity of production and adaptability to climate and soil, the chief place belongs to the white pine (*P. Strobus*), and next in importance stands the longleaf pine (*P. palustris*) of the southern states. The red pine (*P. resinosa*), the shortleaf (*P. echinata*), the Loblolly (*P. Tæda*), with the Cuban pine (*P. caribæa*), add their stores to the enormous quantities furnished annually by the first and second. In the western mountains the bull pine (*P. ponderosa*), the sugar pine (*P. Lambertiana*), and the silver pine (*P. monticola*) are very large timber pines; and in Mexico *P. Ayacahuite* replaces the white pine, and *P. arizonica* and *P. montezumæ* are the important yellow pines. In the Philippine Archipelago one species, *P. insularis*, forms important mountain forests. In Europe the Scotch pine (*P. sylvestris*) furnishes the bulk of supplies, with *P. nigra* in the more southern countries. In Japan and northern China *P. densiflora* and *P. Thunbergii* and in the Himalayas *P. excelsa* and *P. longifolia* are the important species.

Besides the timber, several of the species furnish from their resinous contents naval stores, turpentine, tar, and pitch, the bulk of which is now still derived from the native longleaf pine. Pine wool is made from the leaves of this and other species, essential oils are distilled from leaves and young shoots and used medicinally, and the seeds of the nut pines are used for food and flavors. While the economic importance of the genus can hardly be overrated, the ornamental value is undoubtedly less than that of other genera like the spruces and firs. Nevertheless, at least interest and picturesqueness, if not beauty and symmetry of form, attach to a large number of species.

Choice of material for planting with such a wealth of species is difficult; yet climatic limitations reduce the number that may be grown within each climatic zone, and further assistance in the choice may be found in the fact that the botanical division of the species into three groups; viz., white pines, yellow pines (so called from the color of the wood), and nut pines, denotes at the same time differences of habit and form.

In no other group, perhaps, is it so necessary to keep in mind that form and habit change through the different periods of life from the juvenile through the adolescent to the virile and senile stages of development; while symmetrical and pleasing in their youth and grand or picturesque in their age, in their intermediate stages the trees may be straggling and unsightly. Starting in its youth with the pyramidal aspiring habit of all the conifers, the shaft dominating over the branch system and the latter surrounding the former in regular whorls, later on the symmetry is disturbed and finally the towering old pine may have its bole split up into many stout branches and the crown may have broadened and flattened or rounded off in the umbrella-like fashion which the stone pine (*P. Pinea*) exhibits so strikingly in the Italian landscape. This flattening of crown is characteristic of most yellow pines, while the piñons or nut pines have a tendency to the broom-like or apple-tree appearance. Of the eastern species, the white pines alone preserve to some extent the conical habit of the crown in imitation of the spruces with more or less symmetrical horizontally spreading branches, which render them pleasing objects throughout all periods of life. On the Pacific Coast a number of species preserve the conical form.

In the choice and combination of plant material it should be kept in mind that the pines are essentially light-needing species, hence do not bear overtopping or crowding unless they have a chance by their rapid growth in height to escape from the pressure of their shade-making neighbors; the white pines, especially *P. Strobus* with its denser foliage, are more tolerant of shade than others; the dwarf *P. montana* is also tolerably shade-enduring.

In each of the three groups there are rapid growers (in height) and slow growers, although all are slow during the first two to seven years.

The common white pine (*P. Strobus*) and the Cuban pine (*P. caribæa*), with the European, Scotch, and Austrian pines, are good examples of the first class, making under favorable conditions annual shoots of 1 to 2 feet for a number of years; while the Swiss stone pine (*P. Cembra*) and other pines of high altitudes, like *P. flexilis* and *P. albicaulis*, are examples of slow growers. There are persistent growers reaching great heights, and laggards, remaining dwarfs or medium-sized trees; again the king of pines, the common white pine, and its giant congener the sugar pine, with the bull pine in favorable situations, take first rank, the first with a maximum height of 160 feet and more, the last with over 200 feet, while many of the so-called scrub pines, like *P. virginiana*, *P. serotina*, *P. Banksiana*, the Alpine white pines, *P. flexilis*, *P. aristata*, *P. Peuce*, *P. pungens*, *P. densiflora*, and most nut pines reach rarely over 40 feet; some, like *P. koraiensis*, *P. Bungeana*, *P. montana*, with several of the nurserymen's varieties, remain actually dwarfs and maintain a compact bush-like appearance for a long time.

In regard to foliage, quite a large variety can be secured. For grace and elegance nothing better again than the five-needled silver-lined white pine can be suggested, although *P. excelsa* from the Himalayas, with its slenderer and longer branches and more drooping foliage, and the dwarfs *P. Peuce* from Macedonia and *P. koraiensis*, with their denser and more compact crowns, and some others of the white pine tribe, may vie with it. Among the yellow pines, the native almost entirely overlooked, *P. glabra*, deserves mention in this connection, where the climate permits its use, as well as the interesting sand pine, *P. clausa*.

For richness, fulness, and vigor of foliage, the red pine (*P. resinosa*) outranks even the much-planted more somber Austrian pine, and for interest in development nothing can compete with the longleaf pine (*P. palustris*). With its needles, which in young specimens exceed a foot in length, surrounding in dense graceful tufts the big silvery buds at the tip of the candelabra-like branches, *P. palustris* offers a most striking appearance. Unfortunately, it is not adapted for planting north of 32°.

The thin, grayish, short foliage of the frugal Banksian pine and of several other of the scrub pines, and the stouter, also grayish, foliage of the Scotch pine, make a pleasing color contrast against the somber dark background of spruces and firs, while the short stiff needles of the nut pine, *P. edulis*, and the interesting one-needle pine (*P. monophylla*) resemble the spruce foliage. Color of bark varying in species from silvery gray through red and yellow tints to almost black, and character of size of cones from the diminutive globose forms of *P. contorta* to the long pendulous cones of the sugar

pine, 2 feet in length, and the hooked, ponderous cones of *P. Torreyana* and *P. Sabiniana*, may also influence choice of material.

With wide range of distribution and hence adaptiveness as far as climate is concerned, we have the shortleaf pine (*P. echinata*), which is found from Massachusetts to Texas, and in the West the bull pine (*P. ponderosa*), which ranges from the moist Pacific Coast in Washington to the dry slopes of Arizona. In Europe, the Scotch pine comes nearest to such wide distribution. Besides the native northern species, there have been found hardy in the northeastern states the Scotch and Austrian pines, *P. Bungeana, P. Cembra, P. koraiensis, P. montana, P. Thunbergii*, while the Mexican pines and those of southern Asia will endure only the light frosts of the southern states. Yet in the parks of Washington, D. C., the following pines are to be found: *P. Strobus, P. Cembra, P. excelsa, P. Lambertiana, P. Ayacahuite, P. koraiensis, P. palustris, P. Tæda, P. ponderosa, P. rigida, P. nigra, P. glabra, P. virginiana, P. echinata, P. montana, P. Pinaster, P. edulis, P. pungens, P. sylvestris, P. Massoniana;* and the probability is that most of the other species could find a place there to live if not to thrive.

The list of species hardy in the Arnold Arboretum (Boston) comprises the following:

1. *Thriving well.*

Banksiana.	Lambertiana.	resinosa.
Bungeana.	montana.	rigida.
Cembra.	monticola.	Strobus.
densiflora.	nigra.	sylvestris.
echinata.	parviflora.	Thunbergii.
Jeffreyi.	Peuce.	virginiana.
koraiensis.	pungens.	

P. excelsa and *P. ponderosa pendula* thrive well in a sheltered place, but are probably not quite hardy here.

2. *Hardy, but not of promising growth.*

aristata.	flexilis.
contorta var. Murrayana.	monophylla.
edulis.	

In the interior middle states the number which would stand the extremes of drought and cold would probably be reduced; a partial list found in the Missouri Botanical Garden is given below:

The best are given first. All of the later ones on the list die out sooner or later, as the city smoke is very detrimental to conifers. None does very well on that account.

Mughus (Pumilio).	best three.	virginiana.
austriaca.		resinosa.
Strobus.		nigra.
Cembra.		sylvestris.
rigida.		ponderosa.

For seaside planting, *P. rigida* has shown itself most fit, and of foreigners in proper climate, *P. Pinaster* and *P. halepensis*, while *P. contorta* on the northwest coast and the frugal *P. radiata* on the southwest coast are the seacoast trees *par excellence*.

The pines are essentially inhabitants of the poor sandy soils and dry situations, their stout root-system enabling them to seek the scanty water-supplies where other species find it difficult. Some, like the white pine, are adapted to a variety of soil conditions, but only a few can endure a surplus of water: *P. resinosa* will follow the white cedar into the swamp and thrive there as well as with the Banksian pine on the poorest gravels; *P. rigida* is at home both in wet and dry places; the Scotch pine of the Baltic sand plains may be found in the peat-bogs, but only eking out a miserable existence, while *P. Tæda*, the old field pine, makes magnificent trees in the southern swamp, and with its slow growth under such conditions an excellent timber. *P. contorta* and *P. serotina* also are indifferent to water conditions at the root; so is the Cuban pine, but *P. palustris* belies its name, for it is only very rarely found in poorly drained places and does not thrive there.

The propagation of pines does not offer any difficulties. The seed usually has a high germination percentage in most species if kept dry and cool, and it retains vitality for several years, deteriorating of course somewhat from year to year. To avoid deterioration in transoceanic shipments, packing in charcoal dust has been found very serviceable. While most of the pine seeds sprout readily, the white pine, with some others, has the bad habit of lying over for one year in part, unless treated to a hot-water bath for twenty-four hours before sowing; or perhaps by sowing in autumn immediately after coming out of the cone, which is during the first two weeks of September. The seeds should be sown in light mold early, rather thinly to permit a good root-system to develop, covering them thinly according to size of seed, not over ¼ inch, which is best done by sifting sand over the seed with a sieve. During the first year special care is necessary to regulate the water-supply and transpiration for the young seedlings; they need to be kept humid, not wet, but resent drought as much as a surfeit; and especially sudden changes from drought to wet are likely to produce "damping-off." To prevent too rapid transpiration, the familiar lath screens should be applied.

To prevent the formation of excessively long taproots which some species form, mechanical means may be adopted; but the best plan is to manure near the surface, so that fibrous roots will be formed. Such manure consists of one-third steamed bone-meal and two-thirds ammonia superphosphate. Root-pruning and transplanting in nursery rows when one or two years old is practised to secure a stocky root-system. In Germany one-year-old Scotch pines are planted by the million for forest purposes, but for ornamental purposes older plants are to be used; yet it is safest not to use them older than three or four years for permanent situations. In the third year usually the first branching occurs, indicating that the root-system is now well established.

In transplanting, the utmost care must be taken not to expose the roots to drying influences, a thin loam puddle answering best to keep them moist. While transplanting can be done at any time of the year, it is safest to do so in early spring, except when a droughty season is likely to follow, in which case fall planting is to be preferred.

A large number of nurserymen's varieties, dwarf and pendulous, varicolored, and the like, have been developed, especially from *P. sylvestris* and *P. Strobus*. The most interesting freaks perhaps are those bushy forms derived from *P. canariensis* and *P. Pinea* produced by layering, in which single needles instead of the usual bundles of two in one sheath are produced, imitating the primary single needles of seedlings. The manner in which nurserymen's varieties are propagated by grafts or cuttings is discussed under *Pinus*.

According to the nature of the pines, if there is choice of location possible, the well-drained situations, even dry ones, should be reserved for them. They belong, with few exceptions, to the hilltops not the bottoms, to the sands not clay soils, and will stand southern exposures better than the spruces.

Pines are frugal by nature, and can stand poverty better than surfeit,—nevertheless they respond best to medium conditions, namely, a mellow surface and well-drained deep loamy sand, not too rich in organic matter and loose enough to permit the natural development of the heavy tap-root system. Under such conditions, the peculiar rich foliage gives most satisfaction and the rank luxuriant growth which leads to poor form is checked; disease from fungi is obviated; the cottony scale (almost the only enemy of the white pine) is more readily fought, and injuries from caterpillars and beetles are more easily repaired. Lately,

two enemies of the white pine have developed which require attention. The one, a fungous disease, seems to be an importation from Germany, the white pine blister rust (*Peridermium strobi*), which attacks young trees and young foliage of the white pine tribe. It needs gooseberry and currant as intermediary host plants. The other pest is the white pine weevil, which works in the young shoots and disfigures the tree by inducing repeatedly new leaders to develop.

To prune evergreens, and especially pines, requires an artist, or else the result will be malformation: the best plan is to correct form by breaking out the center bud from such shoots as project beyond proper limits; thereby also a more compact growth is induced, which in the pines with their open habit is desirable. If it becomes necessary to prune the branches, the cut must remove also the bolster at the base of the branch; the resinous exudation will prevent decay, and the cambium soon covers the scar if the cut has been made properly. For hedge planting the pines furnish no specially desirable material, being light-needing and therefore thinning out soon in the interior; yet the white pine will stand as a hedge for a considerbale time and also the dwarf *P. montana*. Perhaps some others may answer the purpose.

For the botany of the pines, see *Pinus*.

B. E. Fernow.

PINEAPPLE. The pineapple (see *Ananas*) is indigenous to America. It produces one of the most delicious fruits now regularly on the markets. The finest qualities are developed when the fruit is permitted to ripen naturally upon the plant. For distant markets the crop has to be gathered in varying degrees of unripeness to suit the time required in transit.

The year 1850 seems to be the earliest date at which pineapple-growing was attempted in the United States. This attempt was made near St. Augustine, Florida, according to Taylor. In 1860, planting was begun on

2952. Cuttings of pineapple, ready to be planted.

the Keys, but the want of facilities for rapid transportation and the more favored Cuban and Porto Rican plantations, made the development slow. In 1897, about $15,000 worth was imported from the Hawaiian Islands.

Good pineapple land may usually be obtained for $25 to $100 an acre, the higher-priced land being in favored locations at railway stations and near settlements. The cost of clearing and preparing varies from $20 to $80 an acre, according to the cost of labor and the character of the growth on the land.

From 8,000 to 15,000 plants are needed to the acre, varying with the variety and the notion of the planter. The price of plants in the field varies from $3 the 1,000 for Red Spanish to $350 the 1,000 for the finer varieties. The cost of cultivating and fertilizing an acre for one year varies from about $20 to $150. It requires about eighteen months from the time of setting out to the maturing of the first crop, which yields 50 to 350 crates to the acre. Under favorable circumstances the second crop may be double that of the first. By careful attention the plantation may be continued for eight or ten years without resetting; the second or third crop frequently bears the maximum amount of fruit.

When a common variety is planted, the returns are mainly from the sale of fruit, but with fancy varieties the sale of plants constitutes the main source of returns. Four hundred dollars or more an acre has been realized frequently for a crop of the commonest varieties; in this case increase in plants cannot be considered as of much value. The value of a crop of fancy fruit is about double that of the common, and $1,000 worth of plants may be sold without detriment to the plantation, if it is a variety that is in demand. From this must be subtracted the cost of transporting to the markets, which varies more or less with the distance the fruit is hauled. This cost varies with the quantity shipped, from $20 to $80 or more an acre.

The pineapple thrives in a variety of soils, but whatever its texture it must not be moist or wet. The pineapple plant will survive air-drying for months, but decays rapidly in a moist atmosphere. The greatest acreage is located upon dry sandy land, formerly overgrown with spruce-pine (*Pinus clausa*) or a mixture of spruce-pine and hardwood. Chemical analyses of the soil from pineapple fields show an exceedingly small fraction of a per cent of the essential fertilizer ingredients present. A physical analysis shows that the water-content is very low. A considerable acreage is planted on the Florida Keys. Here there is only a small amount of leaf-mold, often not more than an inch on the average, covering a coralline rock. But for the fact that pineapples actually grow and make crops on such soil it would seem entirely incredible.

With conditions of soil as described above, it is imperative to fertilize, and under the existing conditions in the pineapple belt there is no other remedy than the addition of commercial fertilizers, and nothing better. While much is still to be learned about fertilizing this crop, it is fairly well established that for pineapples on spruce-pine land, dried blood, ground bone, and nitrate of soda are good sources of nitrogen; that low-grade sulfate of potash, carbonate of potash and high-grade sulfate of potash are good sources of potash; that acid phosphate should be used in small quantities only or avoided, using pulverized bone instead. A good plan for fertilizing is to drop a small handful of cottonseed meal into the bud immediately after setting out. In October, apply about 600 pounds blood and bone and 400 pounds low-grade sulfate of potash (not kainit) to the acre, or the equivalent of these fertilizers in some of the forms mentioned above. A second application may be made the following February; at this time the amount may be increased 10 to 25 per cent, according to the growth the plants have made. A third application may be made in June or July; and if the plants have grown vigorously a still further increase in amount may be made. A fourth application may be made in October, increasing the amount if the plants have grown vigorously. The succeeding applications may be made at the time suggested above, and the increasing and decreasing of the amounts may be determined by the progress of the plants. As the average spruce-pine pineapple land is not sufficiently fertile to grow a full crop of pineapples, much more depends upon proper fertilizing than any other one operation.

This plant is propagated by means of crowns, slips suckers, and rattoons. The crown is the leafy part

of the fruit as found in the market. Just below the fruit small plants form, which are left in the field when the fruit is gathered; these are known as slips. In the axils of the leaves buds occur; those that develop near the ground make strong plants in a few months and are known as suckers. (Fig. 2952, after Wester.) A strong plant will mature an "apple" in June and produce two to five suckers by the middle of September. Buds that

2953. The Queen pineapple.

develop from an underground part and form a root-system independent of the parent plant are known as rattoons. Crowns are not planted extensively, as they remain on the fruit when marketed. Good strong suckers are usually employed for planting out. Rattoons are left in the field to replace the plants which have borne a crop, but they are not sufficiently numerous to make a full stand; hence some of the suckers must be left also. Slips require a year longer than suckers to mature a crop. According to Webber, it requires ten to twelve years to mature a plant from seed. Plants are raised from seed only for breeding purposes.

If spruce-pine land is prepared it is cleared of all stumps, wood, roots, and any other organic material, and is plowed deep and leveled off smooth. The fields are then laid off in beds of six or eight rows wide, depending on the variety. The beds should be narrow enough to permit fertilizing and working with a scuffle-hoe without entering the beds, as breaking the leaves is very detrimental. For Red Spanish the rows are made 18 to 20 inches apart; for Queens, 20 to 22 inches; for Porto Ricos, 30 to 36 inches. They are usually placed in checks of about the same distances.

The methods employed on the Keys are quite different. The land is cleared by cutting off the trees, shrubs, and the like, which are allowed to dry and are then burned. The plants are then set out with a grubbing-hoe; they must be set out irregularly, as the rocky soil does not furnish root-hold everywhere. Such fields become exhausted in a few years and have to be abandoned.

Cultivation consists in running over the ground with a scuffle-hoe. When the plantation is set out in beds the handle of the hoe is long enough to permit cultivating to the middle without the laborer entering the bed. Only about an inch of the surface soil is agitated, usually immediately after the fertilizer has been applied. Weeds are not troublesome, excepting in fields that have been cultivated a long time. Under sheds tillage is more frequent and appears to be more necessary. On the Keys no tillage is possible, but tall-growing weeds and such ligneous plants as may spring up are cut off. In all of the work among pineapple plants the greatest care should be exercised to avoid breaking the leaves, which are very brittle.

The fruit is picked a week before it would mature. It is packed at once into barrel (12 by 20 by 36 inches) and half-barrel (12 by 10 by 36 inches) crates, usually in the latter, the different sizes being packed in separate crates and designated as 18's, 24's, 30's, 36's, 42's, 48's, and 54's, according to the number required for a half-barrel crate. The fruit must be handled without being bruised and packed firmly to prevent its abrasion in transit. To protect the fruit each one is wrapped separately in brown paper.

Since the propagation is accomplished by means of offsets, the varieties are fairly stable and rather definitely marked. The variety most extensively grown is called Red Spanish, Spanish, or Reds. It has a medium-sized apple, and is a hardy plant. Abachi (Abakka), Blood, Queen (Fig. 2953), Sugar Loaf, Enville (Fig. 2954), and White Antigua are varieties that produce medium-sized apples of excellent quality. Black Jamaica, Black Prince, and Prince Albert produce large fruits or apples of excellent quality. Smooth Cayenne and Porto Rico produce large apples of good quality, those of the latter being of greater size. Other varieties are grown more or less extensively, and there are different names for these varieties, but the foregoing have been officially recognized by the Florida State Horticultural Society.

It has been found very advantageous to build a shelter for "pines;" in the winter a shed protects the plants from too great radiation of heat, and in the summer it reduces the intensity of the sun. The original object of the shelter was to protect the plants from frosts and freezes. Pineapple plants freeze at 32° F. This degree of cold does not kill the heart of the plant, but only the larger part of the leaves. Pines under sheds have passed through a temperature of 25° F. without serious injury. The roof of a shed is usually flat, or undulating with the surface of the land. The height varies with the desires of the individual, but is usually about 8 feet above the ground.

In Fig. 2955 the roof is slightly less than 7 feet from the ground. The stringers running crosswise in the figure are 1½″ by 3″ by 21′; those running lengthwise are 1½″ by 1½″ by 15′. The material for the roof is cypress plastering lath of usual length and width. The stringers running lengthwise are 46 inches apart. The openings between the lath are just the width of a lath. The amount of lumber needed (to the acre) is about as follows:

424 posts (352 for roof, 72 for sides) 4″ x 4″ x 8′.
160 pieces 1½″ x 3″ x 20′.
960 pieces (840 for roof, 120 for sides) 1½″ x 1½″ x 15′.
80,000 lath (75,000 for roof, 5,000 for sides) ⅜″ x 1″ x 4′.

It requires about 9,000 feet of lumber for the above material exclusive of the lath. All lumber must be first-class and free from knots. This can still be reduced by about 2,500 feet by using wire in place of the 1½″ by 1½″ by 15′ and weaving the lath in this. Under the most favorable circumstances such a shed can be erected for $450 an acre, but this is about the cheapest and lightest form that will withstand the elements.

2954. The Enville pineapple.

The following diseases and insects attack pineapples:

(1) Heart-rot; bitter-heart: The cause of this disease is not known, but it seems to be more prevalent in a rainy season than in a dry one. It manifests itself by the portion around the heart taking on a water-soaked appearance. This condition progresses outward until the whole apple is involved. It is not necessarily accompanied by rotting, although this usually follows. The whole apple becomes bitter, even before it is entirely involved. When this disease is present in a field, the fruit should be marketed as soon as possible, that the apples may be consumed before becoming badly affected. (2) Sanding: This disorder occurs immediately after setting out, especially if a long dry spell occurs at this time. It is produced by sand being blown into and filling the bud of plants. Immediately after setting out, drop into the bud a small handful of cottonseed-meal, or the same amount of a mixture of one part ground tobacco stems and three or four parts cottonseed-meal. This soon forms a firm plug in the

2955. Pineapple shed in Florida.

bud, keeping out sand but not interfering with growth. Blood and bone, or blood, bone and tankage, may also be used. (3) Spike; longleaf: This disease manifests itself by the leaves failing to expand at the base, thus giving the plant a contracted appearance. The outer portion of the leaf spreads from the center of the plant, but usually fails to take on a broad flat healthy appearance. Experiments have proved that this disease may be produced by improper use of commercial fertilizers, although the disease has occurred where no fertilizer had been used. Abundant evidence is at hand to show that the disease is not due to an organic agent but rather to untoward condition in the soil. Change the fertilizer, avoiding acid phosphate, kainit, and cottonseed-meal in large quantities, and give protection as by a pineapple shed (spike is a rare thing under sheds). (4) Blight; wilt: This disease occurs in a sporadic manner, usually without any apparent regularity. In some varieties the first intimation of blight is by the outer end of the leaves turning red, and later by the tips wilting. This wilting progresses until the entire plant has dried up. According to Webber the direct cause is a soil-inhabiting fungus which attacks the roots. Remove the wilted plants and set in healthy ones. If the plants are of valuable varieties trim off all diseased roots and much of the stem, together with larger leaves, and reset. It is probable that the fungus will not survive until the roots again penetrate the soil. (5) Red-spider (*Stigmæus floridanus*): This species attacks the tender white portion at the base of the leaves. The effect upon the plant is greatly out of proportion to the small amount of injury to the parts attacked. In later stages the leaves rot off at the place attacked. Drop a small handful of tobacco dust into the bud of the plants. Subsequent rains and dews leach the tobacco and carry the solution down to the red-spiders. If they are not all dead in a week or ten days, repeat the dose. (6) Scale insect (*Diaspis bromeliæ*): This scale insect becomes troublesome in dry localities and in greenhouses. The insect usually attacks the lower surface of the leaf, but each point of attack shows through as a yellow spot or blotch on the upper surface. Spray with resin wash, resin compound, or whale-oil soap. (7) Mealy-bugs (*Dactylopius citri* and other species): These insects attack the base of the leaves just at or below the ground-level; also the bud, and when fruit matures they multiply in great numbers among the slips and in the eyes of the fruit itself. The remedy is the same as for scale insects, but it is very difficult to make the application effective. When the mealy-bugs are present before the fruit-bud forms, much good can be done by applying a large handful of tobacco dust in the axils of the lvs.

See also under *Florida*, page 2230. P. H. Rolfs.

PINEAPPLE AIR-PLANT: *Tillandsia utriculata.* **P. Flower:** *Eucomis punctata.*

PINE, DAMMAR: *Agathis.* **P., Kauri:** *Agathis.* **P., Moreton Bay:** *Araucaria.* **P., Norfolk Island:** *Araucaria.* **P., Prince's:** *Chimaphila.* **P., Screw:** *Pandanus.*

PINÈLIA: *Restrepia.*

PINÉLLIA (after Pinelli). *Aràceæ.* About a half-dozen hardy perennial tuberous herbs, native to China and Japan. Foliage appearing with the fls.; lvs. 3 or pedatisect: peduncle solitary: spathe marcescent: fls. monœcious in the appendiculate spadix, all fertile; perianth none; male fls. with 1 stamen; female fls. 1-sided; ovary 1-celled; ovule solitary, orthopterous.

tuberífera, Tenore. Adult lvs. 3-parted, the middle segms. 1½–2 times longer than wide and elliptic-oval. China.—There is a variety with narrower lf.-segms. and another with lvs. cut into 5 segms.

PINGUÍCULA (diminutive of Latin *pinguis*, fat; referring to the succulent and greasy foliage). *Lentibulariàceæ.* Butterwort. Small acaulescent herbs of carnivorous habits, with pretty long-spurred flowers something like a snapdragon; sometimes grown for their oddity and for the study of insectivorous habits.

Plants of moist or wet grounds, sometimes growing on damp rocks, with fibrous roots: lvs. in a basal tuft or rosette, broad and entire, soft, the upper surface usually glandular-viscid (secreting a digestive fluid) and the margins infolding when insects and other objects adhere: fls. white to purple and yellow, solitary on naked scapes which are coiled in vernation; calyx 5-lobed and somewhat 2-lipped; corolla mostly 2-lipped, ringent or more or less personate, with 5 spreading unequal lobes, the base extended into a sac or spur; stamens 2: fr. a 2-valved caps.—Species 30–40, in the northern hemisphere and also along the Andes to Patagonia. The species are little seen in cult., *P. caudata* and *P. lutea* being best known to growers. Pinguicula is one of the very few dicotyledonous plants with only 1 seed-leaf. The fls. of pinguicula are often reversed in position before and during anthesis.

This interesting genus is rarely seen under cultivation, except in botanic gardens. The most noteworthy species of the genus is the Mexican butterwort, *P. caudata*, both for its floral and leaf characters. A peculiar feature of the plant is that it produces two kinds of growth,—the resting type, in which the small succulent leaves are imbricated and form a small dense rosette about 1 inch in diameter; also the growing type, in which the obovate leaves when fully grown measure 3 to 4 inches long by 2 to 3 inches wide.—In February the small rosettes of *P. caudata* should be potted in the pans large enough to carry them throughout the

growing period, because they are not conveniently transplanted. Three plants may be placed in 6-inch pans, keeping them close to the side of the pan in triangular form. A good growing medium consists of two parts peat soil, one part fibrous loam and one part sand, with plenty of drainage. When in full growth, the top of the pan will be fully covered by the viscid leaves. Watering the plants from above should not be practised because of destroying the dew-like deposit on the surface of the leaves. The pans should be placed in saucers of water, and set in a light position in the warm-house; give plenty of sunshine and the plants will readily flower throughout the summer. In October place the plants in the cool end of the house to rest. The growth will gradually deteriorate until it assumes the rosettes of small succulent leaves to carry them through the resting period.—Young plants are propagated almost as readily as echeverias. The small rigid leaves should be carefully broken from the main stem; if not broken clean they will not reproduce young plants. These should be laid flat on sand in pans of convenient size; the top of the pan should be protected by glass or a bell-jar, to retain the moisture; place the pan in a saucer of water. In four to six weeks the young plants with the leaf attached will be sufficiently rooted to allow potting. One of the worst pests are woodlice. (G. H. Pring.)

A. *Color of fls. yellow.*

lùtea, Walt. Exceptional by reason of its yellow fls. and nearly regular (not 2-lipped) corolla: variable in the size of all its parts, and in the obtuse toothing of the corolla-lobes: lvs. ovate to oblong-ovate: scapes 5–12 in. high; fls. ½–1½ in. long and broad; spur curved, about as long as the rest of the corolla; throat spotted and lined with red; palate very prominent and densely bearded. Low pine barrens, N. C. to Fla. and La. B.M. 7203. B.R. 126.

AA. *Color of fls. purple to lilac.*

B. *Spur 2 or 4 times as long as remainder of the corolla.*

caudàta, Schlecht. (*P. orchidioìdes*, A. DC. *P. Bakeriàna*, Hort.). Lvs. in dense rosettes when young, long and narrow; on older plants few and large, obovate and obtuse: scapes 5–7 in. high; fls. deep carmine, with lighter throat and reddish lines, attaining 2 in.; lobes all rounded except the middle one of the lower lip, which is retuse. Mex. B.M. 4231. G.C. II. 15:541. R.H. 1902:456. Gn. 23, p. 309. G. 29:181. G.W. 9, p. 482; 12, pp. 308–10. Var. **supérba,** Hort. Fls. rich rosy carmine with white eye, about 2 in. long and nearly as broad.—According to W. Watson, England, *P. caudata* "is largely grown by orchid-breeders, who find it an excellent trap for the tiny midge-like fly which lays its eggs in orchid seedlings when they are very young. . . . It is a most charming little pot-plant, and has become a favorite in many gardens."

Ròsei, W. Wats. Very like *P. caudata* and perhaps a form of it, but the fl. deep violet-purple, almost a blue, nearly 2 in. across and remaining fresh for weeks. Prop. from the fleshy lvs. Mex. G.C. III. 49:82.

gypsícola, Brandeg. Plant 3–4 in. high: lvs. when plant is in bloom linear from a rather broad base, about 2 in. long, revolute on margins, with viscid glandular hairs on upper surface; later or winter lvs. spatulate-oblong and cotyledon-like, in a very dense rosette: fl. purple, with a very short white tube; upper lip 2-parted into linear-oblong lobes; lower lip 3-parted into similar lobes; spur more than 1 in. long, slender, purplish, 2-toothed at tip. Mex. B.M. 8602.

BB. *Spur about as long as remainder of the corolla.*

C. *Fls. ¾–1 in. long and broad.*

grandiflòra, Lam. Scapes 3–8 in. long; fls. "blue, rarely purplish violet," according to De Candolle, 10–15 lines long, 9 lines broad (3 or 4 times longer than in *P. vulgaris*); lobes undulate; palate with 1 or 2 white spots; spur straight, a trifle shorter than the broadly funnel-shaped tube. W. Eu. G.C. III. 10:373.—According to Bentham, this is a large-fld. variety of *P. vulgaris*, with longer spur and broader lobes, which in the western part of Eu. passes into the common form.

hirtiflòra, Tenore. Scapes 3–4 in. high; fls. 8 lines long and broad, lilac or rose (blue according to Tenore, and shown as purple in B.M.), with a white tube; spur straight or curved, about as long as the rest of the corolla. S. Eu. B.M. 6785. Gn. 25, p. 291. G. 11:251.—Possibly distinguished from *P. grandiflora* by the color of the tube, which is white outside and yellow in the throat. According to Burbidge there is a variety with pure white fls.

CC. *Fls. ½in. long and broad.*

vulgàris, Linn. According to Hooker, this differs from *P. hirtiflora* in the bright blue color and the retuse lobes of the corolla, as also in the less globose caps.: scapes 1–5 in. high; fls. bluish purple or violet, about 6 lines long; spur nearly straight, about 2 lines long or as long as the rest of the corolla. Wet rocks, Eu., Asia, New England, and north and westward. Gn. 57, p. 335; 69, p. 101.—Sometimes called "Labrador violet."

P. elàtior, Michx., in N. C. to Fla., is a beautiful species that should be in cult.: plant 3–5 in. across and 10–12 in. tall: lvs. viscid-glandular, in pale green rosettes: fls. whitish purple, to ¾ in. broad.

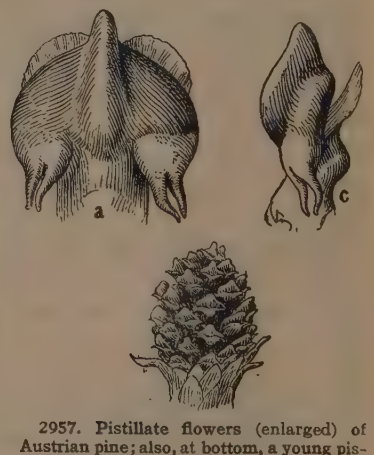
WILHELM MILLER.

PINK: *Dianthus.* L. H. B.†

PÌNUS (ancient Latin name). *Pinàceæ.* PINE. PINE-TREE. Ornamental trees grown for their handsome evergreen foliage and symmetrical or picturesque habit, some also for their conspicuous large cones; many species are valuable timber trees. See *Pine.*

Resinous evergreen trees with usually whorled branches, rarely shrubby: winter buds covered with

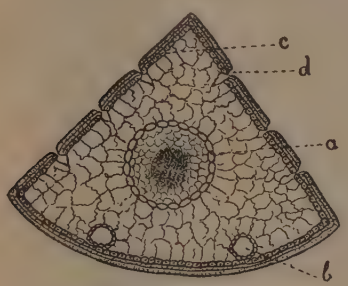
2956. Staminate cone of Pinus rigida. (×2)



2957. Pistillate flowers (enlarged) of Austrian pine; also, at bottom, a young pistillate cone (natural size). *a*, front view of two ovules; *c*, side view.

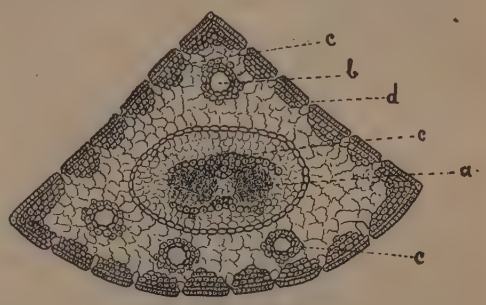
imbricate scales: lvs. of 2 kinds; the primary lvs. are spirally arranged and as they appear on young seedling plants and occasionally on shoots from the old wood, are green and subulate, but commonly they are reduced to small scarious bracts bearing in their axils the acicular, semi-terete or triangular secondary lvs. borne on an undeveloped branchlet in clusters from 2–5, or occasionally more, rarely reduced to 1, surrounded at the base by sheaths of 8–12 bud-scales: fls. monœcious; the

staminate ones axillary, clustered at the base of the young shoots, catkin-like, yellow, orange, or scarlet, composed of spirally arranged numerous 2-celled anthers with the connective enlarged and scale-like at the apex (Fig. 2956); pistillate lateral or subterminal, greenish or purplish, consisting of numerous spirally arranged scales each in the axil of a small bract and bearing 2 ovules inside near the base (Fig. 2957): cone subglobose to cylindric, with woody scales closely appressed before maturity and tightly inclosing the seeds, which are usually furnished with a long thin wing, but in some species are wingless or short-winged; the apex of the scales is usually more or less thickened and the exposed part, which is usually rhombic in outline and termed apophysis, is often protracted into prominent bosses or knobs; the apophysis is terminated by the umbo, usually differing in color and ending mostly in a spine or prickle. In *P. Strobus* and the allied species the apophysis is flat and thin, and bears the spineless umbo at the upper end, while in most other pines the apophysis is thickened and transversally keeled and bears the umbo in the middle. These differences belong to the most important characters in the grouping of the species: other valuable characters are furnished by the structure of the lvs., which contain either 1 or 2 fibro-vascular bundles and usually 2 or more resin-ducts, being either external (or peripheral), i.e., situated beneath the epidermis; or medial (or parenchymatous), i.e., inclosed by the tissue of the lf.; or internal, i.e., close to the fibro-vascular bundles; some species, as *P. Armandi, P. resinosa, P. sinensis,* also *P. excelsa, P. Lambertiana, P. virginiana,* and the like, have resin-ducts in 2 positions, either external and medial or internal and medial, but such combinations are not found in all the lvs. of these species. Strengthening cells, i.e., cells with thickened walls, are mostly present beneath the epidermis and often surround the resin-ducts, sometimes also along the fibro-vascular bundles. (See Figs. 2958–2961.) The number of the fibro-vascular bundles and the position of the resin-ducts can be readily seen with a common magnifying glass in thin cross-sections made with a sharp razor from the middle of the lf. and placed on a glass plate.—About 80 species are known, distributed throughout the northern hemisphere from the arctic circle to Mex. and the W. Indies, N. Afr., and the Malayan Archipelago; in the tropical and subtropical regions they are confined to the mountains. In the following enumeration the species are grouped according to Shaw's classification. To facilitate the determination of the cult. species, a key is given to determine plants without cones, but owing to the great variability in pines this key may fail, if the plant in hand represents some uncommon variation. Good illustrations are found in Sargent, Silva of N. America, vol. 11; Lambert, Description of the Genus Pinus; Lawson, Pinetum Britannicum; Forbes, Pinetum Woburnense; Antoine, Die Coniferen; Clinton-Baker, Illustrations of Conifers, vol. I; Pardé, Iconographie des Conifères (in course of publication). For the horticultural varieties, see Beissner, Nadelholzkunde, second edition (1909), and the new edition by A. H. Kent of Veitch's Manual of the Coniferæ. Among other important works may be mentioned E. A. Carrière's Traité général des Conifères, second edition, 1867; Heinrich Mayr's Die Waldungen von Nordamerika, 1890; G. Engelmann's Revision of the Genus Pinus, in Transactions of the Academy of Science of St. Louis, published in 1880; Maxwell T. Masters in Journal of the Linnean Society, vols. 22 (1886) and 27 (1889); Conifer Conference in Journal Royal Horticultural Society, vol. 14 (1892); Silva Tarouca's Unsere Freiland-Nadelhölzer (1913); G.R. Shaw's The Pines of Mexico (1909) and The Genus Pinus (1914), both well illustrated.



2958. Pinus Strobus.

Leaf with a single fibro-vascular bundle (*a*), usually two external resin-ducts (*b*); strengthening cells (*c*) only beneath the epidermis; stomata (*d*) only on the two inner sides.

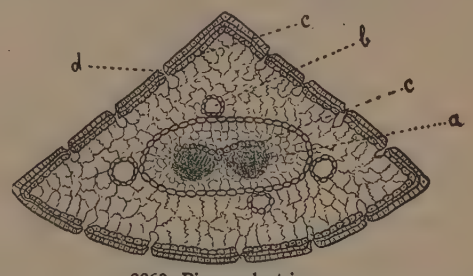


2959. Pinus Coulteri.

Leaf with two fibro-vascular bundles (*a*); several medial resin-ducts (*b*); strengthening cells (*c*) around the resin-ducts, several layers beneath the epidermis and along the inner and outer side of the fibro-vascular bundles; stomata (*d*) all around.

The pines are usually tall trees, rarely shrubby, with spreading branches forming a pyramidal or round-topped, in old age often very picturesque head, and clothed with acicular leaves in clusters of 2–5, rarely solitary. The flowers are catkin-like, appearing in spring, the staminate yellow or purple, often conspicuous by their abundance, and the pistillate greenish or purplish, developing into subglobose to cylindric, usually brown cones, which sometimes attain 18 or more inches in length, ripening mostly not before the second or rarely the third year. The pines are among the most important timber trees of the northern hemisphere, and many of them are valuable for the decoration of parks and gardens.

Young pines are with few exceptions of more or less regular, pyramidal habit; but in old age they are often very picturesque, especially *P. Strobus, P. radiata, P. rigida, P. Pinea, P. Cembra, P. nigra, P. parviflora,* and others. Of very graceful habit, with slender branches and more or less drooping foliage, are *P. excelsa,* and the tender *P. Ayacahuite, P. longifolia,* and *P. canariensis.* The very large cones of some species, as *P. Lambertiana, P. Ayacahuite, P. Sabiniana,* and *P. Coulteri,* are a conspicuous ornament. Most species are of vigorous growth when young, but the foreign species usually grow rather slowly and are therefore well suited for smaller gardens, especially *P. koraiensis, P. Peuce, P. Bungeana, P. parviflora;* the American *P. aristata* and *P. flexilis* may also be recommended for this



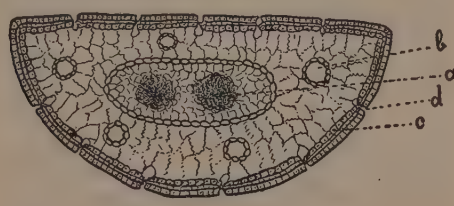
2960. Pinus palustris.

Leaf with two fibro-vascular bundles (*a*); several internal resin-ducts (*b*), one layer of strengthening cells (*c*) beneath the epidermis and on the inner side of the fibro-vascular bundles; stomata (*d*) all around.

purpose. For planting rocky slopes *P. Banksiana, P. rigida, P. virginiana,* and some western species are valuable; and if dwarf forms are desired *P. montana* is one of the best, thriving better than any other species in shaded positions and as undergrowth in open woods.

A great number of the species are hardy North. Among the hardiest are *P. Strobus, P. Cembra, P. parviflora, P. Bungeana, P. koraiensis, P. rigida, P. Banksiana, P. Thunbergii, P. resinosa, P. sylvestris* and *P. montana.* The Mexican species and those from southern Asia stand only a few degrees of frost.

The pines are not very particular as to the soil, and in their native habitats they usually occupy the less fertile situations, as dry uplands and sandy plains. Some, as *P. rigida, P. caribæa,* and *P. Tæda,* can be grown both in dry and in swampy ground. *P. palustris* is very unhappily named, since it almost never grows in swamps. Pines are much used for the afforestation of barren sandy plains and dry rocky mountain slopes. For seaside planting *P. rigida* and the more tender *P. radiata, P. Pinaster, P. halepensis,* and *P. canariensis*



2961. Pinus echinata.

Leaf with two fibro-vascular bundles (*a*) and several medial resin-ducts (*b*); only one layer of strengthening cells (*c*) beneath the epidermis; stomata (*d*) all around.

are valuable; the last three species are now much planted in California, both for timber and ornament.

Pines cannot be transplanted as successfully as large plants on account of their long tap-roots, and only younger nursery-grown trees should be used for planting. As they cannot usually be taken up with a good ball of earth, it is well to immerse the roots in a loam puddle immediately after the trees are dug up.

Pines are propagated by seeds sown in spring in prepared beds or frames, or in boxes or pans; the seeds should be covered slightly with fine soil, but the larger ones about ¼ inch, and the young seedlings shaded and watered when necessary. Varieties and rarer kinds are grafted on their types or allied species, usually by veneer-grafting on potted stock in the greenhouse in winter, or in spring outdoors by cleft-grafting in the terminal bud (M.D. 1901, p. 15). Cuttings even of the dwarf forms do not root readily; the easiest to root are young shoots with primary foliage, as they sometimes appear on older branches or on the trunk.

The pines belong to the most important timber trees in their native countries; these are, in eastern North America, *P. palustris, P. Strobus,* and *P. echinata;* in the western states, *P. Lambertiana, P. monticola,* and *P. ponderosa;* in Europe, *P. sylvestris* and *P. nigra;* in eastern Asia, *P. Thunbergii* and *P. densiflora,* and in the Himalayas, *P. excelsa.* From the resinous secretions of many species, chiefly *P. palustris, P. caribæa, P. Pinaster, P. halepensis,* and *P. longifolia,* turpentine, tar, and pitch are obtained. An essential oil used medicinally is distilled from the leaves and young shoots of several species. Edible seeds are produced by some species, in America by *P. edulis* and *P. cembroides;* in Europe by *P. Pinea* and *P. Cembra;* in East India by *P. Gerardiana.* Mats similar to cocoa mats are manufactured from the leaves of *P. palustris,* and pine wool for stuffing mattresses is made from leaves of European and American species.

For another account of the relative value of species of Pinus and their culture, see *Pine.*

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NO. I. KEY TO THE SPECIES WITH THE CONES.

I. Soft Pines (*Haploxylon*).

Wood soft, close-grained, light-colored, the sap-wood thin and nearly white: sheaths of the lf.-clusters deciduous; lvs. with 1 fibro-vascular bundle.

A. *Umbo of scales terminal.*
B. *Seeds wingless or with rudimentary wing.*
C. *Margin of lvs. serrulate.*
D. *Branchlets hairy: cones indehiscent.*
E. *Cones ovate: branchlets brownish tomentose* ..... 1. **Cembra**
EE. *Cones cylindric-conical: branchlets pubescent* ..... 2. **koraiensis**
DD. *Branchlets glabrous: cones dehiscent, cylindric-conical* .... 3. **Armandi**
CC. *Margin of lvs. entire: cones dehiscent: lvs. stout, 1½–3 in. long* .. 4. **flexilis**
BB. *Seeds winged, with long wing, short in No. 5.*
C. *Cones less than 10 in. long.*
D. *Scales of cone with convex thickening.*
E. *Length of cone about 2 in., shape ovate: branchlets pubescent: lvs. ¾–1½ in. long* ..... 5. **parviflora**
EE. *Length of cone 3½–10 in., shape cylindric: branchlets glabrous.*
F. *Lvs. 3–4 in. long, stiff* ... 6. **Peuce**
FF. *Lvs. 6–8 in. long, drooping* 7. **excelsa**
DD. *Scales of cone uniformly thin.*
E. *Branchlets glabrous: lvs. thin, soft* ..... 8. **Strobus**
EE. *Branchlets at first pubescent: lvs. stiff* ..... 9. **monticola**

CC. *Cones 10–18 in. long: branchlets pubescent.*
D. *Scales of cone rounded: lvs. stout*.....10. **Lambertiana**
DD. *Scales of cone with elongated and more or less recurved apex: lvs. slender*.....11. **Ayacahuite**
AA. *Umbo of scales dorsal.*
B. *Seeds wingless or with very short wing: cones green at maturity.*
C. *Margin of lf. entire; lvs. ¾–1½ in. long.*
D. *Number of lvs. 3 or 4.*
E. *Lvs. usually 4*.....12. **Parryana**
EE. *Lvs. usually 3*.....13. **cembroides**
DD. *Number of lvs. 1 or 2.*
E. *Lvs. usually 2, sometimes 3.* 14. **edulis**
EE. *Lvs. usually 1, sometimes 2.* 15. **monophylla**
CC. *Margin of lf. serrulate: lvs. 3, 2–4 in. long*.....16. **Bungeana**
BB. *Seeds with long wing: cones purple at maturity.*
C. *Cones with minute incurved prickles*.....17. **Balfouriana**
CC. *Cones with long slender prickles*..18. **aristata**

II. PITCH PINES (*Diploxylon*).

Wood usually heavy, coarse-grained, generally dark-colored, sap-wood pale, often thick: sheaths of lf.-clusters persistent (in the following species): lvs. with 2 fibro-vascular bundles, serrulate: umbo of cone-scales dorsal.

A. *Seed-wing very short or long and adnate.*
B. *Wing very short, deciduous: lvs. 2, 5–8 in. long*.....19. **Pinea**
BB. *Wing long, adnate: lvs. 3, 8–12 in. long.*
C. *Apophysis broad-pyramidal; seed ½in. long*.....20. **canariensis**
CC. *Apophysis elongated and more or less recurved; seed ¾–1 in. long*.....21. **longifolia**
AA. *Seed-wing articulate.*
B. *Wing of seed membranous, long.*
C. *Lvs. in 2's: cones deciduous, dehiscent at maturity, in No. 29 persistent and lvs. sometimes in 3's.*
D. *Resin-ducts external.*
E. *Branchlets bloomy: lvs. 2½–5 in. long*.....22. **densiflora**
EE. *Branchlets not bloomy.*
F. *Lvs. 4–8 in. long.*
G. *Color of branchlets yellowish brown: lvs. dark green, slender and thin*.....23. **Massoniana**
GG. *Color of branchlets orange: lvs. stout, light green*.....24. **resinosa**
FF. *Lvs. ¾–3 in. long.*
G. *Umbo obtuse, gray: lvs. more or less bluish green*.....25. **sylvestris**
GG. *Umbo more or less prickly, surrounded by a black marking: lvs. bright green*.....26. **montana**
DD. *Resin-ducts medial, or medial and external.*
E. *Cones deciduous: resin-ducts medial.*
F. *Winter buds brown, resinous, ovate-oblong*.....27. **nigra**
FF. *Winter buds grayish white, cylindric*.....28. **Thunbergii**
EE. *Cones tenaciously persistent: lvs. in 2's and 3's*.....29. **sinensis**
CC. *Lvs. in 3's or in 2's and 3's.*
D. *The cones deciduous.*
E. *Resin-ducts medial.*
F. *Young cones subterminal.*
G. *Branchlets orange: cones 3–6 in. long*...30. **ponderosa**
GG. *Branchlets glaucous: cones 5–15 in. long*..31. **Jeffreyi**

FF. *Young cones lateral.*
G. *Lvs. 3–5 in. long*.....32. **echinata**
GG. *Lvs. 6–9 in. long*.....33. **Tæda**
EE. *Resin-ducts internal: lvs. 8–18 in. long.*
F. *Winter buds whitish: cone dull brown, 6–10 in. long*.....34. **palustris**
FF. *Winter buds light brown: cone lustrous, brown, 3–6½ in. long*.....35. **caribæa**
DD. *The cones tenaciously persistent, often sérotinous: resin-ducts medial (except in No. 36).*
E. *Lvs. in 2's.*
F. *Resin-ducts external: umbo obtuse*.....36. **halepensis**
FF. *Resin-ducts medial.*
G. *Cones symmetrical.*
H. *Lvs. 5–8 in. long*....37. **Pinaster**
HH. *Lvs. 1–3½ in. long.*
I. *Prickles of cone stout*.....38. **pungens**
II. *Prickles of cone slender.*
J. *Cones remaining closed for many years*...39. **clausa**
JJ. *Cones opening at maturity*.....40. **virginiana**
GG. *Cones unsymmetrical.*
H. *Length of lvs. less than 4 in.*
I. *Cones not prickly, lateral*.....41. **Banksiana**
II. *Cones prickly, subterminal*.....42. **contorta**
HH. *Length of lvs. 4–6 in.: cones with stout and large prickles*..43. **muricata**
EE. *Lvs. in 3's: cone prickly.*
F. *Cones symmetrical.*
G. *Length of lvs. 6–8 in.: cones remaining closed for 1 or 2 years.*44. **serotina**
GG. *Length of lvs. 3–5 in.: cones opening at maturity*.....45. **rigida**
FF. *Cones unsymmetrical.*
G. *Prickles of cone minute: upper part of trunk rough*.....46. **radiata**
GG. *Prickles of cone stout: upper part of trunk smooth*.....47. **attenuata**
BB. *Wing of seed thick, short: lvs. 3 or 5, 6–13 in. long: cones large.*
C. *Lvs. in 3's, 6–12 in. long.*
D. *Cone conical-oblong; wings about 1 in. longer than the seed: lvs. stout*.....48. **Coulteri**
DD. *Cones broadly ovate; wing about ½in. longer than the seed: lvs. slender, flexible*..49. **Sabiniana**
CC. *Lvs. in 5's, rigid, 8–13 in. long: cone broadly ovate; seed short-winged*.....50. **Torreyana**

NO. 2. KEY FOR DETERMINING PINES WITHOUT CONES.
(Compare Figs. 2958–2961.)

A. *Number of lvs. 5, only occasionally 3 or 4.*
B. *Sheaths deciduous: fibro-vascular bundle 1.*
C. *Edges of lvs. serrulate.*
D. *Length of lvs. 1½–8 in.*
E. *Branchlets glabrous or nearly so.*
F. *The lvs. 6–8 in. long: branchlets glaucous*.... 7. **excelsa**
FF. *The lvs. 3–5 in. long: branchlets not glaucous.*
G. *Tree a rather dense pyramid with ascending branches*..... 6. **Peuce**

GG. *Tree an open pyramid.*
H. *Lvs. bluish green*.... 8. **Strobus**
HH. *Lvs. bright green: habit loose, with wide-spreading branches*..... 3. **Armandi**
EE. *Branchlets densely brownish tomentose*..... 1. **Cembra**
EEE. *Branchlets pubescent or puberulous.*
F. *Needles slender, somewhat pendulous, 4–6 in. long*. 11. **Ayacahuite**
FF. *Needles stiff, 1½–4 in. long.*
G. *Back of lvs. with fine white lines*..... 10. **Lambertiana**
GG. *Back of lvs. usually not lined.*
H. *Color of lvs. bluish or dark green*..... 9. **monticola**
HH. *Color of lvs. bright green*..... 2. **koraiensis**
DD. *Length of lvs. ¾–1½ in.: lvs. usually twisted, forming brush-like tufts at the end of the branchlets*..... 5. **parviflora**
CC. *Edges of lvs. entire.*
D. *Lvs. 1½–3 in. long*..... 4. **flexilis**
DD. *Lvs. 1–1½ in. long.*
E. *Branchlets dark orange-brown: lvs. rigid*.....17. **Balfouriana**
EE. *Branchlets orange: lvs. usually slender*.....18. **aristata**
BB. *Sheaths persistent: fibro-vascular bundles 2: lvs. 8–12 in. long, rigid* 50. **Torreyana**
AA. *Number of lvs. 3, or 4 or 1, only occasionally 2 or 5.*
B. *Usually solitary, sometimes in 2's*..15. **monophylla**
BB. *Usually 4, sometimes 3 or 5*.....12. **Parryana**
BBB. *Usually 3, occasionally 2.*
C. *Fibro-vascular bundle 1: sheaths deciduous.*
D. *Margin of lvs. entire: lvs. ¾–2 in. long.*
E. *Lvs. usually 3, 1–2 in. long*. 13. **cembroides**
EE. *Lvs. usually 2, ¾–1½ in. long*.....14. **edulis**
DD. *Margin of lvs. serrulate: lvs. 2–4 in. long*.....16. **Bungeana**
CC. *Fibro-vascular bundles 2: sheaths persistent.*
D. *Branchlets glaucous: lvs. bluish or grayish green (see also No. 33.)*
E. *Habit of lvs. slender, drooping*.....49. **Sabiniana**
EE. *Habit of lvs. straight, stiff.*
F. *Buds very resinous: lvs. 6–12 in. long, dark bluish green*.....48. **Coulteri**
FF. *Buds not or little resinous: lvs. 5–8 in. long, pale bluish green*.....31. **Jeffreyi**
DD. *Branchlets not glaucous: lvs. dark yellow or bright green.*
E. *Habit of lvs. slender, drooping.*
F. *Resin-ducts internal*.....34. **palustris**
FF. *Resin-ducts external.*
G. *Branchlets yellowish: buds brown*.....20. **canariensis**
GG. *Branchlets light yellow-brown: buds bright chestnut-brown*.....21. **longifolia**
EE. *Habit of lvs. stiff.*
F. *Length of lvs. 6–12 in.*
G. *Resin-ducts internal: buds cylindric, with spreading scales: lvs. dark green, in 2's and 3's, 8–12 in. long*.35. **caribæa**
GG. *Resin-ducts medial.*
H. *Buds oblong-ovate, slightly or not resinous: lvs. 6–9 in. long.*
I. *Lvs. light bluish green*.....33. **Tæda**
II. *Lvs. dark yellow-green*.....44. **serotina**
HH. *Buds ovate, acuminate, resinous: lvs. 5–11 in. long, dark yellowish green*....30. **ponderosa**
FF. *Length of lvs. 3–7 in. (see also No. 29).*
G. *Character of lvs. slender.*
H. *Foliage pale yellowish or bluish green: buds oblong-ovate, dark brown*.....47. **attenuata**
HH. *Foliage bright green: buds ovate, bright chestnut-brown*....46. **radiata**
GG. *Character of lvs. stout.*
H. *Form of buds thick, ovate, acute or acuminate*.....30. **ponderosa** [var. **scopulorum**
HH. *Form of buds oblong-ovate*.....45. **rigida**
AAA. *Number of lvs. 2 (see also No. 14).*
B. *Branchlets glaucous.*
C. *Buds very resinous*.....40. **virginiana**
CC. *Buds not or little resinous.*
D. *Hue of lvs. dark bluish green*..32. **echinata**
DD. *Hue of lvs. bright green*.....22. **densiflora**
BB. *Branchlets not glaucous.*
C. *Length of lvs. 1–3½ in.*
D. *Branchlets brown or orange: resin-ducts medial.*
E. *Character of lvs. slender: branchlets brown*.....39. **clausa**
EE. *Character of lvs. stout, twisted: branchlets orange or orange-brown*
F. *Lvs. 1–3½ in. long.*
G. *Resin-ducts 1 or 2*.....42. **contorta**
GG. *Resin-ducts 2–5*.....38. **pungens**
FF. *Lvs. ½–1 in. long*.....41. **Banksiana**
DD. *Branchlets dull greenish yellow or greenish brown: resin-ducts external.*
E. *Character of lvs. slender: buds not resinous*.....36. **halepensis**
EE. *Character of lvs. stout: buds coated with resin.*
F. *Generally a tree*.....25. **sylvestris**
FF. *Generally a shrub*.....26. **montana**
CC. *Length of lvs. 3–9 in.*
D. *Color of buds whitish or grayish white*.....28. **Thunbergii**
DD. *Color of buds brown (see also No. 36).*
E. *Scales of the oblong buds with reflexed tips, chestnut-brown.*
F. *Position of resin-ducts external.*
G. *Habit of lvs. very slender and thin*.....23. **Massoniana**
GG. *Habit of lvs. stiff and rigid*.....19. **Pinea**
FF. *Position of resin-ducts medial or internal.*
G. *Buds not resinous: lvs. lustrous green, 5–9 in. long*.....37. **Pinaster**
GG. *Buds resinous: lvs. dark green, 4–6 in. long*.....43. **muricata**
EE. *Scales not reflexed.*
F. *Resin-ducts external: lvs. lustrous: buds ovate, acuminate, resinous*....24. **resinosa**
FF. *Resin-ducts medial: lvs. dull: buds ovate, acuminate, resinous*.....27. **nigra**
FFF. *Resin-ducts medial and external: buds oblong-ovate, not resinous: lvs. sometimes 3*.....29. **sinensis**

Section I. CEMBRA.

Group 1. Cembræ.

1. Cémbra, Linn. Swiss Stone Pine. Tree, to 70 or sometimes 120 ft., with spreading usually short branches forming a narrow, dense pyramid, in old age often with very picturesque broad, open, round-topped head: branchlets coated with dense yellowish brown tomentum: winter buds globose-ovate, long-acuminate: lvs. straight, dark green on back, bluish white inside, 2–3½ in. long: cones short-peduncled, ovate, obtuse, light brown, 2½–3½ in. long; scales broadly ovate, rounded at apex, apophysis much broader than high; seed ½in. long. Cent. European Alps. H.W. 1:8, pp. 174–7. G.W. 1, p. 352; 7, p. 19. G.C. II. 17:80, 81; III. 24:459. Gn. 19, p. 369; 28, pp. 175, 182; 59, p. 59; 65, p. 431. Gt. 45, p. 205; 58, p. 443.—Handsome hardy pine of slow growth and symmetrical habit when young. The large seeds are eaten. Var. **columnàris,** Beissn., is a form of narrow, columnar habit. G.W. 2, p. 209. Var. **compácta,** Beissn., is compact and conical in habit. Var. **sibírica,** Loud. (*P. sibírica,* Mayr), has shorter lvs. and longer cones, and is of narrower habit and more vigorous growth. N. Russia and Siberia. Var. **pùmila,** Pall. See *P. pumila* in suppl. list.

2. koraiénsis, Sieb. & Zucc. (*P. mandshúrica,* Rupr.). Pyramidal tree, to 100 ft.: branchlets with yellowish brown pubescence: winter buds oblong-ovate, acuminate, dark chestnut-brown: lvs. straight, dark green and glossy on the back, bluish white on the inner sides, 2½–4 in. long: cones almost sessile, conic-oblong, yellowish brown, 4–6 in. long; scales rhombic-obovate, with recurved obtuse apex; seed over ½in. long, brown, sharply edged. Japan, Korea. S.Z. 2:116. Gng. 6:1. F.E. 18:333; 25:35. S.I.F. 1:2.—In cult. of slow growth, forming a rather dense, broad pyramid, with handsome foliage. One of the best hardy pines for smaller gardens.

Group 2. Flexiles.

3. Armándi, Franch. (*P. scipionifórmis,* Mast. *P. Mastersiàna,* Hayata). Tree, to 60 ft., with wide-spreading horizontal branches: branchlets glabrous: winter buds cylindric, chestnut-brown: lvs. slender and thin, 3–6 in. long, serrulate, bright green: cones peduncled, oblong-conical, 4–6 or sometimes 8 in. long, yellowish brown; scales obovate, appressed, much thickened in the middle, with large broadly rhombic apophysis and small obtuse thickened umbo often slightly recurved; seeds pale reddish brown, ovoid, compressed, ½in. long, with a sharp edge all around. Cent. and W. China. B.M. 8347. G.C. III. 33:34 (as *P. koraiensis*), 66. R.H. 1910, p. 425.—A handsome pine which has proved hardy at the Arnold Arboretum.

2962. Pinus flexilis (×¼). No. 4.

2963. Pinus Strobus (×¼). No. 8.

4. fléxilis, James. Limber Pine. Fig. 2962. Tree, to 50, occasionally to 80 ft., with stout horizontal branches forming a narrow open pyramid, in old age with low, broad, round-topped head: winter buds broadly ovate, slender-pointed: lvs. rigid, acute, dark green, 1⅓–3 in. long: cones short-stalked, ovate to cylindric-ovate, light brown, 3–6, rarely 10 in. long; scales rounded at the apex, tipped with an obtuse, dark umbo, the lower ones elongated and reflexed; seeds dark brown, mottled with black, ⅓–½in. long, with narrow wing. Alberta to Calif. and New Mex. S.S. 11:546, 547. G.F. 10:165. B.M. 8467. M.D. 1904:49. F.E. 29:47.—Hardy pine of slow growth; seems to be best adapted for ornamental planting on rocky slopes. Var. **reflèxa,** Engelm. (*P. reflèxa,* Engelm. *P. strobifòrmis,* Sudw., not Engelm.). Tree, to 100 ft.: lvs. slender, to 4 in. long, entire or remotely serrulate: cones 5–9 in. long, on longer stalks, with often thin reflexed scales. Ariz. S.S. 11:544, 545. Var. **álbo-variegàta,** Schwerin. Has many of lvs. white.

Group 3. Strobi.

5. parviflòra, Sieb. & Zucc. Tree, to 80 ft., of dense, pyramidal habit, with slender, horizontal branches: branchlets light greenish brown, puberulous: lvs. crowded, rather stiff, usually twisted, forming brush-like tufts at the end of the branchlets, bluish green, ¾–1½ in. long: cones ovate or oblong-ovate, almost sessile, reddish brown, 2–3 in. long; seeds dark brown, hardly ½in. long, with short wing. Japan. S.Z. 2:115. S.I.F. 2:2. A.G. 14:212.—Hardy and very ornamental pine, bearing numerous decorative cones when older. Cult. plants are often grafted and assume a more irregular habit. In Japan it is often cult. in pots and dwarfed. Var. **glaùca,** Beissn. With bluish green lvs. The wild form with somewhat longer lvs., longer cones and seeds with longer wings has been described as *P. pentaphýlla,* Mayr.

6. Peùce, Griseb. (*P. excélsa* var. *Peùce,* Beissn.). Attains 50 ft., with ascending short branches forming a narrow dense pyramid: branchlets greenish, glabrous, not glaucous: winter buds ovate: lvs. straight, bluish green, 3–4 in. long: cones short-stalked, cylindric, 3½–6 in. long, with obovate scales; seed 4 lines long. S.E. Eu. Gn. 76, p. 613.—An ornamental hardy pine of

dense, regular habit and slow growth; forms a narrower and denser pyramid than the white pine (*P. Strobus*).

7. **excélsa,** Wall. (*P. nepalénsis,* Chambr.). Attains 150 ft., with spreading and slightly ascending branches forming a broad open pyramid: branchlets greenish, glabrous, glaucous: winter buds cylindric-obovate, acute: lvs. slender, flaccid, drooping, grayish or bluish green, 6–8 in. long: cones cylindric on 1–2-in.-long stalks, 6–10 in. long; seeds brown, 4 lines long. Himalayas. Gn. 31, p. 195. A.G. 19:149. F.E. 13:664 (pl. 8); 33:113. Gn.M. 6:290. M.D.G. 1903:185.—Handsome tree, of somewhat loose habit, with graceful pendulous foliage, hardy as far north as Mass. in sheltered positions. Var. **zebrìna,** Bailly (var. *variegàta,* Hort.), has the lvs. with a whitish zone near the tip. F. E. 31:191. R.H. 1889, p. 392.

2964. Pinus Strobus. (×½)

8. **Stròbus,** Linn. (*Stròbus Stròbus,* Small). White Pine. Figs. 2958, 2963, 2964. Attains 100, occasionally 150 ft., with horizontal branches in regular whorls forming a symmetrical open pyramid; in old age the head is usually broad and open and often very picturesque: branchlets greenish or light greenish brown, glabrous or slightly puberulous: winter buds ovate, acuminate: lvs. soft, bluish green, 2–4 in. long (or 3½–5): cones on stalks ½–1 in. long, cylindric, slender, often curved, 2–4 in. long, with oblong-obovate scales; seed red-brown, mottled with black, 3 lines long. Newfoundland to Man., south to Ga., Ill. and Iowa. S.S. 11:538, 539. A.G. 12:645; 13:1. Gn. 30, p. 404. F.E. 15:340. C.L.A. 11:310. H. W. 1:9, pp. 183–5.—Very valuable ornamental hardy pine of rapid growth, symmetrical when young, picturesque in old age: no tree is better adapted to break up the monotonous sky-line of plantations in northern parks. There are a number of gardens forms occasionally cult. Var. **álba,** Loud. (var. *nívea,* Carr.). Low form of irregular habit, with almost silvery white foliage. Var. **aùrea,** Carr. With yellow foliage. Var. **glaùca,** Beissn. With light bluish green foliage. Var. **brevifòlia,** Loud. (var. *nàna,* Knight. Var. *pygmæa,* Hort.). Dwarf, compact, round bush, with short lvs. F.E. 20:788 (pl. 112); 29:569. Gt. 52, p. 435. Gn. M. 2:23. Var. **fastigiàta,** Beissn. (var. *pyramidàlis,* Hort.). With ascending branches, of narrow pyramidal or columnar habit. Var. **prostràta,** Arb. Kew. Dwarf, procumbent form, diffuse and trailing on the ground. Var. **umbraculífera,** Knight. Dwarf, flat-topped bush, with short lvs. R.H. 1869, p. 38. There are also forms with variegated foliage.

2965. Cones of pines. Beginning at the top: P. Coulteri, P. Lambertiana, P. palustris. P. radiata. (×⅓)

9. **montícola,** Don. Mountain White Pine. Tree, to 100 or occasionally 150 ft., with slender, spreading, somewhat pendulous branches forming a narrow open pyramid: branchlets puberulous, yellowish or reddish brown: winter buds ovate, acute: lvs. stiff, bluish green and glaucous, 1½–4 in. long, with few inconspicuous or no lines on the back: cones short-peduncled, cylindric, slender, slightly curved, 5–11 in. long, yellowish brown: scales pointed by the slightly thickened umbo; seed red-brown, mottled with black, ⅓in. long. Brit. Col. to Idaho and Calif. S.S. 11:540, 541. G.F. 5:5, 7. R.H. 1869, p. 126 (as *P. Groezelieri*). F.E. 31:293.—Similar to *P. Strobus,* but forming a somewhat narrower, more slender pyramid; hardy as far north as Mass.

10. **Lambertiàna,** Douglas. Sugar Pine. Fig. 2965. Tree, to 200 or 220 ft., with spreading somewhat pendulous branches forming a narrow open pyramid; old trees usually with flat-topped wide-spreading open head: branchlets brown, pubescent: winter buds oblong-obovate, apiculate: lvs. stout, sharply pointed, dark bluish green, 3–4 in. long, with conspicuous white lines on the back: cones on peduncles 2–3½ in. long, cylindric, often slightly curved, light brown, lustrous, 10–20 in. long; seed about ½in. long, dark brown or nearly black. Ore. to Mex. S.S. 11:542, 543. Gn. 31, pp. 152, 153. G.C. II. 23:11; III. 1:769. F.S.R. 1, p. 129. M.D.G. 1905:126. G.W. 8, p. 617.—One of the tallest trees of the Pacific Coast; in the eastern states it is hardy as far north as Mass., but grows slowly; has handsome dark foliage.

11. **Ayacahùite,** Ehrenb. (*P. Bonapártea,* Roezl. *P. Don-Pèdrii,* Roezl. *P. Loudoniàna,* Gord.). Tree, to 100 ft., with spreading, slender branches: branchlets yellowish brown, finely pubescent: lvs. slender and somewhat pendulous, bluish green, 4–6 in. long: cones short-stalked, cylindric-conical, gradually narrowed toward the apex, often slightly curved, brownish yellow, 9–15 in. long; seeds about ½in. long, gray-brown, mottled dark brown. N. Mex. G.C. II. 18:493; III. 20:751, 753. Gn. 25, pp. 192, 193. C.L.A. 7:364.—Handsome tree, somewhat resembling the white pine, but foliage more slender, especially ornamental with its large cones. Not hardy N.

Section II. PARACEMBRA.

Group 4. Cembroides.

12. **Parryàna,** Engelm., not Gord. (*P. quadrifòlia,* Sudw.). Nut Pine. Pinnon. Tree, to 40 ft., with stout, spreading branches, forming a regular pyramid, but in old age usually round-topped and irregular: branchlets puberulous, light grayish brown: lvs. 3–5, usually 4, rigid, incurved, pale glaucous green, 1½–1¾ in. long: cone subglobose, 1½–2 in. broad, chestnut-brown, lustrous; apophysis thick, pyramidal, conspicuously keeled; umbo with minute recurved prickle; seed about ½in. long. Calif. S.S. 11:549. M.D.G. 1903:97.—Not hardy N.

13. **cembroides,** Zucc. (*P. osteospérma,* Engelm.). Small tree, usually not over 20 ft., with stout spreading branches forming a round-topped head: branchlets dark orange, pubescent at first: lvs. usually 3, sometimes 2, slender, dark green, with stomata on all 3 faces, much incurved, 1–2 in. long: cone subglobose, 1–2 in. broad; apophysis pyramidal, strongly keeled, lustrous brown, with broad obtuse umbo; seeds oblong-obovate, ½–¾in. long, dark brown, with very narrow wing. Ariz. to Low. Calif. and N. Mex. S.S. 11:550. G.F. 4:353. F.S. 4, p. 325*b*.—A slow-growing densely branched pine; tender. By some authors the preceding and the two following species are referred to this species as simple variations in the number of lvs.

14. **edùlis,** Engelm. (*Caryópitys edùlis,* Small). Nut Pine. Fig. 2966. Small tree, 10–20 or occasionally to 40 ft., with horizontal branches, bushy when young, with low, round-topped head in old age: branchlets light yellowish brown, puberulous at first: lvs. 2–3, rigid, dark green, ¾–1½ in. long: cones almost sessile, broadly ovate, greenish yellow, lustrous, about 1½ in. long; apophysis pyramidal, strongly keeled; umbo with minute recurved tip; seed ½in. long, with narrow wing remaining attached to the scale. Colo. to N. Mex. and Texas. S.S. 11:552. F.E. 29:205.—Hardy as far north as Mass., forming a slow-growing and compact bush. The seeds are an important article of food among the Indians. Var. **âlbo-variegàta,** Hort., has white lvs. mixed with the green ones.

15. **monophýlla,** Torr. & Frem. (*P. Fremontiàna,* Endl.). Tree, 15–20, occasionally to 50 ft., similar to the preceding: branchlets light orange, glabrous: lvs. usually solitary, sometimes 2, terete, rigid, spinescent, glaucous green, ¾–1½ in. long: cones broadly ovate, light brown, 1½–2 in. long; apophysis depressed-pyramidal, ridged, the flattened umbo with a minute incurved tip; seed ½in. long. Calif. to Colo. and Ariz. S.S. 11:551. G.C. II. 20:44; 26:137.—Of slow growth, hardy as far north as Mass. The solitary lf. has been believed to consist of 2 connate ones, but this is certainly not the case, as the solitary fibro-vascular bundle plainly shows.

2966. Pinus edulis. (×⅓)

Group 5. Gerardianæ.

16. **Bungeàna,** Zucc. Lace-Bark Pine. White-Bark Pine. Tree, to 80 or 100 ft., with long and slender branches: bark flaky, light gray: young branches grayish green, glabrous: lvs. rigid, acute, light green, 2–4 in. long: cones almost sessile, conic-ovate, light yellowish brown, 2–3 in. long; apophysis much broader than high, ridged, with a triangular pointed and recurved umbo; seed dark brown, with narrow wing, ⅛–½in. long. N. W. China. B.M. 8240. G.C. II. 18:9.—Hardy slow-growing tree of bushy habit in cult. and with rather sparse light green foliage.

Group 6. Balfourianæ.

17. **Balfouriàna,** Jeffrey. Foxtail Pine. Tree, to 40, occasionally 90 ft., narrow-pyramidal when young, irregular and open in old age: branchlets dark brown,

2967. Scotch pine.—Pinus sylvestris (×⅓). No. 25.

puberulous at first: lvs. crowded, incurved and pressed against the branches, rigid, acute, dark green on the back, with conspicuous white lines inside, 1–1½ in. long, remaining for 10–12 years on the branches: cones pendulous, subcylindric, dark purplish brown, 3½–5 in. long; apophysis flattened, the concave oblong umbo with minute incurved prickle; seed ⅓in. long. Calif. S.S. 11:553.—Not hardy N.

18. **aristàta,** Engelm. (*P. Balfouriàna* var. *aristàta,* Engelm.). Hickory Pine. Foxtail Pine. Bushy tree, occasionally to 50 ft., sometimes a semi-prostrate shrub: branchlets light orange and almost glabrous: lvs. stout or slender, dark green, 1–1½ in. long, with white lines inside: cones cylindric-ovate, 3–3½ in. long; apophysis elevated; umbo with a slender incurved spine to ¼in. long; seed ¼in. long. Calif. to Utah and Ariz. S.S. 11:554. G.C. III. 20:719. M.D. 1904, p. 49 (pl. 5).—Hardy as far north as Mass.; in cult. usually a handsome low, bushy shrub of distinct habit: lvs. often sprinkled with resinous dots.

Section III. PARAPINASTER.

Group 7. Pineæ.

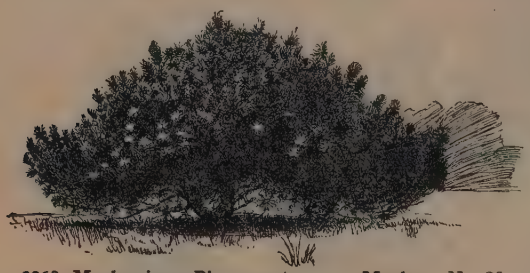
19. **Pínea,** Linn. Stone Pine. Tree, to 80 ft., with long, horizontally spreading branches forming in older trees a broad, flat-topped head: branchlets pale brown: buds with revolute scales, oblong-ovate, not resinous: lvs. rigid, acute, bright green, 5–8 in. long: cones broadly ovate, chestnut-brown, 4–5½ in. long; apophysis depressed-pyramidal, radiately ridged; umbo flat, obtuse; seed reddish brown, ¾in. long, edible. S. Eu. G.C. II. 20:45; III. 4:604, 605. Gn. 27, pp. 245–7; 50, p. 460; 76, p. 648. H.W. 1, pp. 170, 171. F.S.R. 2, p. 274. J.H. III. 68:447.—Tree of picturesque habit, with a trunk usually destitute of branches for a considerable height and with a wide-spreading parasol-like head. Not hardy N.; in warmer regions often cult. for its edible seeds.

Group 8. Longifoliæ.

20. **canariénsis,** C. Smith. Tree, to 80 ft., with slender branches forming a broad, round-topped head: branchlets yellowish: lvs. slender, spreading and pendulous, light green and lustrous, 9–12 in. long, with medial resin-ducts: cones cylindric-ovate, 4–8 in. long; apophysis low-pyramidal, irregularly 4-sided, light brown and

glossy, with obtuse umbo; seed ½in. long. Canary Isls. G.C. III. 3:721.—Handsome pine cult. in Calif., where it does very well and grows faster than the native *P. radiata*, even in very rocky and dry locations; in colder regions grown sometimes in the greenhouse.

21. **longifòlia,** Roxbg. (*P. Róxburghii*, Sarg.). Tree, to 100 ft. or more, with round-topped symmetrical



2968. Mugho pine.—Pinus montana var. Mughus. No. 26.

head: branchlets light yellow-brown: winter buds oblong, light chestnut-brown, not resinous: lvs. slender, pendulous, light green, 8–12 in. long, with external resin-ducts: cones short-stalked, conic-ovate, 4–7 in. long; apophysis elongated-pyramidal, compressed, more or less recurved; umbo obtuse; seed ¾–1 in. long. Himalayas.—Important forest tree in its native country. Not hardy N., but cult. in Calif. Very decorative as a young plant, with its long drooping light green foliage.

Section IV. PINASTER.

Group 9. Lariciones.

22. **densiflòra,** Sieb. & Zucc. Japanese Red Pine. Tree, to 100 ft., with spreading branches forming an irregular, rather broad head: branchlets orange-yellow, bloomy: buds oblong-ovate, chestnut-brown: lvs. slender, acute, bright bluish green, 2½–5 in. long: cones short-stalked, conic-ovate to oblong, grayish brown, somewhat oblique at the base, about 2 in. long; apophysis flattened and slightly ridged, those near the base sometimes elongated; umbo small, with a short prickle or obtuse; seed grayish yellow, ¼in. long. Japan. S.Z. 2:112. S.I.F. 1:1. Gn.M. 2:22.—Ornamental hardy tree, rapidly growing when young, often very picturesque when older. Many garden forms are cult. in Japan, several of them with variegated lvs. The best are perhaps var. **umbraculífera,** Mayr, a low form with horizontally spreading branches forming a flat head; var. **péndula,** Mayr, with pendulous branches; var. **aùrea,** Mayr, with yellow foliage; var. **álbo-terminàta,** Mayr, with the tips of the lvs. yellowish white, and var. **Óculus-dracònis,** Mayr, like var. **variegàta,** Mayr, similar to the varieties, of the same name under *P. Thunbergii*. (No. 28.)

23. **Massoniàna,** Lamb. Tree, to 80 ft., with slender, spreading branches: branchlets yellowish brown: lvs. very slender and thin, light green, 5–8 in. long: cones oblong-ovate or ovate, dull brown, 2–3 in. long; apophysis flattened, slightly keeled, with a small, flat, unarmed umbo; seed ⅕in. long. China.—Not hardy N. and rarely cult. Often confounded with *P. sinensis* and *P. densiflora*.

24. **resinòsa,** Ait. Red Pine. Norway Pine. Tree, to 70, occasionally to 150 ft., with stout spreading and sometimes pendulous branches forming a broad pyramidal head when young and an open round-topped one in old age: branchlets orange-color: buds ovate, acuminate, light brown, resinous: lvs. slender and flexible, acute, dark green and lustrous, 4–6 in. long: cones subsessile, conic-ovate, light brown, 1½–2½ in. long; apophysis flattened, conspicuously keeled, obtuse, with small dark unarmed umbo; seeds dark brown, ⅓in. long. Newfoundland to Man., south to Pa. and Minn. S.S. 11:550, 551. A.G. 12:645. C.L.A. 11:310.—One of the most ornamental pines for northern parks, quite hardy and of vigorous growth. Lumber tree.

25. **sylvéstris,** Linn. Scotch or Scots Pine. Fig. 2967. Tree, to 70, or occasionally 120 ft., with spreading, often somewhat pendulous branches, pyramidal when young, with broad and round-topped often picturesque head in old age: branchlets dull grayish yellow: winter-buds oblong ovate, brown, resinous: lvs. rigid, acute, twisted, bluish green, 1½–3 in. long: cones short-stalked, conic-oblong, grayish or reddish brown, 1½–2½ in. long; apophysis little thickened, slightly keeled, only those near the base elongated; umbo small, obtuse; seed dark gray, ⅛in. long. Eu. to W. and N. Asia. Gn. 36, p. 167; 38, p. 455; 49, p. 296. H.W. 1:4, pp. 121–6. F.E. 29:157. G.C. III. 34:298. F.S.R. 1, p. 16.—One of the most important timber trees of Eu. It is quite hardy, but has little to recommend it as an ornamental tree. Several geographical and garden forms have been distinguished. Var. **argéntea,** Stev. Foliage light bluish green, with silvery hue. Var. **aùrea,** Beissn., with the young lvs. golden yellow. F.E. 13:972 (pl. 14). Var. **nívea,** Schwerin. Lvs. a dirty greenish white. Var. **Beissneriàna,** Schwerin. Lvs. green at first, changing to golden yellow in summer. Var. **columnàris compácta,** Bailly. Slow-growing, dense, columnar form. R.H. 1889, p. 393. Var. **fastigiàta,** Carr. (var. *pyramidàlis*, Hort.). Of pyramidal habit. Var. **virgàta,** Casp. Sparingly branched form with long flagellate branches. H.W. 1, p. 126. Var. **crispàta,** Schwerin. Lvs. curved in different directions, having a crisp appearance. Var. **péndula,** Beissn. With pendulous branches. Var. **pùmila,** Beissn. Dwarf globose bush. Besides these varieties a number of geographical races have been distinguished which differ chiefly in habit, growth, and hardiness and are more of silvicultural than of horticultural interest. The best known are var. **rigénsis,**

2969. Austrian pine.—Pinus nigra var. austriaca (×⅛). No. 27.

Loud., with a straight tall st.; var. **lappónica,** Fries (*P. lappónica*, Mayr). A pyramidal form of slow growth: lvs. broader and shorter, remaining green on the branches for 4–7 years: cones more yellowish. N. Eu. Var. **engadinénsis,** Heer. A slow-growing pyramidal form with thick and rigid lvs. 1–1½ in. long and grayish green. Tyrol.

26. **montàna,** Mill. Swiss Mountain Pine. Very variable in habit, usually low, often prostrate shrub, sometimes pyramidal tree to 40 ft., similar to the preceding: branchlets usually of darker, brownish color: lvs. bright green, acutish, stout, crowded, ¾–2 in. long: cones ovate or conic-ovate, ¾–2¼ in. long; apophysis often pyramidal; umbo light gray, surrounded by a blackish ring. An anatomical character in the lvs. to distinguish this species from the preceding is found in the cells of the epidermis which are of nearly equal diam. with a dot-like central space in *P. sylvestris*, but in this species are much higher than broad with a dash-like central space. Mts. of Cent. Eu. Gn. 30, p. 225. Mn. 5, p. 49. H.W. 1:5, pp. 140–3. M.D. 1912, pp. 141–8. G.W. 1, p. 351.—Handsome hardy low shrub with ascending branches densely clothed with bright green foliage; ornamental as single specimens or for covering rocky slopes and as undergrowth in open woods. A very variable species which has been divided according to the cones into the following 3 varieties or subspecies: Var. **uncinàta,** Willk. (including vars. *rostràta* and *rotundàta*, Ant., var. *arbòrea*, Tubeuf). Cone very oblique, usually deflexed; apophysis pyramidal, with often reflexed umbo. Often arborescent. Var. **pumílio,** Willk. (*P. pumílio*, Haenke. *P. carpática*, Hort., var. *frutéscens erécta*, Tubeuf). Cone regular, subglobose to ovate, before maturity glaucous and usually violet-purple, ripe yellowish or dark brown. Usually shrubby and upright. Var. **Mùghus,** Willk. (*P. Mughus*, Scop., var. *prostràta*, Tubeuf). Fig. 2968. Cone regular, conical or conic-oval, with usually prickly umbos, not bloomy, yellowish brown before ripening, cinnamon-brown when ripe. Usually shrubby and prostrate. Gn. M. 2:23. Var. **aûreo-variegàta,** Schwerin, has some of lvs. golden yellow. Var. **grâcilis,** Schwerin, is a regular pyramidal form with lvs. 1–1¼ in. long. M.D. 1906, p. 193.

2970. Pinus ponderosa. (×½)

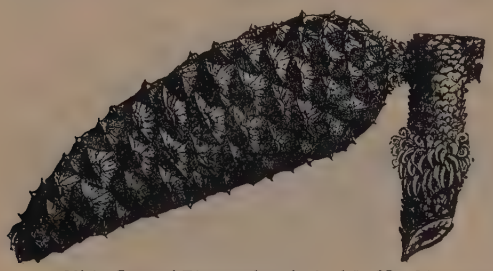
27. **nigra,** Arnold (*P. Larício*, Poir.). Austrian Pine. Tree, to 100 or occasionally 150 ft., with stout, spreading branches in regular whorls forming a symmetrical pyramid, in old age sometimes broad and flat-topped: branchlets usually light brown: buds ovate or oblong-ovate, light brown, resinous: lvs. stiff, acute, dark green, 3–6½ in. long: cones sessile, ovate, yellowish brown, glossy, usually 2–3½ in. long; apophysis depressed, conspicuously keeled; umbo flattened, obtuse or with a very short prickle; seeds gray, ¼ in. long. S. Eu. to W. Asia.—Very variable and usually the following geographical varieties are distinguished: Var. **austrìaca,** Schneid. (*P. Larício* var. *austrìaca*, Endl. *P. austrìaca*, Höss. *P. nigricans*, Hort.). Fig. 2969. Tall tree, with dark gray bark, broadly ovate head and very dark green, rigid lvs. 3–4 in. long: branchlets grayish or yellowish brown. S.E. Eu., from Austria to Dalmatia and Rumania. Gn. 19, p. 477; 38, p. 113. F.S.R. 3, p. 10. F.E. 18:376 (pl. 84). G.W. 15, p. 466, H.W. 1:6, pp. 148–51. Mn. 10, p. 170. R.H. 1894, p. 271. Var. **Pallasiàna,** Schneid. (*P. Pallasiàna*, Lamb.). Crimean Pine. Tall tree, with long and stout branches: lvs. dark green and glossy: cones light brown, about 4 in. long. W. Asia. G.C. II. 20:785; 21:481. Var. **calábrica.** Schneid. (*P. Larício calàbrica*, Delam.). Calabrian Pine. Tall tree, with shorter ascending branches forming a narrower, less dense head: lvs. of lighter green: branchlets light brown. Italy, Sicily. Var. **píndica,** Rehd. (*P. Larício píndica*, Mast. *P. píndica*, Formanek). Lvs. pale green, about 5 in. long: cones about 3 in. long with convex apophysis and small obtuse umbo. Thessaly. G.C. III. 31:304. Var. **leucodérmis,** Rehd. (*P. leucodérmis*, Ant.). Pyramidal tree: bark light gray, broken into angular plates: lvs. dark green, 2–4 in. long: cones oblong-ovate, light grayish brown, dull, about 3 in. long. S. E. Eu. H.W. 1, p. 158–61. Var. **Poiretiàna,** Schneid. (*P. Larício*, Poir. *P. Larício corsicàna*, Hort.). Corsican Pine. Tall tree, to 150 ft., with shorter ascending branches forming a narrower head: bark gray: branchlets reddish brown: lvs. lighter green, 4–6 in. long. Corsica. R.H. 1897, pp. 355, 357. F.S.R. 1, p. 33. Gn. 27, p. 321; 29, p. 104; 36, p. 523; 52, p. 219. G.C. II. 21:15; III. 4:693, 705. Var. **tenuifòlia,** Schneid. (*P. Larício tenuifòlia*, Parl. *P. Sálzmannii*, Dun. *P. monspeliénsis*, Salzmann. *P. pyrenàica*, Lapeyr. *P. cebennénsis*, Hort. *P. horizontàlis*, Hort.). Tree, to 60 ft.: branchlets orange-colored: lvs. slender, to 6½ in. long: cones small, about 2 in. long. Of the horticultural varieties may be mentioned var. **péndula,** Rehd. (*P. Larício péndula*, Beissn.); var. **pygmæa,** Rehd. (*P. Larício pygmæa*, Rauch), a dwarf dense bushy form; var. **prostràta,** Rehd. (*P. L. prostràta*, Beissn.), of prostrate habit, and var. **Mòseri,** Rehd. (*P. L. Mòseri*, Moser), compact and dwarf, needles turning golden yellow in winter.—The var. *austriaca* is hardy N., the others are at least hardy as far north as Mass. They are of rapid growth and conspicuous by their large, dark green foliage. Var. *tenuifolia*

2971. Pinus Tæda (×⅛). No. 33.

2972. Seedlings and young plant of Pinus palustris. No. 34.

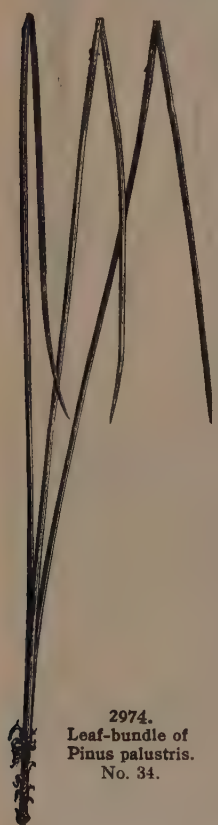
is especially very handsome as a young plant, with its long, dense lvs.

28. **Thúnbergii,** Parl. (*P. Massoniàna,* Sieb. & Zucc., not Lamb.). JAPANESE BLACK PINE. Tree, to 100 ft., or occasionally 120 ft., with spreading, often somewhat pendulous branches, forming a broad, pyramidal head:



2973. Cone of Pinus palustris (×⅓). No. 34.

branchlets orange-yellow, the winter buds oblong, grayish or silvery white: lvs. stiff, sharply pointed, bright green, 3–4½ in. long: cones short-stalked, conic-ovate, grayish brown, 2–3 in. long; apophysis flattened, with small, depressed umbo, obtuse or with a minute prickle; seed grayish brown, ¼in. long. Japan. G.C. II. 23:345. S.Z. 2:113. S.I.F. 1:1.—Handsome tree and hardy N. Several horticultural varieties have been intro. from Japan: one of the most distinct is var. **Óculus-dracònis,** Mayr, each lf. being marked with 2 yellow bands and therefore the tufts of the lvs. at the end of the branches, if seen from above, show alternate yellow and green rings, hence the name *Oculus-draconis* (dragon-eye). Var. **variegàta,** Hort., has the lvs. partly yellow or occasionally wholly yellowish white. There are also similar forms in *P. densiflora,* which may be distinguished by the brown color of the winter buds.



2974. Leaf-bundle of Pinus palustris. No. 34.

29. **sinénsis,** Lamb. (*P. leucospérma,* Maxim. *P. funèbris,* Komar. *P. Hénryi,* Mast. *P. Wilsonii,* Shaw. *P. tabulifórmis,* Carr.). Tree, to 70 ft.: bark of trunk dark gray, fissured, red on the limbs: branchlets pale orange-yellow or pale grayish yellow, slightly bloomy while young: winter buds oblong, light brown, lustrous, slightly or not resinous: lvs. 2–3, oftener 2, stiff, glaucescent, with rough margins, 2–4 in. long: cones subsessile, ovoid, 1½–2½ in. long, persistent for several years, pale yellow-brown; apophysis rhombic, prominently keeled, with an obtuse or mucronate umbo; seeds brown, mottled or whitish, over ¼in. long, with the wing ¾in. long. Cent. and W. China. Var. **densàta,** Shaw (*P. densàta,* Mast. *P. próminens,* Mast.). Lvs. 3–5 in. long, stiff: cones ovoid, 2–2½ in. long, oblique, with their posterior apophysis tumid and prominent. Var. **yunnanénsis,** Shaw (*P. yunnanénsis,* Franch.). Lvs. oftener 3, slender, 4–8 in. long: cones 2½–3½ in. long; apophysis flat; umbo small; seed with wing nearly 1 in. long. S.W. China. G.C. III. 38:226.

Group 10. AUSTRALES.

30. **ponderòsa,** Douglas (*P. Benthamiàna,* Hartw.). YELLOW PINE. BULL PINE. Fig. 2970. Tree, to 150, occasionally to 230 ft., with stout spreading and often pendulous branches usually ascending at the ends and forming a narrow, spire-like head: branchlets orange-brown, fragrant when broken: winter buds oblong-ovate or ovate, resinous: lvs. acute, dark green, 5–11 in. long: cones almost sessile, often in clusters, ovate-oblong, light reddish or yellowish brown and lustrous, 3–6 in. long; apophysis depressed-pyramidal or flattened, with a broadly triangular umbo terminated by a stout, usually recurved prickle; lower scales with more elongated apex; seed ¼in. long. Brit. Col. to Mex., east to Neb. and Texas. S.S. 11:560, 561. G.F. 8:395. G.C. III. 8:557, 561, 569. F.S.R. 3, p. 99. M.D.G. 1905:126.—One of the tallest and most important pines of the western states. Hardy as far north as N. Y., and in sheltered positions to Mass. Var. **péndula,** H. W. Sarg., has drooping branches. Var. **scopulòrum,** Engelm. (*P. scopulòrum,* Lemm.), is a geographical variety, smaller in every part; usually to 75 ft. high: lvs. 5–7 in. long, sometimes in 2's: cones smaller, ovate. S. D. to Mex. and Texas. S.S. 11:564. G.C. II. 9:797. M.D. 1912, p. 364. Somewhat hardier than the type.—*P. Málletii,* Mott., is probably a form of this species with more ascending branches forming a rather narrow pyramidal head. R.H. 1913, p. 265. Fig. 2970 is adapted from Pacific R. R. Report.

2975. Pinus caribæa (×⅛). No. 35.

31. **Jéffreyi,** Balfour (*P. ponderòsa* var. *Jéffreyi,* Vasey). JEFFREY'S PINE. Tree, to 120 or occasionally to 180 ft., with short spreading or often pendulous branches, the uppermost ascending, forming an open pyramidal and sometimes narrow spire-like head: young branches glaucous, fragrant when broken: winter buds oblong-ovate, not resinous: lvs. stout, acute, pale bluish green, 5–8 in. long: cones conic-ovate, light brown, 6–12 in. long; apophysis depressed, keeled; umbo elongated into a slender recurved spine; seed about ½in. long. Ore. to Calif. S.S. 11:562, 563. G.C. II. 22:813; III. 5:361, 369. G.F. 5:185. B.M. 8257. G.W. 2, p. 199.—Distinct and ornamental pine of symmetrical habit when young, hardy as far north as Mass. Among the hardier species this pine has the longest lvs.

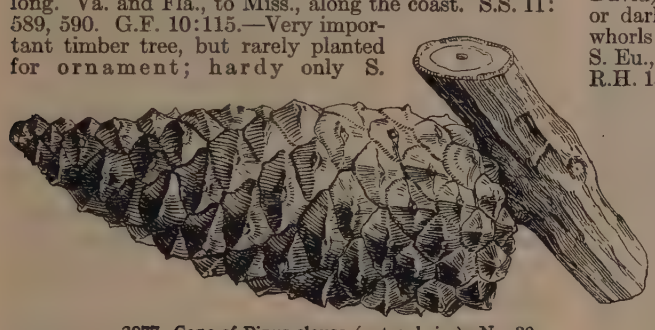
32. **echinàta,** Mill. (*P. mìtis,* Michx.). SPRUCE PINE. YELLOW PINE. Tree, to 100 or 120 ft., with slender often pendulous branches in regular whorls: winter buds oblong-ovate, brown: lvs. slender, acute, dark bluish green, sometimes in 3's, 3–5 in. long: cones short-stalked or almost sessile, conic-oblong, dull brown, 1½–2 in. long; apophysis flattened; umbo little elevated, with short straight or curved prickle;

2976. Pinus caribæa. (×⅔)

seeds ⅛–¼in. long. N. Y. to Fla., west to Ill. and Texas. S.S. 11:587.—Handsome tree, with broad, oval head, hardy as far north as Mass.

33. **Tæda,** Linn. Loblolly Pine. Old Field Pine. Frankincense Pine. Fig. 2971 (adapted from U. S. Forestry Report). Tree, to 100, occasionally to 170 ft., with spreading branches, the upper ascending, forming a compact round-topped head: branchlets yellowish brown, sometimes slightly bloomy: winter buds oblong, resinous: lvs. slender but stiff, acute, bright green, 6–9 in. long: cones sessile, spreading, conic-oblong, light reddish brown, 3–5 in. long; apophysis flattened or depressed-pyramidal; umbo small, with short triangular, recurved spine, lower scales not elongated; seed ⅛in. long. Del. to Fla. and Texas. S.S. 11:577, 578.—Not hardy N., and rarely cult. for ornament.

34. **palústris,** Mill. (*P. austrâlis,* Michx.). Long-Leaf Pine. Southern Pine. Figs. 2965, 2972–2974. Tree, to 100 or 120 ft., with ascending branches forming an oblong open head: branchlets orange-brown: winter buds whitish, oblong: lvs. crowded, forming tufts at the end of branchlets, dark green, 8–18 in. long, with internal resin-ducts: cones almost sessile, cylindric, dull brown, 6–10 in. long; apophysis flattened; umbo dark brown, with triangular, reflexed short spines; seed almost ½in. long. Va. and Fla., to Miss., along the coast. S.S. 11: 589, 590. G.F. 10:115.—Very important timber tree, but rarely planted for ornament; hardy only S.



2977. Cone of Pinus clausa (natural size). No. 39.

Branches are imported in great quantities into the northern cities in midwinter and used for decorations on account of their large handsome foliage. Figs. 2972–2974 are adapted from U. S. Forestry Report.

35. **caribæa,** Morelet (*P. cubénsis,* Griseb. *P. heterophýlla,* Sudw. *P. Ellióttii,* Engelm.). Slash Pine. Swamp Pine. Figs. 2975, 2976. Tree, to 100 or 120 ft., with horizontally spreading branches forming a round-topped broad and compact head: branchlets orange-brown: winter buds cylindric, light brown: lvs. dark green and lustrous, acute, in 3's and 2's, 8–12 in. long, with internal resin-ducts: cones short-peduncled, conic-oblong, dark brown and glossy, 3–6½ in. long; apophysis flattened, keeled; umbo small, with minute recurved prickles; seed ⅛–¼in. long. Ga. to Fla., near the coast, Cuba. S.S. 11:591, 592. G.C. III. 35:179. G.F. 8:223 (adapted in Fig. 2996).—Handsome pine, with compact broad head, hardy only S. Fig. 2975 is adapted from U. S. Forestry Report.

Group 11. Insignes.

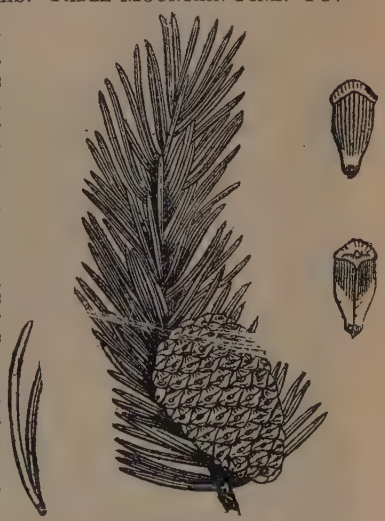
36. **halepénsis,** Mill. (*P. alepénsis,* Poir.). Aleppo Pine. Tree, to 60 ft., with short branches forming an open round-topped head: branchlets slender, yellowish or light greenish brown: winter buds small, cylindric, not resinous: lvs. sometimes in 3's, slender, light green, 2½–4 in. long: cones short-stalked, spreading or deflexed, usually 1–3, conic-ovate or conic-oblong, yellowish brown, unarmed, 2½–3½ in. long; apophysis flattened, with a transverse line and slightly or not elevated obtuse umbo; seed ¼in. long. Medit. region. G.C. II. 22:553; III. 3:629. G.W. 9, pp. 469, 471. H.W. 1:7, pp. 162–5.—Not hardy N. and of little ornamental value, but recommended for seaside planting. Trunk usually slender and destitute of branches for a considerable height: foliage thin and sparse, in tufts

2978. Cone of Pinus clausa, grown over by the branch. (×⅔)

at the end of branchlets. Var. **Pityûsa,** Gord. (*P. Pityûsa,* Stev.), is a smaller tree with slenderer branches, longer lvs., and smaller cones. W. Asia. Var. **brûtia,** Henry (*P. brùtia,* Ten. *P. eldàrica,* Medw. *P. pyrenàica,* David). Lvs. 4–7, rarely 8 in. long, more rigid, bright or dark green: cones sessile, not deflexed, usually in whorls of 2–6, 2–4 in. long with rugose depressed knobs. S. Eu., W. Asia. G.C. III. 4:268. H.W. 1, pp. 172, 173. R.H. 1867, pp. 150, 151.

37. **Pináster,** Ait. (*P. marítima,* Poir.). Cluster Pine. Tree, to 100 ft., with spreading or sometimes pendulous branches forming a pyramidal head: branchlets bright reddish brown: buds oblong-oval, brown, not resinous: lvs. stiff, acute, usually twisted, glossy green, 5–9 in. long: cones short-peduncled, clustered, conic-oblong, light brown and glossy, 4–7 in. long; apophysis pyramidal, conspicuously keeled with prominent triangular, acute umbo; seed grayish brown, ⅛in. long. S. Eu., near the coast. Gn. 14, p. 20. G.W. 9, p. 470. H.W. 1, pp. 168, 169.—Handsome pine of regular, pyramidal habit and rapid growth, but not hardy N. In England it is much used for seaside planting and the vars. **Hâmiltonii,** Parl., var. **Lemoniàna,** Endl. (*P. Pináster Aberdòniæ,* Loud.), and var. **mìnor,** Loisel., are occasionally cult. in English gardens.

38. **púngens,** Lamb. Table Mountain Pine. Poverty Pine. Tree, to 30, occasionally to 60 ft., with stout spreading branches forming a broad open often flat-topped head: branchlets light orange: winter buds oblong, obtuse, dark chestnut-brown: lvs. stout, twisted, sharply pointed, dark green, 1¼–2½ in. long: cones conic-ovate, oblique at the base, light brown, 2½–3½ in. long; apophysis pyramidal and conspicuously keeled, the conical elongated umbo ending in a stout curved spine; seed light brown,



2979. Pinus contorta (×⅓). No. 42.

¼in. long. N. J. to N. C. and Tenn. S.S. 11:584.—Hardy as far north as Mass., but of little ornamental value.

39. **claûsa,** Vasey (*P. inops* var. *claùsa*, Engelm.). Sand Pine. Spruce Pine. Figs. 2977, 2978. Tree, to 20, occasionally to 70 ft., with slender spreading

2980. Pinus rigida (×½). No. 45.

branches: branchlets red-brown: winter buds oblong, obtuse, not or little resinous: lvs. slender and flexible, acute, dark green, 2–3 in. long: cones short-stalked, often oblique at the base, conic-ovate, dark reddish brown, 2–3½ in. long, remaining closed for 3 or 4 years after ripening and occasionally becoming enveloped by the growing wood of the st.; apophysis depressed-pyramidal, conspicuously keeled; umbo with a short, stout spine. Fla. and Ala. near the coast. S.S. 11:582. G.F. 5:161.—Little known in cult., and not hardy N.

40. **virginiàna,** Mill. (*P. inops*, Ait.). Scrub Pine. Jersey Pine. Tree, to 40, or sometimes to 100 ft., with slender horizontal or pendulous branches in remote and irregular whorls, forming a broad open pyramid or sometimes flat-topped: winter buds oblong, dark brown: lvs. stiff, twisted, spreading, acutish, 1½–2½ in. long: cones conic-oblong, reddish brown, 1½–2½ in. long; apophysis little elevated, with a broad depressed-pyramidal umbo ending in a short recurved prickle; seed pale brown, ¼in. long. N. Y. to S. C., west to Ky. and Ind. S.S. 11:581.—Hardy as far north as Mass., but of little ornamental merit. Valuable in the middle states for covering dry and barren soil.

41. **Banksiàna,** Lamb. (*P. divaricàta*, Dum.-Cours.). Jack Pine. Tree, to 70 ft., usually lower, sometimes shrubby, with slender spreading branches, forming broad open head: branchlets yellowish to purplish brown: winter buds oblong-ovate, light brown, very resinous: lvs. stiff, twisted, spreading, acute or obtusish, dark or bright green, about 1 in. long: cones conic-oblong, usually curved, pale yellow-brown and lustrous, unarmed, 1½–2 in. long, remaining on the tree for 12–15 years; apophysis flattened, with a transverse line and a small dark obtuse umbo; seed black, ⅜in. long. Hudson Bay to N. Y., west to Minn. S.S. 11:588.—The most northern of all American pines and quite hardy, but not of much ornamental value.

42. **contórta,** Douglas (*P. Bolánderi*, Parl. *P. contórta* var. *Bolánderi*, Koehne). Scrub Pine. Fig. 2979 (adapted from Pacific R. R. Report). Tree, to 20, occasionally to 30 ft., with rather stout branches forming a round-topped compact or open head: branchlets light orange or orange-brown: buds ovate, dark chestnut-brown, resinous: lvs. stiff, twisted, acutish, dark green, 1–2 in. long: cones ovate or conic-ovate, very oblique at the base, often remaining closed for several years after maturity, 1–2 in. long, light yellowish brown and lustrous, scales of the upper side with elevated, pyramidal apex, the dark umbo ending in a slender incurved spine. Alaska to Calif., and the variety east to Mont. and Colo. G.C. II. 19:45. S.S. 11:567. Var. **latifòlia,** Engelm. (*P. contórta* var. *Murrayàna*, Engelm. *P. Murrayàna*, Balfour. *P. Boursièri*, Carr.), Lodge-Pole Pine, is the form in the Rocky Mts. and a taller tree of pyramidal habit, to 80, or occasionally to 150 ft. tall, with longer, lighter green, 1½–3½-in.-long lvs., less oblique cones. S.S. 11:518. G.C. 1869:191 and R.H. 1869, p. 278 (as *P. Tamrac*). R.H. 1854, p. 226.—In cult., it is usually a bushy low tree and is hardy N., while the typical form is tender.

43. **muricàta,** Don. Prickle-cone Pine. Tree, to 50, occasionally to 90 ft., with stout spreading branches forming a regular pyramid in young trees, in old age usually round-topped and compact: branches orange-brown: winter buds ovate, dark brown, resinous: lvs. stiff, usually twisted, acute, dark green, 4–7 in. long: cones usually clustered, oblong-ovate, oblique at the base, chestnut-brown, 2–3½ in. long; scales of the upper side with elongated conical apex terminated by a dark triangular spiny umbo, scales of the lower side more flattened, with slender straight spines; the cones usually remain closed for several years after maturity; seeds almost black, ¼in. long. Calif. S.S. 11:585, 586. G.F. 10:235. F.S. 5, p. 517. G.C. II. 21:48, 49, 53; III. 45:259–61. Gn. 59, p. 129. G.M. 54:977.—Handsome pine, with regular, pyramidal head; not hardy N.

44. **serótina,** Michx. Pond Pine. Marsh Pine. Tree, to 50, or occasionally to 80 ft.: branchlets dark orange-color: lvs. 3, rarely 4, slender, dark green, 6–8 in. long, with stomata on all 3 faces: cones subglobose to ovate, short-stalked or nearly sessile, rounded or pointed at the apex, light yellow-brown, 2–2½ in. long, remaining closed for one or two years after maturity; scales thin with depressed apophysis and a small slender, mostly deciduous prickle; seeds with the wing about ¾in. long. N. C. to Fla. S.S. 11:580.—Not hardy N.

45. **rígida,** Mill. Pitch Pine. Figs. 2980–2983. Tree, to 80 ft., with horizontally spreading branches forming an open irregular pyramid: branchlets light brown: winter buds ovate or ovate-oblong, chestnut-brown: lvs. stiff and spreading, acuminate, dark green, 2–5 in. long: cones almost sessile, often in clusters,

2981. Pinus rigida, with young cones. (×½)

ovate, light brown, 2–4 in. long; apophysis little elevated; umbo triangular, ending in a slender, recurved prickle; seed dark brown, ¼in. long. New Bruns. to Ga., west to Ont. and Ky. S.S. 11:579. G.F. 4:402; 10:195. G.C. III. 44:178. Gn. 31, pp. 128, 132. M.D.G. 1896:301.—Hardy pine of rapid growth when

2982. Pinus rigida, recent cone. (×⅓)

young and easily raised from seed; grows on dry and sterile soil. As an ornamental plant it may be used on dry and rocky slopes, where it becomes often very picturesque when older. It sprouts readily from stumps if cut down or destroyed by fire, but the sprouts are short-lived and never develop into trees.

46. **radiàta,** Don (*P. insignis,* Douglas. *P. montereyénsis,* Hort.). Monterey Pine. Fig. 2965. Tree, to 80 or 100 ft., with stout spreading branches forming an irregular open, round-topped head: bark thick, furrowed: branchlets brown: buds ovate, bright chestnut-brown: lvs. acute, bright green, 4–6 in. long: cones short-stalked, conic-ovate, upper scales with elevated, rounded, almost hemispherical and obscurely keeled apex; umbo small, with minute straight or recurved prickle, lower scales with almost flattened apex; seed black, ¼in. long. S. Calif. S.S. 11:573, 574. F.S. 6, p. 44. G.C. III. 9:336, 341; 38:435. G. 12:263; 22:131. R.H. 1906, p. 154. Gn. 36, p. 47; 49, p. 312.—Handsome species with bright green foliage and of rapid growth and bushy habit when young; valuable for seaside planting. Not hardy N.

47. **attenuàta,** Lemm. (*P. tuberculàta,* Gord., not Don. *P. califórnica,* Hartw., not Loisel.). Knot-cone Pine. Tree, usually 20, occasionally to 100 ft., with slender horizontal branches ascending at the ends, forming a broad pyramid, with open round-topped head in old age: bark thin, scaly: young branches slender, dark orange-brown: winter buds oblong-ovate, dark brown: lvs. slender, acuminate, pale yellowish or bluish green, 3–7, usually 4–5 in. long: cones short-stalked, usually in clusters, elongated-conical, 3½–6 in. long, upper scales with pyramidal apex; umbo prominent, sharply pointed and recurved, lower scales with depressed apex and small prickly umbo; seed ¼in. long. Ore. to Calif. S.S. 11:575, 576. G.C. II. 24:784, 785. G.M. 56:255. F.S. 5, p. 517*c*.—Of little ornamental value and not hardy N. Usually a bushy tree with sparse dull foliage.

2983. Old cone of pitch pine.—Pinus rigida. (×½)

Group 12. Macrocarpæ.

48. **Còulteri,** Don (*P. macrocárpa,* Lindl.). Pitch Pine. Fig. 2965. Tree, to 80 ft., with stout branches, pendulous below and ascending above, forming a loose pyramidal head: winterbuds oblong-ovate, resinous: lvs. stout, acuminate, dark bluish green, 6–12 in. long: cones short-stalked, pendent, cylindric-ovate, yellowish brown, 9–14 in. long; apophysis elongated-pyramidal, narrowed into the compressed spiny-tipped straight or incurved umbo. Calif. S.S. 11:571, 572. G.C. II. 23:409, 413; III. 4:765.—Not hardy N. Old trees are often very picturesque and the large cones are conspicuous and ornamental.

49. **Sabiniàna,** Douglas. Digger Pine. Bull Pine. Fig. 2984 (adapted from Pacific R. R. Report). Tree, to 50 or occasionally 80 ft., usually divided into several sts. with short crooked branches, the lower ones pendent, the upper ones ascending, forming a round-topped head: lvs. slender, flexible, pale bluish green, 8–12 in. long: cones pendent on about 2-in.-long stalks, oblong-ovate, light red-brown, 6–10 in. long; apophysis pyramidal, sharply keeled, flattened at the straight or incurved apex, the lower scales with much-recurved apex; seeds ¾in. long, short-winged. Calif. S.S. 11:569. G.C. III. 4:43; 5:45. F.S. 9:964.—Not hardy N. Distinct pine of loose habit and with sparse pale foliage. The seeds are edible.

2984. Pinus Sabiniana. (Cone ×⅙, leaves and seed ×½)

50. **Torreyàna,** Carr. Soledad Pine. Tree, to 40, or occasionally to 60 ft., with spreading and sometimes ascending branches: branchlets greenish or purplish, bloomy, glabrous: lvs. rigid, dark green, 8–13 in. long: cones broadly ovate, 4–6 in. long, chocolate-brown; apophysis low-pyramidal; umbo elongated and reflexed with short spiny tip; seeds ¾in. long, short-winged. S. Calif. S.S. 11:557, 558.—Rarely cult.; not hardy N.

P. Àbies, Linn.=Picea excelsa.—*P. albicaùlis,* Engelm. Pyramidal tree, to 30, rarely 60 ft., sometimes shrubby, allied to P. flexilis: bark whitish or light brown: cones smaller, 1½–3½ in., subglobose or oval, purplish brown. Brit. Col. to Calif. and Wyo. S.S. 11:548. G.C. II. 24:9. Probably as hardy as P. flexilis.—*P. arizónica,* Engelm. (P. ponderosa var. arizonica, Shaw). Tree, to 100 ft. with pyramidal or open round-topped head, allied to P ponderosa: lvs. shorter, 5–7 in. long: cones smaller, 2–2½ in., with recurved spines. Ariz. S.S. 11:559.—*P. chihuahuàna,* Engelm.= P. leiophylla var. chihuahuana.—*P. Gerardiàna,* Wall. Tree, to 60 ft., with broad round-topped head, allied to P. Bungeana: lvs. bluish green, 2½–4 in. long: cones 6–9 in. long, with the tips of scales reflexed; seeds short-winged, to 1 in. long, edible. Himalayas. Not hardy N.—*P. glàbra,* Walt. Cedar Pine. Spruce Pine. Pyramidal tree, to 80, rarely 120 ft., allied to P. echinata: lvs. dark green, 1½–3 in. long: cones broadly to oblong-ovate, 1¼–2 in. long. S. C. to Fla. and La. S.S. 11:583. Hardy only S.—*P. Gordoniàna,* Hartw.=P. Montezumæ.—*P. Grenvilleæ,* Gord.=P. Montezumæ.—*P. Heldreichii,* Christ. Small

tree, allied to P. nigra: lvs. 3–4 in. long: cone 3 in. long, with impressed dull umbo furnished with a small curved prickle. Greece. G.C. II. 21:740.—*P. insulàris*, Endl. Tall tree: lvs. 3, flaccid and very slender, 7–9 in. long: cones conic-ovate, 2½–3 in. long; scales with low pyramidal, sharply keeled apex and obtuse or on the upper scales mucronulate umbo. Philippine Isls. Not yet intro.—*P. latifòlia*, Sarg. (P. Mayriana, Sudw.) Tree, to 60 ft., allied to P. ponderosa: lvs. 12–15 in. long and $\frac{1}{16}$in. wide: cones oblique at the base, 3–4 in. long. Ariz. S.S. 11:565. G.F. 2:496; 8:25. Not hardy N.—*P. latisquàma*, Engelm.=P. Pinceana.—*P. leiophýlla*, Schlecht. & Cham. Allied to P. Lambertiana. Tall tree: lvs. usually 5, slender, grayish green, 4–6 in. long: cones ovoid, nearly symmetrical, 2–3 in. long, with small recurved prickles. Mex. Var. *chihuahuàna*, Shaw (P. chihuahuana, Engelm.). Lvs. usually 3 or 4, stouter and shorter. Calif. to New Mex. and Mex. S.S. 11:566. G.F. 8:24.—*P. macrophýlla*, Lindl., not Engelm. =P. Montezumæ.—*P. Mayriàna*, Sudw.=P. latifolia.—*P. Montezùmæ*, Lamb. (P. Gordoniana, Hartw. P. Grenvillæ, Gord. P. macrophylla, Lindl., not Engelm.). Tree, to 80 ft. and more: allied to P. Torreyana: lvs. glaucous or green, 7–16 in. long: cones 4–14 in. long, light brown; apophysis depressed pyramidal, with a short, recurved spine. Mex. G.C. III. 8:465–7, 475; 15:271, 273. Gn. 56, p. 481; 58, p. 397. Very variable species, as the numerous (about 70) synonyms show. Not hardy N.—*P. Nélsonii*, Shaw. Allied to P. cembroides. Low bushy tree to 30 ft.: lvs. with persistent sheaths 3, 2½–3½ in. long, serrulate: cones on stout curved peduncles, cylindric; seeds wingless. Mex. G.C. III. 36:122; 37: 306.—*P. pátula*, Schiede. Allied to P. Tæda. Tree, to 80 ft.: lvs. sometimes 4 or 5, drooping, light green, 7–9 in. long: cones oblong-ovate, oblique with depressed knobs, 4 in. long. Mex. G.C. II. 23:108, 109, 117; III. 9:435. Graceful tree, but not hardy N.—*P. Pìcea*, Linn.=Abies Picea.—*P. Pinceàna*, Gord. (P. latisquama, Engelm.). Allied to P. cembroides. Low tree with slender branches: lvs. usually 3, entire, 5–6 in. long: cones oblong-ovate, long-stalked, 2½–3½ in. long; seeds wingless. Mex. G.C. II. 18:713; III. 38: 122.—*P. pùmila*, Regel (P. Cembra var. pumila, Pall.). Shrubby, often procumbent, allied to P. Cembra, but resin-ducts of lvs. external: lvs. 1¾–3 in. long: cone 1½ in. long; seed ⅖in. long. N.E. Siberia to Japan. Hardy. S.I.F. 2:1. G.C. III. 46:193. M.D. 1912, pp. 159, 161.

ALFRED REHDER.

PÌPER (the ancient Latin name). *Piperàceæ*. PEPPER. A vast genus (probably 600 to 700 species) of both the Old and New Worlds, mostly in the tropics, a few of which are in cultivation as greenhouse foliage subjects and in collections of economic plants.

Pipers are mostly dicœcious: erect or climbing woody plants, or sometimes herbaceous, and some are trees: fls. very minute, borne beneath decurrent bracts in slender, erect or drooping axillary spikes or catkins; perianth none; stamens usually 1–4; ovary 1-loculed, with a solitary erect ovule: fr. a small globular drupe or berry: lvs. alternate, stipulate, usually entire. The pepper of commerce is the product of *P. nigrum*. The family contains many plants with aromatic, pungent and stimulating qualities. Some of them are used in medicine, and others yield intoxicating and masticatory products. For red pepper and chilli or chile pepper, see *Capsicum* and *Pepper*. To this genus are also referred Enckea and species sometimes grown under the name of Chavica.

In choice collections, one is likely to find several species, but as they seldom fruit it is very difficult to determine their species. In the following list are all the names that have appeared in the American trade. Piper is an exceedingly difficult genus to the systematist because of the great numbers of species, the variation of foliage in the same plant at different epochs, the difficulty of matching the sexes of the same species, the imperfect specimens in herbaria, and the scarcity of good studies of the plants in the wild. They are easy of cultivation. Most of those known in houses require a warmhouse temperature and a humid atmosphere. Easily multiplied by cuttings of the firm wood. They are grown for the decorative value of their drooping or bushy sprays.

A. *Plant erect, and bushy or arboreous.*

excélsum, Forst. (*Macropìper excélsum*, Miq.; see p. 1962, Vol. IV). Glabrous shrub, reaching 20 ft. in some of its native places: lvs. aromatic, cordate-orbicular to ovate, stalked, short-acuminate, 7–9-nerved from the base, the blade 2–4 in. across: spikes short-peduncled, the staminate ones 2–3 in. long and the bracts peltate, the stamens 2 or 3; pistillate spikes shorter, the fls. usually with 3 stigmas. New Zeal. and other S. Pacific islands.—Offered in Calif. A form with yellow-blotched or cream-colored foliage is known as var. *aùreo-pìctum*.

methýsticum, Forst. (*P. inèbrians*, Soland. *Macropìper methýsticum*, Hook & Arn.). Dicœcious shrub, 8–10 ft., nearly glabrous: lvs. round-oval, deeply cordate at base, acuminate at apex, slightly pubescent beneath on the nerves and on the short petiole: spikes mostly shorter than the lvs. and opposite them. Pacific islands.—From the root of this plant is made the drink known as kava, ava, yaquona.

geniculàtum, Swartz (*Artánthe geniculàta*, Miq.). Shrub with swollen nodes, the branchlets glabrous: lvs. oblong or oblong-lanceolate, mostly acuminate, with several pairs of prominent veins, the petioles canaliculate: spikes or catkins 3–5 in. long, on peduncles as long as the petioles. W. Indies, S. Amer.—Offered in S. Calif.

AA. *Plant climbing, or drooping when not given support.*

B. *Lvs. ovate-lanceolate, deciduous.*

Futokadsùra, Sieb. JAPANESE PEPPER. Clinging closely to walls by its aërial roots: lvs. ovate-lanceolate and acuminate, cordate at base, glabrous: fls. greenish: berries globose, red or brownish. Japan.—Handsome plant, withstanding considerable frost.

BB. *Lvs. broadly ovate or roundish, evergreen.*

nìgrum, Linn. BLACK PEPPER. Plant woody below: st. strong, terete, emitting roots, tall-climbing, glabrous: lvs. thickish, stalked, broadly ovate-oblong or nearly orbicular, the base usually rounded and oblique, 5–9-nerved above the base, the nerves alternate: fls. sometimes polygamous but usually dicœcious: fr. globose, red. Old World tropics, but now widely dispersed in warm countries. B.M. 3139.—Sometimes grown in hothouses, particularly amongst collections of economic plants. In the wild it is a strong climber, rooting at the nodes, sometimes reaching 20 ft. in height. It is reported as hardy at Santa Barbara, blooming but not fruiting. The dried berries, which are collected before ripe, are black and wrinkled, and constitute the black pepper of commerce. When the outer skin is removed from the ripe fruit, the product is white pepper. The commercial pepper comes mostly from eastern tropics.

Cubéba, Linn. (*Cubéba officinàlis*, Raf.). CUBEB. Climbing or tree-like: lvs. glabrous, oval, short-acuminate, obliquely cordate, the upper ones smaller and oval-oblong, somewhat unlike on plants of the different sexes: peduncle glabrous, about the length of petiole or somewhat surpassing it; stigmas 4: fr. a subglobose somewhat apiculate stalked berry, resembling that of *P. nigrum*. E. Indies.—The fr. is employed in medicine.

ornàtum, N. E. Br. Climbing, 10–15 ft. tall, glabrous, rooting at nodes: lvs. glabrous "and directed to one side;" petioles slender and nearly terete, the blade peltate, ovate-orbicular, with a short, rather blunt point, the nerves 7 but not prominent above and uniting in loops on the margin, the upper surface of the young lvs. shining green and covered with pinkish spots, the old lvs. duller and whiter-spotted. Celebes.

P. Bètle, Linn. BETEL (which see, p. 496). Climbing, nearly or quite glabrous: lvs. large and thick, ovate-oblong, acuminate, usually oblique at base, strongly 5-7-nerved: spikes often 4–6 in. long: fr. very fleshy, often cohering into a long-cylindrical mass. Eastern tropics. B.M. 3132. Lvs. of this and others chewed by natives with the betel-nut.—*P. metállicum*, Hort. (Hallier?). Lvs. thick, rounded, handsome metallic green. Borneo.—*P. officinàrum*, C. DC. (Chavica officinarum, Hort.?) has long-elliptic somewhat sharp-pointed feather-veined coriaceous lvs. and globular united berries in a dense spike. India and Malaya.—*P. porphyrophýllum*, N. E. Br. (Cissus porphyrophylla, Lindl., and of horticulturists). Handsome climbing foliage plant with broadly cordate-oval short-pointed lvs. that are purple beneath and bronzy green and pink-spotted along the veins above. Probably E. Indies. F.S. 14:1491. R.H. 1883, p. 560. Lowe, 59.—*P. rubronodòsum*, Bull. Shrub, with red-jointed roughish sts.: lvs. cordate-ovate, somewhat blistered, silvery gray, the petiole pubescent. Colombia. —*P. rubrovenòsum*, Hort. Climbing: lvs. cordate-ovate, acuminate, marked with rose-colored dots and streaks along the veins. Very like P. ornatum, and perhaps not distinct. Papua. I.H. 34:33.

L. H. B.

PIPSISSEWA: *Chimaphila.*

PIPTADÈNIA (Greek, *falling gland;* meaning obscure). *Leguminòsæ.* About 45 species of shrubs or trees, mostly native to S. and Cent. Amer., a few in the tropics of the Old World, similar to Mimosa and Acacia: lvs. bipinnate with numerous small lfts., rarely with few and large lfts.: fls. small, white, in axillary globose heads or cylindric spikes; petals small, equal, connate to the middle; stamens 10, free: pod broadly linear, 2-valved, not septate within and not pulpous. The following species has been intro. to Calif. by Franceschi chiefly for its economic interest; in its native country it is valued for tan bark. Prop. by seeds.

P. Cebíl, Griseb. (*P. macrocárpa* var. *Cebíl,* Chodat & Hassler). Tree, to 60 ft., glabrous: lvs. with 10–16 pairs of opposite pinnæ, each with 24–40 pairs of linear-oblong acutish lfts. about ⅛in. long; petiole about 1 in. long with a conspicuous gland near the middle: fl.-heads globose, axillary, 1–4, ½in. across, on slender pedicels ¾–1 in. long; stamens long-exserted: pod 6–8 in. long, about ¾in. wide, sinuate between the seeds. Argentina.

The following three species have been recently intro. by the Dept. of Agric.: *P. communis,* Benth. (Acacia gonoacantha, Mart.). Prickly tree or shrub sometimes sarmentose: branchlets puberulous, angled, older branches sometimes developing corky wings; prickles small: lvs. with 5–12 pairs of pinnæ, each with many oblique, falcate, linear lfts.: fl.-spikes 2–3 in. long, solitary or 2–3 in the axils or sometimes crowded at the end of the branches; ovary glabrous: pod linear, 3–4 in. long, reticulate, with scarcely thickened margin. Brazil. Fl. Brazil. 15, 2:74.—*P. macrocárpa,* Benth. (Acacia grata, Willd.). Unarmed tree: branchlets and petioles grayish tomentulose: lvs. about 6 in. long, with 10–25 pairs of pinnæ, each with many oblique linear lfts. scarcely 1 line long: fl.-heads peduncled, globose, many-fld., 2–4, axillary, sometimes crowded at the end of the branchlets: pod 4–10 in. long, ¾–1 in. broad, with thickened margin. Brazil, Bolivia.—*P. rígida,* Benth. (Acacia Angico, Mart.). Unarmed tree or shrub, nearly glabrous: lvs. with 3–6 pairs of pinnæ, each with many oblique linear, falcate, lustrous lfts. about ½in. long: fl.-spikes axillary, 1–1½ in. long; ovary glabrous: pod linear, to 5 in. long, with slightly thickened margin. Brazil. It furnishes the Angico gum similar to gum arabic; the bark is rich in tannin.

Other species, known as acacias, are likely to appear in cult. *P. chrysóstachys,* Benth. (Acacia chrysostachys, Sweet). Unarmed tree, puberulous: pinnæ 3–6 pairs; lfts. 8–15 pairs, oblong, obtuse, nearly ½in. long: spikes solitary or 2, dense, 3 in. long; calyx and corolla grayish pubescent. Madagascar. The wood is used by the natives for musical instruments.—*P. latifólia,* Benth. (Acacia fruticosa, Mart.). To 4 ft. high: lvs. bipinnate, glabrous, with 2 or 3 obovate-elliptic lfts.: fl.-spikes axillary, or terminal panicles. Brazil.—*P. peregrina,* Benth. The Acacia microphylla, Willd., is referred here. It is unarmed: pinnæ 25 pairs; lfts. 50–60 pairs, linear, acute, ciliate; large gland at base of petiole: branches and petioles pubescent: heads pedunculate, twin, in the axils: pod linear, 9 in. long. Brazil to Trinidad.

ALFRED REHDER.†

PIPTÁNTHUS (Greek, *to fall,* and *a flower;* the teeth of the calyx, petals, and stamens fall off soon). *Leguminòsæ.* Two shrubs natives of the mountains of southern Asia, grown for ornament.

Plants 3–10 ft. high: lvs. digitately 3-foliate: fls. racemose, bracted; calyx campanulate, 5-toothed; teeth equal, lanceolate; corolla 3 times longer than the calyx; petals all with long claws; standard orbicular, erect, margins reflexed; wings obovate; keel obovate-oblong, connate down the back, slightly incurved; stamens free; anthers uniform; ovary linear, stalked, downy, 6–10-ovuled; style filiform, incurved; stigma minute, terminal: pod linear, flattened, continuous within. Closely related to Baptisia and Thermopsis, from which it is at once distinguished by having its stipules opposite-connate instead of free or wanting as in those genera. As yet but little known in U. S.

A. *Lvs. glabrate on both sides.*

nepalénsis, D. Don (*Baptísia nepalénsis,* Hook. *Thermópsis nepalénsis,* DC.). Shrub 6–10 ft. tall: branches downy: stipules small, connate; petiole 1 in. or less; lfts. glabrescent, lanceolate, 2–4 in. long, narrowed to both ends: fls. 12–20 in rather dense racemes; bracts large, deciduous; calyx downy, deciduous from the base; corolla yellow, 1 in. or more long: pod 2–5 in. long, 3–10-seeded. Temperate slopes of Himalayas, 7,000–9,000 ft., and in Yunnan. R.H. 1914, p. 9. G.C. III. 43:178. J.H. III. 43:250. H.U. 1:260.—An attractive ornamental of the habit of laburnum. Flowers in May in the Middle States. Recently re-intro. from W. China; probably not hardy north of Washington, D. C. Prop. is by seeds sown in spring; if sown early in the greenhouse, the plants will sometimes bloom the same year; also prop. by soft-wood cuttings under glass in spring or early summer.

AA. *Lvs. reddish tomentose beneath, silky above and becoming glabrate.*

tomentòsus, Franch. Slender shrub 3–7 ft. tall: young branches tomentose, brownish glabrescent with age: lfts. ovate to ovate-lanceolate, before flowering silky-white above, beneath pale reddish tomentose, nearly glabrous above with age: fls. similar to the above species but calyx with long silky hairs and sepals more acuminate: pod narrowly linear, about ¼in. wide and 2–3½ in. long, at maturity densely short-tomentose, 5–8-seeded. Wooded mountain slopes of Yunnan, China.—More beautiful and much more hardy than *P. nepalensis,* producing an abundance of fls. in April to May in the Middle States. Its white silky hairs give it a distinctive silvery appearance.

P. L. RICKER.

PIPTÙRUS (Greek, *fallen tail,* in allusion to the inflorescence of some species). *Urticàceæ.* Erect, dicœcious trees or shrubs: lvs. alternate, 3- or 5-nerved; stipules bifid: fls. in axillary clusters or the clusters spicately arranged; male fls., perianth 4–5-fid, lobes valvate; stamens 4 or 5; female fls. on a somewhat fleshy receptacle, perianth ovoid, narrowed to a minute mouth; ovary adherent to the perianth: achenes small, surrounded by the accrescent fleshy perianths, forming a soft and fleshy fruit.—About 12 species, Mascarene Isls. to Malaya, Austral., and Polynesia.

P. argénteus, Wedd. Tree, 18–20 ft.: lvs. up to 8 in. long and 4 in. broad, oval-acuminate, recurved at the top, entire, dark green with silvery white marking on the upper surface, silvery white on the under surface: fls. in sessile glomerules, inconspicuous. Malaya, Austral., and Polynesia. G.W. 7, p. 111. This has been intro. in botanic gardens.

PIQUÈRIA (A. Piquer, Spanish physician of 18th century). *Compósitæ.* Under the name of *Stevia serrata* or *S. serratifolia,* florists grow **Piquèria trinérvia,** Cav. (Fig. 2985), for its small white fragrant fls. and for bedding. It is native in Mex., Cent. Amer., and Hayti. It is perennial. The genus contains about 20 species of herbs or bushes, all of Trop. Amer. They have exclusively tubular fls. in densely cymose heads, the heads containing 3–5 whitish fls.; torus plane or convex, naked; pappus none or very short: achene 4–5-angled. It resembles a small eupatorium in foliage and fls. The small heads are borne in small panicled corymbs, each cluster terminating a slender axillary branch or peduncle. The lvs. are opposite, lanceolate to oblong-lanceolate, serrate-dentate, very short-stalked. There is a dwarf, compact form, var. **nàna,** Hort., and also one with broadly white-edged lvs., var. **variegàta,** Hort., Fig. 2986, which are much used for bedding out. The Cent. American var. **luxùrians,** O. Kuntze, has slightly larger heads but does not appear to have been intro. into

2985. Piqueria trinervia. Known to florists as Stevia serrata. (×½)

horticulture. The piqueria endures both sun and shade, and thrives with even indifferent treatment. For fls. it is much prized in winter, when delicate white sprays are not abundant. It demands the general treatment given zonal geraniums. Prop. by cuttings with great ease, and may begin to bloom when only 2 or 3 in. high. It often blooms in the cutting-bed. It also grows readily from seeds, which are handled by seedsmen. Frequent pinching will keep the plants within bounds and contribute to floriferousness. Plants allowed to grow as they will soon become straggly and wiry. For winter bloom the plants may be handled in pots or grown in beds. A stock of compact pot-plants kept in a cool corner is very useful for filling vacancies in the house.

2986. Marginate form of Piqueria trinervia.

Cultivation of piqueria (by Wm. Scott).—Usually the best way to produce good flowering plants of stevia in midwinter is to save a few old plants after the flowers are cut at New Years. Cut off the old stems 5 or 6 inches above the pots and stand the plants in any cool house. The plant needs the coolest house at all times; 40° at night during the winter will grow it better than a higher temperature, but, for all that, it does not endure the slightest frost. About March 1, these old plants will have sent out any number of small growths from the base of the stems. These root very readily in a cool propagating-house. They should then be grown along, first in 2- and afterward in 3-inch pots, until the first of June, when they should be planted out in the open ground. It need not be very rich ground, for they are very rampant growers. Give every plant 2 feet of space. They seldom need any artificial watering in summer, but they should have frequent pinching to produce bushy plants. The more shoots, the more flowers will be secured. Before there is any danger of frost in the fall, the plants should be lifted and put into 6-, 7-, or 8-inch pots. They lift well, and if stood in the shade and kept syringed for a few days they will show no bad results of the lifting. A position at the north side of a shed or wall is much better for them for the next month than under glass, but always have them in a position where they can be protected in case of a frost. By the end of October, if frost is escaped, put them in the lightest and coolest house available. If kept cool the very desirable sprays of flowers will be in perfection at Christmas, and that is the time they are most valuable. Although classed as a common cheap flower, there is a grace about stevias that makes them indispensable for many flower arrangements.

L. H. B.

PIRCÙNIA: *Phytolacca.*

PISCÍDIA (Latin for *fish* and *kill*). *Leguminòsæ.* One or 2 species, including the fish-poison tree of the American tropics, or Jamaica dogwood. The lvs., bark, and twigs of this tree when thrown into the water intoxicate or stun the fish so that they can be caught readily. (For the plant used in China for this purpose, see *Cocculus.*) The bark has also been used in medicine for its hypnotic effect. Botanically this genus is close to Lonchocarpus, differing mainly in the pod, which is long, thickish, and longitudinally 4-winged: calyx-teeth 5, short, broad: wings adhering to the falcate keel; vexillar stamen free at the very base, but grown together at the middle with the others into a closed tube; ovary sessile, many-ovuled.

Erythrìna, Linn. (*P. piscípula,* Sarg. *Erythrìna piscípula,* Linn. *Ichthyomèthia piscípula,* Hitchc.). Fish-Poison Tree. Jamaica Dogwood. Lfts. 7–11, opposite, oblong or elliptical, pointed or blunt: fls. purplish white, ½in. across: pod 2–4 in. long, 4 lines broad; seeds 6–8, black. Trop. Amer., especially common in Jamaica.

P. L. Ricker.

PISÒNIA (named after Willem Piso, a physician and naturalist of Amsterdam, who died in 1648). *Nyctaginàceæ.* Erect or rarely subscandent trees and shrubs: lvs. opposite or subverticillate: infl. terminal, axillary or lateral clusters; fls. dicœcious, rarely monœcious or hermaphrodite, pink, greenish or yellow; perianth 5-toothed; stamens 6–10; ovary elongate-ovoid, sessile: fr. an elongated utricle often bearing at its base the persistent filaments enveloped in the calyx and becoming fleshy, smooth or covered with spiny glands. About 80 species, mostly natives of Trop. and Subtrop. Amer. but a few in Asia, in the Mascarene Isls., and Polynesia. *P. Brunoniàna,* Endl. A tree reaching a height of nearly 50 ft.: lvs. alternate, oval-oblong, up to 10 in. long and 4 in. broad, acuminate, entire or sinuate; petiole somewhat thick, up to 1 in. long: fls. very inconspicuous in spreading terminal cymes. Tahiti and Marquesas Isls. Intro. in Belgian gardens. This species has been referred to both *P. umbellífera,* Forst., and *P. inérmis,* Forst., not Jacq. The most recent treatment by Rock, "The Indigenous Trees of the Hawaiian Islands," regards it as a synonym of *P. inermis.* The following species are also reported as having been in cult.: *P. aculeàta,* Linn., *P. inérmis,* Forst., not Jacq. (*P. grándis,* R. Br.), and *P. obtusàta,* Jacq., but apparently are not now grown.

PISTÀCIA (derived indirectly from ancient Persian *pista*). *Anacardiàceæ.* Trees or shrubs which exude turpentine or mastic. One species of the genus, *P. vera,* produces the pistachio-nuts or pistache of commerce which are used in confectionery and flavoring, and some of the other species are used for ornamental planting and as stock on which to graft the commercial species.

Leaves alternate, evergreen or deciduous, 3-lvd. or even- or uneven-pinnate: infl. paniculate or axillary, racemose; fls. small, dicœcious and without petals; males with 5-divided or -parted calyx and 5 stamens; females with 3–4-divided or -parted calyx, short 3-divided style and 1-celled ovary: fr. a dry drupe.—About 20 species, Medit. region to Asia, with one species from the Canaries, and one from Mex., which has also been found in Calif. The so-called nut of Pistacia is really the seed or kernel of a dry drupe. The seed is green, and has a highly peculiar flavor. *P. Terebinthus* exudes from its st. the fragrant Cyprian or Scio-turpentine used in medicine as early as the time of Hippocrates.

Cultivation of the pistachio, or pistache. (G. P. Rixford.)

Several species of Pistacia, *P. vera, P. atlantica, P. Lentiscus, P. mutica, P. Terebinthus, P. chinensis, P. mexicana, P. integerrima,* and *P. verestina,* a hybrid, have been introduced into this country by the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture and are being tested as stocks upon which to work the best varieties of *P. vera.* The cultivated species of pistache is indigenous to Asia Minor, Syria, and Palestine. It was first brought to Rome, according to Pliny, by Vitellius, then governor of Syria, during the reign of Tiberius early in the first century of the Christian era and was then carried to

Spain by Flavius Pompeius. The first introduction into the United States dates from an importation of nuts by the Federal Patent Office in 1853–1854. These nuts were widely distributed throughout the middle and southern states but do not seem to have attracted much attention until trees were introduced into California by the writer, from southern France in 1876, and subsequently by the United States Department of Agriculture at various times up to the present.

The best named varieties, a half-dozen in number, have been imported from Syria, Sicily, and other Mediterranean countries and have been extensively propagated at the Government stations, chiefly at Chico, California. During the past seven or eight years, budded trees of the named varieties and seedlings of various species to the extent of 25,000 or 30,000 have been distributed to sections of the southwestern states, chiefly California. The best nuts in market are from the island of Sicily, where wild Terebinthus trees are thinned out and grafted with *P. vera* cions.

In this country, the tree is propagated by either budding or grafting. In nursery rows the stocks are budded when one year old. One experienced nurseryman has best success by the use of dormant buds from old wood inserted in April or May when the bark peels freely. He sometimes takes buds in winter and keeps them in cold storage until ready for use. All the species mentioned above are successfully used for stocks, some, however, give the preference to *P. Terebinthus*, *P. vera*, *P. mutica*, and *P. atlantica*.

The trees may be worked either in nursery or in the orchard when the seedlings are well established. In planting the orchard, it is best to put out trees one year from the bud or one or two years from the seed, as the tap-root is large and young trees are most successfully moved.

It is suggested that one form of the commonly cultivated pepper tree, *Schinus terebinthifolius*, is so closely related to the pistache that it may be used as a stock for *P. vera*. The vigor, hardiness, and rapid growth of *P. chinensis* seemed to indicate it as an ideal stock upon which to work *P. vera;* but the growth of the bud the first year was a disappointment, as when it began to grow the stock in most cases stopped, resulting, at the end of the season, in a top-heavy tree, frequently ¾ inch above and ½ inch below the union. However, the second or third year, the stock overtakes the bud, so that the only precaution required is to stake the tree the first year or two.

The pistache is a dry-climate tree, somewhat hardier than the fig and olive. When once established in good deep soil, little irrigation is required. It flourishes in the southwestern states wherever the climate permits the growth of the olive. The trees are planted 25 feet apart, and one male to six or seven females must be put out as pollinizers. The males of *P. vera* blossom first and in some countries these flowers are gathered and preserved in a dry place until the female flowers open; the pollen is then dusted over them. Sometimes twigs of staminate flowers are cut from the tree and pushed into pots of moist earth where they will keep fresh a few days until the pistillate flowers open. *P. atlantica* male flowers open earlier than the female flowers of *P. vera* and have served as good pollinizers for the latter. In that case, of course, the seeds of such crosses, if planted, would produce hybrid trees. Sometimes the male cions are grafted into female trees. The male trees are invariably larger and more vigorous than the females.

The grafts begin to bear the fourth year, and at the age of eight to ten years, with good care, should yield twenty-five to one hundred pounds of nuts in the shell, of which it takes three pounds to make one of shelled kernels, in which form most of them are imported. There are seedling trees in California eight and nine years of age which are producing annually twenty to twenty-five pounds of nuts. It is the highest-priced nut in our markets, selling at wholesale from 35 to 75 cents a pound. It is a curious fact, not mentioned by botanists, that the shells grow to about normal size and remain empty if not pollinized. After pollination the ovule rapidly expands and fills the shell.

In central California, seeds are planted in March. The seeds should be soaked over night in lye-water made with a can of lye to twenty gallons of water; then put into a coarse sieve and rub with a piece of burlap to remove the pulp. If this is not done, the seeds will be long in germinating. Plant in good soil in house or hotbed.

The pistache nut is greatly appreciated in the countries bordering on the Mediterranean, especially in Syria, where it is extensively used, as is the almond and walnut in this country. In Syria it always forms an important ingredient of all wedding feasts. The parting guest after a social call is always provided with a bag of nuts. At present, in this country, owing to the high price, its use is restricted to confectioners who use it for coloring and flavoring. When processed as are salted almonds, but in the shell, they are widely liked. The dehiscent shell is penetrated by the salt-water, while the crack facilitates the opening by the fingernails It is not presumed that growing the nuts will become an important industry; still, as the tree is a good bearer and thrives in hot arid regions where the filbert and walnut cannot be grown, it will probably have a place in nut-production not now occupied by other species It is not segregated by the customs authorities from other nuts, but dealers estimate the annual importations into the United States at a value of $250,000.

The cultivated species of Pistacia.

Terebínthus, Linn. A small tree: lvs. deciduous; lfts. 9–13, mucronate; the petiole slightly winged: fls. small, in axillary panicles; stamens purplish; stigmas red: fr. small, orbicular, slightly flattened, dark purple, and wrinkled. Medit. region.—It produces a transparent gum from incisions, and in hot countries it exhales a penetrating resinous odor in the evening.

atlántica, Desf. Tree up to 60 ft. in height and 12 ft. circumference: lvs. deciduous, odd-pinnate; lfts. 7–11, alternate, lanceolate, obtuse, glabrous and sessile; petiole narrow-winged: pistillate fls. in loose, axillary racemes; staminate fls. axillary and more compact. Sahara region.—It exudes a gum similar to that of *P. Lentiscus* and *P. Terebinthus*. Its heartwood is brown, resembling walnut. Preferred by some as stock for *P. vera*.

chinénsis, Bunge. Chinese Pistachio. Tree, 50–60 ft. high: lvs. deciduous, odd-pinnate; lfts. 5–6 pairs, short-petiolate, lanceolate: infl. compositely branched panicles: fr. an obovoid-rotundate drupe, compressed and about ¼in. long and broad, scarlet turning purplish. China.—Used as stock for *P. vera* and also said to be a good shade tree in Fla. and useful for ornamental planting, being rapid-growing and the foliage coloring finely in the late fall.

integérrima, Stew. Medium-sized tree: lvs. aromatic, even- or uneven-pinnate, finely pubescent when young; lfts. 4–5 pairs, usually opposite, lanceolate from an oblique base; the petiole very short: drupe broader than long, ¼in. diam. March–May. Himalayas.—Yields the zebra wood of India. It is said that the seeds must pass through the intestines of a fowl before they will germinate; tree also said to have promise as an ornamental and perhaps even as a timber tree in some parts of the S. W. Little known in cult.

Lentíscus, Linn. Small evergreen tree, often shrubby, up to 12–15 ft.: lvs. even-pinnate with winged petioles; lfts. 3–5 pairs, coriaceous, glossy green above, light green below, ovate, obtuse: drupe about 1 in. diam., orbicular, slightly apiculate, reddish finally black at maturity. Medit. region.—In Algeria, it forms dense

copses along the coast of 15,000 hectares in extent. It is the mastic tree of the island of Chios. The gum is obtained by making transverse incisions in the bark. This gum is in constant use by Turkish and Arab women in the harems under the impression that it whitens the teeth and perfumes the breath. Oil is pressed from the seeds, one hundred kilos producing twenty litres of oil. It is used by the Arabs for food and lights. The flexible twigs are used by the same people for baskets.

mexicàna, HBK. A small shrub or tree: lvs. odd-pinnate on a somewhat winged or angled slightly hairy petiole; lfts. 9–12 pairs, ovate or cuneate, obtuse, glabrous, ½in. long, oblique at the base: fls. in axillary panicled spikes fr. 1¼–2 lines diam., smooth and somewhat compressed. Mex. and Calif.—A very ornamental shrub or small tree, sparingly in cult.

mùtica, Fisch. & Mey. Tree up to 35 ft. high: the bark dark brown with longitudinal fissures: lvs. deciduous, odd-pinnate; lfts. 2–4 pairs, oblong or oblong-ovate, obtuse; the petioles marginate or slightly winged, puberulent: drupe 1¼ in. long, obovate, flattened, obliquely apiculate. Asia Minor.—The heartwood is dark brown and very hard. Some cultivators dislike it as a stock for *P. vera,* finding difficulty in making the grafts take.

vèra, Linn. PISTACHIO. Small tree up to 30 ft. high, with spreading branches: lvs. pinnate, at first tomentose, then glabrous, somewhat coriaceous, borne on angular petioles; lfts. 1–5 pairs, ovate, obtuse, nearly sessile (in one variety in cult. in Calif. the lvs. have only 3–5 lfts.): drupe ovoid, oblong, pedicelled, reddish and wrinkled. Medit. region and Orient.—The kernel has a rich, oily, agreeable flavor and in different varieties is either pale green or creamy yellow.

F. TRACY HUBBARD.

PÍSTIA (probably from Greek, *pistos,* watery; referring to its aquatic nature). *Aràceæ.* WATER-LETTUCE. TROPICAL DUCKWEED. A small tender, perennial floating herb desirable for aquaria.

Flowers unisexual; spadix without appendage, adnate to the back of the spathe; male fls. in whorls, with 2 very short stamens which are much grown together and inserted at the apex of the spadix; female fls. solitary; ovary 1-celled; ovules numerous, orthotropous, in 4–6 series: fr. baccate, irregularly breaking open, normally with many seeds. Botanically, the genus Pistia is unique. The monographer of the aroids (Engler, in DC. Monogr. Phaner. 2, 1879) makes Pistia the sole representative of a subfamily, one of his 10 primary natural divisions of the arum family. He regards the pistias as all one species, though 9 or more have been described. He recognizes 4 well-marked varieties, based upon the shape of the lvs., which he calls *cuneata, spathulata, obcordata* and *linguiformis.* After the continental fashion Engler takes no one of these as a type to which the others are referred. It is probable that the form with obcordate lvs. is the one chiefly cult. in American water-gardens. It forms a loose rosette of lvs. and has long slender feathery roots. The plant sends out runners on which may sometimes be seen young plants in all stages of development. A healthy plant measures about 6 in. across. The lvs. are generally more or less wedge-shaped, 2–5 in. long, pea-green, velvety to the touch, and covered beneath with a sort of mealy down. The pistia rosette has been compared to a half-grown lettuce plant before the head has formed. Like many other aquatics, the water-lettuce has an immense range. It is found in fresh waters throughout the tropics, and in the U. S. is native from Fla. to Texas.

Water-lettuce is commonly grown outdoors in summer in collections of tender aquatics, and also in aquaria. The summer temperature of the water should be 70° to 80° F. Although it grows well when floating free in several feet of water, it seems to do better when placed in shallow water where the roots may reach the soil. Larger-sized plants may be secured by using a thin layer of rich soil or well-rotted manure in the bottom of the vessel. Soft water is said to be essential. Running water is not necessary. The plants should be shaded during the middle of the day in summer, or the foliage is likely to become yellow and sickly-looking.

Stratiòtes, Linn. WATER-LETTUCE. TROPICAL DUCKWEED. Tender perennial aquatic herb already described. The small white fls., though inconspicuous and borne at the bottom of the cup of lvs., are large enough to show at a glance their relation to the arum family. B.M. 4564. F.S. 6:625. J.F. 2:137. Var. **spathulàta,** Engler. Lvs. spatulate, velvety green, more deeply nerved than the type. S.E. U. S., Trop. Amer.

WILHELM MILLER.

PÌSUM (Greek and Latin name of pea). *Leguminòsæ.* Mostly tendril-climbing herbs of the Medit. region and eastward, one of which is the common pea.

Hardy annuals or perennials of easy culture, growing well in the cooler months: calyx-tube oblique at the base, the lobes more or less leafy; standard obovate or orbicular; wings adhering to the keel; style mostly rigid, widened above, bearded down the inner margin: lfts. 1–3 pairs, the lf. ending in a tendril or point, the stipules conspicuous.—Species about a half dozen.

2987. Pisum sativum. (×½)

satìvum, Linn. GARDEN PEA. Fig. 2987. Annual, glabrous and glaucous, tendril-climbing: stipules large and leafy (usually as large as lfts.): lfts. oval or ovate, 2–3 pairs, the lf. ending in tendrils; fls. few, on an axillary peduncle, white: seeds globular. Eu., Asia.—The pea runs into many forms, which have been variously named. Two major types of garden peas are those grown for the seeds (shelling peas) and those grown for the edible pods (sugar peas). See *Pea.*

Var. **arvénse,** Poir. (*P. arvénse,* Linn.). FIELD PEA. Fls. usually bluish, light lilac, or dull white, with purple wings, and greenish keel, 1–3 on peduncle about as long or little longer than stipules: seeds angular, often gray. Grown for forage.

Var. **saccharàtum,** Hort. SUGAR PEA. Fls. mostly in 2's: pod large and soft, more or less fleshy, sweet, not dehiscing, edible.

L. H. B.

PITANGA: *Eugenia uniflora.*

PITCÀIRNIA (W. Pitcairn, a London physician). *Bromeliàceæ.* Billbergia-like very short-stemmed perennial herbs or subshrubs.

Leaves in dense rosettes, narrow, often prickly-margined: infl. a central spike or raceme of long-tubular red, yellow or nearly white fls.; fls. perfect; sepals 3, free; petals 3, unguiculate, erect or spreading at the apex, usually with 2 small scales at the base; stamens 6, free, with linear anthers: fr. a 3-valved caps., with numerous seeds.—Mez, the recent monographer of the bromeliads (in DC. Monogr. Phaner. 9), admits 134 species of Pitcairnia. See also Baker in Journ. Bot.

1881. They are American, mostly tropical. In choice collections, various species of pitcairnias may be expected, but very few of them are in the American trade. For pictures of two Mexican species, *P. Jaliscana* and *P. Palmeri* (not cult.), see G.F. 1:197 and 211. *P. farinosa* is an undetermined trade name. For other species, see *Puya*. For cult. of pitcairnias, follow advice given under *Billbergia*.

A. *Infl. on a scape.*

B. *Fls. pendulous.*

corállina, Lind. & André. Stemless: outer lvs. hard and dry, without marginal spines, the inner ones with brown-spined petioles and broad plicate recurved blades which are somewhat scurfy on the back: peduncle about 1 ft. long, bright red, the raceme of about equal length and drooping: fls. coral-red, about 3 in. long, the calyx part comprising about one-third of this length; stamens as long as the petals, with white filaments; stigmas twisted. Colombia. R.H. 1875:250. B.M. 6600.—Perhaps the best species.

BB. *Fls. erect.*

Moritziàna, Koch (*P. Klotzschiàna*, Baker). Stemless: lvs. linear, in a rosette, 12–18 in. long, usually spineless and the petiole short or none: raceme 1 ft. or less long, on a leafy peduncle of about the same length; fls. red or yellowish, usually not 3 in. long. Venezuela. R.H. 1903, p. 175.

AA. *Infl. sessile.*

heterophýlla, Beer (*P. Morrénii*, Lem. *Pùya heterophýlla*, Lindl.). Stemless: lvs. of two kinds, the outer ones narrow and spiny, brown, and being the termination of bulb-like scales, the later ones being longer (16–24 in.) and green and entire: fls. rose or white, in a close oblong spike that is shorter than the green lvs., the latter arising, however, from separate shoots. Mex. to Venezuela and Ecuador. B.R. 26:71. J.F. 3:291.—Odd.

Var. **exscàpa,** Mez (*P. exscàpa*, Hook.). Differs in its intense purple-red fls. Ecuador. B.M. 4591. J.F. 2:151.

P. alpéstris=Puya.—*P. cærùlea*=Puya.—*P. echinàta*, Hook. Lvs. of two kinds, the one scale-like, the other normally developed, up to 3 ft. long and 2½ in. wide, spiny: panicle bipinnate; sepals acute, keeled, echinate with stellate hairs; petals yellow. Colombia. B.M. 4709. J.F. 4:407.—*P. flámmea*, Lindl. Lvs. up to 3 ft., and 1¼ in. broad, linear-ensiform, entire: racemes densely many-fld., on a scape; sepals acute; petals red. Brazil. B.M. 7175 (as P. Roezlii).—*P. Funckiàna*, A. Dietr. Lvs. 1–2 ft. long, 2 in. wide lanceolate, glabrous, unarmed: fls. in a lax raceme on a manifest scape; sepals obtuse; petals white. Guiana and Colombia. Gt. 4:44. B.M. 4705 (as P. macrocalyx).—*P. Jácksonii*, Hook.=P. punicea.—*P. Karwinskyàna*, Schult. Lvs. of two kinds, the one persistent, setiform, the other normal, deciduous when old, up to 1 ft. long, and ½in. broad, unarmed, glabrous, grass-like: raceme few-fld., on a manifest scape; sepals acute; petals red. Mex.—*P. Micheliàna*, André. Tufted, stemless: lvs. linear, channeled, 2 ft. or more long: scapes tall, bearing spikes of scarlet-red fls. Mex. R.H. 1901:576.—*P. punícea*, Scheidw. Lvs. up to 10 in. long, less than ½in. wide, narrowly linear-lanceolate, longly acute, glabrous above, pale scaly beneath: raceme on a scape, several-fld.; sepals obliquely acute, scaly; petals brick-red. Mex. J.F. 2:127. B.M. 4540 (as P. Jacksoni).—*P. recurvàta*, Koch. Lvs. 2 ft. long, 1–2 in. broad, lanceolate, minutely serrulated toward the tip: fls. in dense raceme, 4–6 in. long, milk-white. Brazil.—*P. ríngens*, Klotzsch & Link. Lvs. of two kinds, the one brown, awl-shaped, the other grass-like, 2½ ft. long, about ½in. broad, unarmed except at base, glabrous: raceme few- to several-fld., on a manifest scape; sepals acute; petals red. Mex. Gt. 2:53.—*P. spathàcea*, Griseb.= Puya spathacea, Mez.—*P. suavèolens*, Lindl. Lvs. up to 18 in. long, and about ½in. broad, narrowly ensiform, unarmed, green: raceme dense, on a manifest scape; sepals very acute; petals yellow. Brazil. B.R. 1069.—*P. tabulæfórmis*, Lind. Lvs. up to 6 in. long, 1¼ in. wide, oblong-spatulate: infl. globose, head-like, sessile; sepals acute; petals red. I.H. 9:344. F.M. 5:297. B.M. 8410.—*P. undulàta*, Scheidw. Outer lvs. triangular, brown, entire, the inner ones few, up to 2 ft. long, ¾in. wide, unarmed, undulate, pale scaly on back: raceme many-fld., on a manifest scape; sepals acute, scaly, becoming glabrous; petals red. S. Brazil. F.S. 2:162 (as P. Altensteini). Gt. 781.

GEORGE V. NASH.†

PITCHER PLANTS are various carnivorous plants bearing pitchers which in some cases contain a secreted liquid by the aid of which the plant digests the bodies of insects. The native pitcher plants of the northern and southern states are Sarracenias. The California pitcher plant is described under Darlingtonia. The favorite pitcher plants of greenhouses are Nepenthes. All these plants have a morphological resemblance in their pitcher-bearing foliage, but their flowers and seeds are so apparently unlike that they suggest derivation from widely different parts of the vegetable kingdom. The genus Nepenthes might possibly be derived from the Aristolochia family, being a derivative along one line, while the parasitic Cytinaceæ might be regarded as having degenerated along another line from the same source. The Australian genus Cephalotus, which has a pitcher strikingly like the pitchers of Nepenthes, may be an outlying relative of the saxifrage family. Sarracenia, Darlingtonia, and the Venezuelan genus Heliamphora seem to be more closely allied to one another than to the others, and they make up the Sarraceniaceæ. See the different generic entries for fuller accounts.

PITHECOCTÈNIUM (Greek, *monkey's comb;* alluding to the spiny fruit). *Bignoniàceæ.* Ornamental vines cultivated for their showy flowers.

Evergreen shrubs climbing by lf.-tendrils: young branches ribbed: lvs. opposite, 3-foliolate or the middle lft. replaced by a filiform 3-parted tendril: fls. in terminal racemes or panicles; calyx campanulate, truncate or with small teeth; corolla campanulate, tubular at the base, curved, leathery, white or yellowish; stamens included; disk large; ovary warty, with many seeds in several rows: caps. broad, densely covered with prickly warts; the persistent septum with enlarged margin.—About 20 species in Cent. and S. Amer. From the allied genera Bignonia and Anemopægma it is easily distinguished by the prickly caps. and the ovary with the seeds in several rows. Adapted for cult. in subtropical and tropical countries only. For cult. and prop. see *Bignonia*.

cynanchoìdes, DC. (*P. clematídeum*, Griseb. *Anemopægma clematídeum*, Griseb. *Bignònia álba*, Hort., not Auth.). Branchlets slightly hairy at first: lfts. ovate, long-acuminate and obtusely pointed, subcordate or broadly cuneate at the base, glabrous above, 1–2 in. long; petiole pubescent at the apex: fls. in terminal few-fld. racemes; the lowest pair of fls. long-stalked; corolla white, tubular-funnelform with spreading limb, pubescent outside, 1¾–2 in. long; ovary tomentose: fr. 2½ in. long, covered with yellowish spines. Nearly all the year. Argentina, Uruguay. Hieronymus, Icon. Descr. Plant. Argentina, 7. B.M. 8556.

muricàtum, DC. (*Bignònia echinàta*, Jacq.). Glabrous: lfts. ovate, acute or acuminate, rounded or subcordate at the base: fls. in terminal many-fld. racemes; corolla about 1 in. long, white, with yellow throat: fr. oblong, 2–5 in. long, densely covered with prickles. Mex.

P. buccinatòrium, Mairet=Phædranthus buccinatorius.—*P. cinèreum*, DC.=Distictis cinerea.

ALFRED REHDER.

PITHECOLÒBIUM (Greek, *monkey*, and *ear-ring*). *Leguminòsæ.* Tropical shrubs or trees planted for ornament and shade.

With or without axillary stipular spines: lvs. bipinnate; lfts. at first small, many pinnate or large, 1–3-pinnate, rarely with 1 lft.; petiolar glands rarely wanting; stipules small and inconspicuous or persistent, hardened or spiny: fls. 5- or rarely 6-merous, hermaphrodite or rarely polygamous, in head-like spikes; calyx campanulate or tubular, short-toothed; corolla tubular or funnelform; stamens few or many, much exserted, at the base or above united into a tube; anthers small; ovary sessile or stipitate, many-ovuled, style filiform, stigma terminal, small or capitate: pod compressed or flattened, circinate, twisted falcate, or rarely nearly straight, coriaceous, thick or somewhat fleshy, 2-valved, not septate between the seeds; seed

pulpy, short, often dark-colored, ovate or orbicular, compressed; funiculus filiform or with variously expanded fleshy arils.—About 125 species. The subgenus Samanea of Bentham is of generic rank. See *Samanea*, Vol. VI. It is distinguished from Pithecolobium by its straight indehiscent septate pods, and from Enterolobium by its straight, more or less constricted instead of short thick circinate or reniform pods.

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A. *Stipules mostly spiny: lvs. 1- or rarely irregularly 2-pinnate; lfts. 1- or few-pinnate: pod spirally twisted; seed with funiculus dilated at apex into a fleshy aril.* (*Unguis-cati.*)

B. *Heads with short peduncles.*

1. dúlce, Benth. (*Mimòsa dúlcis*, Roxbg. *Ínga dúlcis*, Willd.). Guaymochil, Huamuchil, or Manilla Tamarind. Large stately trees: lvs. and lfts. 1-pinnate; lfts. obovate or oblong, obtuse, very oblique, about 1 in. long: heads short-peduncled, the upper paniculate-racemose; fls. white, finely pubescent; calyx 1 line, corolla 1½ lines long, white: pod twisted, 5–6 in. long, ⅓–½in. broad. Mex., Philippines. Blanco Fl. Filip. 237. Beddome, Fl. Sylv. 188.—Widely cult. in the tropics as an ornamental. The pulpy aril of the seed is eaten by the poorer classes as food. The bark yields a yellow dye. It is said not to have fruited in S. Calif.

BB. *Heads with long slender peduncles.*

C. *Lfts. leathery: ovary pubescent.*

2. guadalupénse, Chapm. (*Ínga guadalupénsis*, Desv.). An unarmed shrub, 3–7 ft. high: lfts. 4, obliquely obovate, ¾–1½ in. long, leathery, mucronate, undulate, delicately nerved, shining above; petioles shorter than the petiolules: heads yellow; peduncles solitary on the axils, 1½–3 in. long, exceeding the subtending bracts; calyx campanulate, pubescent, triangular lobes shorter than the tube; corolla pubescent, stamens 3–4 times longer than the corolla: pods 2–4 in. long, contorted. Fla. and W. Indies.

CC. *Lfts. membranous: ovary glabrous.*

3. Unguis-càti, Benth. (*Mimòsa Unguis-càti*, Linn.). Cats-Claw. Black Bead. Bread-and-Cheeses. Uña de Gato. An armed or unarmed shrub or small tree, sometimes 25 ft. high: lfts. 4, rather thin, obliquely obovate, oval, rounded or mucronate at the apex, finely reticulated; petioles slender, mostly larger than the petiolules: heads in terminal axillary panicles; calyx turbinate-campanulate, glabrous; corolla glabrous or nearly so; stamens twice as long as the corolla: pods 3–4½ in. long, contorted. Fla., W. Indies, and Trop. Amer. Jacq. Hort. Schoenbr. 3:392. Vahl, Eclog. 3:25.—The bark is astringent, fr. edible, and the seeds medicinal.

AA. *Stipules inconspicuous: spineless: lvs. 1- to several-pinnate; lfts. 1- to several-pinnate, large or many-pinnate and small: heads small, paniculate: pod spirally twisted; seed without apex of funiculus dilated.* (*Clypearia.*)

B. *Fls. mostly few, sessile, in heads.*

4. scutíferum, Benth. (*Mimòsa scutífera*, Blanco. *P. lobàtum*, Benth.). A small tree: lvs. glabrous, 1–2-pinnate; lfts. 2–3-pinnate, ovate or oblong, acuminate, 3–6 in. long: fls. in heads, few (often 2–3) sessile, glabrous, or puberulent; calyx ½–1 line long; corolla up to 2 lines long: pod twice or irregularly twisted, often nearly a foot long, 1–2 in. diam., often much constricted between seeds; seeds large, compressed, orbicular. Trop. Asia, Java, Borneo, Philippines.

BB. *Fls. many, in heads, distinctly pedicelled.*

C. *Branches terete: lvs. large, few-pinnate.*

5. pruinòsum, Benth. (*Albízzia pruinòsa*, F. Muell.). A slender tree, brownish puberulent or glabrous: lvs. 1–2-pinnate; upper lfts. 3–4-pinnate, broadly ovate or subrhombic, largest acuminate, 2–3 in. long: fls. in heads in the upper axils or in short corymbose terminal panicles, pedicellate, glabrous; calyx ½ line long; corolla 2 lines long: pod spirally twisted or long-contorted, glabrous, deeply constricted, about ⅝in. broad. E. Austral.—Intro. in 1901.

CC. *Branches angular: lvs. several- to many-pinnate.*

6. angulàtum, Benth. (*Ínga angulàta*, Graham. *Mimòsa heterophýlla*, Roxbg.). An ornamental small tree: branches and petioles at first brownish, puberulent, becoming glabrous: lvs. 2–4-pinnate; upper lfts. 4–8-pinnate, oblique, ovate-oblong, acuminate, 3–5 in. long, lower shorter, ovate-rhombic: panicle terminal; fls. few, in heads, pedicellate, tomentulose; calyx less than a line long; corolla about 3 lines long: pod circular or elongated, contorted, about ½–⅝in. broad. Trop. Asia, Borneo, Philippines.

AAA. *Stipules present: shrubs (or rarely trees): lvs. 1– to several-pinnate; lfts. small or rarely 1 in. long.* (*Ortholobium.*)

B. *Spines straight.*

C. *Lvs. 2–6-pinnate.*

D. *Lfts. 5–10-pinnate.*

7. mexicànum, Rose. Chino. A small tree, 15–20 ft. high, 1 ft. diam.: lvs. with straight stipular spines (sometimes wanting) 1 line long, 2–5-pinnate; lfts. 5–10-pinnate, oblong, 2–4 lines long, midrib a little excentric, puberulent, as are also the rachis and branches: infl. paniculate; fls. in heads, pedicellate; pedicels 1–2 lines long; calyx ½ line long; corolla 1½ lines long; petals spreading or reflexed; stamens long, numerous: pods oblong, somewhat constricted, 3–4 in. long, 1 in. broad, straight, its valves not elastic nor revolute; seeds 2, oval, 2–4 lines long. Mex.—It has the habit of mesquit and is valued for its wood. Rare, and rapidly becoming exterminated.

DD. *Lfts. 3–6-pinnate.*

8. flexicaùle, Coult. (*P. texénse*, Coult. *Acàcia flexicaùlis*, Benth.). Ebony. A shrub or small tree, 20–30 ft. high: trunk 2–3 ft. diam., branching 8–10 ft. from ground, with short stout stipular spines: lvs. 4–6-pinnate, long-petiolate; petioles slender, puberulent; lfts. 3–6-pinnate, lower pair shortest, ovate-oblong, rounded at apex, glabrous, membranaceous or subcoriaceous, dark green, shining on the upper surface, paler below, ¼–⅛in. long on short broad petiolules: fls. in cylindrical dense or interrupted spikes, 1½ in. long on stout pubescent peduncles, fascicled in axils of lvs. of preceding year, sessile, yellow or creamy, fragrant; stamens exserted; corolla 4–5 times longer than calyx, puberulent; ovary glabrous, sessile: pod flattened, turgid, straight or falcate, sessile, oblique at base, rounded and narrowed to a short point at apex, 4–6 in. long, 1–1¼ in. broad, dehiscent, thick, woody; seed imbedded in a thick pithy pulp, suspended on a short straight funiculus, ½in. long, ¼in. broad, irregularly obovate, bright reddish brown, sides faintly depressed. Texas to Low. Calif. S.S. 3:147.—The wood is heavy, hard, compact, close-grained, dark rich reddish brown tinged with purple, with clear bright yellow sapwood. Almost indestructible in contact with the ground and much used for fence-posts. The seeds are palatable and nutritious if boiled when green. They are roasted when ripe by the Mexicans who use the thick seed-coat as a substitute for coffee. A slow grower and not of sufficient size for timber.

cc. *Lvs. 6–10-pinnate; lfts. 20–40-pinnate.*

9. **brevifòlium,** Benth. (*Acàcia Neucidna*, Buckl.). HUAJILLO. An evergreen shrub or small tree up to 30 ft. tall, armed with short spines: lvs. 6–10-pinnate; lfts. 20–40-pinnate, oblong or narrowly oblong, ⅛–⅛in. long, obtuse or acutish, reticulated beneath: panicles 2–4 in. long, peduncles ⅜–½in. long: heads subglobose, ⅝–¾in. diam.; corolla 6–8 times longer than the calyx, lobes ovate, shorter than the tubes; stamens 2–3 times longer than the corolla: pods linear, oblong, flat, 2½–4 in. long, acuminate at apex, stipitate. Texas and Mex. S.S. 3:146.—The fls. are whitish and much sought by bees.

BB. *Spines recurved.*

10. **Sonòræ,** Wats. UÑA DE GATO. A shrub or small tree 15–20 ft. high, armed with short recurved stipular spines: foliage, infl. and branches canescent with very short spreading pubescence: lvs. 1-pinnate on a short (1–2-line) or very short rachis; lfts. 10–15-pinnate, oblong-elliptic, about a line long: peduncles mostly solitary (1–3) in the axils, 6 lines long or less; heads loose; fls. white, finely pubescent, nearly 2 lines long: pod rather thin, short-stipitate, flat, straight, dehiscent, puberulent, 2–4 in. long and ½–¾in. wide, 3–6-seeded. Mex.—Wood very hard and takes a fine polish. A good hedge plant for the Southwest if trimmed. A decoction of the branches is used for scours in horses.

AAAA. *Stipular spines absent: lvs. 1- or rarely 2- or more-pinnate; lfts. 1- to several-pinnate, large: fls. usually short, in heads or spikes at nodes of leafless branches: pod stiff, leathery.* (*Caulanthon.*)

11. **latifòlium,** Benth. (*Mimòsa latifòlia*, Linn. *Inga latifòlia*, Willd. *Calliándra latifòlia*, Griseb.). A small tree or tall shrub, entirely glabrous: stipules persistent, lanceolate-acuminate: lvs. 1-pinnate; lfts. often 2-pinnate, ovate or ovate-oblong, acuminate, 3–6 in. long: fls. in loose nearly sessile or short-peduncled heads; calyx very small; corolla about ¼in. long: pod curved, often a foot long and an inch broad. Brazil to Panama and in the W. Indies. Mart. Fl. Bras. 15, 2:119.

AAAAA. *Stipules fascicled: lvs. 2- to several-pinnate; lfts. 5- to many-pinnate, small: infl. in heads, axillary, peduncled; fls. sessile, short, glabrous: pod smooth, leathery or somewhat fleshy, straight or curved, scarcely dehiscent.* (*Chloroleucon.*)

12. **tòrtum,** Mart. A shrub or small tree, glabrous or pubescent: lvs. 2–5-pinnate; lfts. 5–9-pinnate, oblique, oblong, ¼–½in. long: calyx less than a line long; corolla about ¼in. long: pod curved or almost circular, about 6 in. long, ½–⅔in. broad. Brazil. Mart. Fl. Bras. 15, 2:118.

P. ácle, Vidal (Mimosa acle, Blanco)=Albizzia acle, Merrill.—*P. álbicans*, Benth. (Acacia albicans, Kunth). Canescent-puberulent: lvs. 4–6-pinnate; lfts. 12–20-pinnate, oblique, linear-oblong, 3–4 in. long: infl. axillary; fls. glabrous; calyx ½ line long; corolla 2 lines long: pod glabrous, 3–5 in. long, ½in. broad, coriaceous. Mex.—*P. filicifòlium*, Benth. (Mimosa filicifolia, Lam.)=Samanea filicifolia, Ricker.—*P. fràgrans*, Benth. (Inga fragrans, Macfad. Acacia Berteriana, DC.). Scabrous or minutely pubescent: lvs. 8–10-pinnate; lfts. 30–40-pinnate, oblong-linear or linear-falcate, 2–4 in. long, dark above, pale beneath, costa excentric: heads pedicellate in racemose panicles; calyx ⅓–¾ line long; corolla 1½–2 lines long: pod straight, smooth, not much thickened, 3–4 in. long, 6 lines broad, indehiscent. W. Indies.—*P. geminàtum*, Benth. (Calliandra ? geminata, Benth.)=Inga geminata, Wight & Arn. An ornamental tree with large lfts. Ceylon. Hook. Ic. 16:1510.—*P. Samán*, Benth. (Mimosa Saman, Jacq. Enterolobium Saman, Prain)=Samanea Saman, Merrill.—*P. umbellàtum*, Benth. (Mimosa umbellata, Vahl. Acacia Concordiana, Loud.). Puberulent: lvs. 1–2-pinnate; lfts. 4–10-pinnate, oblique-oblong, obtuse, ⅓–¾in. long: fls. in pedicellate heads, glabrous; calyx 1–1½ lines long; corolla 3–3½ lines long: pod curved, thick, 3–4 in. long, ¾in. broad, constricted between the seeds. India.

P. L. RICKER.

PITTÓSPORUM (Greek, *pitch seed;* in allusion to the resinous coating of the seeds). *Pittosporàceæ.* Hardy or half-hardy evergreen woody plants grown especially in California and Florida. Several species are excellent hedge plants, much preferred to privet and box in some localities; many are useful ornamentals for lawns and shrubberies; a few are used as avenue trees; nearly all have fragrant flowers.

Shrubs and trees: lvs. simple, exstipulate, alternate or apparently whorled: fls. regular, the parts in 5's; sepals distinct or connate at base; petals distinct or lightly united, tips often recurved; ovary incompletely 2-celled (rarely 3–5-celled); style 1; stigma 1: fr. a globose, ovate or obovate caps., 2- to many-seeded; valves leathery or woody.—About 100 species, chiefly of the southern hemisphere and largely Australian.

2988. Pittosporum Tobira var. variegatum. (×⅜)

Pittosporums are usually propagated by seeds, which are sown in winter or early spring in ordinary soil in the cool greenhouse. Seeds do not keep well and those of the rarer kinds are difficult to procure; but all species are readily propagated from cuttings of half-ripened wood. *P. Tobira*, which seldom sets seeds, and its variety, which does not come true, are also obtained in this manner. *P. phillyræoides* is best if grafted upon *P. undulatum*, since otherwise it is liable to be crooked and branched. *P. eriocarpum* is also grafted upon this stock. Seedlings should be repotted from the seed-bed as soon as the second or third leaf has formed.

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A. *Fls. chocolate to black: seeds black.*

1. **crassifòlium,** Soland. KARO. Tall shrub or small tree, 15–30 ft.: young parts densely clothed with white or buff downy pubescence: lvs. 2–3 in. long, narrow-obovate or oblong, obtuse, narrowed to a short petiole, very leathery, dark green above, downy beneath, the margins revolute: fls. ½in. long, in terminal clusters: fr. ¾–1¼ in. long, short-hairy, with 3 or 4 thick woody valves; seeds ripen in about five months. New Zeal. G.C. III. 30:431. Kirk, For. Fl. N. Z. 14. F.S. 21:2151. B.M. 5978.—Suitable for windbreaks and shelter near the sea; said to resist gales and salt spray; too coarse and rigid for ordinary yard planting. Wood white and tough; used for inlaid work; difficult of combustion.

2. **tenuifòlium,** Gaertn. (*P. nigricans*, Hort.). TAWHIWHI. Shrub or small tree, 20–40 ft., of symmetrical and compact growth: lvs. 1–3 in. long, oblong or somewhat obovate, mostly acute, thin, dark green, glabrous and lustrous when mature, the margins undulate: fls. ¼–½in. long, solitary in the lf.-axils, rarely fascicled; ovary silky: fr. ½in. thick, globose,

3-valved, glabrous and minutely roughened when mature. New Zeal. Kirk, For. Fl. N. Z. 46.—One of the best for clipped hedges, for mass planting, and for screening off undesirable views. Occasional pruning is necessary if a dense foliage is desired. Both this and No. 1 have yellow-fld. forms but these are not in the trade.

AA. *Fls. white, greenish, or yellow.*

B. *Lvs. very obtuse, thick and leathery, but less so in P. erioloma.*

3. **Tobira,** Ait. TOBIRA. JAPANESE PITTOSPORUM. Winter-flowering shrub, 6–10 ft.: lvs. 2–3½ in. long, 1–1½ in. wide, obovate, very obtuse, narrowed to the short petiole, thick and leathery, perfectly glabrous, margins revolute: fls. white or yellowish, fragrant, ⅜in. long, in terminal umbels: fr. ½in. long, ovoid, angled, densely short-hairy. China and Japan. B.M. 1396. Var. **variegàtum,** Hort. (Fig. 2988), has lvs. (often thinner) variegated with white.—In the E. this variety is the favorite pittosporum, as it makes a good house plant: both forms are cult. in Fla. and Calif. as lawn plants and for shrubberies: the deep green foliage and fragrant fls., the latter resembling orange blossoms, are very agreeable. Withstands violent saline winds better than most other shrubs, according to Franceschi.

4. **eriolòma,** Moore & Muell. Tall shrub, 10–12 ft. or more, branching close to ground: lvs. 2–3 in. long, ½–1 in. wide, oblanceolate to obovate, obtuse, short-petioled, leathery but not so thick as in *P. Tobira*, deep green, paler beneath, glabrous at maturity, margins revolute: fls. yellowish, few in terminal umbels, ½in. long, equaling the pubescent pedicels; sepals 1½ in. long, pubescent within: fr. globose, glabrous, ½–¾ in. across. Lord Howe's Isl.—Resembles *P. Tobira* and *P. viridiflorum* but is more desirable as an ornamental in that it is densely leafy to the ground and has handsome foliage.

5. **viridiflòrum,** Sims (*P. sinénse,* Desf.). CAPE PITTOSPORUM. Characters much as in *P. Tobira*, but becoming larger, to 25 ft., more tree-like: fls. smaller, greenish and yellow, in dense compound clusters: fr. subglobose, glabrous. Dec.–April. S. Afr. B.M. 1684.—One of the best of the larger pittosporums, scarcely known as yet; intro. by Franceschi.

BB. *Lvs. acute, thin.*

C. *The fls. in terminal clusters: lvs. lanceolate or broader.*

D. *Young lvs. glabrous or nearly so.*

E. *Petals about ½in. long.*

6. **undulàtum,** Vent. VICTORIAN BOX. MOCK ORANGE. Fig. 2989. Tree, to 40 ft. or more, but often pruned as a shrub: lvs. crowded on the branchlets, 3–5 in. long, 1–2 in. broad, oval-oblong to lanceolate, abruptly acute, deep green, coriaceous and shining, entire, undulate or flat: fls. white; sepals more than half as long as corolla, acuminate: fr. scarcely ½in. long, nearly globose, smooth; seeds numerous, light brown. Jan.–July. Austral. B.R. 16.—Suitable for large broad hedges with dense foliage; when well spaced makes a large tree: used as an avenue tree in S. Calif., where it attains stately dimensions. Often selected for planting near summer-houses and dining-porches because of the rich odor of the bloom, resembling that of orange blossoms.

EE. *Petals less than ¼in. long.*

7. **eugenioìdes,** A. Cunn. TARATA. Tall shrub or slender open tree with sparse and glossy light green foliage: lvs. 2–4 in. long, ¾–1¼ in. wide, elliptic-oblong, acute, undulate: fls. greenish yellow, numerous; sepals minute, acuminate: fr. slightly exceeding ¼in. long, ovoid, pointed at each end, ribbed, glabrous when mature. New Zeal. Kirk, For. Fl. N. Z. 49.—In Calif. the most extensively cult. species, much used for clipped hedges and ornamental shrubbery; hardy; growth rapid; grows in pure limestone shale (Braunton); a variegated variety is cult. in Eu. Gn. 77, p. 277.

8. **rhombifòlium,** A. Cunn. QUEENSLAND PITTOSPORUM. Pyramidal tree, to 80 ft.: lvs. 3–4 in. long, 1–2 in. wide, rhomboid, acuminate, coarsely toothed: fls. white, numerous, in terminal corymbs: fr. berry-like, ¼in. long, nearly globose, becoming bright orange-yellow, glabrous; seeds 2–3, black. June–Sept. Austral. Hook. Icon. 621.—Sometimes grown as a pot-plant, more often as a tree for lawns and avenues. The bright berries persist through autumn and winter, making the tree very attractive.

DD. *Young lvs. very pubescent, as also the fr.*

9. **revolùtum,** Ait. Tall shrub, rusty-pubescent on young parts: lvs. 2–3 in. long, 1–1½ in. wide, elliptic, glabrous above when mature, rusty-pubescent beneath, entire or undulate: fls. pale yellow, fully ½in. long; sepals acuminate: fr. ½–¾in. long; seeds numerous, red or brown. Feb.–April. Austral. B.R. 186.

10. **eriocárpum,** Royle. Widely spreading shrub or tree, 10–20 ft., the young parts white-tomentose: lvs.

2989. Pittosporum undulatum. (×⅓)

4–6 in. long, 1½–2½ in. wide, elliptic or oblong, narrowed to the ends, white-tomentose beneath: fls. yellow, ½in. long, numerous in an oblong terminal raceme, fragrant: fr. ⅜in. long. Himalayas. B.M. 7473.—Grown in S. Calif.: very useful when a mass of light-colored foliage is desired: fls. notably banana-scented.

CC. *The fls. axillary: lvs. linear.*

11. **phillyræoìdes,** DC. NARROW-LEAVED PITTOSPORUM. Glabrous tree, to 20 ft. or more, with pendent twigs: lvs. 2–3½ in. long, about ¼in. wide, entire; tips slender, recurved: fls. yellow, under ½in. long, pedicelled in the lf.-axils: fr. about ½in. long, oval, compressed, yellow, granular. Australian deserts. Maiden, For. Fl. N. S. W. 4.—Remarkable tree, resembling weeping willow but evergreen and suited to dry regions: root-suckers abundant.

P. bícolor, Hook. f. Shrub or tree with tomentose twigs: lvs. linear, glabrous above, tomentose beneath: fls. axillary, ½in. long, yellow and purple. Austral.—*P. Buchánani,* Hook. f. Closely allied to P. tenuifolium: lvs. 2–5 in. long, oblong-lanceolate, acute, very thin, flat: fr. less than ½in. thick. New Zeal.—*P. Cólensoi,* Hook. f. Sometimes considered as a form of P. tenuifolium: branches stouter: lvs. 2–4 in. long, sharply pointed, flat, more coriaceous and deeper green. B.M. 8305. G.C. III. 26:370. Cult. in England.—*P. Fàirchildii,* Cheesem. Shrub, related to P. crassifolium: lvs. broader, glabrous when mature, margins not revolute: fr. 9–12 lines long, glabrous when mature. New Zeal.—*P. floribúndum,* Wight & Arn. A small tree: lvs. lanceolate or oblong-lanceolate, glabrous, shining: fls. in terminal compound corymbs, numerous, yellow. Subtrop. Himalayas, ascending to 5,000 ft.—*P. hawaii-*

ense, Hillebrand. Lvs. ample, acute, 7–10 in. long, 2–3 in. wide, sparsely to silvery hairy beneath: fls. in terminal clusters, cream-color. Hawaii.—*P. heterophýllum*, Franch. Half-reclining: lvs. medium-sized, ovate, acute, glabrous: fls. few, terminating short branchlets, light yellow. China. Offered by Franceschi for rockeries and embankments; drought-resistant.—*P. ilicioides*, Makino. A handsome evergreen shrub: lvs. glossy green: fls. greenish yellow. Japan. In general appearance resembles Illicium anisatum. —*P. Kirkii*, Hook. f. Glabrous shrub: lvs. narrow-obovate, very thick, obtuse: fls. yellow, in terminal umbels. New Zeal.—*P. Rálphii*, Kirk. Shrub, related to P. crassifolium but lf.-margin not revolute: lvs. white-tomentose beneath: fr. 8 lines long, pubescent. New Zeal. G.C. III. 26:205 (as P. crassifolium).—*P. tetraspérmum*, Wight & Arn. Shrub: lvs. ovate, acute, 2–4 in. long, glabrous: fls. terminal, yellowish: fr. glabrous, 4-seeded. India.

HARVEY MONROE HALL.

PITYROSPÉRMA: *Cimicifuga.*

PLÀCEA (possibly derived from a Chilean name). *Amaryllidàceæ.* Rare and beautiful Chilean bulbs, of difficult culture, bearing showy flowers something like an amaryllis (Hippeastrum), the colors being white or yellow, streaked with red.

Perianth funnel-shaped, with scarcely any tube; corona funnel-shaped, inserted at the base of the segms., deeply cut, the divisions notched, stamens inserted inside the corona; ovary top-shaped, 3-celled; ovules many, superposed; style declinate; stigma capitate, obscurely 3-lobed.—Five or six species. Botanically the peculiar feature of Placea is its cup or corona, which is smaller than that of Narcissus, and red instead of yellow or white. The beauty of the placeas, however, is of the hippeastrum type, though the fls. are not so symmetrical, for at first sight it looks as if two of the perianth-segms. were torn away. The peduncle is long and hollow.

Placeas are generally classed as autumn-flowering bulbs. Though natives of the Andes at considerable elevations, they are not hardy. The bulbs are said to lie deep in the ground in their native country, and pot culture is generally considered unsuitable for deep-lying bulbs. The bulbs go to rest about August and push up about December, flowering in May. In a pot they ought to have their time of rest, and must be buried in the soil, which ought to be very rich, but in pots they are not certain to flower. They must be planted with at least an inch of soil over their necks, and they prefer a loose soil.

ornàta, Miers. Bulb 1 in. thick: lvs. 2, linear, appearing with the fls.: scape 6–9 in. high; umbel 4–6-fld.; perianth-segms. 1–1¼ in. long. B.R. 27:50. Gn. 54:510.

P. grandiflòra, Lem., is thrice as big as P. ornata, more floriferous, and is essentially distinguished by its perianth-segms., which are more acuminate and sharp-pointed. I.H. 15:574. F.S. 20:2047 (erroneously as P. ornata).

WILHELM MILLER.

PLAGIÁNTHUS (Greek, *oblique flower*). *Malvàceæ.* Trees or shrubs, rarely herbs, with large or small white 5-petaled flowers, little known in this country.

Bractlets none or distant from the calyx, which is 5-toothed or cut; column of stamens divided at the apex into many filaments; cells of ovary 2–5, rarely 1 or many; ovules solitary, pendulous: carpels in a single series: style-branches longitudinally stigmatose within: foliage and infl. various. Distinguished from Abutilon by the number of ovules.—About 12 species from Austral., New Zeal., and Van Dieman's Land. They are hardy in the most favored parts of England. None of the species is offered in America. They are known as "ribbon trees."

Lámpenii, Booth. Botanically only a variety of *P. pulchellus*, but horticulturally very much superior. Shrub, attaining 6–8 ft.: lvs. oblong-lanceolate, 4–5 x ½–1 in., sharply serrate: fls. in short, axillary leafy panicles, very numerous and crowded; styles very small. Van Dieman's Land. G.C. II. 22:201.

pulchéllus, Gray (*Abùtilon pulchéllum*, Sweet. *A. púlchrum*, Don). Tall shrub: lvs. lanceolate, cordate, acuminate, 2–3 in. long, coarsely crenate: fls. few, clustered along rachis of axillary racemes; ovary 5-celled. Austral. B.M. 2753 (as *Sida pulchella*).

P. betulinus, A. Cunn. RIBBONWOOD. Tree, 30–60 ft. high, with trunk sometimes 3 ft. diam.: lvs. of mature plants 1–3 in. long, ovate or ovate-lanceolate, acuminate: fls. small, unisexual, in terminal or axillary decompound panicles, yellowish white. New Zeal. Said to be used by the Maoris for making rope and twine.—For *P. Lyallii*, Hook., see under Gaya, Vol. III, p. 1319, additional illustrations of which are G. 32:543; 35:677. G.M. 55: 572. Gn. 44:28; 75, p. 372. G.C: III. 4:209; 41:332, 335. H.F. II. 13:361.

WILHELM MILLER.

PLAGIOBÒTHRYS (Greek, *plagios*, sideways, and *bothros*, pit or hollow; wherefore the name should have been written *Plagiobothrus*). *Boraginàceæ.* Several species of low-growing commonly diffuse annuals from W. Amer., with small white fls. Here belongs *P. nothofúlvus*, Gray, from Calif. to Wash., which was once advertised under its synonym *Eritrichium nothofulvum*, Gray. This plant has no horticultural standing.

PLAGIOGÝRIA (Greek, *oblique* and *round*, alluding to the oblique ring around the sporangium). *Polypodiàceæ.* Warm-country ferns, formerly included as a section under Lomaria.

Sori inserted on the more or less thickened ends of the forked side-nerves, finally often confluent, usually covered by the revolute margin; indusium lacking; sporangia long-stalked with a complete oblique ring; spores tetrahedral: lvs. tufted, simple-pinnate, dimorphous; petiole fleshy-swollen at the base, the upper side of which has 3–6 spongy protuberances; sterile lvs. serrate; fertile lvs. smaller, mostly entire.—About 10 species, in tropics of New World, in the Philippines, Formosa, S. China.

costaricénsis, Mett. (*Lomària costaricénsis*, Baker). A plant requiring warmhouse cult.: sterile lvs. 1 ft. and more long and about half as wide, with entire falcate lfts. which are less than ½in. broad and united at their bases, thereby forming a winged rachis; fertile lvs. 1½ ft. long and 6 in. broad, with contracted lfts. Costa Rica.

PLAGIOSPÉRMUM: *Prinsepia.*

PLANÈRA (after J. J. Planer, 1743–1789, professor of medicine at Erfurt; author of several books on botany). *Urticàceæ.* WATER-ELM. Monotypic genus, allied to Ulmus and Celtis: lvs. pinnately veined, alternate: fls. polygamous, with deeply 4–5-lobed calyx; staminate fls. short-stalked, in clusters at the base of the young branchlets, with 4–5 stamens; pistillate or perfect ones on rather slender stalks, 1–3 in the axils of the lower lvs.: fr. a small muricate nut. The only species is **P. aquática,** Gmel. (*Anónymus aquáticus*, Walt. *P. ulmifòlia*, Michx.). Small tree, sometimes to 40 ft.: lvs. short-petioled, somewhat unequal at the base, ovate to ovate-oblong, unequally serrate, glabrous at length and somewhat leathery, 1½–2½ in. long: fr. oval, ⅓in. long, with irregularly crested fleshy ribs. April, May. S. Ill. and Ky. to Fla. and Texas. S.S. 7:316. R.H. 1903, p. 351. This tree is not in general cult. and has little to recommend it as an ornamental plant. It would not prove hardy N. It probably thrives best in moist soil and is prop. by seeds sown soon after ripening in May and by layers, also by grafting on elm. The plants sometimes cult. under the name of *P. aquatica* belong either to *Ulmus campestris* var. *viminalis*, *U. parvifolia*, or *U. alata*, to which the true Planera is similar in foliage, or to some other small-lvd. elm.

P. acuminàta, Lindl.=Zelkova serrata.—*P. carpinifòlia*, Wats. =Zelkova ulmoides.—*P. crenàta*=Zelkova ulmoides.—*P. Keàkii*, C. Koch=Zelkova serrata.—*P. rèpens*, Hort.=Ulmus pumila or parvifolia.—*P. Richardi*, Michx.=Zelkova ulmoides.

ALFRED REHDER.

PLANE-TREE: *Platanus.*

PLANER-TREE: *Planera.*

PLANT (Latin, *planta*). A plant is a living organism consisting of one or more cells, some of which, in most of the higher forms, contain a green substance—chlorophyl—by the aid of which they are able in the light to construct carbohydrate food-matters (as sugar, starch, and the like) from carbon dioxide and water. The cell protoplasm assimilates or uses these carbohydrates and is nourished by them, and from the elements they furnish it is able to make cellulose, the substance which walls it in and gives strength and solidity to the plant. Animals do not (as a rule, at least) have chlorophyl, and cannot construct carbohydrates from carbon dioxide and water, and the same is true of some plants, as explained below.

Green plants absorb carbon dioxide from the air, and in the process of carbohydrate formation they give off a certain quantity of oxygen. However, in the further chemical activities of their cells, oxygen is absorbed and carbon dioxide is given off. In the plants which are not green (as in animals, also) the first process is wanting, while the second takes place. These facts have given rise to the view that plants and animals are quite opposite in their physiological relations to the surrounding air. They should not be contrasted, however, in this way; it is more exact to say that green plants have two important nutritive functions, namely (1) carbon absorption and fixation (technically photosynthesis), and (2) assimilation of food matters. Respiration—the process in which oxygen is absorbed and carbon dioxide is given off—occurs in all plants and animals.

With this general definition of a plant before us we may say that while some lower plants are minute single cells, or rows of cells, and others are flat, expanded and often irregular growths, in all of which there is a marked simplicity of structure, in higher plants we find the plant-body composed of well-defined roots, stems, leaves, flowers, fruits, and seeds. The lower plants referred to perform all the functions necessary for their continued existence, and are not in any sense "imperfect plants," as the older botanists used to denominate them. The difference between lower and higher plants is that the functions of the former are performed by fewer organs, while in the latter there is an approach to one organ for every function. Still it is true that some organs even in the highest plants have more than one function: so that it may be said that plants are theoretically capable of considerably higher development than they have yet attained. Thus while the chief function of the root may be for the absorption of food-matter, it commonly has in addition a holdfast function, and may become an organ of storage also. So, also, while the chief function of the leaf is to supply green cells for carbohydrate making (photosynthesis), it may be used as a storage organ (as in cabbage leaves), or even for making the plant more conspicuous (ornamental), as in many euphorbias. Even the flower usually unites two functions (that of fertilization and of showiness), which in more highly specialized forms are separated, as in the wild snowball where the large marginal flowers are for show but are sterile, while the small inconspicuous central flowers are fertile.

One more thing must be included in our general conception of the plant. While it is true that plants are normally, and typically, green in color, there are many plants which have so changed their food habits that they are no longer green. Thus parasitic plants that secure carbohydrates from living organisms, having no need of chlorophyl, are not green, and the same is true of saprophytic plants (those that get their food from dead or decaying organisms), which are also destitute of a green color. This is the explanation of the fungi, lichens, bacteria, and some flowering plants (e.g., dodder, Indian pipe, beech drops, and the like). Such plants are more or less degenerated, and are physiologically like animals, but they still retain enough of the typical plant structure so that one is rarely at a loss where to place them. C. E. Bessey.

PLANTÀGO (the Latin name). *Plantaginàceæ*. A group of 200 or more species of annual and perennial herbs or subshrubs occurring in many parts of the world. It is a weedy genus, and only two or three species have any economic or commercial value worth mentioning. They are generally known as plantains, although this name is also applied to certain bananas (see *Musa*), which are plants of widely different kind. *P. lanceolàta*, Linn., or ribwort, is sometimes used in pasture mixtures abroad, because it affords more or less spring pasturage on dry and sterile soils. The seed is offered by American seedsmen for feeding birds, but not for sowing. In this country, however, it is one of the worst of lawn weeds, thriving in our hot dry soils when grass kills out. The best remedy for it is to secure a better stand of grass, and this is made possible by making the ground rich and so treating it that it will hold moisture. *P. Coronòpus*, Linn., the buck's-horn plantain, native to Eu., Asia, and N. Afr., is sometimes eaten as a potherb (see p. 1411). It is a low perennial, with linear-lanceolate often pinnatifid lvs. It is not in the American trade. *P. cordàta*, Lam., of the E. U. S., has been offered by dealers in native plants as a subject for colonizing in bogs and margins of ponds. It is perennial, with a stout rootstock, large cordate-orbicular shining lf.-blades, and a slender spike rising 1–2 ft. high and bearing small pinkish fls. with exserted style and stamens. *P. màjor*, Linn. (Fig. 2990), is a very common dooryard weed. Var. *variegàta*, Hort., a variegated lf.-form, is offered in England. *P. máxima*, Jacq., from Siberia, said to have white feathery spikes, has been intro. into England. There are about 20 native or naturalized species in N. Amer. Plantago is the typical genus of the Plantaginaceæ, a family that contains two other genera, bitypic and monotypic,—Littorella in Eu. and N. N. Amer., and Bougueria in the Andes of Peru and Chile. L. H. B.

2990. Spike of Plantago major.—Common plantain. (Nat. size.)

PLANTAIN: *Plantago* and *Musa*. **P. Lily**: *Hosta*. **Rattlesnake P.**: *Hieracium venosum*. **Wild P.**: *Heliconia Bihai*.

PLANT-BREEDING: *Breeding*, p. 545.

PLANTING. This Cyclopedia considers two classes or kinds of horticultural work,—the growing of plants, and the identifying of plants. The latter purpose runs through every generic entry, throughout the alphabet. The instructions for growing are combined with these generic entries, and are also extended in many separate articles, under the popular names of the plants themselves, as Rose, Strawberry, Carnation, Lettuce, Mushroom, and many others; and they are also displayed in class articles, as Alpine Plants, Kitchen-Gardening, Annuals, Biennials, Perennials, Herbs, Orchids, Palms, Arboriculture, and many others.

At this point, another set of class articles is assembled, with the purpose to bring together such instruction as is commonly associated with what is known as "planting,"—with the use of plants in the open and particularly in relation to their uses as a part of a landscape development. In connection with this symposium, the reader will naturally give special attention to the assembly on

Herbs in Vol. III and on Landscape Gardening in Vol. IV. Inasmuch as trees are discussed under Arboriculture and herbaceous plants under Herbs, the present treatment is mostly of shrubs. (Figs. 3001–3005, 3011–12, are adapted from "Garden and Forest.")

2991. A street improvement, exhibiting good community feeling.

This symposium on planting has the following parts:

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The relation of planting to the fundamental design.

It is the business of the landscape architect to combine beauty and utility into a harmonious composition. The artistic aim in the practice of landscape architecture is to produce beautiful pictures. To achieve such pictures, the creative imagination must be controlled by familiarity with the accepted canons of design. Good design in landscape work must be based on the fundamental principles of art and the laws of nature. Fitness, proportion, variety, mystery or intricacy, unity, and harmony,—all these must be considered.

While it is the aim, in creating landscape gardens and parks, to produce natural effects, the best results are not necessarily secured by a mere imitation of nature as it happens to exist in a given locality. It is possible to modify nature to fit artificial conditions; and by changing the scale, by adding new features, or making different combinations, compositions may be produced which have all the charm of a natural scene, yet surpass nature in beauty and interest. Varied emotions are produced by different compositions. Sometimes the mood is gay, as in flower-gardens. Awe, wonder, and admiration are produced by the large natural features,—rocks, cliffs, cañons, waterfalls, the mountains, and the sea. Mystery and intricacy are conceived by rambles through the dense woods and jungles. Rest, peace, tranquillity are suggested by certain woodland scenes, a sheltered lake, or a meadow with a meandering stream. The sense of deliberation, dignity, and maturity is produced by the stately arched trees of avenue or mall, and by groves of matured trees.

Many laymen and artists think of landscape architecture only as a decorative art; and to their minds planting is of value only in so far as the foliage hides some ugly foundation, softens hard lines or relieves bare spaces, screens some unsightly view or forms a setting for an architectural feature. Sculptors and architects especially are prone to think that the most charming natural parts of our public parks are suitable sites for memorials in stone and statues in marble and bronze. They reason that the spreading branches of the trees and the background of foliage will enhance the beauty of their work of art. Their thought is of their own creation and they fail to realize that by introducing an artificial object, no matter how beautiful it may be in itself, the harmony and beauty of the natural scene may be destroyed.

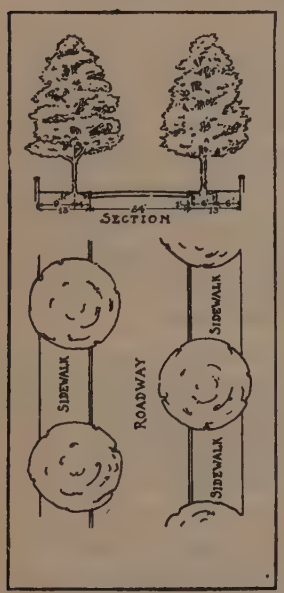
From the point of view of the landscape architect, planting is not merely a superficial decorative process. He considers the arrangement and disposition of the foliage-masses as well as the modeling of the earth's surfaces to be fundamental in landscape design. Necessary buildings, roads, paths, and other artificial features must be provided for use and enjoyment; but the best design is the one that succeeds in effectively obscuring or subduing these necessary objects in the landscape and still provides fully the facilities required for use, shelter, and other enjoyments of the people.

While design is the main consideration in creating a landscape, nature, life, and time are necessary for the completion of the design and the full development of its beauty. The beauty of a landscape is dependent largely on the green living things, as trees, shrubs, grass; but the success of the picture is due more to the disposition and arrangement of the material than to the materials themselves. Therefore, it sometimes happens that a thorough knowledge of horticulture, especially when this knowledge is combined with great enthusiasm and, perhaps, with an added interest in botany, is a decided handicap to the success of the amateur designer. The horticultural features are overemphasized at the expense of the composition. Many places and parks that were originally well designed have been robbed of their charm and beauty and landscape effects, because of the interest and enthusiasm on the part of gardeners, owners of estates, or park commissioners in horticultural things. In the conviction that they are embellishing the beauty of a glade, valley, lawn, or meadow, they proceed to cover these open spaces with rare specimens of trees and shrubs, thus

2992. A series of back-yard improvements, exhibiting pride in premises.

destroying the arrangement. Open areas should not be considered as waste space.

A landscape design may be either formal or natural. The character of the planting of formal gardens and terraces and the embellishment of buildings by planting should be in harmony with the type of architecture and with the nature of the site of the garden and its relation to the house. In the design of a natural landscape, the three general classes of planting material—woods, shrubbery, and lawns or meadows—should intermingle to a certain extent, and yet be so arranged as to present in general an open central feature of lawn or meadow, with the masses of foliage surrounding. This provides unity, and the broad masses of light and shade produce a pleasing composition.



2993. Planting plan for a business street in town.

The outlines of the lawn or meadow should be irregular, and their limits somewhat obscured. Now and then trees or groups should be introduced, especially near the boundaries of the lawn, to add diversity and interest; the shadows will relieve the monotonous expanse of light.

To design effective plantations, a knowledge of planting material, a conception of composition, and imagination and taste are requisite.

In planting, the landscape architect is more concerned with the color, texture, form, and size of flowers and foliage than with botanical families or with cultural requirements of plants; still, in order to design places and parks that will be in harmony with the general surroundings and to use material that will thrive, he must be familiar with the indigenous plant material, and know what soil conditions and locations are suitable for their peculiar needs. However, it must not be assumed that only those trees, shrubs, and plants that grow in the immediate vicinity may be used; but, in the creation of the natural landscape, the native plants and trees should predominate.

The most important planting material used by the landscape architect is "grass seed." Ordinarily grass is not considered in the general conception of planting, but most landscape architects and many laymen realize that grass in the form of lawns and meadows is the most significant feature of our naturalistic landscapes. Its value when used within formal lines, the tapis vert and terrace, are generally recognized. It is not far-fetched to say that grass is the most important planting material used in the creation of landscape in this climate.

Lawns and meadows provide color, texture, motion of the waving meadows, the play of light and the shadows of clouds and trees. The covering of grass over earth enhances the beauty of the contours and the modeling of the earth's surfaces—knolls, valleys, glades, and plains. The effects of space, breadth, dignity, and distant views are dependent upon the proper framing of open spaces with foliage. Indeed, open spaces, whether in the form of sea, lakes, or streams, lawns or meadows, sand-dunes or even paved spaces, are one of the most important elements in landscape design.

C. F. Pilat.

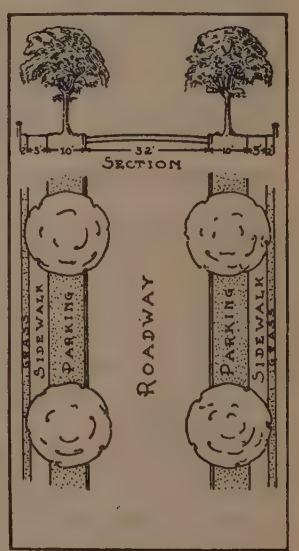
Village improvement in relation to planting.

Village improvement is a branch of civic art. Civic art in turn may be defined as the conservation, improvement, and utilization of public property. Village improvement thus takes its place alongside of town-planning, country-planning, the development of garden cities, and other work of a similar nature. The public-property test may be rather strictly applied to all branches of civic improvement, including village improvement, for while village improvement does in fact undertake extensive work upon private grounds, this is undertaken solely in the public interest.

In village improvement it is rather important to fix attention upon the village or small town as a permanent unit. For the most part, the small towns of America have had notable ambitions for growth. Each one has intended to grow up into a state capital or a large manufacturing center. On this account it has been impracticable to make intelligent plans for the actual circumstances, that is for an indefinite period of existence without further expansion. The growth problem, while it is largely a psychological factor, is a very important one in connection with village life and development. It is a problem which should be seriously faced. Each community should understand its actual circumstances and its ambitions, if it is to make any real improvement in its condition.

Inasmuch as civic improvement is based upon public property, the scope of its work may be outlined rather strictly by the extent and character of property owned in any community. The more important types of public property, with some discussion of the problems attached to their improvement, are taken up herewith. The illustrations and plans (Figs. 2991–2996) suggest some of the important phases, particularly as related to planting.

Streets.—Streets and public roads constitute perhaps the most important mass of public property in each community. They are absolutely indispensable and have a very high monetary value judged by any scale whatever. Road and street improvement is always looked upon as a practical benefit to the community and may, therefore, naturally and properly become the starting-point of general village improvement. Street improvement should be studied with reference to (*a*) location, (*b*) design, (*c*) construction, (*d*) furnishings, (*e*) maintenance. (*a*) The location of streets and roads is generally looked upon as an inviolable accomplishment, yet many roads and streets can be, and should be relocated, or altogether abandoned. In other places new streets should be provided. (*b*) Some streets ought to be straight, some ought to be curved, some ought to be wide, some should be narrow. Some should be provided with wide grass verges, with rows of trees and with parkings. In other parts of the village, streets should have no such furnishings. In fact, each street should be made a study by itself, and should be properly designed



2994. Plan for main residential village street.

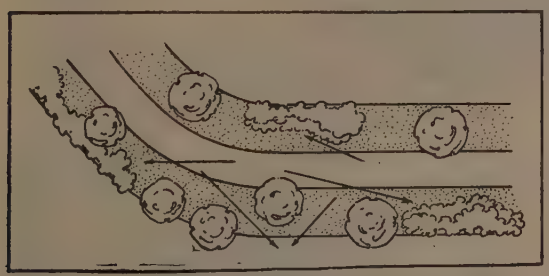
LXXXIX. Planting.– Rhododendrons in a landscape composition.

for its special conditions. (*c*) All streets, of course, should be well constructed. Macadam and tarvia are good materials. However, there are many streets which do not need such expensive improvement. The problems of street construction are generally fairly well studied, but of course, final and perfectly satisfactory results are never achieved. (*d*) Besides the trees in the street, there are many other things to be considered, such as guide-posts, letter-boxes, and especially telephone, electric-light, and trolley poles. All these furnishings should be made as satisfactory as possible. Especially in the matter of poles the ideal is to reduce their number to the minimum. (*e*) All streets need to be kept in good repair and to be kept clean. These are always important matters, but they cost considerably more care, labor, and money than most persons imagine. Village improvement can nearly always make considerable progress in this one point of keeping the streets clean and in good condition.

Transportation may be reckoned as the second great problem of village improvement. The development of attractive railroad station-grounds, by proper planting of trees, shrubs, and grass is a matter always to be looked after. In rural communities, at the present time, with the large development of trolley service, the design and location of first-class trolley waiting stations becomes a matter of great importance and should receive careful attention.

Schoolhouses and school-grounds constitute a very important type of public property, and every campaign of village improvement should look after them carefully. School-grounds should be kept clean and orderly and should have some tree plantings. Wherever possible there should be grass, but the improvement of school-grounds with flower-beds is almost out of the question. Perhaps the most insistent problem of the improvement of the school-grounds themselves, lies in securing adequate area, which should be from 2 to 5 acres for each school instead of the ¼ acre commonly allowed.

Playgrounds are very much needed in every village and rural community. The problems connected with them are, (1) to secure the necessary allotment of land; (2) to have this ground properly planned and developed, (3) to have the play properly supervised. The embellishment will consist chiefly of large trees for shade and to improve the appearance. Flower-beds and borders are quite out of place on playgrounds.

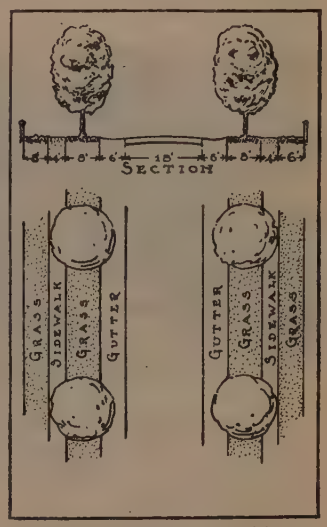


2995. Plan of country road, showing suggested arrangement of trees, shrubs, and flowers.

Reservations of several sorts are needed in every village. These should be primarily for recreation, but should include also places of historic importance or those of great scenic beauty.

Public buildings, including churches, libraries, grange halls, town halls, and the like, must be of the best character in order to secure proper results in village development. All these public buildings should be studied with reference to adaptation to use, proper location, grouping with other public buildings, good architectural design, and substantial construction. The grounds about these public buildings should be developed to the best possible advantage. As a rule, shady lawns with good substantial trees give the best result.

Home-grounds are of prime significance in every community and every village-improvement society should undertake to secure the best treatment of them possible. Neighborhood competitions are useful to this end but sound horticultural instruction is always necessary.



2996. Plan for country road four rods wide.

The more strictly horticultural phases of village improvement, therefore, are the planting and care of trees, the development of grass areas, especially lawns, home-garden improvement with some emphasis upon front yards, and school-garden enterprises of several sorts.

In the care of trees on public streets and grounds, a competent tree-warden is greatly to be desired. When state legislation provides for such an officer he should be chosen with great care and supported with reasonable appropriations of public funds; and in states where tree-wardens are not provided for by law such legislation should be secured as soon as possible. The Massachusetts law is perhaps as good a pattern as any.

Street trees are subject to severe injuries even beyond the liability of other shade trees, such as the damage from leaky electric wires and gas-pipes, gnawing of horses, and sometimes the attacks of ignorant linemen putting up wires. Add to these the usual menace of insect attacks, such as elm leaf-beetle, leopard moth, forest caterpillar, gipsy moth, and the like, and it will be seen that the protection of valuable street trees is a real undertaking. (See *Diseases and Insects* and *Arboriculture*.) The improvement of home-grounds and similar areas is treated elsewhere. (See *Landscape Gardening*.)

The peculiar agent of village improvement is the village-improvement society, but other organizations are equally useful. Woman's clubs and boards of trade are usually effective. Very often smaller groups which undertake to cover only a single street or a single small neighborhood accomplish the most intensive and satisfactory results. As a rule it is undesirable to form a new organization in any community for village improvement. It is better policy to seek the coöperation of the various existing societies. In certain circumstances these can be federated in a way to cover the problem satisfactorily.

Four factors must always coöperate in order to secure satisfactory results in civic improvement of any sort. These factors are (*a*) local initiative, (*b*) expert advice, (*c*) time, and (*d*) money. (*a*) It is always necessary to have some energetic local society or group of men and women who will stand behind any improvement proposition. Without this local initiative nothing can possibly be done. (*b*) In addition to this it is usually desirable and sometimes positively necessary to have work undertaken on the basis of practical plans drawn by experts from outside the community. The outside assistance is valuable even when no more expert than advice which might be secured within the community itself. Good

plans are, however, always indispensable. (*c*) It then requires a considerable amount of time to carry out important improvement projects. It has been estimated that from six to ten years are always necessary in order to bring a community around to a proper understanding of its problems, and to secure sufficient unity of opinion to accomplish valuable results. (*d*) Money is

2997. Planting without composition.

very important, but not one-half so important as persons usually suppose. As a rule the money can be raised whenever the community is convinced, as a whole, that the proposed improvement is worth while. It is best under all circumstances to have public property paid for and improved from public funds. This means that the money should be voted by the people themselves from the public treasury. The ordinary way of raising money for village improvement, by raffles, fairs, and other voluntary means, is wholly unsatisfactory. It can accomplish only trivial results.

FRANK A. WAUGH.

Shrubbery in the landscape.

Shrubs and bushes have two values: an intrinsic value as individual or single specimens; a value as part of the structure or design of an ornamented place. As individual specimens, they are grown for the beauty of the species itself; as parts of the landscape, they are usually grown in masses, constituting a shrubbery. It is often advisable to plant shrubs as single specimens, in order to produce the characteristic beauty of the species; but the temptation is to plant exclusively as isolated specimens, and the emphasis needs, therefore, to be placed on mass-planting.

Plants scattered over a lawn destroy all appearance of unity and purpose in the place (Fig. 2997). Every part of the place is equally accented. The area has no meaning or individuality. The plants are in the way. They spoil the lawn. The place is random. If the shrubs are sheared, the spotted and scattered effect is intensified. Rarely does a sheared shrub have any excuse for existence, unless as a part in an artistically designed formal garden.

A mass or group of planting emphasizes particular parts of the place. It allows of bold and broad contrasts. It may give the place a feeling of strength and purposiveness. The shrubbery-mass usually should have an irregular outline and it often contains more than one species. Thereby are variety and interest increased. Fig. 2998 suggests the interest in a good shrubbery-mass. The shrubbery-masses should be placed on the boundaries; for it is a concept of landscape gardening that the center of the place shall be open. (Fig. 2999; also Figs. 2076, 2077, and others in Vol. IV.) The boundaries are the lines between properties, the foundations of buildings, the borders along walks and drives. Judicious planting may relieve the angularity of foundations and round off the corners of the yard. (Fig. 3000.)

Individual specimens may be used freely, but only rarely should they be wholly isolated or scattered. They should be planted somewhere near the borders, that they may not interfere with the continuity of the place and that they may have background to set them off. The background may be a building, a bank, or a mass of foliage. In most places, the mass or border-planting should be the rule and the isolated specimen the exception; but, unfortunately, this rule is frequently reversed. It is not to be understood, however, that boundaries are always to be planted or that foundations are always to be covered.

L. H. B.

The chief value of shrubbery comes from its use in an artistic way, although some shrubs have edible fruits. Many shrubs, such as lilacs, some of the spireas, gooseberries, and currants, produce leaves very early in the season and some, like forsythia, daphne, and the juneberry are covered with a profusion of blossoms at this time. From early spring until November in temperate latitudes leaves and flowers are to be found on deciduous shrubs, and from June until the following spring ornamental fruits can be seen on their branches, the red berries of the elder beginning and barberries ending the list. Some of these fruits are so richly colored and so abundant that they can be seen from a long distance. Many shrubs, like some of the viburnums and dogwoods, attain a height of 10 to 15 feet, while others, like bunchberry and *Daphne Cneorum*, grow to a height of only a few inches. The leaves of some,

2998. A composition of shrub and tree forms.

like the chokeberry, Thunberg's barberry, the hazels, viburnums, dogwoods, and sumachs are beautifully colored in autumn. The rhododendrons, laurels, and mahonias, and the daphne already named, are examples of shrubs having evergreen foliage. Some leaves, like those of the *Salix lucida*, are glossy; others, as those of the common hazel, are hairy; some are thick, and others are thin; some large, some small; some entire, and some lobed, serrated or compound. Throughout the season the foliage of a good collection of shrubbery will present the greatest variety of color, including all the hundreds of shades of green as well as yellow, white, gray, and purple. Even in winter shrubbery is wonderfully attractive in appearance from the gracefulness of its stems and branches, and from the color of its bark. With the right selections, it will serve almost as well as evergreens to shut out from view fences or other low unsightly objects.

This great variety in foliage, flower, fruit, and habit of growth makes shrubbery adapted to very extended use in the development of landscapes. It is especially appropriate along the boundaries of ornamental grounds (Fig. 2999), upon steep slopes, and in the immediate vicinity of buildings where foliage and graceful lines are needed to connect the walls of a structure with the ground (Fig. 3000), without making too much shade. It might with advantage replace the grass upon all surfaces too steep to walk upon with comfort. The foliage of shrubs that are well established remains green when dry weather turns grass brown. The broad mass of shrubbery will take care of itself when the grass needs frequent attention. Even some level surfaces might be improved in places by exchanging a lawn covering for the covering of low woody plants. Often a broad open space over a lawn is an important feature of a landscape, since it allows extended views. Many times a landscape would be more interesting if the green underneath this open space were produced by a broad mass of shrubbery, like a miniature forest, instead of grass.

In planting borders or groups of shrubs, the ground to be occupied by such a group should be entirely spaded over or plowed. Perhaps no better advice could be given than to prepare the soil as it should be prepared for a field of corn. The bushes should then be planted so that there is room for about two years' growth before their branches intermingle. If placed closer they would have a crowded appearance from the start and would not join their branches as harmoniously as when the new growth is allowed to choose its own position. If placed farther apart the effect is also bad. Occasionally a single shrub at the margin of a belt may stand out almost by itself, but generally the effect of a group should be that of a continuous mass of varying foliage.

3000. An effective planting against a hard corner.

2999. The open center and margined sides.

In arranging different shrubs, the taller-growing kinds should generally be placed in the center of the group, and the lower species along the border, the space being graded from the highest to the lowest. The reason for this arrangement is that the lower plants would be killed by the shade of the larger ones if placed back of them, and moreover would not be seen; but one should avoid too uniform a slope. For example, in a continuous border there should be places where shrubs of larger size occupy the full width so as to bring growth of considerable height into the lawn. The arrangement should be varied so as to avoid all monotony, but in securing this variation a mixture of miscellaneous shrubs of all kinds does not give so good an effect as broader areas of single species or genera slightly interspersed at the margin with shrubs of another kind. Straight rows should be avoided. A laborer or a novice when told this will arrange the plants in a zigzag manner, thinking that he is placing them irregularly, the result often being almost the same as that of two rows. If the group is being planted along a straight line, as the boundary of a lot, the distances of the successive plants from this line might be somewhat as follows: 2 feet, 4 feet, 5 feet, 3 feet, 1 foot, and the distances apart, measured parallel with a fixed line, should vary also.

The ideal condition of a group of shrubbery is to have all the individual plants healthy, so that the foliage will appear fresh and of good color. This foliage should extend down to the surface of the adjacent lawn or walk, and shade the ground underneath so completely that nothing will grow there. The leaves which fall with the approach of winter should be allowed to remain as a perpetual mulch. The desired result cannot be secured the first year the shrubs are planted unless they are of large size and moved but a short distance. The aim in caring for a new plantation should be to secure thrifty plants, and this care, like the preparation of the soil, should be such as is given to a field of corn.

Very little trimming should be done. If a bush is tall and spindling it may be well to cut it off next to the ground and allow it to sprout again. If there is any dead wood it should, of course, be cut off. But when a shrub is healthy and vigorous, let it grow in its own

graceful way. If it encroaches upon the walk, cut away the encroaching branch near the root so that the mark of the knife will not be noticed. Such treatment will help to retain the winter beauty of the branches.

3001. A protection of shrub and tree forms.

The value of shrubbery is not appreciated, either as part in a landscape design or as furnishing for a place. In combination with trees and woods, it ties the planting together, providing easy gradations from greensward up to the tops of trees. Merely to relieve bareness, shrubs are of singular value, as in the suggestion in Fig. 3000, and again, even when slight in quantity, in Fig. 3001. The background in Fig. 3002 is brought down to the ground-line by greenery, mostly of shrub growth. The beauties of Fig. 3003 are in large part the shrub forms and colors, and the arrangement insures much of the general effect. The reader will find that most verdurous landscapes that please him will have their furniture of shrub and bush.

O. C. Simonds.

Woods in the landscape.

The principal elements of landscape are atmospheric conditions, irregularities of the earth's surface, water, artificial constructions, herb and shrub ground-cover, and the woods. In the United States the great areas east, west, north, and south of the treeless prairie regions were mostly in evergreen or deciduous woods. Industries, habitation, and cultivation have divided the great wooded areas into small wood-lots and into forests that are for the most part broken into sprout- and tree-growth areas as the cordwood or timber is harvested in thirty- to sixty-year periods. The corresponding landscape modifications to that offered by this cutting of the forests is presented by homestead tree plantations that have broken the great unobstructed herb-covered prairie sweeps into series of tree-framed vistas. This offers a striking example of the importance of woods in landscape.

3002. A verdurous landscape of tree and shrub.—Thiergarten, Berlin.

In the arid regions of the West, the woods are confined to a meager growth in places made moist by springs, streams, or by irrigation, to mountain slopes and valleys, and to the humid regions and mountain valleys of the Northwest. In this last section, the region of sequoias, pines, spruces, and firs, are the stateliest cone-bearing forests of the continent. The white and Norway pines of the Northeast and the long-leaf pine of the Southeast, only approach the Pacific Coast Range trees in grandeur.

As landscapes of the highest types of beauty include woods, and as wood has a high economic value, one should determine how best to save woods for their beauty and to set aside the areas that should be harvested. To fix upon areas to be kept in woods and those to be used for agriculture, industries, and habitation, economic surveys should be made of large areas. In such surveys land that is ill fitted for cultivation should be outlined and set aside in public reservation, with a view to maintaining it largely in forests. Land that is suitable for cultivation, habitation, and industries should be set aside for these purposes, and the forests stripped therefrom as the land is needed. This country-side planning is already being worked out in the study of city and county. The plans of the regions about Boston, Massachusetts, in Essex County, New Jersey, and Cook County, Illinois, and of such towns as Hopedale, Massachusetts, represent studies in which forest areas are set aside, in public reservations, and the forest growth encouraged thereon.

It is not to be assumed that such forests are without other economic values than the recreation they offer to many persons. It has been found possible in the development of such areas to increase the beauty of the forests and to secure a money-return that will nearly, if not quite, cover the cost of the cutting from the sale of forest-thinning products. It is likely that under wise management such forests can be constantly increased in beauty with little or no burden of cost.

In the areas that are assigned in the economic study of a region for other purposes than permanent forest holdings, the existing forest growth may often be continued for many years as the principal crop, or new forests may even be planted and grown before the time comes to cultivate the land in annual crops.

In the development of woods in landscape, the work can be performed in such a way as greatly to increase the beauty of the existing growth, which now is seldom the primeval growth, by thinning to develop the finest specimens and the finest groups of trees. A selection can also be made in the cutting to increase the dominance of different species in different localities. Cutting may often be made to open vistas and wide views from particularly attractive viewpoints. It can also be made to develop more attractive sky-lines and foliage-masses as seen from valley viewpoints or from hilltop and ridges to distant hills and ridges.

The larger factors of beauty in landscape and the economic values of woods are of interest to the general public. To the individual owner of estates and home-grounds the woods have a more intimate and personal interest. Such owners are concerned about the protection against drifting snow, bleak wind, and hot sun, a shelter for the bird-life that protects the crops, a setting and a background for their home buildings to merge them into an agreeable landscape picture, a ramble and a picnic place where the wild flowers, the fruits, and the autumn leaves can be found by the children who love the woods. The wood-lot is also a place where many sticks of timber for special purposes and some

cordwood will be secured in the cutting from year to year of the weaker trees that are overtopped by their neighbors, and from thinning that must be made if the highest types of woodland beauty are to be developed. Bear in mind that the wood-lot in good soil may produce a cord of wood to the acre each year.

3003. A good open area, with attractive shrub forms and tree forms.

Fortunate is the owner who has an established wood-lot, and especially if he appreciates and takes wise advantage of its utility and beauty. As woods would be included the thicket of few trees in the little town lot as well as the acres of trees on the large estates, because in the cool shade and leaf-mold soil of each the same plants and bird-shelters may be established. When there is no wood-lot one must plant either evergreen or deciduous trees to make one. If the home lot is a small one and it is desired to have a little wood-lot high enough to walk under at once, at reasonable cost, tall slender collected or nursery-grown trees may be planted close together and then thinned as they grow.

If a shelter-belt for winter is the most important consideration, use such cone-bearing evergreens as the pines, spruces, hemlocks, junipers, arbor-vitæ, cypress, the last three for a narrow belt, or in the South and on the Pacific coast, such broad-leaved evergreens as the magnolia, eucalyptus, camphor tree.

It should be known that undergrowth and ground-cover plants with attractive flowers cannot be so easily established under evergreens as under deciduous trees; also that among the deciduous trees are more rapid-growing species with attractive flowers and fruit.

To grow a very interesting wood-lot in a few years from the small seedling plants that can be secured in large quantities at low cost, such plants would be set from 3 to 5 feet apart. At this distance they soon shade the ground so much with foliage as to kill out ordinary weeds and give encouragement to the more attractive woodland plants. Furthermore, close planting will force a rapid growth in height. In the selection of plants, about a third would be made up of the quick-growing low-cost species such as poplar, soft maple, negundo, catalpa, locust, and in warm sections the eucalyptus, pepper tree, grevillea. Another third would be made up of the slower-growing more permanent trees, such as oak, maple, and magnolia. The last third would be of such undergrowth, shrubs, and small trees as the flowering dogwoods, red-bud, benzoin, viburnums, white fringe, rhododendrons, azaleas, callicarpa, manzanita, and madrona. Woodland ground-cover plants may be established by bringing them in from the woods with an abundance of the natural leaf-mold soil retained about their roots.

The location for the wood-lot is at the point near the home buildings where it will best serve such purposes as are referred to early in this article, but as open land in this position is very valuable for farm uses the lot should not be large; elsewhere on the farm the wood-lot should occupy land least suited for annual crops, such as the very steep slopes and the rocky or barren areas.

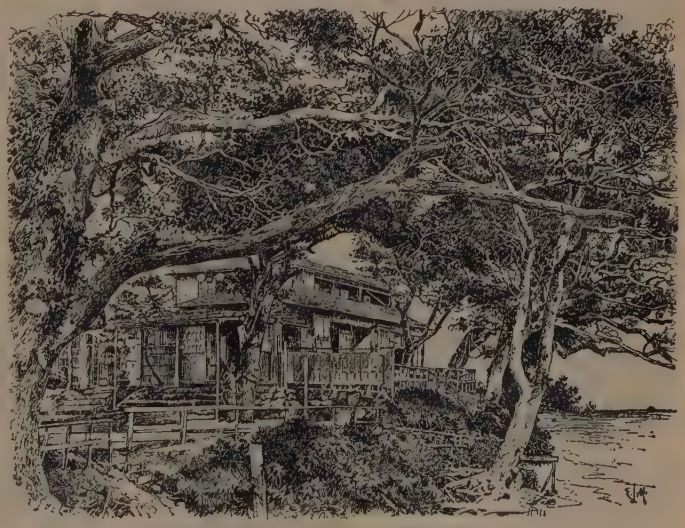
Aside from woods themselves, tree forms have their special values in providing structural features in a landscape, combining well with architectural forms and affording good backgrounds and boundaries. Strip the trees from such constructions as shown in Figs. 3004 and 3005 and note the effect.

WARREN H. MANNING.

Wild-gardening.

Wild-gardening is the art of arranging and growing colonies of hardy plants, native or foreign, so that they will look like wild flowers, multiplying with little or no care after planting. A wild-garden is not a garden that has run wild, reminding us of man's neglect; it is a poetic suggestion of the beauty of nature untouched by man. Beginners commonly suppose that wild-gardening is merely the cultivation of native flowers, as in a small border. Such an effort is worth while, but it is rarely artistic and can hardly be called wild-gardening. The main idea of the latter, originally, was to naturalize foreign flowers in larger masses than those of the garden. Wild-gardening is, therefore, a branch of landscape gardening which aims to reproduce the largest floral effects of nature with the least suggestion of man's interference.

The large facts in wild-gardening are: (1) the place or location for it; (2) the composition, as part of the landscape; (3) the kinds of plants; and (4) the small



3004. Tree forms in relation to informal architecture.—House in Japan.

or incidental effects of clumps and nooks here and there. Fig. 3006 shows a wild-garden composition; ordinarily, a wild-garden is supposed to be merely "wild" or growing at random, as in Fig. 3007, and this effect is sometimes much to be desired. The nook or corner effect of planting (4) is shown in Fig. 3008, representing a rear screen.

Wild-gardening as a distinct department of floriculture first came into popularity about 1870, when "The Wild Garden" was written by William Robinson. Robinson's first aim was to introduce more variety into English gardens, which were monotonously gaudy in the Victorian era. Because of their greater showiness, tropical bedding-plants had driven hardy perennial flowers out of fashion. Robinson put the border on an artistic plane by paying more attention to grouping, color schemes, and new varieties; he popularized the rock- and water-garden; and he created the wild-garden. His second aim in wild-gardening was to reproduce some of the loveliest floral pictures of the

3005. A background protection for an architectural construction.—Temple entrance, Nikko, Japan.

North Temperate zone which demand freedom from the garden inclosure. A third aim was to make a place for thousands of plants worth growing that are banished from conventional gardens because they have small flowers, a short season, or are unsightly when out of bloom. A fourth aim was to satisfy the universal craving for wildness.

The areas most commonly used for wild-gardening are woods, meadows, and orchards. Unfortunately, orchards cannot usually be kept in grass for many years, as in Europe. Those who are the fortunate possessors of waterside, bluffs, rocks, or sandy wastes have special opportunities for wild-gardening. Those who are confined to city lots can merely suggest the spirit of wild-gardening in lawns and borders.

The finest effects in wild-gardening are suggested not by book-study but by nature-study, paying special attention to grouping and massing. For example, if the problem is to cover a bank, the books suggest locust, willows, or other suckering plants. The beginner then covers the bank exclusively with locusts or willows, which produces an artificial or gardenesque effect. Nature rarely adopts a one-plant solution of any problem. She generally grows three or four crops on the same ground, e. g., tree, shrub, and vine, or shrub, carpeting-plant, and bulb.

If one follows the nearest river-bank for a mile or so, the finest combination may be buckeye, wild gooseberry, and American bluebells, or sumach, blue phlox, and adder's-tongue. Such combinations always give more variety than one-plant solutions, generally more color, and look wilder because they represent a mode of living worked out by ages of struggle. When one combines roses, lilacs, and peonies on a sand-hill, the plants look unhappy, especially in August, but if one plants red cedar and bayberry the plants soon look as if they had been there from time immemorial. The skill of the wild-gardener lies in detecting plant associations that will solve each practical problem and look as if they were hundreds of years old.

In massing plants so as to imitate nature the commonest notion is to scatter them indiscriminately, but this is no longer considered the surest and quickest way to produce the finest effects. The showiest floral effect in nature is the solid mass or sheet of flowers of a single kind. But this is not the finest or wildest effect. William Robinson often takes the clouds as patterns in outlining his colonies. Clouds also suggest good combinations of density and thinness in sowing seeds or planting bulbs. One of the finest floral effects in nature is the kind of massing known as "the mother country and her colonies." The object is to suggest that the flowers have sprung from seed scattered by the prevailing wind. The outlying masses, therefore, follow one general direction (without being in straight lines), and they decrease in number, size, and density as they recede from the largest mass.

Design in wild-gardening.

In the woods one generally has the greatest opportunity for intensifying the feeling of wildness, because it is often possible to shut out all suggestion of the outside world—including even the sounds of civilization. Therefore, woods are generally surrounded by an irregular belt of native shrubs dense enough to hide artificial objects from the interior of the wood, leaving openings only for the main trails. The entrances can be marked without making them too gardenesque by saving or planting any trees that naturally form a good arch or frame, as white pine often does, by planting some accent marks, such as red cedar, arbor-vitæ, canoe birch, and mountain-ash, or by training into a bower vines such as wild grape, clematis, bittersweet, or Virginia creeper. A system of trails is next established and the planting is usually made near the trails, from which the colonies are generally expected to spread gradually into the remoter parts of the wood. To secure the finest effects, however, it is necessary to plant the dramatic, or picturesque places, such as spring, brook, rocks, glades, hilltop, or outlook with the wild flowers appropriate to each situation. Wild-gardening in the woods is also known as landscape forestry.

In meadows it is possible to allow daffodil bulbs to multiply for many years, since they may not interfere with the hay crop. The foliage ripens and falls to the ground before harvest. Bulbs that bloom after harvest-time, like *Lilium superbum*, are best restricted to the edges of the meadow. But the sunny meadow generally offers the greatest canvas for painting floral pictures—daffodils by the 10,000 and narcissi either in sheets or colonies.

In fields, however, wild-gardening involves serious economic loss. Despite this fact, many efforts have been made to imitate the European grain-fields made glorious by *Papaver Rhœas*, the scarlet annual weed which is the parent of the Shirley poppies. The seed is cheap but the poppies bloom in a half-hearted fashion and vanish after a year or two.

In permanent pastures wild-gardening is limited to species that are not eaten by cattle, and the effects are necessarily scattering or spotty. On a hillside at Gravetye, Robinson has naturalized the oriental poppy in isolated clumps of about a dozen plants. This is perhaps the most daring feat with which a wild-gardener may hope to succeed, for foreign flowers as gorgeous as this cannot pass themselves off as wild flowers. The

distant effect, however, is very spirited, and the green background saves the effort from vulgarity.

On rocks the arrangement is largely determined by the position of soil-pockets large enough to grow plants. Soil can be added, but at great expense.

The waterside offers chances for unique effects, because the boldest tree-forms and colors have a mirror,

3006. A wild-garden composition, showing the landscape effect.

shrubs may obscure the line where land and water meet, and amphibious plants, like the aquatic buttercup, may swim out a few feet. Also the grace of falling water can be suggested by shrubs with arching branches, or vines planted at the top of the bank. Some of the best colonies of wild flowers are those formed by seeds falling from the top of a bank.

In roadside planting, ideals have changed greatly since 1900. Then the standard of beauty was the shrub-lined roadsides of New England. That type is rapidly vanishing from the main roads, owing to the laws against the gipsy moth and the use of the stone walls for road-making. No two miles of roadside planting should be alike. There should be shrubs enough to bring back the birds; and wild flowers arranged and maintained according to the principles of wild-gardening.

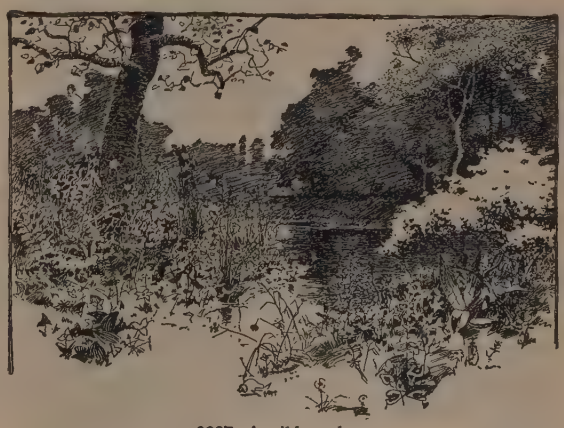
On city lots, the wild-garden shrinks merely to a border of wild flowers but differs from the hardy border of mixed perennials. The latter is a conventional arrangement of flowers, mostly of foreign origin, selected for their showy forms, colors, and succession of bloom. The border of wild flowers may become an artistic wild-garden by directly imitating some natural effect, especially a local combination or plant association. For example, in the shady border the flood-plain may be recalled by hepatica, bloodroot, meadow rue, and trillium; the swamp by cinnamon and royal fern and marsh marigold; the ravine by *Aster lævis* and blue-stemmed goldenrod. In the sunny border the prairie may be recalled by cone-flowers, compass plant, and sunflowers; the swamp by boneset, joe-pye, and blue lobelia; the riverside by mist-flower (*Eupatorium cœlestinum*) and sneezeweed; the dry roadside by butterfly weed and wild bergamot.

On city lots, also, the free meadow contracts into a close-cropped lawn, but the wild-gardening spirit is expressed in numberless attempts to naturalize crocuses and the March-blooming bulbs—snowdrop, Siberian scilla, and glory-of-the-snow. Unfortunately, they cannot ripen their foliage before the lawn must be mown, and therefore they die in a few years.

Plant materials.

There are three principles that grow out of the aim of wild-gardening, which is to grow self-supporting colonies that will look and act like wild flowers. (1) The esthetic principle is that all materials in landscape wild-gardening shall be primitive species or slightly improved varieties. This rules out all flowers that have been profoundly modified by man, such as double and round-petaled flowers of all kinds. Double daffodils thrive permanently in some meadows, but they do not look like wild flowers, as single daffodils do. May tulips and Darwins are permanent, but these also do not look like wild flowers, as do tulips with pointed petals. Cottage tulips look wilder than other late tulips, and the wildest of all is *Tulipa sylvestris*. The magnificent red flower, *Tulipa Gesneriana*, which somewhat resembles the prototype of garden tulips, is too gorgeous to look like a wild flower in the woods, but it might be used for distant effects in the meadow, if oriental poppy is considered permissible. (2) The cultural principle demands permanence in wild-gardening. Crocuses, early tulips, and hyacinths are too short-lived in long grass. English books and magazines illustrate exquisite effects in March and April made by winter aconite, European cyclamen, Grecian wind-flower, and Apennine anemone, but these are too tender or difficult for the American public to naturalize. (3) The economic principle requires that the materials of wild-gardening shall be cheap, for expensive varieties are instantly recognizable and look out of place. A good rule is to pay not more than 1 or 2 cents a bulb for daffodils by the 1,000 or 500. There are twenty to thirty varieties that can be had at this rate, and they fit the woods and meadows better than the varieties that cost 3 or 4 cents a bulb.

Foreign species offer greater temptations for display than native kinds. The danger line is that between the garden and wild-garden. This has already been indicated for daffodils, which are the unquestioned favor-



3007. A wild-garden.

ites for wild-gardening. Dutch hyacinths are inappropriate in long grass, and they soon perish. The Roman hyacinth looks more like a wild flower, but it is better to plant English bluebells or wood-hyacinths, known to the trade as *Scilla nutans* and *S. hispanica*, and the prairie hyacinth, *Camassia esculenta*. In addition to the foreign species commended, the lemon lily (Hemerocallis) is also adaptable, as its foliage harmonizes with long grass. This species looks much better beside the water than the orange day lily, which is better suited to the roadside. The most beautiful group for the water-side, probably, is the genus Iris. The famous iris meadow of the Royal Horticultural Society at Wisley, which has inspired much American wild-gardening since 1908, is a standard for combining the maximum of splendor with good taste. There is no difficulty in making the Siberian iris look wild, or the tall yellow iris of Europe, but the German and Japanese must be used with restraint, if at all.

It is safer to use large masses of native varieties than of foreign ones, but it is easy to overdo bee-balm, New England aster, butterfly weed, blue flag, and purple cone-flower, unless they are softened by shade, mellowed by distance, or veiled by long grass. Other American plants that are generally easy to manage on a large scale are marsh marigold, large-flowered trillium, wild

3008. A small wild-garden at the rear of a building.

blue phlox, spiderwort, *Lilium superbum*, boltonia, sneezeweed, sunflower, swamp rose mallow, and cardinal flower.

The ideal in the planting and after-care of a wild-garden is to betray no evidence of man's work. In planting bulbs, a good way is to scatter them on the ground, arranging them with the feet in cloud-like outlines containing about fifty bulbs, and then plant them where they lie, using a dibber or bulb-planter when the ground has been softened by the rains. Another method is to cut three sides of a sod with a spade, raise the grass, and insert five to seven bulbs at irregular distances. In the border the common unit of planting is a dozen plants; in the wild-garden fifty is a good unit. This is about the minimum that can be called a colony.

Wild-gardening was formerly considered essentially cosmopolitan in its spirit, as it still is in England. In America, however, wild-gardening commonly means the cultivation of American wild flowers, and the number of pure American compositions has greatly increased. Over $6,000,000 worth of work done in the Middle West since 1901 has been inspired by the idea of restoration.

Gardening within an inclosure is a matter of personal privilege, but wild-gardening has developed a distinct code of ethics, due largely to the Wild Flower Preservation Society of America and walking clubs, like the Appalachian and Prairie, that do not permit their members to pick flowers, and a growing appreciation of wild life

WILHELM MILLER.

Bog-gardening.

Bog-gardening depends for success on the distinction between bogs and other wet or swampy places (Vol. I, p. 519). In the marsh or swamp, drainage is usually fairly regular and free; in the true bog, drainage is practically lacking or free only during the spring thaw. Because of this lack of drainage there is in all bogs an accumulation of sourness in the bog-water, which is strongly acid and dark-colored in some glacial pot-holes, more moderately so in some of the partly drained bogs of the coastal plain regions of the country. There is usually, but not always, a deficiency of lime in bog-soils, and in nature there is a very large percentage of mycorrhizal plants in them. The relation of the mycorrhizal habit of obtaining food and the acidity of the bog is a very delicate and complex one and little is actually known of it; but experience has shown such a relation to exist.

The reason for having a bog-garden is that in it many very interesting plants may be grown that could not thrive in any other situation, and many ordinary swamp plants can also be grown along its edges. For those who have an undrained area or one poorly drained, the problem of having a bog-garden almost solves itself. But the demands of others who wish to grow the many beautiful species that will become naturalized only in such places, has led to the construction of artificial bogs. These may be of any size from a few square feet to comparatively large areas, and methods of construction must vary according to the nature of the subsoil. In places where there is a layer of hard-pan and the downward drainage is poor, it will be necessary only to dig out the desired amount, fill in enough blue clay to make the basin water-tight and then put in the mixture described below.

A more permanent and satisfactory type of construction is to make the basin of concrete, the walls and floor of which should not be less than 6 to 8 inches thick, to prevent the concrete from cracking during frost. Waterproof the concrete, and it is best to smear clay over the walls and bottom because in all concrete mixtures there is lime. The completed bog, whether of concrete or merely scooped out of the ground, should be 2 feet deep, its edges practically flush with the surrounding ground. If of concrete, sods will easily grow over it and the hard line of the rim may thus be completely hidden. One should be sure, before filling with the mixture, that the tank is water-tight, as though it were for a lily-pond. The shape of the structure, whichever type of construction is used, must be a matter of individual taste. While informality is the essence of bog-gardening, a "regular irregularity" is most to be fought against. Observation of natural bogs, their shapes and shorelines, will put the imaginative bog-gardener in possession of all the suggestions needed. As an important feature, it should be remembered that the drainage from the surrounding region should be all in, not out.

The mixture to go in the bog-garden is preferably one that has come out of a cranberry or natural bog,—muck, twigs, water, slime and all. From such a mixture, a host of very interesting bog-plants will spring up the first year and these may be isolated in clumps after the first season. A good plan when following this procedure is to let the inner part of the bog run wild, clearing a strip of a foot or two all around the edges for the cultivation of species needing, for exhibition purposes, more open spaces. Provision should be made, either in this strip or in any other open place in the bog for: (1) a place where only sand and peat soil, mixed about half and half, is found, to be used for certain plants that are described in the lists following; and (2) some small space of practically open water where the very interesting bladder-worts may be grown. The latter situa-

tion can be made by scooping out the muck for a few inches, filling in with sand and peat soil, leaving about 5 to 6 inches depth of water. For those who cannot secure muck from natural bogs, a soil may be mixed of leaf-mold, sand, and twigs and leaves of the oaks or of mountain laurel or rhododendron refuse. One should guard against getting the mixture too heavy and clayey. Sand and plenty of twigs and leaves of the species mentioned will lighten up the mixture,—leaf-mold makes it more heavy.

The management of the bog-garden requires some skill and observation. As the amount of evaporation from the surface is enormous, water must be added, either artificially or naturally. Strive to keep the bog just full enough not to overflow, thus keeping the whole sponge wet, but preventing the leaking out of the valuable acids that are the life of the bog. Both for the effect and for the good of the bog, it is desirable to cover all the open spaces in it with live sphagnum moss, which when once established, will make a delightful carpet.

Plants for the bog-garden.

Many bog-plants are very showy and worthy of cultivation. Others, such as the insectivorous kinds, are among the most wonderful plants in nature, for they have the unique distinction of being able to digest animal matter directly, a habit otherwise unknown in the realm of vegetable life. In the following account of bog-plants many are necessarily omitted, and it should be remembered that a number of purely swamp species, not mentioned here, can also be grown in bogs.

I. Shrubs.

Rhodora (*Rhododendron canadense*), purple flowers before the leaves in April and May; 3 to 5 feet.

Swamp azalea (*Rhododendron viscosum*), white or pink flowers after the leaves in May or June; 5 to 8 feet.

Sheep-laurel (*Kalmia angustifolia*), purplish pink flowers, summer; 1 to 2 feet; also *Kalmia polifolia* in northern regions.

Leather-leaf (*Chamædaphne calyculata*), small whitish flowers along one side of the branches, May; 1 to 2 feet.

Labrador tea (*Ledum grœnlandicum*), white flowers in terminal clusters; leaves russet-brown below; 2 to 5 feet.

Wild rosemary (*Andromeda polifolia*), drooping white flowers, early spring; leaves silvery below; under 2½ feet.

Creeping snowberry (*Chiogenes hispidula*), prostrate, with tiny white flowers and snow berries; leaves dark, evergreen.

There are many others, but these are the best for the temperate regions of the United States. In the South many others are to be found.

II. Perennials, grown chiefly for their flowers.

In any open part of the bog.

Calla palustris, a greenish flowered water arum having a conspicuous white spathe; showy and hardy.

Acorus Calamus, sword-shaped leaves and a finger-like flower-cluster; the root is the medicinal calamus.

Viola lanceolata, a delicate, very free-flowered violet with lance-shaped leaves.

Asclepias lanceolata, a deep red milkweed, very showy, and with smooth narrow leaves.

Potentilla palustris, the purple marshlocks, a sprawling rather rank bog-plant with purple flowers.

Penthorum sedoides, greenish yellow flowers in curved spikes in summer; native plant, probably not in the trade.

Orontium aquaticum, the golden-club, very early flowering, making a patch of gold in March or April.

Menyanthes trifoliata, with three-divided leaves and many conspicuous white flowers; the buck-bean is a valuable addition.

Helonias bullata, flowering in April to May; the swamp pink is our most conspicuous spring flower.

There are many asters, goldenrods, and eupatoriums that grow in bogs, as well as some gentians, but the bog species must be collected from the wild.

In wet sandy places.

Here must be grown all the species of Xyris or yellow-eyed grass, curious plants with long, delicate, grass-like leaves and tiny heads of yellow flowers. Also species of Eriocaulon or bunch-flowers should be grown here. They are not large, have sword-shaped leaves and white erect heads not unlike the everlastings. With these two must go the meadow-beauty, different species of Rhexia with beautiful purplish red flowers. The common *R. virginica* is the hardiest and easiest to procure.

All the plants in this class and the following are to be secured from dealers in bog-plants or collected in the wild. There are others such as Lophiola, Narthecium, and Zyadenus.

In open water.

The bladder-worts are different species of Utricularia, some with purple and some with yellow flowers, some floating on the surface and supported by air-bladders, others rooting near the edges of the pool. They are the most interesting and delicate of all bog species.

III. Bog Orchids.

Many native orchids can be grown only in bogs, and from them the following have been selected, as the most noteworthy. All are perennials and may be secured from the dealers.

Calopogon pulchellus, pink-purple flowers about an inch in diameter, June and July; leaves grass-like.

Cypripedium parviflorum, a small-flowered yellow lady's slipper; raise up so that the roots will not be too wet.

Cypripedium spectabile (*C. reginæ* or *C. hirsutum*), showy lady's slipper; beautiful rose-purple or nearly white flowers; better for a little shade.

Habenaria blephariglottis, a white-fringed orchid with a showy spike; 1 to 2 feet; does splendidly in the open sun.

Habenaria ciliaris, yellow fringed orchid; very showy spike; 1 to 1½ feet.

Arethusa bulbosa, beautiful purplish pink flowers, about the last of May; 3 to 6 inches.

Spiranthes cernua, white, slender spikes; the ladies-tresses; several others, even more slender species are known.

Besides these are over forty other species which may be collected by the enthusiast. Nearly all of our most beautiful native orchids are bog-flowers. Most of them can be grown in pure live sphagnum moss.

IV. Insectivorous Plants.

Grown more for their peculiar habits of getting food and for their odd form than for beauty. They are of several types; some catch insects in a tube-shaped leaf, drowning them at the bottom of the cup, others have sticky hair to which the insect becomes fastened, and the most wonderful of all, the dionæa, actually traps its food by a contraction of its jaw-like, prickly leaves. The best insectivorous bog-plants are as follows:

With pitchers.

Sarracenia purpurea, having short purplish red pitchers, quite hardy northward, but not easy to maintain in an artificial bog.

Sarracenia rubra, the red trumpet-leaf, with tall pitchers; does very well in artificial bog.

Sarracenia flava, also with tall pitchers but yellow.

Sarracenia Drummondii, with variegated pitchers, the largest and most showy of all.

The last three must be taken in during the winter, north of Washington, D. C.; all of them grow rapidly and, if the season is favorable, will color up beautifully.

With sticky hairs.

All the species of Drosera have the curious habit of catching and digesting insects. They are all small plants which should be planted in masses on sphagnum moss. All native species are quite hardy and many can be secured from dealers in bog-plants. *D. rotundifolia* is the best; and *D. capensis* is a good species, but hardy only South.

With contracting leaves.

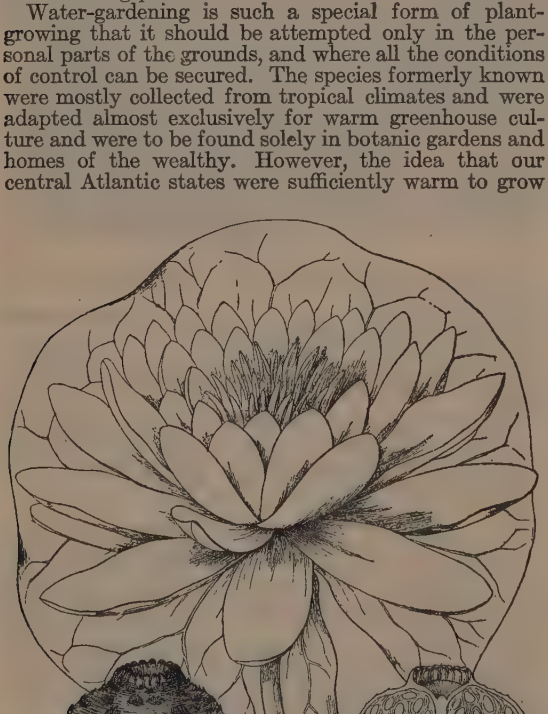
The Venus fly-trap, a low perennial with two valve-like leaves that contract whenever an insect or other irritation comes between them. Closing up rather rapidly these leaves are among the most interesting objects to see in the bog-garden. Not hardy north of Washington, D. C.

The darlingtonia, a Californian insectivorous plant allied to the eastern sarracenia, can be grown along the Atlantic coast only with protection, but south of Washington it should be hardy. One of the most striking bog-plants. See Vol. II, page 964. N. TAYLOR.

Water-gardening.

Water-gardening is the cultivation of water-lilies and the other aquatic plants, those that grow in water rather then in bogs or wet soil, particularly those that have floating parts.

Water-gardening is such a special form of plant-growing that it should be attempted only in the personal parts of the grounds, and where all the conditions of control can be secured. The species formerly known were mostly collected from tropical climates and were adapted almost exclusively for warm greenhouse culture and were to be found solely in botanic gardens and homes of the wealthy. However, the idea that our central Atlantic states were sufficiently warm to grow some of the tropical varieties out-of-doors in summer was tested in the early eighties of last century by the successful flowering out-of-doors without artificial heat of a plant of *Victoria regia*.



3009. Nymphæa tuberosa, a native water-lily readily grown in ponds. The rootstock is shown in Fig. 2555 in Vol. IV. (×⅓)

For many years the aquatic gardens in Lincoln Park, Chicago, the Shaw Botanic Garden in St. Louis, Missouri, the New York Botanical Garden at the Bronx, and Prospect Park, Brooklyn, as well as in other cities, have paved the way for the advancement of this popular and most interesting phase of gardening.

But it was not until Latour-Marliac, of France, conceived the idea of crossing species of the hardy nympheas of the United States, notably the southern species *N. mexicana* (*N. flava*) and *N. tuberosa* (Fig. 3009, from G. F.), that a great impetus was aroused in the cultivation of water-lilies. The cost of maintaining a high temperature for the cultivation of the tropical lilies, besides the necessity of having a glass structure and water-tight tanks, cisterns, and so on, seemed still to impress the public generally that it was too costly to construct artificial pools and fountain basins. The products of Latour-Marliac found a ready market in England and as rapidly as he introduced a new hardy water-lily the more enthusiasm was aroused and the more the demand increased; and their popularity naturally spread to the United States. See also the discussion under *Nymphæa*.

It has been demonstrated that water-lilies can be grown successfully in the United States; not only the hardy varieties and the hybrids but the tender tropical nympheas, the victorias, the Egyptian and Japanese lotus are to be seen, during our summer season.

Many gardens and plantings of water-lilies and aquatic and subaquatic plants are too stiff and formal. Nothing is so inartistic as regular lines on the margins of some ponds and again of crowding too many varieties in one small pond. Natural planting is in masses and groups, and single plants are admissible only in small ponds or artificial basins in small and limited gardens.

Since it is found that reinforced concrete is the simplest means of construction and that water-tight and frost-proof receptacles can be secured at moderate expense, water-gardening is rapidly developing. Also the number of species has so rapidly increased that it is no longer difficult to select water-lilies for a miniature garden, tubs, small pools, fountain basins, ponds, and lakes; also for all seasons of the year, as it has been demonstrated that these charming flowers can be had in the depth of winter.

For the small garden where there is but a limited space, a miniature artificial stream terminating in a small pool could be constructed; on either side of this streamlet may be planted moisture-loving plants such as calamus, calthas, *Calla palustris*, rushes of various kinds, menyanthes, sagittarias, lobelias (cardinal flower), *Myosotis Scorpioides*, and iris in variety; and in the pool the miniature water-lily, *Nymphæa tetragona* (*N. pygmæa*) (white) and *Nymphæa tetragona helvola* (yellow). This style of water-garden can be carried out on a much larger scale where space will permit and a much larger collection of subaquatic and moisture-loving plants can be used as well as more nympheas and of larger dimensions.

Water-gardening on a small scale can be most successfully carried out with the use of tubs, half-barrels sunken in the ground, two, three or more placed as thought best. In the rear of the tubs plant Japanese iris, flags, and moisture-loving plants, making a pleasing background, and between the tubs if ground can be kept moist, parrot's feather (*Myriophyllum proserpinacoides*), or *Myosotis scorpioides* (*M. palustris*), or *Lysimachia nummularia*, or dwarf trailing plants. For tub culture nympheas of moderate growth are preferable. *N. Laydekeri* var. *rosea* and *N. Laydekeri* var. *lilacea* are both charming varieties of pink rosy lilac, changing to rose and carmine, very free flowering. There

are several other nympheas of moderate growth and pleasing shades of color suitable for tub culture. Many persons make serious mistakes by selecting strong and vigorous plants suited only for large ponds or even lakes. The plants may live and be very thrifty but will not flower.

3010. The native fish-grass, Cabomba caroliniana; sometimes confused with Myriophyllum. (×½)

A better and very satisfactory water-garden for a small place can be had by constructing a concrete pool 4 to 5 feet, or any size desired, bearing in mind that a large pool in a small garden is inconsistent. A pool or basin 4 to 5 feet in diameter and 2 feet deep will accommodate three nympheas. The surroundings may be similar as recommended for tubs, but no two gardens are alike.

Other aquatics may be found under the genera Alisma, Aponogeton (Ouvirandra), Azolla, Brasenia, Butomus, Cabomba (Fig. 3010), Ceratopteris, Eichhornia, Elisma, Elodea, Euryale, Hottonia, Hydrilla, Hydrocharis, Hydrocleis, Lemna, Limnobium, Limnocharis, Ludwigia, Myriophyllum, Nelumbo, Nuphar, Nymphoides (Limnanthemum), Pistia, Potamogeton, Riccia, Ricciocarpus, Sagittaria, Salvinia, Utricularia, Vallisneria. See also the articles, *Aquarium*, *Aquatics*, *Nymphæa*, *Victoria;* also *Bog-gardening*, page 2666.

WILLIAM TRICKER.

Subtropical-gardening.

Under this denomination are included all those gardening efforts that aim to introduce into cool or cold climates the plant forms and the foliar luxuriance of tropical and semi-tropical regions. The subtropical garden may be permanent if it is under glass; but the term is usually employed to denote the summer effects secured by transferring glasshouse plants to the open and combining them in such a way as to produce a harmonious composition. It is not often that an approach to real tropical effects can be made in a northern garden, and yet it is well to have these effects in mind; Figs. 3011, 3012, reduced from Garden and Forest, show real tropical vegetation.

Subtropical plants are represented by the lush-leaved caladiums and cannas, the brilliant-colored foliage of crotons and dracenas, the towering plumes of palms, the succulent leaf or stem of century plant or cactus, and the dense rank ground-cover of selaginellas and todeas. The interest in such plants is chiefly in the foliage, rather than in the flowers. In the plant groups they stand at the opposite extreme from the rock-garden plants with tufts, cushions, and mats of miniature foliage that in the blossoming season are nearly covered with flowers, and thin films of mosses, lichens, and algæ on the rock and earth surface.

The subtropical plants of each of the climatic regions of the United States are usually from a warmer region, although natives having a like character may well be used in outdoor planting. The fibrous-rooted exotics, such as palms and tree ferns, are grown in greenhouses for the full year, either in permanent beds or in pots and tubs. The larger and more perfect the specimen, the greater its value. Usually in such a collection of plants under glass there are numerous species each represented by one or a few plants, all grouped together in a crowded mass. Such a collection is not a subtropical garden and does not represent the most effective use of the material.

The potted plants that have foliage tough enough to withstand summer winds and sun, such as palms, cycas, ficus, and crotons, are often used in the garden in summer, or under the protection of trees, as subtropical beds or garden compartments. Each plant is valued for itself, just as it is in the greenhouse in winter, size and perfection of form being its chief attractions. Each has no relation to the foliage about it, except that its unusual character of leaf and growth makes a striking contrast to the normal native vegetation. For this kind of planting a few well-grown specimens give the desired summer appearance to the garden.

One of the very best of indoor subtropical gardens in America is the tropical house at Garfield Park, Chicago, where a comparatively few species, such as the tree-fern overhead and selaginellas as a ground-cover, are used in large numbers to make bands of foliage to arch paths and hide the glass roof, and to frame in vistas to glimpses of water, with carpets of green below. Here is a consistent and exquisite example of subtropical-gardening, the dominant note is light with the artificial construction that supports and protects it all, so cleverly disguised as to make it appear like a real glade in the

3011. A tropical planting.—Entrance to the botanic garden, Peradenia, Ceylon.

tropics. There is an effect of airy lightness to it all that is a thrilling surprise as one passes in from the snows of winter out-of-doors. Equally as distinctive and effective results would be secured by the use of such greenhouse vines as tacsonia, allamanda and bougainvillea, or by the use of the somber greens of ficus.

In the open air, the use of palms, tree ferns, dracenas, crotons, caladiums, and ficus for summer decoration is not widespread. On large estates and in parks that can boast of greenhouses, a group planting of these subjects in the summer in the open is often to be found. In this case the outdoor use of the plants is more or less for the good of the plants and therefore little care or study is given to the grouping. The plants are "turned out to pasture" to rest up from the strenuous winter and stiffen their stems and roots for another year. Their winter appearance is their main purpose. Sometimes, especially in parks and botanic gardens, the plants are grouped by family or ecology, as a succulent group, desert group, or palm group, keeping closely to their winter arrangement under glass, more to put them under somewhat natural conditions for their best growth that they may require less personal attention from the gardener, than from a desire for any definite landscape effects.

The nearest approach in the United States (outside the very southernmost parts) to the tree-like palm vegetation of the tropics and subtropics is in the palmetto (Fig. 3013; also Fig. 3516, Vol. VI), which is native as far north as North Carolina, and is very useful as a decorative plant.

The smaller-growing subtropical plants are much used in the production of the most studied designs in planting, namely, in the construction of floral patterns, the very precise designs of city seals and the emblems of the many secret orders, "floral signs," and rarely, as in Regent Park, London, in the making of floral clocks. In these plantings, use is made of celosias, alternantheras, coleus, and echeverias and other tender succulents. This use of plants is decidedly on the wane on private estates and in the larger parks, for it has not now the sanction of fashion for the making of permanent seasonal garden features, but it has a value as display in horticultural or other exhibitions as a temporary affair, showing gardeners' ingenuity.

3012. A tropical growth.—Giant bamboo in the Botanic Garden of Ceylon. Gigantochloa atter.

One great use of individual subtropical plants in pots has been in formal gardens as decorative adjuncts. These are then distinct garden features, garden accessories of rank similar to statuary and special flowerbeds. For such effects, large "orangeries" were maintained in the great day of the formal garden in Italy and France, and the use of such plants has been retained in our elaborate gardens today.

In park planting, the use of subtropical plants often produces pleasing pictures, but only when the entire surroundings are very artificial and refined. Since the final character of a finished planting is based solely upon the foliage mass, plants of the same character only should be used in the separate plantings. The most natural effect is gained when the plants are grown in the ground, either with the pots plunged or planted directly in the soil. For this purpose the plants must be given conditions under glass to keep them alive all winter, but not necessarily in active growth, or kept in a dormant condition in pits, or stored as tubers. Plants for this purpose may be thus grouped—the taller woody plants to give height of green foliage to the group, low tender flowering herbs to give color from leaf or flower, and bulbous plants for bold leafage or bright flowers as fillers among the foliage plants.

Plantings of this kind involve considerable yearly cost for storage of potted plants or tubers, and great expense of annual planting and digging. Then there is a comparatively short season of foliage and flowers, from the time that the semi-dormant vegetation gets under way in July until cut down by early frosts. Yet effects not otherwise to be secured by plant materials can be given gardens and parks in this way. This is a use of tender plants that will be greatly developed in the future, by park superintendents and owners of large estates who have the courage to break away from the usual specimen or jumbled planting, and make real garden pictures. There is very little of this kind of gardening as yet. The temporary tropical foliage of our summer gardens is much more effectively used today than it was a few years ago, but the problem must be studied more carefully before the best possible use is made of this material.

The ideal subtropical garden gives in a small compass the feeling of the wonder and luxuriance of the vegetation of the tropics, and suggests some of its pictures, whether under great glass roofs or in the open ground in the summer.

WARREN H. MANNING.

Plants for the seaside.

Very distinctive types of American scenery are to be found along our seashores. The very dark green mangrove thickets come to the salt-water's edge on the Florida and the Gulf coasts with a backing of savannas of tall grasses, fringes, and islands of palms, and gloomy thickets of cypress trees draped heavily with the hanging gray moss-like tillandsias. Farther north on the Atlantic coast are great hills and sweeps of sand-dunes, constantly shifting, overwhelming the stunted growth of pine, cedar, oak, and maple. Here the sand-reeds push out their long fingers of undergrowth and root-fibers to hold the sand in place, and they establish conditions for shrubs of huckleberry, rose, deciduous holly,

baccharis, and iva, and give protection to the young forest trees. Along the rock-bound New England coast are wind-swept compact masses and distorted individuals of cedar, pitch and Norway pine, corresponding in a way to the similar Monterey pine and cypress of the Lower California shore. With the pines and oaks of New England are maple and shad-bush with ground-cover thickets of bayberry, rose, beach plum, huckleberry, and baccharis, and compact evergreen mats of bearberry, crowberry, and hanging curtains of the prostrate juniper over faces of ledges. In the salt-marshes are great patches of the rich green sedges, and in the flats the brilliantly colored samphires.

The main thing to be considered in the development of this native growth is to let it alone when it is well established. On the drifting sands of the dunes and plains of the seashore, plantations of the beach-grasses are made and protected as well as plantations of pines and shrubs. In California certain lupines and acacias have been successful, together with the reed, in holding the drifting sand.

There are two kinds of seaside planting: the adaptation of the usual species used in the lawn and garden to seashore conditions for effects like the usual refined planting; the other the planting for definite seaside effects by the almost exclusive use of typical maritime flora. This second kind of seashore planting is rarely attempted, as natural seaside pictures are hard to imitate. The problem as usually conceived is one of finding plants that will endure seaside conditions.

The tidal marshes are always fully planted by nature, and man can add little to good purpose. In sheltered bays, especially where the soil is good, the existing flora usually differs little from that common to the region inland, and it is no great problem to add to it. Even on the most exposed sites there is a low herbage and stunted undergrowth while a few picturesque wind-twisted trees give special distinction to the landscape. Even evergreen trees are often found near the shore-line, and the black spruce on the Maine coast, pitch pine and red cedar in southern New England, Jersey pines on the sand-barren coast of the middle states, and farther south bald cypress, until this gives way to the tropical palmetto and mangrove.

Given partial shelter near the taller woody plants, many low shrubs and herbs may be grown near the seacoast. There are many showy natives in the maritime flora and many more may be brought from Europe, though few have been tried as yet. The salt in the soil or water is rather a minor factor to many plants. More important to their welfare is the light sandy or heavy clay soil on the seashore above the tide-line. For the woody plants, the great factor is the high wind which stunts the branches and foliage. Though the winds are high, yet the temperature is more even and usually higher than at the same latitude inland. This is a favorable factor.

Since the sheltered nooks are not at all difficult to plant, it is on the exposed sites where the soil is poor that the problem is usually specially considered. If the soil is wet just above the tide-line, the beaches need no planting to hold the soil in place. When the soil is light and dry and shifts with the wind, not only is root-hold for the plants difficult, but the wind-driven sand cuts the twigs and foliage. It is here, where wind and wave meet, that several grasses do good work in holding the shifting sand in place until larger-growing plants can get a foothold. Two good sand-binders are the beach-grass (*Ammophila arenaria*) and sea lyme-grass (*Elymus arenarius*). These can be set out as small plants or the seeds sown upon the sand. Immediately branches or heavy straw should be thrown on to hold the sand for a time until the grass takes hold. When these tall grasses are established, they may be reinforced by lower tufted grasses, such as festuca and stipa.

Immediately back of this line of exposure should begin the shelter-belt of trees and shrubs. This would consist of quick-growing trees, such as some of the willows, poplars, locusts, and some of the native cherries (*Prunus serotina, P. pennsylvanica, P. virginiana,* and the like). These are to be followed by more permanent material, such as the stiff thick-growing thorns and native crab-apples, and the species of oaks and other native forest trees that will live in light soil. Trees with large or compound foliage are to be avoided. Several coniferous evergreen trees thrive in conditions close to the salt-water, particularly the white spruce, pitch pine, red cedar, and their geographical relatives. A great many trees, even the sturdiest natives, cannot thrive under extreme conditions along the seashore.

Beneath the partial shelter of groups of trees, a great many shrubs will thrive under the handicap of sand and salt and wind. Particularly worthy of note are such common shrubs as *Baccharis halimifolia, Lycium halimifolium, Ligustrum vulgare, Shepherdia canadensis, Hippophaë rhamnoides, Salix viminalis, Rhamnus Frangula, Cornus paniculata, Rhus copallina,* and the like, and among the beach-grasses *Prunus pumila, P. maritima, Myrica carolinensis, Cytisus scoparius,* and the species of Tamarix. To tie the shrubs together, several vines, as the native species of grapes, celastrus, and smilax, are very useful.

3013. The palmetto or sabal of the southeastern states.

For details of color, masses of native or exotic perennial herbs may be grown. In dry soil select some of the species of Armeria, Sedum, Lathyrus, Asclepias, Liatris, Silene, Statice, Opuntia, and so on. In wet soil try the native species of Hibiscus, Iris, Acorus, Thalictrum, Lythrum, Solidago, and their near exotic relatives. The splash of salt-water is often fatal to many annuals, but those hardy annuals that like light warm soils, as portulaca and the Shirley poppy, will give masses of bright summer color. In the planting of herbs, there would be no special soil-preparation, or after-care, as refined garden effects are here out of place.

Three distinct purposes are served by a judicious seaside planting: shelter from strong winds to benefit the crops and man, checking of shore erosion and sand movement, and definite landscape effects. One should not so much strive to secure gardenesque effects but rather to intensify the natural features of the landscape.

Examples of successful seashore planting are numerous along the coast of New England where summer colonies of the wealthy have been established, parts of Long Island, and in many places along the coast of the Middle Atlantic states. The first work in seaside planting in this country was to prevent shore erosion, and from this work have developed the further uses for shelter and landscape effect. The problem of the shores of the Great Lakes is very similar, and much excellent

work has been undertaken along the shore of Lake Michigan, just north of Chicago. A consistent plan for the development of this particular shore has been advocated.

There are few books devoted wholly to the problem of seashore planting, and much experimenting is yet to be done. See "Seaside Planting of Trees and Shrubs," by Alfred Gaut (England) and "Gardens Near the Sea," by Alice Lounsberry. WARREN H. MANNING.

Succulent plants and their culture.

Succulents are fleshy plants of many kinds, but forming a cultural group well known as such to gardens. They are grown mostly for their striking or grotesque usually condensed form, and not for the verdurous character of foliage and spray; and some of them are notable for their showy bloom.

This aggregation of plants is comprised of genera and species of several very remotely related families. Cactaceæ, perhaps, contains the largest number of genera and species belonging to this group, although not all members of the family are strictly succulent in habit. Next in point of number is undoubtedly Amaryllidaceæ, represented by Agave and Furcræa, with Euphorbiaceæ as a close third, represented almost wholly by the great genus Euphorbia, although a few species of Pedilanthus are to be included. Crassulaceæ comprises a large number of genera and species, nearly all of which are succulent in habit of growth, although comparatively few genera are common in cultivation. Conspicuous among these crassulaceous things may be listed Bryophyllum, Cotyledon, Crassula, Echeveria, Kalanchoë. Sedum, and Sempervivum. In Asclepiadaceæ the group is represented chiefly by Stapelia, although, to a limited extent, one finds in cultivation representatives of Caralluma, Ceropegia, Duvalia, Echidnopsis, and Heurnia. Bromeliaceæ gives two genera, Dyckia and Hechtia. Liliaceæ contributes Aloe, Apicra, Gasteria, Haworthia, and a comparatively small number of species of Yucca. The great family of Compositæ has representatives in a section of the genus Senecio. By some authors this group of senecios is considered as having generic standing under the name Kleinia.

3014. A formal bedding design in succulents.

In their wild forms, succulents are native to widely separated geographical areas, for the most part being indigenous to the arid or semi-arid regions of Asia, Africa, North and South America, and the West Indies. They have this in common, however, that the climatic and soil conditions of these remote habitats are comparable and such as to induce just the characteristic growths that these plants exhibit. For this reason they are usually brought together, in cultivation, and given the same or very similar treatment.

The use of succulents.

Many of the succulents are very attractive and ornamental grown either as single specimens, in groups of one class, or when different genera and species are brought together in mixed planting. For the most part the agaves are too large and bulky to be used to advantage other than as single specimens and a few species are not uncommonly employed in this way. Among these may be mentioned *Agave picta*, the variegated forms of *A. americana*, *A. atrovirens*, and *A. Milleri*. They are commonly grown in tubs to facilitate handling. Thus treated, they are housed in winter and in summer are placed in some favorable location on the lawn. Some of the best yuccas are hardy as far north as New England and the lake region. *Yucca filamentosa*, *Y. gloriosa*, and *Y. glauca* have received considerable attention. They are attractive as single specimens, in small groups on the lawn, or when used as border plants with a shrubbery background. In summer they produce large panicles of showy white waxy flowers which are very striking throughout the daytime and are especially so by twilight. The foliage being evergreen gives an added value to the plants for winter effects. A considerable number of this group of plants is well adapted for use in window-gardens. The very grotesqueness of some and the remarkable symmetry of others appeal to one's interest as much as do many gaudy and highly colored flowers of other classes of plants. Furthermore, a large proportion of these plants produce very excellent flowers, and frequently the resulting fruits are equally showy. Among the species valuable for individual pot-plants may be mentioned the following. Nearly all the echeverias are attractive in both foliage and flower characters. The globose and stemless rosette forms of sempervivum, commonly known as hen-and-chickens, are especially noteworthy. The production of numerous offsets and these appearing from beneath the foliage of the parent are very interesting and suggest the application of the common name.

A very large number of the smaller cacti deserve consideration. The crown of flowers, followed by a like crown of colored fruits, is particularly pleasing. The numerous species of stapelias are easily grown and in the autumn produce a variety of strikingly showy flowers. Their one objectionable feature is the disagreeable odor of the freshly opened flowers, but this passes away in a very short time, while the flowers remain open for several days.

Not all the succulents lend themselves well to ornamental planting, although many can be thus used and very pleasing effects are produced. The small globular and short cylindrical cacti, with their great diversity in color of the plant-body and of the spines, give material for very effective combinations in design work. They have this advantage over foliage plants used in such work, inasmuch as their growth is so slight that the plants may be placed close together at the beginning and, without any special subsequent care, the design thus formed will retain its full outline throughout the season. A suggestion of the possibility of using cacti in this way is to be seen in the accompanying illustration (Fig. 3014). For this class of planting echeverias are undoubtedly the best material obtainable. The individual plants are equally as symmetrical and pleasing as the cacti, and the range of color variations among the species is fully as great. They have the added advantage that they can be propagated more easily and more abundantly than is possible with cacti.

When a large number of mixed genera and species of succulents is available, exceptionally attractive plantings may be produced by a combination of these in more natural rather than formal designs. (Fig. 3015.) These appear to best advantage when planted among rocks and the soil surface covered over with gravel and sand. Such treatment not only gives a more natural appearance to the planting but is advantageous because it keeps the plant-bodies from coming in contact with

the earth, which to most of them is very injurious if the soil is wet for any considerable time. In northern climates these beds must necessarily be but temporary combinations, to receive the plants for the summer months. In the south and southwest regions, where most of the succulents are quite hardy, the planting may be made permanent. In such cases very pleasing effects are produced by planting on a sloping surface, in more or less raised beds or, better still, in rockeries.

3015. An informal planting of succulent subjects.

The cultivation of succulents.

For a general rule, it may be stated that all succulents require an open porous sandy soil and perfect drainage. Other conditions, such as watering and atmospheric humidity and temperature, must vary somewhat with individuals or with special groups. Nearly all the species are very easily grown from seed, although in many cases vegetative reproduction is more available. In fact, some species have natural adaptations for propagation in this way as well as by seeds, and quicker returns may be had from the vegetative methods. The method employed in propagating cacti from seed has given equally excellent results when applied to all other genera of succulents and is therefore given in all essential detail.

Cacti are especially easy to start from seeds and with proper care may be readily brought to maturity. Experience teaches that such plants are better adapted to greenhouse treatment than those brought in from their native wilds. The latter suffer from the shock of radically changed conditions. For a germinating vessel, nothing can be more convenient than a 3- or 4-inch pot. If not fresh from the pottery, this should be thoroughly sterilized. Sterilization can be accomplished by soaking and washing in a dilute solution of copper sulfate (blue vitriol) and subsequently rinsing well; or the pots may be placed in a furnace till all organic matter has been destroyed. This sterilization is necessary for the reason that the seedlings must remain in the seed-pot for a considerable time before it is possible to transplant them. If not sterilized, the pot is likely soon to be covered with algæ or other organic growth and this, spreading over the surface of the soil, will quickly smother the young plants. For the same reason also, the soil should be thoroughly sterilized. This seeding soil should be very sandy with only sufficient humus mixed with it to furnish food for the young plant, of which a very little is sufficient. To insure perfect drainage, the pot is filled at least one-fourth full of broken bits of pots or charcoal, on top of which is placed the soil up to about ¾ inch from the top. This is jarred down lightly and the surface leveled. The seeds are then scattered evenly over the surface and firmed down with a flat-faced cylindrical block. Over the seeds is placed a layer, about ⅜ inch deep, of fine gravel not larger than a small pea. One of the chief drawbacks in growing cactus seedlings is their susceptibility to "damp off" in their younger stages. The protection afforded by this layer of gravel removes that danger. It also prevents any baking of the surface of the soil. The pots are then placed in a pan of water and allowed to remain until the water shows on the surface of the soil. Subsequent watering can be accomplished with a fine spray, applied to the surface of the gravel.

After planting, the seed-pots should be placed on a bench which is insulated in vessels of water or, better, in water with a surface coat of oil. This oil is to exclude ants, which have an especial liking for cactus seeds. Best results are secured in a humid atmosphere and a temperature of at least 70° F. The seedlings of most genera ought to appear within ten days, but opuntia may require a little longer. When the seedlings begin to show spines, they may be transplanted into small flats of earth into which a little more humus or sod soil has been mixed. They may remain in these flats for one to several years, depending on the rapidity of growth in different species. Eventually they are potted off as individual specimens or placed in the open ground.

It is only in the southwest states that many of the cactus plants are hardy enough to be permanently planted out-of-doors. Throughout the greater part of the United States they are tender and require greenhouse protection in winter. In this colder region they may be planted in the open ground of a conservatory, where they thrive excellently, or they may be kept in pots in winter and, in the hottest part of summer, be removed to the outside and the pots plunged in beds.

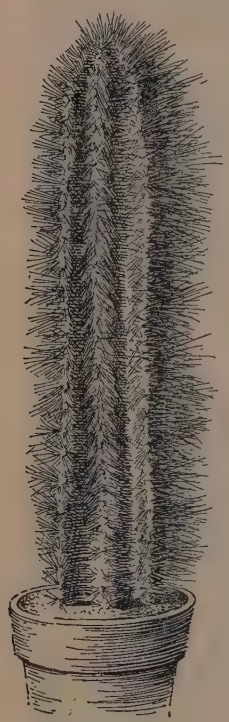
Almost any cactus will readily strike root from cuttings. The cut surface must be allowed to dry for several days, until a corky layer has formed over it. The cutting may then be placed in sand to root, its base but little below the surface. If slender, the cutting should be tied in position to a supporting stick.

Grafting of cacti is almost unlimited in its possibilities, although employed only in particular cases. Small globose forms, such as mammillaria (Fig. 3016), echinocactus, echinopsis, and others, are frequently grafted on some abundantly rooting cereus. Good stocks are provided by *Cereus Bonplandii* and *C. tortuosus*, though

3016. A condensed cactus form.—Mammillaria micromeris. (×⅓

almost any of the smaller columnar forms may be used. With these cions and stocks, it is necessary only to make a smooth horizontal cut across each and place the two flat surfaces together. The cion is held in position by placing soft strings or raffia over it and tying the ends firmly about the stock or to sticks thrust into the earth. Zygocactus (the old epiphyllum), rhipsalis, and

Aporocactus (or *Cereus*) *flagelliformis*, which are epiphytic species, do well when grafted on slender upright species of cereus, but are more commonly placed on pereskia. If zygocactus is used as a stock, cleft-grafting is usually employed; if rhipsalis, either the cleft- or saddle-graft. Cristate forms treated as cuttings usually develop normal-formed new growths, but when grafted will continue the cristate character.



3017. An elongated cactus form.—Lophocereus Schottii.

Although it is possible for cacti to survive a long drought in nature, yet when grown in pots they are seriously injured if their roots remain dry for any considerable time. They should not be placed on benches over the heating-pipes, where the soil soon dries. It is desirable to have the soil cool and the air overhead warm and rather dry for all desert forms. Contrary to a prevalent opinion, they require water. This should be applied in sufficient quantity only to keep the soil moist. A saturated soil quickly induces a soft watery rot which is fatal to the plant. This is especially likely if the soil contains any organic matter that has not been thoroughly decomposed. A small amount of lime in the soil is desirable, and soil should never be sour. Perfect drainage is necessary at all times.

Many species of cereus and phyllocactus (now properly epiphyllum) climb over trees or rocks by means of aërial roots. These are indigenous to the more tropical regions and should be grown in a separate room from the desert forms, in one where the atmosphere can be kept at a higher degree of humidity. They should, also, be provided with suitable supports on which to climb. Zygocactus, rhipsalis, and other epiphytic cacti, may be successfully grown in this same room, but suspended in baskets in the way in which orchids are treated.

Agaves and furcreas, although readily grown from seeds, are more commonly propagated from suckers, or from the bulblets produced in abundance in the inflorescence of many species. For these plants a good soil is one of half sod and half sand. In nature they do not form deeply penetrating roots but widely spreading horizontal feeders. In pot or tub culture, the roots quickly reach the walls of the container and the plant very soon becomes pot-bound. Furthermore, if the container is allowed to remain dry for any time the roots are seriously injured thereby. When possible, it is better to plunge the pots or plant directly in open ground.

Euphorbias and pedilanthuses are best treated in every way as are the cacti. Their cultural methods differ but very little. While it is possible to grow them from cuttings, it is less easily accomplished than with cacti. The cut surface should be placed immediately in powdered charcoal to check the flow of milky sap. When the surface is thoroughly dry, the cutting may be rooted in finely broken charcoal or in sterilized sand. These plants are very susceptible to bacterial rot. Grafting is possible but difficult. It is sometimes employed to preserve a cristate growth of the cion.

Most genera of Crassulaceæ are propagated more readily from seeds or from stem-cuttings. There are a few noteworthy exceptions, however. Bryophyllum can be more quickly and just as abundantly multiplied by placing matured healthy leaves flat on wet sand and kept in a moist warm atmosphere. In a very short time tiny plants will appear in the notches about the margin of the leaf (Fig. 673, Vol. I). When of sufficient size these may be removed and potted as individual plants. In most species of echeveria, multiplication is best accomplished by carefully removing the healthy mature leaves and placing them on sand as with bryophyllum. The base of the leaf must not be injured, for it is from this point that the one or more young plantlets develop. The leaf-like bracts on the flowering stock of many species are very easily detached and propagate even more readily than the normal leaves. The above method is adapted to the acaulescent species of echeveria. With the caulescent species the rosette is cut from the top of the stem and treated as a cutting. The parent plant, thus pruned, will soon throw out a number of growths from the dormant lateral buds. As soon as these have formed rosettes of about an inch in diameter they, too, may be removed and will readily grow as cuttings.

Many Crassulaceæ, and echeverias in particular, suffer severely from attacks on their roots and the base of the stem by nematodes. For this reason only clean fresh or sterilized soil should be used in growing them. The various genera and species may be grafted back and forth but no special advantage is to be gained by the process. It is also possible to hybridize between the genera and the species, and a number of interesting results have been secured. Some of the echeveria hybrids have proved to be valuable additions to the group used in design work or for bordering other beds.

Asclepiadaceæ is most commonly represented in collections by the genus Stapelia. These plants fare excellently when given the treatment recommended for cacti. The chief difficulty in growing them, in the past, seems to have been their proneness to decay at the surface of the soil, especially in wintertime. This is easily prevented. See that the drainage is perfect and use porous sandy soil. Spread the roots out on the surface of the soil and cover not more than ½ inch deep with more soil. Over this place an inch layer of gravel about

3018. A garden scene in which topiary craft is a feature.

the size of peas. Their susceptibility to decay at the surface is comparable to the damping-off of seedlings. The mulch of gravel is invaluable in remedying both maladies. Keep the soil moist but never saturated, and do not permit the roots to become excessively dry. This treatment will insure good continuous healthy growth and, in autumn, a reward of many attractive flowers. The other genera require like treatment. Grafting of genera and species is easily effected but of no special cultural value. Owing to the highly specialized structure of the flower in Asclepiadaceæ, it has thus far been impossible to effect artificial pollination, although natural hybrids, through the agency of flies, are very common. This is especially true in stapelias. Bigeneric hybrids have been reported.

Dyckia and hechtia of the Bromeliaceæ and yucca, and the aloe group of the Liliaceæ, should receive the same treatment as agave. The species are more commonly propagated by seeds, and the hybrids by division and stem-cuttings or division of the crown. Senecio (Kleinia), of the Compositæ, may be propagated either by seeds or by cuttings. With them, also, grafting is possible.

C. H. Thompson.

Topiary planting and garden architecture.

Topiary work includes sheared hedges, pollarded trees, clipped individual shrubs, whether shaped into simple, rounded, or pointed form, or into more elaborate designs. It includes the trimming of masses of foliage into the form of birds, beasts, furniture, architecture, and other conceits. The more intricate designs are usually attempted in evergreen plants.—Garden architecture comprises all structural or architectural elements introduced into the landscape except the main buildings that are to serve the primary uses of a property. This definition thus includes all walls, trellages, posts, gates, pavilions, exedras, loggias, pergolas, shelters, fountains, bridges, seats, pavements; closely related with it are garden and lawn ornaments and furniture, such as statuary, vases, urns, dials, bird-fountains, lanterns, and the like. It includes the plain, the simple, and the rustic, as well as the more elaborate, ambitious, or ornate. Virtually all of the historical architectural styles are represented or suggested in the forms of garden architecture. For interesting illustrations and discussions of these subjects, the reader should consult Blomfield and Thomas, "The Formal Garden" (London), from which Figs. 3018 to 3023 are adapted. Compare, also, Fig. 3025. Fig. 3024 shows a common form of vase, used not so much for its architectural placing as for a receptacle in which to grow flowers.

Topiary and garden architecture, although distinct and separate, are nevertheless essentially related, both in origin and in use. Both have their inception in the virtually universal formality of all early landscape design, and historically and at the present day they frequently stand side by side as related elements of a design.

For many centuries gardening was conducted behind inclosing and protecting walls, a practice made necessary by the uncivilized conditions. In general, such inclosed gardens were rectangular or geometrically regular, and comparatively small. They existed in immediate proximity to the owner's dwelling or adjacent to the building. The necessity of conserving ground and of utilizing it most efficiently lead naturally to arrangement and planting in straight lines and rows. Utility having thus first determined a regular arrangement of plant-materials in close proximity to architecture, esthetic composition, in its turn, attracted the attention of more cultured man and formal design in landscape gradually evolved.

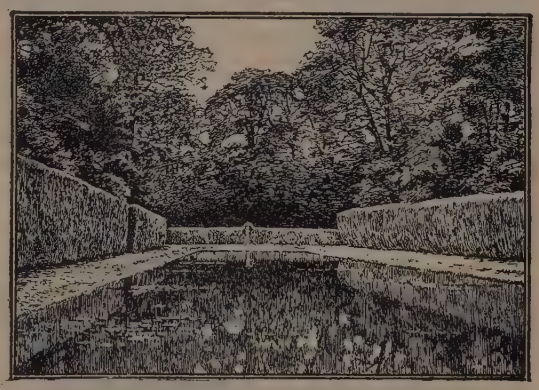
Both garden architecture and topiary are attributes of the formal in landscape design, which is determined by lines, axes, and balance of parts. The inappropriate use of either results in inharmonious and bad design and constitutes an esthetic abuse.

The following plants are well adapted to topiary treatment:

Note: E means plants evergreen.
P means plant must be protected in climate of Boston.
S means plant is semi-evergreen.

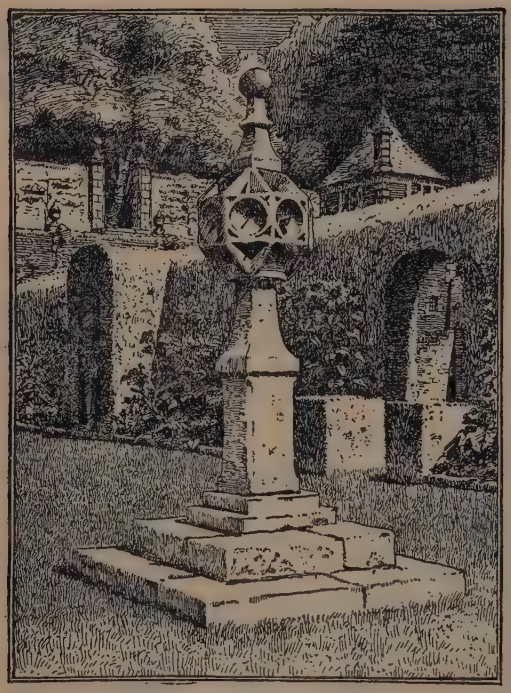
Acer campestre.
Acer platanoides var. globosum.
Berberis Thunbergii.
E—Buxus japonica.
EP—Buxus sempervirens.
Carpinus Betulus.
Carpinus Betulus var. globosa.
Catalpa bignonioides var. nana (=C. Bungei in the trade but not the true C. Bungei from northern China). A dwarf variety of the southern catalpa often grafted high on upright stem.
E—Chamæcyparis nootkatensis.
E—Chamæcyparis obtusa var. nana (=Retinispora in the trade).
Cornus mas.
Cratægus Oxyacantha.
Evonymus alata.
E—Evonymus radicans.
EP—Ilex crenata. (A small-leaved variety of this has grown in the Arnold Arboretum at Boston entirely unprotected.)
E—Ilex glabra.
Ligustrum Ibota.
Ligustrum Ibota var. Regelianum.
PS—Ligustrum ovalifolium.
S—Ligustrum vulgare.
E—Picea excelsa.
E—Picea orientalis.
E—Pinus Cembra.
E—Pinus densiflora var. pumila.
E—Pinus montana.
E—Pinus montana var. Mughus.
E—Rhamnus cathartica.
E—Taxus cuspidata.
E—Taxus cuspidata var. brevifolia.
E—Tsuga canadensis.
Viburnum Opulus var. nanum.
Viburnum prunifolium.

In the growing of the plants for topiary use, no special care is required except to be sure that the plants are well grown in the nursery, vigorous, and naturally thick-topped and fine-twigged. If the piece



3019. A wall inclosure of topiary work.

is to be a hedge or continuous line, the plants should be very uniform in size and vigor when set and the ground should be prepared in uniform condition so that all the subjects will have equal chance. The plants should be set close together. Clipping should be begun soon after the plants are established to keep them close and to develop and preserve the side and lower branches; and the clipping should be practised several times each year. If the plants once overgrow, so that they become open and scraggly below, they can never be brought into good condition. Great care must be exercised to see that insects and disease do not get started, and that the plants suffer neither from drought nor wet feet and that they are well supplied with nourishment. See *Hedges*.



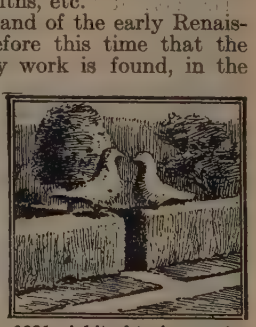
3020. Topiary walls and a dial.

Topiary work, as well as architecture, appears in gardens of many different ages. In fact, the whole history of gardens but emphasizes the continued use of formal foliage and architecture as essential elements in their design. As stated by Blomfield, "The word 'garden' itself means an enclosed space, a garth or yard surrounded by walls, as opposed to an unenclosed field or woods. The formal garden, with its insistance on strong bounding lines, is, strictly speaking, the only 'garden' . . . ; and it is not till the decay of architecture, which began in the middle of the eighteenth century, that any other method of dealing with a garden was entertained." The common use of hedges for the inclosing of gardens doubtless came into use when the more settled conditions made it unnecessary to retain masonry walls for protection.

In the writings of Pliny the Younger, who was born A. D. 62, is the most complete description of the Roman gardens. In a letter addressed to his friend Appolinaris, he describes the garden attached to his Tuscan villa: "In front of the Portico is a sort of Terrace, embellished with various figures, and bounded by a Box Hedge, from which you descend by an easy slope, adorned with the representation of divers animals in Box, answering alternately to each other; this is surrounded by a walk enclosed with tonsile evergreens, shaped into a variety of forms. Behind it is the Gestatio, laid out in the form of a Circus, ornamented in the middle with Box, cut into numberless different figures, together with a plantation of shrubs prevented by the shears from running up too high; the whole is fenced by a wall, covered with Box rising in different ranges to the top . . . ." After describing several summer-houses he proceeds: "In front of these agreeable buildings is a spacious Hippodrome encompassed on every side by Plane Trees covered with Ivy. Beneath each Plane are planted Box Trees, and behind these, Bays which blend their shade with that of the Plane Trees. This plantation forms a straight boundary on each side of the Hippodrome. . . . Having passed through these winding allies, you enter a straight walk, which breaks out into a variety of others divided off by box hedges. In one place you have a little meadow; in another the Box is cut into a thousand different forms; sometimes into letters expressing the name of the master; sometimes that of the artificer; whilst here and there little Obelisks rise intermixed alternately with fruit Trees; when on a sudden you are surprised with an imitation of the negligent beauties of rural Nature, in the center of which lies a spot surrounded with a knot of dwarf Plane Trees. Beyond these is a walk . . . where also Trees are cut into a variety of names and shapes. . . . At the upper end is an Alcove of white marble shaded with Vines, supported by four small Pillars of Corystian Marble. From this bench the water, gushing through several small pipes, falls into a stone Cistern beneath, from whence it is received into a fine polished Marble Basin, so artfully contrived, that it is always full without ever overflowing. . . . Corresponding to this is a fountain, which is incessantly emptying and filling; for the Water, which it throws up to a great height, falling back again into it, is, by means of two openings, returned as fast as it is received. Fronting the Alcove stands a Summer House of exquisite Marble, whose doors project into a green enclosure; as from its upper and lower windows the eye is presented with a variety of different Verdures. Next to this is a little private closet . . . . Here also a fountain rises and instantly disappears; in different quarters are disposed several marble seats, which serve, as well as the Summer House, as so many reliefs when one is wearied by walking. Near each seat is a little fountain; and throughout the whole Hippodrome, several small Rills run murmuring along, wheresoever the hand of Art thought proper to conduct them, watering here and there spots of verdure, and in their progress refreshing the whole."

The Romans, establishing themselves in England, built gardens in which topiary work was doubtless to be found. Otherwise, in England prior to about the eleventh or twelfth centuries, gardening as an art of design and taste can scarcely be said to have existed. It is recorded, however, that in 1123 Henry the First formed a park at Woodstock, and it is the first of which authentic record has been preserved. It was probably intended chiefly as a game-preserve but contained, however, a labyrinth. And it is recorded as the custom of the times for the nobility to develop pleasure-gardens in the orchards beyond the walls of their castles, the chief embellishments of which consisted in "plants cut into monstrous figures, labyrinths, etc."

It is in the gardens of England of the early Renaissance periods and shortly before this time that the most extensive use of topiary work is found, in the greatest variety and elaboration of form. Topiary art was practised, however, in all European countries for centuries. It has been given particular and peculiar expression in each of several countries. The Dutch developed the art of carving in verdure at an early date and many strange and curious forms in box, along with many rare and flowering plants, were introduced into England from Holland. In France and Italy it was not so much a large variety of elaborate and intricate topiary as an extensive use of the simpler forms of clipped foliage as a means of gaining effect in larger, more monumental, and pretentious landscape arrangements than were elsewhere undertaken. The architectural gardens of the Italian Renaissance exemplify the effective and appropriate use of architecture in the garden. Here trees, naturally formal in habit, are combined with sheared hedges and edgings. These wonderful gardens teach the remarkable effectiveness



3021. A bit of topiary craft.

of such method in design when executed by the master hand.

The designers of the tremendous and monumental landscape arrangements executed in France in the later Renaissance periods gained distinctive effects by the very bold use of sheared foliage; they virtually carved their broad axially related plans out of the woodland. The "Bosque" in French design is comparable to the "Topiary grotesque" in the English. The French parterre gardens, in which intricate and elaborate geometrical designs are worked out in low sheared foliage or bed edging and white or colored gravel, are another expression developing from the same original motive as produced the topiary bird.

3022. An attractive dial.

In the colonial gardens in America topiary work was common, mostly in the simpler form of clipped hedges, generally of box, and box-edged parterre gardens. Remains of many of these old gardens are still to be found in the Atlantic states, and a few old gardens are still in a good state of preservation and cultivation. The box-garden at Mount Vernon is perhaps the most noted, and is in an excellently preserved and restored state at the present time. See Plate XLVI, Vol. III.

A moderate amount of interesting and good topiary work is under way in gardens in this country today, and a few nurserymen are in position to furnish good clipped specimens in a variety of designs. The use of topiary work other than simple clipped hedges should be carefully and advisedly undertaken, however, for it is appropriate only when the whole architectural style of a property makes it suitable and when it becomes an inherent part of the scheme as a whole.

Garden architecture.

Any structure or structural element placed out-of-doors in nature takes on the significance of architecture, and must bear judgment as such. Landscape as such is either nature's work or man's work with nature's materials in their natural form. The placing of architecture in the landscape is always the combining of the obviously artificial with the natural, and the two must be brought into harmony. It is a deplorable fact that when, with the exercise of judgment and good taste, it is possible to attain harmony in the least costly as well as in the most expensive, so much bad and inharmonious architecture encumbers the landscape.

Under any circumstances, architecture becomes to some extent a feature of accent in the landscape, at least within its immediate surroundings. It is emphatic in contrast with its setting and always functions as focalizing the composition of which it forms a part.

In general, it is wiser to attempt a simple design and insure its substantial construction than to undertake the ornate in garden architecture. There is a world of interesting precedent in simple designs for the many smaller architectural embellishments of the garden, such as summer-houses or pools, pavements, seats, dial-bases, boxes, tubs, jars, and other ornaments and accessories. The use of simple boxes or ordinary pots for flowers and specimen plants is to be encouraged, and the conversion of such inappropriate materials as plumbing fixtures into garden ornaments is to be condemned. The usual cast-iron vases and the like are marks of a passing era of bad taste. In lawn pottery, in the form of pots and vases, excellent designs are now to be had, as also of sun-dials.

No one consideration is more important than that the architectural style of even the simplest seat or sun-dial be similar to that found in the larger architecture of the building or buildings to which the landscape development may be related.

3023. Vase at Hampton Court.

A number of reputable firms now produce substantially made garden furniture in considerable variety of good designs and in many different materials. Particularly good garden seats and garden pottery are now obtainable at reasonable prices and may be found in shops in some of the larger cities. The advertisements and trade catalogues of the manufacturing concerns are interesting and instructive.

However, the obtaining of individually well-designed and substantial articles having been assured, there remains still the selection of appropriate patterns. Garden architecture should correspond to the style, architectural and otherwise, of a property as a whole. Its appropriate use is its justification.

Rustic work is fitting and often most appropriate in a naturalistic setting. It is, however, architecture and should be so designed as to bear analysis as such. It should be structural in its line, and substantial. It is best when simple and unobtrusive in design. It is seldom appropriate when fantastic or whimsical. The occasional use of rustic work in such way that in its rough character it appears almost to have grown up with the surrounding wild conditions is very pleasing, particularly good unobtrusive seats, bridges, and shelters.

3024. Stone flower vase 4 or 5 feet high, used as a plant basket.

EUGENE D. MONTILLON

Planting for winter effect.

Winter is the season when there is the least sunshine, and the least sign of life and color in vegetation. As a floral festival, Christmas ranks second to Easter, owing doubtless to the relative scarcity and higher cost of materials. The ideal is for every family to grow its own flowers for Christmas gifts, but most persons have to content themselves with less personal products purchased from the florist. Holly is the symbol of Christmas as

the lily is of Easter, each exemplifying the dominant color of the season. The popular demand in winter is for signs of hope and courage—hence the red berry, flower, or ribbon.

The phrase "winter-garden" has been used for a great variety of projects, indoors and out, ranging from the metropolitan restaurant with a few bay trees in tubs, to a winter home in Florida where one may work outdoors every day and all day. Notable progress has been made along many lines since 1900 in the art of living the year round amid beautiful vegetation.

Indoor winter-gardens.

Perhaps the oldest use of the phrase winter-garden refers to a type of unheated or little-heated greenhouse which was popular in England when plants from the Cape and Australia were fashionable, but was generally a museum of potted plants rather than a garden. A new stage began in America about 1905, when Mrs. J. W. Stewart, of Glen Ridge, New Jersey, made a real garden under glass. (C. L. A. 13:168–70.) It has a broad lawn to tread upon, instead of narrow concrete walks, and in place of potted plants raised in tiers for show, there is a continuous border 3 to 4 feet wide, with bulbs and other flowers growing out of the earth at the familiar garden level. The temperature is that of a living-room. Another new stage began in 1906 when the conservatories in Garfield Park, Chicago, were completed. These were not the first attempts at landscape gardening under glass on a large scale, but they are believed to be the most impressive series of indoor nature-pictures in the world. Portable greenhouses and window-gardens now make it possible even for renters to have something more than a few potted plants on the window-sill. Those who can afford no glass may at least force twigs in water, preferring the early bloomers, like peach, plum, and forsythia to the late bloomers, like lilac and dogwood. In this line, the most notable achievement, of late, is the forcing of stems 6 to 8 feet high, by keeping them in a slightly heated attic until wanted for the living-room.

Outdoor winter-gardens.

The southern states have a winter climate that makes outdoor work pleasant, and a landscape rich in types of beauty, as evergreen magnolias, long-leaved pines, and winter roses. Southern winter-gardens have their problems, but they can receive less notice here than the more acute problems of northern climates. A country with an evergreen grass, like Ireland, has a great advantage over America for winter beauty. English children are well protected from bitter winds by the omnipresent walled-garden or high-hedged home grounds. The formal winter-garden of England is often merely a straight walk, between high walls of clipped yew. Wordsworth's winter-garden is an early example of the naturalistic winter-garden, i. e., a sheltered spot surrounded by informal masses of trees and shrubs noted for their winter attractions.

3025. A winter-garden, presenting evergreen forms in tree, bush, and box borders.

3026. A good winter form.—One of the retinisporas.

In the northern states, however, it is neither safe nor pleasant to garden out-of-doors every day, and the winter landscape is commonly bleak, ugly, bare, or commonplace. Our most pressing problem, usually, is shelter from winds. On the plains and prairies many homes are surrounded by shelter-belts, but the landscape effect is not the best, owing to the artificial outlines of the farmsteads, the ill-concealed barnyards, and the inferior species used—soft maple, box elder, Norway spruce. Windbreaks in straight lines, protecting orchards or stock, sometimes give a spirited army-like effect, but may become monotonous in a country where everything seems to be rectangular. In the East naturalistic shelter-belts are commoner. The practice of moving large evergreens with a half-frozen ball has developed notably since 1900, and full-grown evergreen hedges can be secured to shelter winter playgrounds.

Most persons see little beauty in the northern winter landscape. It is true that the East has little brilliant color or living green compared with England, China, or Japan, while the prairies and great plains have still less. Nature-study, however, opens the eyes of the people to a new world of beauty in outline and structure of trees, their trunks, and winter buds. The universal instinct for bright color, however, ought also to be gratified, and every family can receive and give satisfaction by means of foundation planting. Unfortunately, New York and Philadelphia may not have monumental evergreens to the extent that every London yard has box and holly, aucuba and veronica, yet many eastern homes may have mountain laurel on the sunny sides and rhododendron on the shady sides. Among the conifers most persons prefer the brilliant quick-growing but short-lived Japan cypresses, while lovers of permanence are willing to wait for Canadian and Japanese yew, Mugho pine, and Canadian juniper. Two superb evergreen vines, European ivy and evergreen bittersweet (*Evonymus radicans* var. *vegeta*), enliven house walls of brick and stone. On sunny days the red branches of Siberian dogwood are a cheery sight. Among the shrubs with brightly colored berries, the favorite for foundation planting is the Japanese barberry, largely because its red fruits are attractive all winter.

Types of winter-gardens.

Evergreen winter-gardens.—Perhaps the oldest type of winter-garden is the pinetum, which is primarily a collection of evergreens, but is also full of beauty during the period when other trees are leafless. One example is the Hunnewell collection at Wellesley, Massachusetts, part of which is doubled in beauty by reflection in a lake. Another example is the conifer valley in the Arnold Arboretum, which has a brook meandering through the center, while the heights are crowned by trees, the cultivated specimens on one side being balanced

by a noble hemlock forest on the other. In the pinetum at Highland Park, Rochester, New York, the walk runs through the grassy center of the valley, with dwarf evergreens ascending the banks, these being disposed at convenient levels and distances for the eye, so that the different textures may be enjoyed to the full. The apparent height of this shallow valley is increased by planting the ridges with the tallest evergreens.

3029. Attractive winter objects.—Cones of white pine.

Shrubby winter-gardens.—Every arboretum or botanical garden is likely to have a fruticetum, or collection of shrubs. A garden composed almost exclusively of shrubs is attractive throughout the growing season, as well as during winter. There is a naturalistic winter-garden at Llyndanwalt, Abington, Pennsylvania, where a wood of about an acre near the house has been provided with features of year-round interest, including a rhododendron collection, a dense underplanting of young hemlocks, and a border of shrubbery selected with special reference to winter beauty. From the outside, these shrubs give privacy, shelter, and color in delightful contrast to the ordinary wooded pasture, which is rather colorless. From the interior these shrubs animate the trails and enliven the outlooks that have been purposely left toward the best features of the landscape.

Skating-ponds.—It is now the fashion to border skating-ponds with shrubs that have brightly colored twigs. On sunny days these furnish bold masses of color that harmonize with the vigorous mood and gay costumes of the skaters. After providing for the casino and for the snow that must be removed from the ice, there is generally ample room for a collection of showy dogwoods, willows, and wild roses. At Rochester, New York, is a charming example, the shrubs being allowed to interlace like an old woodland border, so that the color of the twigs steals upon one unconsciously.

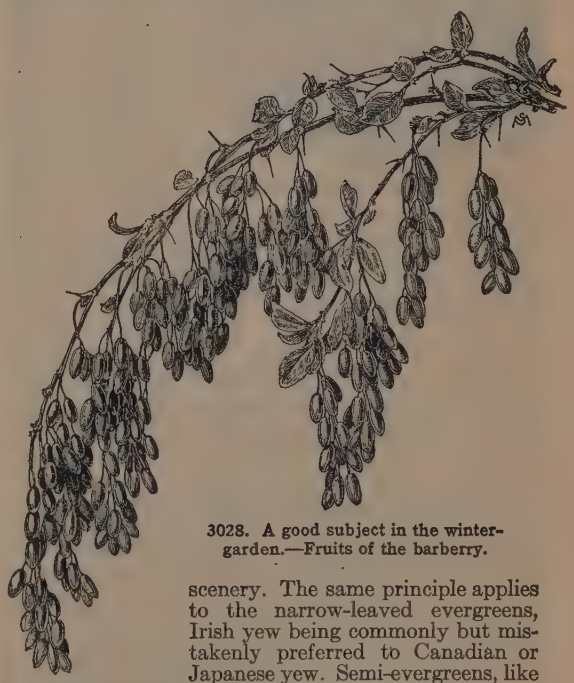
Gardenesque effects.—That it is possible to spoil even a winter landscape by overdoing color has been much demonstrated recently in parks, where nurserymen and gardeners have been allowed to plant large masses of Siberian dogwood and salmon-barked willow, the brightest of all winter reds. Such swamp-type plants are particularly inappropriate and gaudy on hilltops. A more poetic effect is produced by the "sunset willow" of the prairie states, a species of uncertain botanical status known to collectors as *Salix longifolia*. It is common along middle-western streams. The most brilliant but least tasteful effects produced with shrubs that have brightly colored bark are in reality the carpet-bedding system. The willows and dogwoods are cut to the ground every year or two, in order to produce the greatest number of showy shoots, which are kept at a height of about 3 feet. This system sacrifices height, habit, and dignity to display. A standard park effect is white pine bordered by Siberian dogwood, which is about the strongest contrast that is in good taste on lawns. Perhaps the strongest contrast furnished by nature in the North is hemlock and canoe birch.

Winter walks.—The cheapest and most practical winter-garden for the largest number, may be a simple walk leading to the front, back, or side door, bordered by shrubs and trees, of which half or more have winter attractions. Brick set on concrete is considered pleasanter to the eye and foot than concrete, and is drier than grass. The tapestry type of brick set on edge is expensive, but gives a rich texture.

Materials for winter-gardening.

One hundred and twenty-eight trees and shrubs that have pronounced winter beauty were listed by John Dunbar from the Rochester parks, not including the evergreens or plants that lose their vivid color before the end of the holidays. With such a wealth of material there should be little excuse for bare and ugly surroundings. Only the classes of materials may be mentioned and exemplified here.

Broad-leaved evergreens.—These are often more expensive than the narrow-leaved evergreens, and of smaller stature, but they have more ample foliage and frequently showier flowers or fruits. All require special care. Examples are American holly, mountain laurel, *Rhododendron catawbiense* and *R. maximum*, evergreen thorn, trailing myrtle, evergreen bitter-sweet, box, and its substitute, *Ilex crenata* var. *microphylla*. The English standard of beauty is European holly, laurel, and hybrid rhododendrons, because the darkest and shiniest foliage is commonly thought to be more beautiful than the duller and yellow-green type. A more practical standard for our climate is furnished by American holly, laurel, and rhododendron. In nurseries where both classes of plants may be observed, the European kinds are unquestionably rich and aristocratic, but sound a foreign note, while the native kinds have a cheery, sunny color that is eloquent of adaptation to our climate and



3028. A good subject in the winter-garden.—Fruits of the barberry.

scenery. The same principle applies to the narrow-leaved evergreens, Irish yew being commonly but mistakenly preferred to Canadian or Japanese yew. Semi-evergreens, like Hall's honeysuckle, are listed in this work under *Autumn-Gardening*.

Narrow-leaved evergreens.—The European standards are Scotch and Austrian pine, Norway spruce, silver fir, Irish juniper, and Irish yew. These are climatic misfits in America and constitute the bulk of the evergreen planting east of the Rockies that proves unsatisfactory. The American standards are white pine, hemlock, Douglas spruce, concolor fir, red cedar, and Canadian yew. The types of beauty represented in the two lists are not closely comparable.

Deciduous trees and shrubs.—Though lacking in brilliant color, the following are standards of quiet beauty.

Marked for their outline or habit are pin oak, sweet gum, white birch, pepperidge, sassafras, tulip tree, white oak, and sycamore. Noted for their winter buds are flowering dogwood, beech, shagbark, balm of Gilead, honey locust, swamp bay, sassafras, and pussy willow. Familiar by their trunks are beech, birch, shagbark, sycamore, white oak, tulip tree, sweet gum, flowering dogwood, and mountain-ash.

Shrubs with brightly colored berries.—These materials do more to transform ordinary city lots than any others here mentioned. Shrubs cost less than evergreens,

3029. A graceful winter form in dwarf juniper.

mature more quickly than trees, are fairly permanent, and are cheap. Of the shrubs with decorative fruits, there are two main groups based on duration. Those which are attractive all winter, like barberries, must be reckoned more valuable than those which drop by New Year's or cease to be attractive then, like snowberry and Indian currant. Each of these groups may be divided again on a basis of color. Red is the favorite color, because it seems to give the most warmth at the time it is most needed. Consequently the most popular shrubs for winter berries are the common and Japanese barberries, the multiflora and prairie roses, and the high-bush cranberry, all of which retain their red berries until spring. Of the other red berries, *Viburnum dilatatum* lasts until April; Japanese bitter-sweet until March; *Viburnum Sargentii* until February; while the following are attractive until February: Most species of Evonymus and Cotoneaster, *Ilex verticillata*, and red chokeberry (*Aronia arbutifolia*). The red-berried species tend to produce yellow varieties, but they have less popular appeal. Blue berries of great beauty are borne by the familiar white fringe and the little known symplocos. Theoretically black is an unattractive color, yet practically the black fruits appear well, especially against the snow, the most familiar example being the massive cluster of California privet, while the open cluster of Regel's privet has more grace. Viburnums furnish many dark berries, as do the following choice plants: *Acanthopanax sessiliflorus*, *Rhamnus carthartica*, rhodotypos, *Phellodendron amurense*, *Rhamnus dahurica*, and *Aronia melanocarpa*. Theoretically white should be the chilliest and least attractive color in winter, yet the snowberry is probably the only bush that is planted almost wholly for its winter berries, and its popularity continues although it often loses its attractiveness before Thanksgiving. The small waxy berries of candleberry (Myrica) are an agreeable sight till January, but this plant is more famous for its fragrance.

Shrubs with brightly colored twigs.—These materials are even more brilliant than shrubs with brightly colored berries. The ordinary 2- to 3-foot bush of barberry has few berries, when planted in the fall, while a Siberian dogwood of the same size is a consistent mass of red from planting day in October until April. These materials are showier on sunny days than clouded ones, and look best when the sun is at one's back. They do tolerably in the smallest yards of large and smoky cities but do not develop the brightest colors in dense shade.

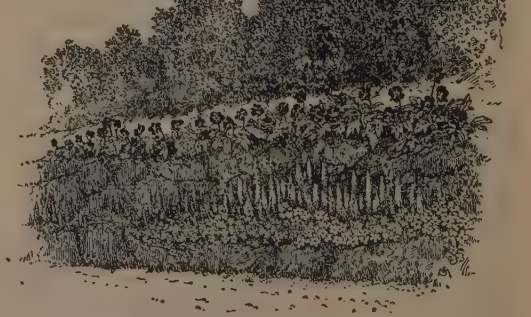
In this group, also, red is the favorite color, the most popular being Siberian dogwood, with the Britzensis willow a fair second, the latter being unsuitable for foundation planting. Vivid color is often confined to twigs or wood a year or two old, as in the lindens, but a four-year-old Siberian dogwood is showy from the ground up. Those who like a change from the Siberian sometimes plant the silky dogwood, which has purplish red wood, or the quieter-toned stolonifera, but the latter needs a moist situation and is too scaly for foundation planting. Yellow branches are more popular than yellow berries. Willows furnish half a dozen yellow kinds, dogwood two good ones, and yellow poplar one. Vivid green wood is furnished by kerria, *Forsythia viridissima*, sassafras, *Colutea arborescens*, and a variety of *Cornus sanguinea*.

Winter flowers.—The only hardy winter flower of importance is the Christmas rose (*Helleborus niger*), which blossoms in the North amid or under the snow any time from November to March. Winter crocuses are merely a coldframe hobby for enthusiasts. Scillas and the other March-blooming bulbs are often seen blooming in the snow, but they are essentially spring flowers. A unique and wonderful winter beauty is *Pieris floribunda*, which seems to be crowned by white flowers, but these are really buds. They are all the more wonderful because naked, and all the more beautiful because set off by evergreen foliage.

WILHELM MILLER.

Planting on walls. (Fig. 3030.)

Wall-gardening and walled gardens are two different departments of horticulture. The walled garden is an old English development based on the need of protecting fruit from thieves and on the fact that grapes and peaches do not ripen in the cool summers of England without extra heat, such as a south wall gathers. Out of these conditions have grown high brick and stone walls aggregating hundreds of miles in extent and forming a familiar sight in the English landscape. The walls have come to be covered with all sorts of fancy fruits trained like vines. They also shelter many subtropical shrubs trained as climbers, which otherwise could be grown only under glass. Although these walls are often crowned with broken glass or spikes, they are generally beautiful in themselves, or are made so by a clothing of vines. Moreover, earth-filled holes are often purposely left on top for the growing of rock-loving flowers, such as wallflowers, snapdragons, wall pepper, Kenilworth ivy, houseleeks, and wild pinks. Time adds the crown-



3030. Piece of a wall-garden.

ing touch of loveliness by encouraging mosses on the shady side and lichens on the sunny. This type of garden is not common in America because it is very costly to make and also to maintain, owing to the higher cost of skilled labor for training fruits. Moreover, a wall is not necessary in our own hot summer climate for the ripening of grapes and peaches. However, the walled garden will gradually increase in numbers, for several reasons: It offers better protection from thieves than hedges or shrubbery; it makes a kitchen-garden yield from one to three months longer by giving protection from cutting winds and frost; it makes a sheltered outdoor playground for children in winter; it makes an effective background for hardy perennial flowers; and it gives privacy and charm, which gardens open to every eye do not possess.

Wall-gardening, on the other hand, is a modern application, growing out of the English passion for alpine flowers and based largely upon the fact that many of these exquisite flowers perish in the hardy borders, because of the wet English winters, but flourish permanently in the chinks of a wall, where they get better drainage. This is true of wallflowers and snapdragons, which have glorified many ruins for centuries, while on the level ground they are short-lived. Thus, dry-walling became fashionable at the beginning of the twentieth century. It was customary, whenever grading operations left a bank of earth, to put in a retaining wall, avoiding cement, and laying alpine plants between the stones. The popularity of this type of garden is attested by Gertrude Jekyll's "Wall- and Water-Gardens," which has thirty-three plates illustrating the construction and main floral effects. Steps are commonly made in such a way that nearly all parts not actually needed for treading are filled with carpets and cushions of rock-loving flowers.

In America, wall-gardening was welcomed as an opportunity to replace some of the artificial, monotonous, and ill-kept grass-banks by retaining-walls clothed with the natural and varied beauty of flowers. Unfortunately, much of the most refined beauty of English wall-gardens, such as the mossy saxifrages give, is impossible here, because the hot summers are unfavorable to the choicer alpines. Analysis of the four largest and most successful examples of wall-gardening known in America in 1914 shows that great and new beauty has been achieved in this way, but that the largest floral effects are made by plants that are not particularly associated with mountains or rocks and which are easy to grow in ordinary gardens without the expense of dry-walling. Such desert plants as the houseleeks and stonecrops spread over large areas. Other successes are rock cress (*Arabis albida*), woolly chickweed (*Cerastium tomentosum*), snow-in-summer, woodruff, wild pinks, alpine forget-me-nots, Kenilworth ivy, and veronicas. Such carpets, however, do not have the charm of the dainty rosettes and mossy cushions of the high-altitude alpines, such as saxifrages, primroses, gentians, and edelweiss.

It is possible to have some of these finer things, if one does not stuff the walls with too much earth. This practice, which seems reasonable to every beginner, encourages the plants to make roots within the walls, and such roots are naturally destroyed by the first hot weather. It is better to give them a little grit and only a pinch of earth, so as to force the plants to send long roots through the walls into the earth banks where they will find the moisture, coolness, and drainage that are demanded by high alpines.

Steps have been successfully filled in America with chink-loving flowers, but most gardeners are conservative about experimenting, declaring that the colder winters of America will cause damage to stone and flowers by the heaving action of frost. It is certainly unwise to have wide spaces between stones filled with material that will expand too much, but the aim should be to give the plants as little root-room and food as possible in order to encourage their rooting outside the stonework.

WILHELM MILLER.

Screen-planting.

From the landscape architect's point of view, screen-planting may be used to hide unsightly objects, to afford protection from prevalent winds, to give a background to the house, to lend an air of privacy and seclusion, or sometimes to add an ornamental feature. It may take the form of deep border planting, narrow hedge lines or mere vine-covered screens. Trees, shrubs, and vines are all available; but, whatever is used, the denser its habit of growth, the better screen it will make. Other things being equal, evergreens are better than deciduous plants, for the latter lose their leaves in winter. However, if evergreens are not available, there are still many deciduous plants whose dense habit of growth make a good screen even after the leaves are gone. A border planting, as in Fig. 2999, is really a screen against objects beyond: so also are such cover-plantings as those in Figs. 3000, 3001, 3031 and others. The real screens, however, are those plantings made for this particular purpose, mostly narrow in form but dense.

3031. A screen subject in a corner.

Vines for screen-planting.

For brick, stone, tree-trunks, or other solid surfaces.

Deciduous:

Hydrangea petiolaris (climbs by root-like holdfasts).

Parthenocissus quinquefolia var. Engelmannii. A variety of Virginia creeper with disks, or suckers, on the ends of the tendrils, which enable the plant to fasten itself to a surface.

Parthenocissus tricuspidata var. Veitchii.

Evergreen:

Evonymus radicans var. vegeta (climbs by root-like holdfasts).

Hedera helix. Somewhat tender; in the N. should be planted where it will be shaded from winter sun or at least have its roots thoroughly mulched and the ground shaded by low growth about its base; climbs by root-like holdfasts.

Rapid-growing vines for banks or unsightly objects.

Annuals:

Boussingaultia baselloides. Twining tender perennial treated as an annual, growing from 10 to 15 feet a season; roots must be taken up and stored away from frost.

Calonyction aculeatum (twining).

Echinocystis lobata (self-seeding; tendrils).

Humulus japonicus (twining).

Ipomœa purpurea (twining).

Phaseolus multiflorus (tendrils).

Herbaceous perennials (dying down to the ground, but springing up again from the root):

Ipomœa pandurata (twining). This and next have fleshy roots and may become a nuisance if allowed to spread.

Pueraria hirsuta. This is known also in commerce as Dolichos japonicus; grows 40 feet in a season; twining.

Woody perennials (woody stem persisting above ground).

Actinidia arguta (twining).

Aristolochia macrophylla (A. Sipho) (twining).

Celastrus scandens (twining).

Lonicera japonica var. Halliana (twining).

Lycium chinense and L. halimifolium. Both are shrubs with recurving trailing stems which do not twine. Plant must be fastened to its support. Excellent to hold banks, but very vigorous and may become a nuisance.

Tall-growing vines reaching eaves of the house.

Actinidia arguta (vigorous; dark glossy foliage twining).
Aristolochia macrophylla. Twining; large heavy foliage; should not be used unless dense shade is desired.
Campsis radicans. This is a heavy vine climbing by root-like holdfasts which are too weak to hold it in storm or wind; must be fastened to its support. Somewhat tender in the N. and usually has more or less dead wood. Better when used as porch or pillar vine where it can be reached and pruned easily.
Celastrus scandens (twining).
Parthenocissus. All kinds; tendrils with or without disks.
Wisteria chinensis. The finest of tall-growing vines; vigorous and hardy at all times.

Vines for foliage only. All in the following list are deciduous, i. e., drop their leaves in winter. The only evergreen vines which can be used in the North are *Evonymus radicans* and *Hedera helix.* Even the foliage of *Evonymus radicans* will occasionally burn in winter although it is hardier than English ivy in this respect. *Vinca minor* and *Pachysandra terminalis* are good creeping plants for evergreen ground-cover and Hall's honeysuckle is semi-evergreen, holding good foliage until Christmas. Other flowering vines also good in foliage are *Clematis paniculata, Forsythia suspensa,* which is a shrub with recurving and trailing stems excellent for running over a bank or hanging down a wall, *Rosa Wichuraiana* and some of its many hybrids. and *Wisteria chinensis.*

Actinidia arguta.
Akebia quinata. Very graceful vine with delicate five-parted foliage, semi-evergreen, remaining until January; twining.
Aristolochia macrophylla.
Celastrus scandens (berries red and orange all winter; twining).
Lycium halimifolium.
Parthenocissus quinquefolia. Beautiful red autumn color; first vine to color in the fall; climbs by tendrils usually without disks except in var. Engelmannii.
Parthenocissus tricuspidata var. Veitchii (beautiful autumn color; climbs by tendrils ending in disks).
Smilax rotundifolia. A vigorous wild vine with thick glossy foliage enduring both shade and wet soil.
Vitis Coignetiæ. From Japan; a vigorous grower with immense leathery leaves usually brown felty beneath; the foliage is especially strong and bold and turns a rich red color in fall.

Vines for flower. Plants marked with an asterisk (*) have attractive foliage as well as bloom.

Campsis radicans. A heavy vine.
Clematis Jackmanii. Climbs by twisting leaf-stems. Flowers large and purple. C. Jackmanii var. alba is similar, but the flowers are creamy white. Both of these are good vines for bloom in July and August.
*Clematis paniculata. Climbs as does the preceding species. Flowers small and white, covering plant with a mass of bloom in September and October. Foliage remains glossy green, good until December. The best fall-blooming vine.
*Forsythia suspensa. Flowers yellow, appearing before the leaves, covering the plant with a mass of bloom in April. Flower-buds often killed by cold in the northern tier of states.
Lonicera Heckrottii. Climbs by twining. This is a hybrid which blooms continuously during July, August, and September. The flowers are rose outside and yellow inside, and as open and closed flowers are present at the same time they make a very handsome showing. The only objection to the plant is that it is badly infested with aphids or green-flies.
*Lonicera japonica var. Halliana. Bloom profuse and fragrant; flowers white, fading yellow in June and July.
Rambler roses, in order of bloom, June and July. These must be tied up, but are hardy without protection except possibly in the northern tier of states. In such cold places one must be content with the upright shrubby Rosa rugosa in white, and red varieties, both single and double, beginning in early June; with the white Rosa multiflora, beginning from middle to late June; and with the pink Prairie, or Michigan, rose (Rosa setigera) which does not begin until the second week in July. R. multiflora and R. setigera are both shrubs with an arching habit and have produced many Rambler roses. Of the varieties following, those marked with a dagger (†) are the best: †Tausendschön, middle June, double, delicate pink, larger than Dorothy Perkins; Lady Duncan, single, rich salmon-pink; †Excelsa, late June, or early July, a long-season rose, double, rich crimson, a new variety, blooming at the same season as the old Crimson Rambler, but a better color; Dorothy Perkins, early July, double pink; white Dorothy Perkins, a white variety of the preceding; Alberic Barbier, middle July, semi-double or double creamy white, yellow in center, dark yellow in bud, excellent glossy foliage; Aviator Bleriot is a new variety, very similar to Alberic Barbier; †Hiawatha, middle July, a long-season rose, single, bright red with white center and yellow stamens; *†Mrs. H. M. Walsh, middle July, double, white, same long season and good foliage as Rosa Wichuraiana, the Memorial rose of which it is practically a double form; *†R. Wichuraiana, which is blooming at this time, is the parent of many of the varieties named above, and is itself a very attractive rose.
*Wisteria chinensis. A strong, twining vine, with long, hanging clusters of white or purple flowers, according to variety, in middle and late May. Leaves alternate, compound, large, loose, and feathery. Beautiful in flower, graceful in habit, satisfactory in foliage, and vigorous and hardy at all times.

Large trees for wind protection and for background setting to the house.

Deciduous: These deciduous types are dense and compact in habit and make a good screen or background even after the leaves are gone in winter.
Acer platanoides.
Acer saccharum.
Æsculus Hippocastanum.
Fagus sylvatica.
Quercus alba.
Tilia europæa.
Evergreen: The Scotch pine (*Pinus sylvestris*), Norway spruce (*Picea excelsa*), and Colorado blue spruce (*Picea pungens*) are probably the three most commonly planted evergreen trees. The Scotch pine is the best of the three for neutral mass planting but none is so satisfactory as the hemlock or the pines listed below. The Scotch pine has an irregular spreading habit with bluish green foliage, salmon-colored limbs and trunk and picturesque habit when old. It grows rapidly but is short-lived in America. The Norway spruce and Colorado blue spruce are both conical evergreens and for this reason alone they are always emphatic and conspicuous. Even when planted in mass the individuals are so distinct that it requires years for them to merge into a uniform solid mass. Comparing a solid planting of Norway spruce with a similar planting of hemlock, it is seen that in the former every individual spruce is stiff and conical and remains so for years, while the hemlocks with their graceful form and habit have lost their individuality and merged into one indefinite mass. The Norway spruce is also too somber and funereal for cheerful home-ground planting. It is also short-lived in America and while hardy and rapid-growing it begins to go back and die at the top after forty or fifty years except in very favorable locations. The Colorado blue spruce is also short-lived in the eastern states and is altogether too conspicuous and emphatic both in form and color for neutral background planting.
Pinus austriaca.
Pinus resinosa.
Pinus Strobus.
Pseudotsuga taxifolia. This is a large conical tree like Norway spruce and therefore not so good for neutral background planting as either the pines or the hemlock mentioned in this same list. But it is the best of the conical spruce or fir type because more graceful in habit, with soft more flexible foliage which is green or gray-green in color. It is a vigorous grower and though little known it is a very promising evergreen tree. Only the Rocky Mountain form is hardy in the East.
Tsuga canadensis, the common hemlock.

Rapid-growing trees for screens. As a class, the rapid-growing trees are weak-wooded and transient. They are cheap and are usually thought of as fillers for temporary or quick effects until more permanent trees can be established.

Deciduous:
Acer Negundo.
Acer saccharinum.
Populus, Carolina poplar.
Evergreen:
Picea excelsa.
Pinus sylvestris. These are probably the fastest growing evergreen trees but they are not so long-lived as white pine, nor do they make either as graceful or as effective screen.

Screens tall and narrow (10 to 15 feet). Space the plants 2–3 feet apart in single row. For taller and more rapid-growing material, use Lombardy poplar (*Populus nigra* var. *italica*), or upright sugar maple (*Acer saccharum* var. *monumentale*), 6 feet apart in the row. This latter is a new and very desirable form. It is durable and slower-growing like the sugar maple but narrow and upright like the Lombardy poplar. Bolle's poplar (*Populus alba* var. *pyramidalis*) is a narrow upright form of the European white poplar and is just as undesirable as that tree. Moreover, the white woolly coating on the under side of the leaves makes the tree very conspicuous and when pronounced color is thus added to narrow upright form the tree becomes too emphatic for ordinary use. The Lombardy poplar with its normal green foliage is much safer to use when either vertical emphasis or a tall narrow screen is needed.

Deciduous:

Carpinus Betulus var. globosa. This is a compact upright variety of the European hornbeam. Excellent hedge-plant but very slow-growing. A plant standing in the open at Arnold Arboretum, Boston, has grown 6 feet wide and 12 feet high in 25 years. Perfectly hardy and, like Berberis Thunbergii, so dense that it makes a definite screen even after the leaves have fallen.

Quercus pedunculata var. fastigiata compacta (a compact upright form of the English oak).

Evergreen:

Chamæcyparis nootkatensis. This is little known in the East as yet but has all the requirements for an ideal hedge-plant, tall and narrow. Plants observed in the open at Ithaca, New York, are perfectly hardy and have grown 5 feet wide and 7 feet high in twelve years. They have not been protected nor trimmed nor specially cared for in any way. They are upright and oval in shape and very dense and compact. The foliage is thick and soft to the touch.

Juniperus chinensis. Resembles the native red cedar, J. virginiana, but is better because the foliage does not brown in winter. Also the leaves are more spreading and their bluish gray upper surfaces more noticeable which gives the spray a fuller and lighter-colored appearance.

Juniperus communis var. hibernica. This should be trained in the nursery to one central stem. When young the Irish juniper is a handsome narrow upright plant with bright gray-green foliage; but it grows much more rapidly than other cedars and soon looks miserable because, as now grown, its more or less equal upright parts become too heavy to support themselves and spread apart destroying the symmetry of the plant as well as revealing the dead and unsightly inner foliage.

Juniperus virginiana.

Taxus baccata var. hibernica (not quite hardy above N. Y. City).

Thuya occidentalis var. pyramidalis.

Thuya orientalis. This resembles the native arborvitæ but is more handsome. Its branches and branchlets are also more distinctly vertical and the foliage smaller and brighter green.

Shrubs for screen border-planting.

Small (2 to 4 feet) (other native plants not so dense in habit but with good foliage will make very effective screen-planting when massed together):

Deciduous:

Berberis Thunbergii (occasionally 6 feet).

Catalpa Bungei. This is the trade name for C. bignonioides var. nana. It is simply a dwarf variety of the southern catalpa and makes a dense round bush when growing on its own roots. It is often grafted high on upright stem and planted as a substitute for bay trees.

Chænomeles japonica.

Deutzia gracilis (2 to 3 feet).

Deutzia Lemoinei (3 to 4 feet).

Dirca palustris. This has thornless flexible leathery twigs but is dense and symmetrical like Berberis Thunbergii. If allowed to grow naturally it will make good low hedge.

Hypericum aureum.

Hypericum prolificum.

Kerria japonica.

Ligustrum Ibota var. Regelianum.

Ligustrum ovalifolium. This is not hardy north of Philadelphia and can be used only for low hedge in the North. May be cut to the ground and will spring up vigorously every year.

Lonicera thibetica.

Lycium chinense.

Lycium halimifolium.

Philadelphus coronarius var. nanus (2 to 3 feet).

Philadelphus Lemoinei (in variety, especially var. Avalanche Candelabre, and Gerbe de Neige).

Philadelphus microphyllus (this and P. coronarius are the original parents of the Lemoine hybrids).

Rhus canadensis.

Rosa rugosa (often 5 or 6 feet high but better if kept low and vigorous by frequent renewal from the base.

Rosa rugosa var. Blanche de Coubert (beautiful semi-double, white).

Rosa spinosissima var. altaica (often 5 feet).

Spiræa Bumalda, Anthony Waterer variety (2 feet).

Spiræa japonica (3 feet).

Spiræa Thunbergii.

Spiræa trilobata.

Symphoricarpos albus (often 5 feet).

Symphoricarpos orbiculatus (2 to 3 feet).

Vaccinium corymbosum (often 5 to 6 feet).

Viburnum Opulus var. nanum (2 to 3 feet. Seldom has flowers).

Evergreen:

Buxus japonica. A new and hardy box; will probably reach 8 feet, but is slow-growing and easily restrained by clipping.

Buxus sempervirens. Must be protected in the North but is hardy and tree-like in the South.

Chamæcyparis obtusa var. nana (6 to 8 feet, but very slow-growing and easily restrained).

Evonymus radicans var. vegeta (2 to 3 feet; with a little clipping can be brought into a low natural hedge mass).

Ilex glabra.

Picea excelsa var. Clanbraziliana.

Pieris floribunda (2 to 3 feet).

Pinus densiflora var. pumila (often 6 feet).

Pinus montana var. Mughus (often 5 to 6 feet).

Rhododendron, Boule de Neige (white, blooming-period early).

Rhododendron carolinianum. Color lavender-pink, blooming-period very early. See note on page 2692.

Taxus cuspidata var. brevifolia.

Thuya occidentalis var. nana. This may reach 3 to 4 feet but is very slow-growing and easily restrained by clipping.

Thuya orientalis var. nana. This may reach 3 to 4 feet but is very slow-growing and is easily restrained by clipping.

Medium (6 to 8 feet) (other native plants not so dense in habit but with good foliage will make very effective screen-planting when massed together):

Deciduous:

Acanthopanax pentaphyllus.

Acer palmatum (often larger but slow-growing).

Berberis vulgaris.

Cornus paniculata.

Evonymus alata.

Forsythia suspensa. Good definite form and best for individual specimen planting.

Ilex verticillata.

Lonicera fragrantissima.

Lonicera Morrowii.

Myrica carolinensis. Sometimes much larger than 6–8 ft. Can be kept lower very easily by thinning out and renewing from the base. Is still known in commerce as M. cerifera. Ranges north to Nova Scotia near the coast. Is more shrubby, with blunt leaves which are broader and more oblong than those of M. cerifera.

Philadelphus inodorus. Has more definite and graceful form than P. coronarius and dark green almost glossy foliage.

Rhodotypos kerrioides.

Spiræa bracteata.

Spiræa gemmata.

Spiræa prunifolia var. flore-pleno.

Spiræa Vanhouttei.

Evergreen:

Ilex crenata.

Kalmia latifolia (sometimes higher than 6 to 8 feet).

Picea orientalis. Large tree but adapted to small-scale planting because very slow-growing and also because easily restrained by pruning or pinching back.

Rhododendron, Caractacus (color bright red, blooming-period medium).

Rhododendron catawbiense var. album. Compact habit of R. catawbiense but flowers white, blooming-period early.

Rhododendron delicatissimum (color blush-white, blooming-period late).

Rhododendron Everestianum (color lavender, blooming-period early).

Rhododendron, H. W. Sargent (color dark red, blooming-period late).

Rhododendron, Lady Armstrong (color pink, blooming-period early to medium).

Rhododendron purpureum elegans (color purple, blooming-period medium).

Taxus cuspidata.

Tsuga canadensis. The most graceful and effective large evergreen for screen-planting. Takes up less room than white pine and is much slower-growing. Can be restrained easily and therefore is adapted to small-scale planting.

Large (10 to 15 feet) (other native plants not so dense in habit but with good foliage will make very effective screen-planting when massed together):

Deciduous:

Acer campestre (small compact tree, dense foliage).

Acer ginnala (gorgeous autumn color).

Acer platanoides var. globosum (dwarf, dense, slow-growing).

Benzoin æstivale.

Berberis aristata.

Carpinus Betulus. Much used for hedges. Better than our native hornbeam, Carpinus caroliniana.

Cornus mas (small compact tree, 15 to 20 feet).

Cotinus Coggygria.

Cratægus coccinea.

Cratægus Crus-galli.

Cratægus Oxyacantha var. Paulii.

Cratægus punctata. All these thorns are better as natural screens with room to spread at the bottom than when confined in restricted hedge lines.

Hibiscus syriacus. Ten feet, dense and compact making good tall hedge, but thin at bottom. Plant low dense shrubs in front. The white variety is the best.

Laburnum alpinum (compact large shrub or small tree 20 to 30 feet high).

Ligustrum Ibota.

Ligustrum vulgare.

Lonicera tatarica.

Philadelphus coronarius.

Pyrus coronaria (small tree).

Pyrus pulcherrima (small tree).

Rhamnus cathartica.

Rhamnus Frangula.

Syringa chinensis var. alba.

Syringa chinensis var. Sougeana (var. rubra).

Syringa vulgaris.

Viburnum dentatum. Will reach 10 to 12 feet, but may be restrained easily by gradual renewal from the base.

Viburnum Lantana.

Viburnum prunifolium (small tree).

Evergreen:

Ilex opaca.

Pinus montana a low, bushy tree, 20 feet high and 20 feet broad; very slow-growing.

Pinus Strobus. Excellent for screen-planting. More graceful, effective, and permanent than Norway spruce or Scotch pine.

Pseudotsuga taxifolia.

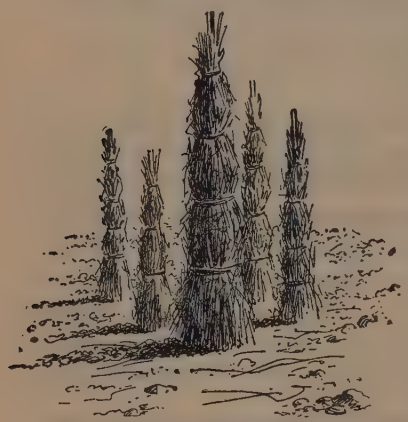
Rhododendron album elegans (color white, blooming-period medium).

Tsuga canadensis. The most graceful and effective large evergreen for screen-planting. Takes up less room than white pine and is much slower-growing. Can be restrained easily and therefore is adapted to small-scale planting.

RALPH W. CURTIS.

Winter protection of planting.

Winter protection is the preparing of plants to withstand the winter (Figs. 3032–3047). All plants are usually hardy in their own habitat, but many become tender when removed to a colder climate, requiring artificial protection. A permanent covering of snow furnishes ideal protection, but unfortunately the American winters are very changeable. Continued steady cold is seldom injurious, but the alternate freezing and thawing toward spring are often fatal, the damage varying according as the situation is wet or dry and the soil light or heavy. For example, shallow-rooted plants, as *Lobelia cardinalis*, will often be thrown out of the ground in clayey soil. Such damage may be prevented by placing sods over the plants. Gaillardias will winter safely in light well-drained soils with ordinary protection, but perish if wet and heavy. The remarks in this article are meant to apply in the vicinity of Chicago.

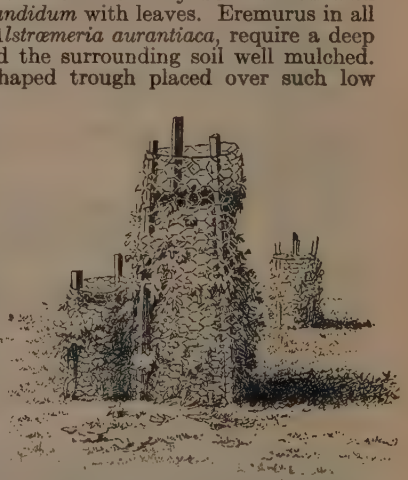


3032. Straw overcoats for roses.

Winter-covering intercepts the sun's rays and retards premature activity. It is as essential "to keep in the cold" during temporary warm spells as it is to retard excessive depth of frost. More damage is generally done in February and March than earlier. Roses and other shrubs may be prepared for the winter any time from the last half of November until well into December, but any plants of an herbaceous nature may be covered much earlier. Where field-mice are troublesome it is well to defer covering until after a good freeze, so that these nibblers may seek other winter quarters. Rabbits are fond of the Japan quince, *Spiræa Vanhouttei*, *Evonymus alata*, and some others, and often damage newly planted material the first winter. When the branches are beyond their reach, protect the trunk with straw, tar paper, or burlaps, which will also prevent sun-blistering. If the shrubs are in groups or low-branched, run wire netting around them. Fall-planted material should be better protected against frost than established plants of the same species. All the Japanese flowering forms of the plum, peach, and cherry tribes should have their roots mulched 4 or more inches deep. The fatal damage in the winter of 1898–1899 was at the roots, not overhead. Figs. 3032, 3033 show protection by means of straw and boughs; Figs. 3034–3036, protection inside of boxes, barrels, and wire netting.

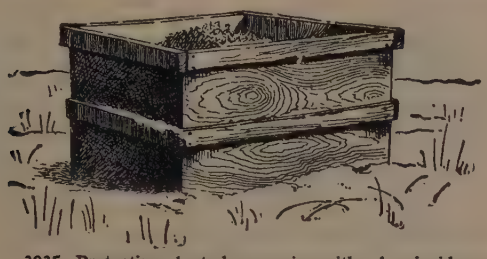
Plants with evergreen foliage, like *Heuchera sanguinea*, are safer with a covering that will not mat down and rot the foliage or injure the crown. The danger is in open, wet seasons. Forest leaves are excellent for winter covering, provided they do not mat down. Oak leaves are good, but those of elm, maple, and other trees that shed their foliage early are soft and mat too much. Leaves may be held in place by evergreen boughs, brush, or tops of bushy perennials like the native asters, or coarse strawy material. When leaves are used in barrels or boxes, the top of the package should be water-tight, and the leaves dry when put in. This precaution is not essential in all cases, but it is a safe rule to follow. Tar paper is comparatively cheap and comes handy in many phases of winter-covering. Gather the leaves when they are dry, and store under shelter until wanted. Save vines like those of *Clematis paniculata* and pole limas; they are good for covering climbing roses that are almost hardy. These keep off the bright sun when the plants are in a semi-frozen condition, shield them from the drying winds, and retard premature starting of the flower-buds. *Forsythia suspensa* trained as a climber on a south wall is benefited by such covering, or by burlaps, as its sheltered position induces activity too early and its flowering buds become a victim to late frosts. Any rhizomatous iris, such as the German iris, should be planted where surface drainage is ample, and in the case of young plants, or those recently divided, not covered with heavy manure or they are likely to decay in wet weather. Cover such plants with light material. Old established plants seldom need protection. *Chrysanthemum coccineum* requires similar conditions and treatment. All lilies except the hardiest, such as *L. tigrinum*, *L. elegans*, *L. canadense*, *L. superbum*, *L. philadelphicum*, *L. speciosum*, *L. tenuifolium*, and so on, are best covered by a mound of ashes—wood or coal—which retains an even temperature. The other lilies may be mulched with manure and *L. candidum* with leaves. Eremurus in all its species, and *Alstrœmeria aurantiaca*, require a deep box of leaves and the surrounding soil well mulched. An inverted V-shaped trough placed over such low edging plants as *Veronica circæoides* and *Thymus Serpyllum* var. *montanus*, is beneficial. It is well to take up a few plants of *Monarda didyma*, the double perennial sunflower, and *Thymus Serpyllum*, and winter them in a frame, over which place a wooden shutter to shed rain, placing leaves or manure on those that remain

3033. A tender tree bound in branches of hemlock. The protected tree is a specimen of gordonia about 10 feet high, at Arnold Arboretum, Boston.



3034. One way of protecting young rhododendrons. The space inside the wire netting is filled with autumn leaves.

Where permanent windbreaks, such as plantations of evergreens, buildings or solid fences, do not exist, temporary ones should be made of boards, evergreen boughs, corn-stalks, and the like, to protect arboreal plants that are not quite hardy, e. g., in this climate *Halesia carolina*, and in the eastern states *Magnolia grandiflora*, hollies, and the like. Place the windbreak at the sides toward the prevailing winds, generally



3035. Protecting plants by covering with a box inside which are placed leaves or straw.

north and west, and at the sunny side of any evergreen that browns. The boughs or stalks may be attached to wire netting or to cords fastened to stakes.

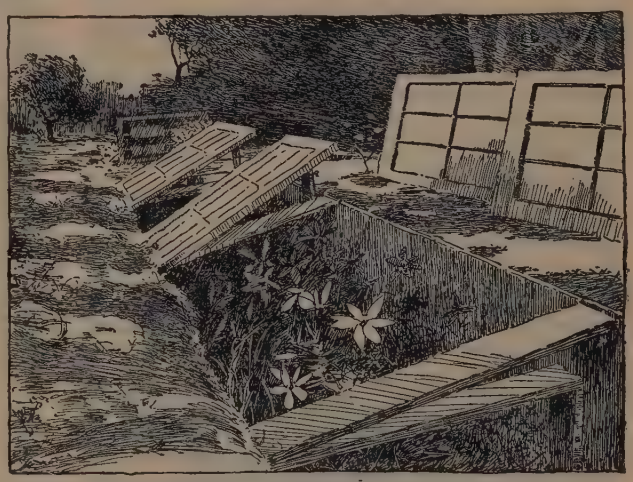
The so-called retinisporas may have placed over them an empty box open at the top. Shrubs that are still more tender should be boxed, the box having a tight top and ventilation at the sides. In all cases mulch well at the roots. *Magnolia Soulangeana*, *M. speciosa*, and plants of similar degrees of hardiness may have their branches tied in and empty casks placed over them, one sitting partially inside the other, and held in place by stakes. Put a cone-shaped covering over the top to shed the snow. Or poles may be set close to the tree, wigwam fashion. Wrap these with burlaps, or wind string around them for the straw to lean against, and in both instances wrap with straw.

The so-called hardy climbing roses, such as the Seven Sisters and Prairie Queen, which are hardy without protection, but are benefited by it, Wichuraiana and its hybrids, Paul Carmine Pillar, Russell Cottage, Crimson Rambler, Thalia, and Lord Penzance Sweetbrier hybrids, if against a wall, may have clematis or other vines placed thickly over them; or if in an open exposed situation, they may be wrapped in straw. (Fig. 3033.) Better still, hill up the soil rather high at the roots, —to prevent breaking and to afford protection and drainage,— and then take the trouble to extend the mound in the form of a gradually diminishing ridge. Bend the canes along the ridge, choosing a time when there is no frost in them; then cover the canes with tar paper, over which place soil, strawy manure, or any warm covering. If the presence of a lawn prevents this method, lay on the grass and cover with a water-tight box filled with leaves. Canes will rot directly under an open knothole. In the spring allow them to remain prostrate some time after uncovering to inure them gradually to the change and to induce the lower buds to strengthen. Hybrid Perpetuals, the tender forms of Moss roses, Hermosa, Clothilde Soupert, and the Dwarf Polyanthas, may be wrapped, boxed, or bent over and covered with soil. Those in beds may be bent over, the tops tied to the base of their neighbors, lead tags bearing numbers fastened to each plant, and a record taken of their names, and all summer labels stored to prevent loss when removing the leaves in the spring. Make a solid frame around them, higher at one end, and fill with leaves so as to cover the plants. Lap the roof-boards; they will shed water and allow ventilation. In the spring remove the leaves, replace the top for a few days, but let the sides remain for a week or so to shield from cold winds. Keep the plants prostrate until cut back.

3036. Plants protected in a barrel covered with burlaps.

The tender Hybrid Teas require special attention. Cultivation and watering should be discontinued in September in order to retard a late growth, but if the fall is a dry one, they should receive a thorough soaking late in October. Early in November hill up the soil around the plants to a height of 6 to 8 inches. After there is a crust of frozen soil a few inches thick, fill up with dry leaves to a little over the height of the hills or higher. Then board up the bed some 2½ feet high at one side and 2 feet at the other, and cover top with boards or tar paper, the object being to keep the leaves dry. Hybrid Perpetuals, or in fact any semi-hardy rose of low growth, may be protected as above. In most winters the Hybrid Teas can be safely carried over by hilling up the soil as described and covering with hardwood leaves 18 to 24 inches deep, held down by evergreen boughs, brush, or corn-stalks.

Field-mice or the smaller moles are troublesome sometimes where any open or loose material like leaves or straw is used for winter protection. Plants in coldframes are often destroyed. This may be prevented by the following method: Procure some poisoned wheat and place in the interior of a 4- or 5-inch common drain-tile. Place these tiles in the frames or among the roses, using ten grains of wheat to a tile. When spring comes lift up the tile carefully, so as not to spill the wheat and count the grains; by the use of the tiles one keeps track of the wheat and does not endanger the birds.



3037. Deep pit built like a coldframe, for carrying half-hardy woody plants over winter.

Tree peonies and yuccas should have an empty box placed over them, large enough to prevent the plant from touching the wood. *Hibiscus syriacus*, diervillas, deutzias—except *D. Lemoinei* and *D. parviflora* which are hardy—*Itea virginica*, *Cornus mas*, and the like, are wrapped in straw, and when the wrappings exceed 4 feet in height they should be staked to prevent high winds from toppling them over. Rhododendrons when planted out are taken up, the roots given a good soaking in a tub, and replanted in cold pits, or in boxes placed in a coldhouse or pits. In the spring, another bath is

given them and the soil firmly pounded around them before replanting. This is essential for continued vigor. Cut all vines of the clematis to within 1 or 2 feet of the ground and lay them down, first mounding the soil a few inches if surface drainage is not good and cover with ashes, boxed leaves, or soil, or mulch well and wrap the canes with straw. If close to a porch or steps, do not let the swept snow stay over them, unless well protected, as this snow solidifies and excludes air. If, as some now think, the broken outer skin of the hybrid forms subjects them to disease, then these varieties should not be bent over, but staked and wrapped. It is

3038. An outside cellar, in which to store roots and tubers, and pots of resting plants.

best not to cut the foliage of the eulalias or the Japan iris, as it, of itself, is a good protection, but manure at the base is essential. Cut down *Arundo Donax*, cover heavily with any material, and cover all with tar paper or water-tight shutters. Place half-rotted leaf-mold over fern-beds, narcissi, English and Spanish iris or any early-blooming bulbous plant, or a light strawy covering that is easily removed. Fine old manure a few inches thick is good and can remain. Place a good coating of stable manure around the trees on the lawn, and when they have been established any length of time bear in mind that the feeding-roots extend out as far as the branches do. The soil under them has a double duty to perform—to sustain both the tree and the grass.

Place short stakes around groups of platycodons, *Asclepias tuberosa*, or any other plants that are late to appear in the spring. Otherwise they may be overlooked in the spring and injured by digging. Examine all labels and see that none is cutting into the limbs of trees. Replace all rotten or defaced ones in the borders, using heavy labels, as thin ones often break off and are carried away when the surplus manure is removed. Cypress is a good material for labels. A good label for young trees and shrubs is made of a thin sheet of copper. The name is written with a stylus and a thin white paint rubbed on so as to fill in the depression. The label is fastened to a copper wire ring 3 or 4 inches in diameter, placed around the trunk and allowed to lie on the ground. Such a label is durable, unobtrusive and requires no attention for fear of cutting the wood, nor can it be lost.

W. C. Egan.

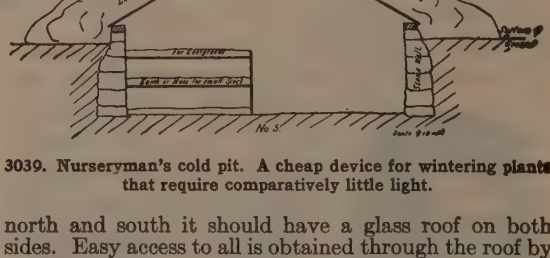
Structures for the winter protection of plants.

Pits, cold pits, storage-pits and plant-cellars (Figs. 3038–3047) are structures, with the greater part sunk beneath the surface of the ground, built for the purpose of protecting plants in winter without continued fire-heat. They are employed almost exclusively for storing dormant plants. They are not suitable for storing growing plants any length of time, neither are they houses in which to grow plants. They should face the south and be sheltered against north winds by buildings or other windbreaks. Owing to their position they should be put in well-drained ground only and well protected against surface water. A well-designed frame-yard is the best possible place for small pits.

The coldframe used by market-gardeners for wintering cabbage and lettuce for spring plantings, or by the florists for pansies, primroses, forget-me-nots, and the like, is really a simple pit. Such shallow pits, with proper protection, are useful for many other small plants which would be injured by severe weather. A deep pit, like a coldframe, is shown in Fig. 3037. A pit built on the plan of the old-fashioned "outside cellar" (Fig. 3038) is useful for storing tubers and roots. See that it is well ventilated. A section of another pit is shown in Fig. 3039. More elaborate pits, for accommodating large plants, are illustrated in Figs. 3040–3047.

Double glazed hotbed sashes are now used and can be employed for the pits shown in Figs. 3043–3046, or wherever winter protection is required, as it takes too much time to cover the ordinary sash with mats and shutters. These sashes cost a little more and they are heavier; it may be well to employ, therefore, a method for ventilation which obviates the necessity of lifting. They lessen the labor and let in sunlight all day. A thin layer of air is shut in by glass; the depth of this layer is the thickness of the sash bar; it keeps in heat and so keeps out frost. It is possible that some dust and perhaps fungous growth may accumulate or form within the layers. The glazing can be done at home, the lower glass being put in without putty and held in grooves on sides and ends and on the sash-bars by thin strips of wood.

For forms of pits, consult Figs. 3043–3046. Figs. 3043–3045 show inexpensive and convenient pits for small and medium-sized plants. They may be built 4 feet or less below the level of the ground, the height and width as shown in the diagrams; the length should be some multiple of 3, any thing between 9 and 30 feet, so that the glass roof may be made of hotbed sash and also protected by the straw mats and wooden shutters in common use. See *Hotbeds*. These pits are useful for storage in winter and also for carrying some of the hardier greenhouse plants in autumn until the houses are relieved of the chrysanthemum crop. Figs. 3043, 3044 make light hotbeds in spring, if filled with the leaves which formed their winter protection, and are also available for growing such plants as euphorbia during the summer. They are generally too deep for dung hotbeds. These pits are planned to run east and west. If Fig. 3045 is thus placed, the roof on the north side may be made of plank instead of glass, but if it runs



3039. Nurseryman's cold pit. A cheap device for wintering plants that require comparatively little light.

north and south it should have a glass roof on both sides. Easy access to all is obtained through the roof by removing a sash. Sometimes a door can be built at one end. Fig. 3043 does not cost much more than Fig. 3044, and furnishes more room. By putting a few doors in the board roof, excellent ventilation and access is provided. Fig. 3045 gives the best head-room, but is rather dark for evergreens with soft foliage, e.g., *Cytisus canariensis*, unless the whole roof is glass. A

pit like this has always been used in the Arnold Arboretum for wintering seedlings, rooted cuttings and grafts,—young stock grown in flats but too delicate for the open ground. The arrangement of shelves shown in the diagram gives storage to large numbers of these small plants.

3040. A durable storing pit or cellar for very large plants.

In Fig. 3046 is shown a small plant-cellar, more expensive but with better capacity for large plants. It should run north and south, and, excepting the glass roof, is wholly below ground, and consequently extremely well protected against frost. The door is at either end or side. By taking advantage of sloping ground it is possible to enter on the ground-floor level, which is important when large plants in tubs must be handled. In such cases a concrete floor may be built. The monitor roof provides plenty of light and ventilation; wooden shutters cover the glass in cold weather. This form of pit is not only well adapted to plants, but also is excellent for storing fruits and also brussels sprouts, celery, and cauliflower until Christmas. The forms of buildings larger than those above described vary much with different circumstances. Sometimes the cellar of a stable, tool-house, or other outbuilding can be utilized. The chief consideration is protection against frost, but provision must be made for thorough ventilation, and against a too high temperature in the autumn and early spring. It is because it is hardly possible to provide for these matters that dwelling-house cellars do not make good pits; they cannot be sufficiently ventilated to keep the temperature low enough except in the middle of winter. Growth is incited and cannot be maintained owing to lack of light.

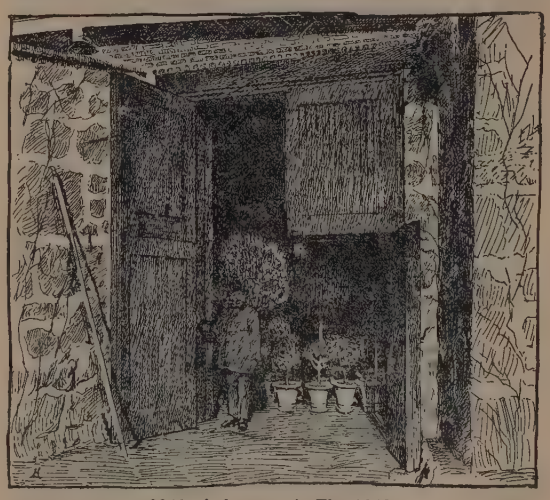
Owing to their position, pits cannot well be made of wood, plank and cedar posts lasting from 4 to 6 years only. For large pits, stone and brick are most economical for walls and ceilings; for small ones concrete probably makes the cheapest and best wall; hollow tile might be used. At the Bussey Institution the concrete walls of several small pits have stood 15 to 20 years without showing any sign of deterioration.

An excavation of the required dimensions is made, with due allowance for the walls. Inside the excavation a plank molding-frame is built at the proper distance; viz., the thickness of the walls, from the walls of earth which should have been cut as true as possible. This frame, which should also be true and plumb, is carried to the required height for the inside face of wall and another frame is made at the proper distance on the surface of the ground, the inner face of which will be the outside face of the completed wall. These frames must be well braced; they carry a heavy load until the cement hardens. It is not necessary to make a complete frame for the whole pit at once; one end and a half of both sides can be built first, and the same frame reversed will serve for the remainder. Use a good quality portland cement mixed one part of cement to two of sand with four or five parts broken stone or gravel which should not be larger than an egg; for floors the broken stone or gravel may be increased to seven or eight parts. The whole should be completely and quite carefully blended with hoe or shovel until each stone is coated. Throw this mass into the space between the molding-frame and earth wall and settle compactly with a rammer. It is not advisable to mix more than a barrel at once, nor so much as this unless at least six men are employed. Continuous batches are made until the work is finished. When the top layers are going in, insert ¾-inch iron bolts 6 to 8 inches long at intervals of 6 feet. These secure the wooden sills. In warm dry weather the frames can be removed within twenty-four hours or less, but first examine carefully the condition of the concrete. After removal, smooth off any roughness and grout in with a whitewash brush a coat of portland cement mixed with water, but without sand, thus obtaining a good color and a more homogeneous surface. For several days the work should be shaded and occasionally sprinkled with the hose. Do not attach the woodwork until the concrete is fully hardened. One and one-half barrels of cement make about 1 cubic yard of concrete, that costs, in place, between five and six dollars, somewhat less if the cost of labor, sand, and gravel is moderate. Build in June or July, so that the concrete will be thoroughly dry before frost.

The construction of a brick roof is shown in Fig. 3046. Concrete could also be used. A good grade hotbed sash make the best glass roof. All sills, cross-bars, and the like, should be made of cypress and painted. The woodwork must be made strong to endure the continual exposures. It is false economy to stint in quantity or quality. In cellars for nursery stock, a comparatively small amount of light is required, and the low roof is boarded in and shingled, building-paper being used. Planks may be substituted for boards, or the roof may be double.

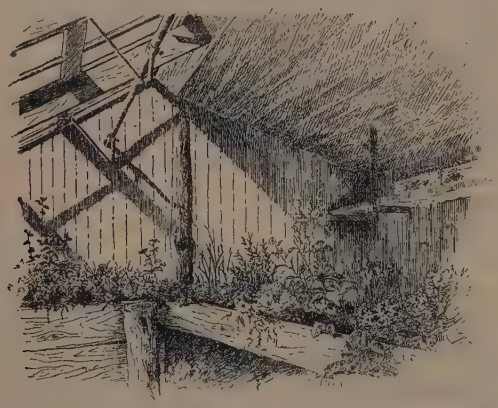
Sand or gravel, 1 foot deep, makes the best floor, or half sand and half loam where plants are to be heeled-in. A concrete floor should be used only where the drainage is absolutely perfect.

The sides and ends should be banked with leaves or other material. (See Fig. 3039). In the vicinity of Boston this should be done about November 15. The same covering can also be given to low roofs. The glass is protected by mats and shutters, much as in ordinary hotbeds. It is a good plan to have on hand an extra supply of dry meadow hay to give additional shelter in zero weather.



3041. A doorway in Fig. 3040.

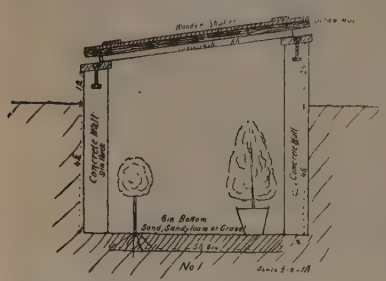
Pits like those shown in Figs. 3043 and 3045, like greenhouses, should carry more than one "crop." In early autumn they hold chrysanthemums, carnations, stevias, and the like; next *Rhododendron* (*Azalea*) *indica*, *Cytisus canariensis*, heaths, and the like, some of which remain for the winter, while others are replaced by



3042. Winter protection. Plants carried over winter in a living condition in an unheated glasshouse.

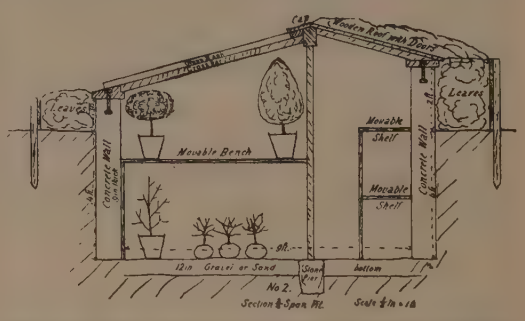
hardy shrubs, bulbs, and other plants for forcing. For spring and summer use, see above. In eastern Massachusetts gardeners begin to use them in September, but the final storage sometimes is not finished until Christmas. The longer the plants can be kept in the open air the better fitted they are for their winter quarters.

In the care of pits, watering and ventilation are of prime importance. When first housed the plants should be well watered, and, if this is carefully done, it will often be found that no further water is required for plants in tubs and large pots (10 inches or more). This also is true of heeled-in stock. Everything, however, should be so arranged that inspection is easy, and water should be given when necessary. Plants on the shelves, particularly in small pots (4-inch), will go dry oftener than those placed on the gravel floor. It is best to water on bright days, when the sashes can be removed. The great difficulty in keeping plants in good condition is owing to the condensation of moisture within the pits at times when it is impossible to open them on account of severe weather; therefore no more water should be given than is absolutely needed. As long as the weather permits, keep the sashes off or the windows open night and day, and afterward open up whenever possible. On sunny days ventilate whenever the thermometer registers over 20 F., but do not begin until the sun strikes the frames, and shut off early in the afternoon. On mild days, with the mercury above freezing, remove the sashes entirely. This is the best way to get rid of the moisture-laden air, and is essential for keeping evergreen plants with soft foliage in good condition. To change the air in large cellars is more troublesome; here it is advisable to build an open fireplace in which a brisk fire may be kindled on mild days when all windows can be unclosed, thus obtaining a better circulation than is otherwise possible. Sometimes these large cellars have a line of hot-water pipes or other means of heating, by which not only is better ventilation secured but also additional protection in severe weather.



3043. One of the simplest and least expensive forms of cold pit for small and medium-sized plants.

An unheated greenhouse (Fig. 3042) can sometimes be used advantageously, not only for protection but, if it is warm enough, for growing plants in spring and autumn, and to a certain extent in winter. It is really a pit 5 or 6 feet deep built below ground and attached on the south side to some building already on the place. It might not be satisfactory for the extreme North but in southern New England and the middle states it is a great help: in European gardens it is sometimes called an alpine house, or, if it is larger and better built, a winter-garden. Give a southern exposure and have it so arranged that the floor is on the same or nearly the same level as the cellar floor; if this cellar is heated, so much the better. The cellar will be convenient for various operations, also for storing soil and tools; water should be handy. A door between it and the cellar is a necessity, but there need be none on the outside. The form of roof can be either lean-to or three-quarters span; in the latter form boarding, double if possible, can cover the roof next the house. Use double glazed glass and provide plenty of ventilation by glass or board shutters; this last is most important. The dimensions should not be less than 10 feet in width and may be more; the length can be any multiple of three so that hotbed sash can be used for the roof. The interior layout should be a walk, not over 2 feet wide, so placed that convenient and economical access is given the plants. These may be grown on benches, either solid or of boards, or planted in the earth. The great advantage of such a structure is that the plants can be handled from the inside in all weathers. The hardier plants, like wallflowers and violets, bloom all winter; in autumn it can be used to prolong the chrysanthemum season, in spring it is a good place for starting seedlings, e. g., lettuce, cauliflower, and cabbage, and, if warm enough, an inside hotbed can be made to start tomatoes, peppers and eggplant also; in it most of the plants named below can be stored or grown. Many plants of doubtful hardiness or of small size can be wintered and tried out. It is much simpler to handle than pits or frames, largely on account of easy access and the storage capabilities of the cellar. It makes a good place to store plants for forcing and will even flower well tulips, hyacinths, and narcissi. A three-quarters span 12 by 15 feet with 8 feet of glass roof, in southern Massachusetts, well protected in all ways, has recorded on a self-registering thermometer only 24° F. in the last three years, outside temperature going as low as—10° F.



3044. A well-ventilated cold pit, roomier than the preceding and not much more expensive.

Following is a list of plants that may be wintered in pits and frames with satisfactory results. The list is made for the neighborhood of Boston.

A. *Hardy plants.*

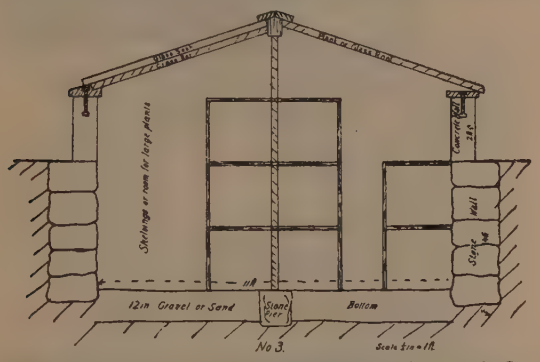
1. Nursery stock of every description.
2. Stocks, cions, and cuttings for winter work.
3. Young nursery stock,—seedlings, cuttings, or grafts too delicate for planting in autumn.
4. Hardy plants for forcing or winter decoration.

The temperature of pit or cellar for the above plants should be 35° F. or even lower occasionally. The larger plants should be heeled-in on the floor in sandy loam or in bunk-like shelves along the sides. Instead of loam, sphagnum can be used and is particularly good for cuttings and grafting stock. The very young stock is stored in flats or pans in which it has been grown. For forcing stock, see *Forcing*, pages 1265–1267.

AA. *Tender and half-hardy plants.*

Those marked with a star (*) are more tender and should not be exposed to frost. They should also be kept in the driest part of the pit.

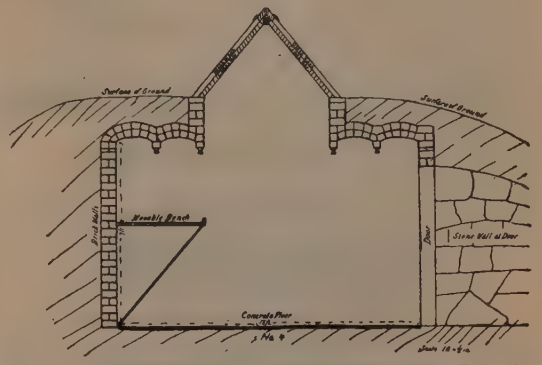
1. Alstrœmeria, canna, dahlia, gladiolus, *Milla biflora*, montbretia, oxalis for summer bedding, tuberose, tigridia, *Zephyranthes Atamasco, Z. candida*. Keep the above in dry house-cellars, where no frost penetrates, temperature 35° to 40° F. Dahlias and cannas can be covered with dry sand if prone to wilt. Tigridias should be hung up in bags to avoid mice.
2. Agave, aloe, *Lippia citriodora, Datura suaveolens*, some of the hardier cacti, e. g., *Selenicereus grandiflorus* and *Opuntia Ficus-indica, Cordyline indivisa*,



3045. A shelved cold pit for wintering young stock grown in flats, seedlings, rooted cuttings and grafts.

fuchsia, *Yucca gloriosa* and probably other genera and species of succulent plants. Keep at temperature 35° to 40° F. in a very dry house-cellar, with as much light as possible; too much moisture is destructive.

3. Abelia in variety, *abutilon, *acacia, *Acanthus mollis*, **Agapanthus umbellatus*, *Araucaria imbricata* and *A. excelsia*, *Aucuba japonica*, bamboos, *Buxus sempervirens*, *Callistemon sorts, *Calluna vulgaris*, *Camellia (different species, including the tea plant), *Ceanothus azureus, Cedrus Libani* and *C. Deodara, Cephalotaxus drupacea*, *citrus in variety, cistus (different species), cotoneaster (tender sorts), *Cryptomeria japonica*, cupressus (tender sorts), **Cytisus canariensis* and **C. racemosus*, **Daphne odora*, *erica (hardier sorts), Eriobotrya japonica, *Erythrina Cristagalli*, **Eugenia Jambos, Evonymus japonica* (tender varieties), *Ficus Carica, Gelsemium sempervirens, Gordonia alatamaha*, grapes (tender kinds), *Hedera helix*, **Hibiscus Rosa-sinensis, Hydrangea hortensis, Ilex Aquifolium*, kniphofia, laurestinus, *Laurus nobilis*, lagerstrœmia, *Magnolia grandiflora*, **Meratia præcox, Myrtus communis*, **Nerium Oleander, Olea europæa*, **Osmanthus fragrans* and *O. Aquifolium, Passiflora cærulea*, pernettya, *Phormium tenax*, **Pittosporum Tobira* and others, *Plumbago capensis, Podocarpus macrophylla* var. *Maki, Prunus Laurocerasus* and others, **Psidium Guajava*, **Punica Granatum*, retinispora in variety, rhododendron (tender hybrids), *Rhododendron indicum, Romneya Coulteri*, roses (Bourbon, Noisette, China, Bengal, and other tender varieties), *Rosmarinus officinalis, Senecio grande, Sequoia gigantea*, taxus, *Trachelospermum jasminoides, Ulex europœus*.



3046. A small plant-cellar for wintering large plants. It is also excellent for storing vegetables and fruits. It combines perfect ventilation with extremely good protection against frost.

The above plants are commonly handled in pits for various reasons. In eastern Massachusetts, with the possible exception of those marked thus (*), they will bear a few degrees of frost, if not too long continued, without harm. The average temperatures of the pit should be just above freezing, say 35° F. The value of these plants depends upon not only carrying them through the winter in good condition, but also in giving them a good start in the spring. For this purpose a cool greenhouse must be provided; a cold grapery or a house constructed from the sashes used on the pits is equally good, in which the plants can be properly grown until it is warm enough to put them out-of-doors.

4. *Anemone japonica* and *A. coronaira, Bellis perennis, Dianthus Caryophyllus* (clove pinks and European carnations from seeds), *Galax aphylla*, myosotis, primula in variety, including auricula, Persian ranunculus, *Viola odorata* (tender sorts), pansies, wall-flowers, lettuce, cabbage, cauliflower and parsley. These plants are wintered in coldframes, which should vary in depth with the size of the plant; sometimes the plants are grown and flowered in the frame, at others they are bedded out when the season permits.

5. Arisæma, arum, calochortus (different species), freesia in variety, iris (tender species), ixia, sparaxis. The above plants can be potted and carried in a pit or frame until wanted in the greenhouse.

B. M. Watson.

3047. The roof of Fig. 3046.

Shrubs, small trees, and woody vines hardy in the northeastern United States.

The use of shrubs in landscape planting is explained in the preceding articles of this symposium on Planting. The illustrations, Figs. 3048 to 3060 inclusive, indicate the habit of some of the species.

1 before name means plant is low, 6 inches to 2 feet.
2 means plant is small, 3 to 5 feet.
3 means plant is medium, 6 to 8 feet.
4 means plant is large, 10 to 15 feet.
D means dicœcious, i. e., only one sex on a plant. Fruiting (i. e., pistillate) plants must be secured with also one or more pollen-bearing (i. e. staminate) plants.
E means plant is evergreen.
e means plant is good for edging (low, neat, and compact).
G means plant is good ground-cover (trailing or creeping).
H means plant is hedge material.
P means requires protection in climate of Boston.
S means semi-evergreen (holding leaves till December or later).
V means plant is a vine.

EP1—Abelia grandiflora (much used in the South).
3—Acanthopanax pentaphyllus.
4—Acer campestre (small compact tree, dense foliage).
4—Acer ginnala.
3—Acer palmatum (often large but slow-growing).
4—Acer pennsylvanicum.
H3 or 4—Acer platanoides var. globosum (a dwarf dense slow-growing variety of the Norway maple).
V—Actinidia arguta.
4—Æsculus parviflora.
SV—Akebia quinata.
4—Alnus incana.
Ee1—Alyssum gemonense (6 inches).
4—Amelanchier canadensis.
4—Amelanchier oblongifolia (A. obovalis).
2—Amorpha canescens.
V—Ampelopsis heterophylla.
EG1—Arctostaphylos Uva-ursi.
V—Aristolochia macrophylla (A. Sipho).
2—Aronia arbutifolia.
2—Aronia melanocarpa. These two aronias will grow 6 to 8 feet, but are better if kept low and vigorous by frequent thinning out and renewal from the base.
EP1—Arundinaria japonica.
Ee1—Aubrietia deltoidea var. græca.
S2—Baccharis halimifolia.
EP1—Bambusa disticha.
4—Benzoin æstivale (B. odoriferum).
4—Berberis aristata.
3—Berberis dictyophylla.
EP2—Berberis Sargentiana (2 to 3 feet).
H2—Berberis Thunbergii (occasionally 6 feet).
EeP1—Berberis verruculosa (1 to 2 feet).
H3—Berberis vulgaris.
HS2—Berberis Wilsonæ (2 to 3 feet).
2—Betula pumila.

3048. A good shrub, taking its natural and characteristic form.

P2—Buddleia Davidii (B. variabilis) var. magnifica (if not protected may be cut to ground annually).
EH2—Buxus japonica (a new and hardy box; will probably reach 8 feet but is slow-growing and easily restrained by clipping).
EHP2—Buxus sempervirens (must be protected in the North, but is hardy and tree-like in the South).
EHP1—Buxus sempervirens var. suffruticosa.
1—Callicarpa japonica.
1—Callicarpa purpurea. Both of these callicarpas are tender and require cutting back early in spring.
EeG1—Calluna vulgaris. Succeeds best in United States if kept low and vigorous by heavy pruning early in spring. Flowers appear in summer.
2—Calycanthus fertilis.
V—Campsis radicans.
2—Campsis radicans var. speciosa.
3—Caragana frutex.
2—Caragana pygmæa.
4—Caragana arborescens.
H4—Carpinus Betulus. Dense slow-growing tree, much used for hedges. Better than the native hornbeam, C caroliniana.
H3—Carpinus Betulus var. globosa. This is an upright, oval form of the above. It is very dense and compact and may reach 15 to 20 feet in height, but is very slow-growing and can be restrained easily. See page 2683.
2—Catalpa bignonioides var. nana. This is known in the trade as C. Bungei, but is not the true C. Bungei from China. It is a dwarf variety of the southern catalpa (C. bignonioides). It is often grafted high on an upright stem, but if grown on its own roots it will make only a dense round bush.
1—Ceanothus americanus.
1—Ceanothus hybridus.
V—Celastrus scandens.
3—Cephalanthus occidentalis.
4—Cercis canadensis.
H2—Chœnomeles japonica.
1—Chœnomeles Maulei.
EH4—Chamæcyparis nootkatensis. This is a large timber tree of the north Pacific coast. It is hardy, but little known in the East. Its good qualities are compact oval shape and dense soft foliage. It is also slow-growing and may be restrained easily for small-scale planting. See page 2683.
E4—Chamæcyparis obtusa.
EH2—Chamæcyparis obtusa var. nana. This is the finest of the Japanese cypresses (Chamæcyparis), all of which were originally introduced in the trade under the name Retinospora. This form will reach 6 to 8 feet, but is dwarf and very slow-growing and can be restrained easily. Its foliage is small and blunt, dark green above with white Y-shaped lines below. The spray is in compact, concave, fan-shaped masses arranged laterally, producing very interesting horizontal lines and shadows.
E4—Chamæcyparis pisifera.
E4—Chamæcyparis pisifera var. filifera.
E4—Chamæcyparis pisifera var. plumosa.
E4—Chamæcyparis pisifera var. squarrosa.
E or S1—Chamædaphne calyculata.
EG1—Chimaphila maculata.
EG1—Chimaphila umbellata.
4—Chionanthus virginica.
V—Clematis apiifolia.
V—Clematis Henryi.
V—Clematis Jackmannii.
V—Clematis Jackmannii var. alba.
V—Clematis montana in variety.
V—Clematis paniculata.
V—Clematis tangutica.
V—Clematis texensis (C. Viorna var. coccinea).
V—Clematis virginiana.
3—Clethra alnifolia.
4—Colutea arborescens.
1—Comptonia asplenifolia.
Cornus (all shrubby cornuses are better if kept vigorous by constant thinning and renewal from base).
3—Cornus alba.
3—Cornus alba var. sibirica.
4—Cornus alternifolia (small tree or tree-like shrub).
3—Cornus Amomum (C. sericea).
4—Cornus florida (large shrub or small tree, 20 feet).
4—Cornus florida var. rubra (shrub or small tree, 20 feet).
4—Cornus mas (small compact tree, 15 to 20 feet).
3—Cornus racemosa (C. candidissima and C. paniculata).
3—Cornus rugosa (C. circinata).
3—Cornus sanguinea var. viridissima.
3—Cornus stolonifera.
3—Cornus stolonifera var. flaviramea.
3—Corylus americana.
3—Corylus Avellana.
4—Corylus maxima.
3—Corylus rostrata.
4—Cotinus Coggygria.
EeP1—Cotoneaster adpressa (6 to 12 inches, slow-growing).
PS2—Cotoneaster Franchetii (occasionally larger).
1—Cotoneaster horizontalis.
EGP1—Cotoneaster microphylla (4 to 6 inches; flatter than C. adpressa and better as ground-cover in rock-garden).
2—Cotoneaster racemiflora.
2—Cotoneaster Simonsii.
2—Cotoneaster tomentosa.
H4—Cratægus coccinea. All these thorns are better as natural screens with room to spread at the bottom than when confined in restricted hedge lines.
H4—Cratægus Crus-galli.
H4—Cratægus Oxyacantha var. Paulii.
4—Cratægus Phænopyrum (C. cordata).
H4—Cratægus punctata.
4—Cratægus tomentosa.
PS1—Cytisus hirsutus.
2—Cytisus ratisbonensis (2 to 3 feet).
P2—Cytisus scoparius.

Ee1—Daphne Cneorum.
2—Daphne Mezereum.
2—Daphne Mezereum var. alba.
E2—Daphne pontica.
1—Deutzia gracilis (2 feet).
2—Deutzia Lemoinei (3 to 4 feet).
3—Deutzia scabra var. flore-pleno (Pride of Rochester).
1—Diervilla Lonicera.
3—Diervilla hybrida in variety (Le Printemps is early pink; Eva Rathke is late red).
H2—Dirca palustris. This is a native shrub with flexible leathery twigs, small yellow flowers in early spring, good light green foliage in summer, and yellow color in autumn.
4—Elæagnus angustifolia.
3—Elæagnus multiflora (E. longipes).
2—Enkianthus perulatus.
E1—Epigæa repens (4 inches).
Ee1—Erica carnea (6 inches; flower-buds conspicuous all winter; foliage glossy).
Ee1—Erica carnea var. alba.
Ee1—Erica Tetralix (6 inches; summer-blooming; no winter buds visible; foliage grayish).
H3—Evonymus alata.
4—Evonymus europæa.
G1—Evonymus obovata (1 foot).
EGHV2—Evonymus radicans var. vegeta. This is the hardiest evergreen vine for brick and stone. It is also used for low mass planting, for hedges and edging, and for ground-cover. The fruit in all varieties is an orange and red berry like that of Celastrus scandens. But not all plants fruit, and therefore care should be taken to select stocks from fruiting plants.
3—Exochorda racemosa.
3—Forsythia suspensa. Shrub with recurving stems, excellent for trailing over a bank or hanging down a wall. Has good definite form and therefore the best forsythia for individual specimen planting.
3—Forsythia suspensa var. Fortunei.
3—Forsythia viridissima.
2—Fothergilla major.
EG1—Gaultheria procumbens.
1—Gaylussacia baccata (G. resinosa).
Ee1—Gaylussacia brachycera.
1—Genista tinctoria.
4—Halesia carolina (H. tetraptera).
3—Halimodendron halodendron.
4—Hamamelis japonica var. arborea.
4—Hamamelis mollis.
2—Hamamelis vernalis (occasionally 6 feet).
4—Hamamelis virginiana.
EGPV—Hedera helix.
EeG1—Helianthemum Chamæcistus (H. vulgare).
H4—Hibiscus syriacus.
4—Hippophaë rhamnoides.
2—Hydrangea arborescens var. grandiflora.
4—Hydrangea paniculata var. grandiflora (15 feet).
GV—Hydrangea petiolaris.
1—Hydrangea quercifolia (cut to ground annually).
1—Hydrangea radiata (cut to ground annually).
2—Hypericum aureum.
e1—Hypericum Buckleii.
EGP1—Hypericum calycinum (6 inches to 1 foot).
2—Hypericum prolificum.
Ee1—Iberis sempervirens (6 inches).
Ee1—Iberis Tenoreana (6 inches).
DEHP3—Ilex crenata.
D2—Ilex decidua.
DEH2—Ilex glabra.
DEH4—Ilex opaca.
D3—Ilex verticillata.
1—Indigofera Kirilowii (cut to ground annually).
DEH4—Juniperus chinensis. All forms of Juniperus in this list are very slow-growing except J. communis var hibernica.
E2—Juniperus chinensis var. erecta.
DE3—Juniperus chinensis var. Pfitzeriana.
DEeG1—Juniperus chinensis var. procumbens.
DE2—Juniperus communis.
DEH4—Juniperus communis var. hibernica.
DEG1—Juniperus communis var. montana (1 foot high).
DEG1—Juniperus horizontalis (J. Sabina var. procumbens).
DEG1—Juniperus horizontalis var. Douglasii.
DE3—Juniperus Sabina.
DEe1—Juniperus Sabina var. tamariscifolia (2 to 3 feet, neat and compact and very slow-growing, with short horizontal branches and upcurving branchlets).
E1—Kalmia angustifolia.
E3—Kalmia latifolia (sometimes higher).
2—Kerria japonica.
4—Kœlreuteria paniculata (round-headed tree 20 to 30 feet high; summer bloomer).
4—Laburnum alpinum (compact shrub or small tree 20 to 30 feet, more hardy than the common L. vulgare).
Ee1—Leiophyllum buxifolium var. prostratum.
2—Lespedeza bicolor.
EG1—Leucothoë Catesbæi (occasionally 3 feet).
H4—Ligustrum Ibota.
H2—Ligustrum Ibota var. Regelianum.
HS2—Ligustrum ovalifolium. See remarks on page 2683.
HS4—Ligustrum vulgare, the common privet.
4—Lonicera bella var. rosea.
3—Lonicera fragrantissima.
V—Lonicera Heckrottii.
SV—Lonicera Henryi.
SV—Lonicera japonica var. Halliana.
4—Lonicera Maackii.
3—Lonicera Morrowii.
V—Lonicera Periclymenum.
V—Lonicera sempervirens.
e1—Lonicera spinosa.
4—Lonicera tatarica.
2—Lonicera thibetica.
S2—Lycium chinense.
S2—Lycium halimifolium (L. vulgare). These lyciums have same general habit as Forsythia suspensa, but are more vigorous. Their branches root easily and the plants may become a nuisance and hard to eradicate. See note on page 2681.

3049. A good shrub ruined by the shears.

4—Magnolia denudata (M. Yulan) (tree, 30 to 40 feet).
S4—Magnolia glauca (M. virginiana).
4—Magnolia Lennei.
4—Magnolia Soulangeana.
4—Magnolia stellata.
EP1—Mahonia Aquifolium (2 feet).
EP2—Mahonia japonica.
EG1—Mahonia repens (1 foot).
V—Menispermum canadense.
EG1—Mitchella repens (1 to 2 inches; very flat and creeping).
DS4—Myrica carolinensis. Can be kept lower very easily by thinning out and renewing from the base. Is still known in commerce as M. cerifera. Ranges north to Nova Scotia near the coast. Is more shrubby, with blunt leaves which are broader and more oblong than those of M. cerifera. This latter is a southern plant, closely related but probably tender in New England. It is more tree-like, with pointed leaves which are narrower and more lanceolate than those of M. carolinensis.
1—Myrica Gale.
2—Neviusia alabamensis.
4—Oxydendrum arboreum.
EeP1—Pachistima Canbyi (4 to 5 inches).
EP1—Pachistima myrsinites (1–2 feet).
EeG1—Pachysandra terminalis (6 inches to 1 foot).
1—Pæonia suffruticosa (P. Moutan).
V—Parthenocissus quinquefolia.
V—Parthenocissus tricuspidata.
3—Philadelphus coronarius (often 10 feet).
1—Philadelphus coronarius var. nanus (2 to 3 feet; very dense and compact; seldom has flowers).
3—Philadelphus inodorus.
4—Philadelphus pubescens (P. grandiflorus or P. latifolius).
2—Philadelphus Lemoinei (in variety, especially vars. Avalanche, Candelabre, and Gerbe de Neige).
2—Philadelphus microphyllus (this and P. coronarius are the original parents of the Lemoine hybrids).
4—Photinia villosa.
3 or 4—Physocarpus opulifolius.
Ee1—Picea excelsa dwarf varieties, as var. Clanbraziliana (2 to 3 feet) and var. Maxwellii (1 foot).
Ee1—Picea mariana var. Doumettii (1 foot).
EH—Picea orientalis. This is a large tree but is adapted to small-scale planting because very slow-growing and also because easily restrained. Foliage small, blunt, and dark glossy green.
E2—Pieris floribunda (2 to 3 feet).
EP2—Pieris japonica.
2—Pieris mariana (2 to 3 feet).
E2—Pinus densiflora var. pumila.
E4—Pinus montana (a low bushy tree 20 feet high and 20 feet broad; very slow-growing).
E2—Pinus montana var. Mughus.
V—Polygonum baldschuanicum.
2—Potentilla fruticosa (2 to 3 feet).
eS1—Potentilla tridentata (6 inches).
EGP1—Prunus Laurocerasus var. schipkaensis.
2—Prunus maritima.

2—Prunus pumila.
3—Prunus tomentosa.
3—Prunus triloba var. flore-pleno.
4—Ptelea trifoliata.
EeHP1—Pyracantha coccinea var. pauciflora (plant low, dense, and thorny).
4—Pyrus coronaria.
4—Pyrus Halliana.
4—Pyrus ioensis, Bechtel's variety.
4—Pyrus pulcherrima (small tree).
4—Quercus ilicifolia (Q. nana).
H4—Rhamnus cathartica.
2—Rhamnus fallax.
4—Rhamnus Frangula.
EeHP1—Rhododendron amœnum.
3—Rhododendron arborescens.
E1—Rhododendron arbutifolium (R. Wilsonii).
E2—Rhododendron, Boule de Neige (white, early).
3—Rhododendron calendulaceum.
E2—Rhododendron caractacus (bright red, bloom medium).
E2—Rhododendron carolinianum (R. punctatum in part). This is a low, compact rhododendron native to the high mountains of North Carolina, with broad leaves and early rose-pink flowers in late May before the new leaves appear. It was placed on the market under the name R. punctatum. The real R. punctatum is a taller looser-growing shrub, native to lower altitudes from North Carolina south, with narrower leaves, and flowers that bloom a month later than those of R. carolinianum and are more or less overtopped and obscured by new leaf-growth. The old R. punctatum is now called R. minus. (See Rhodora, vol. 14, No. 162, June, 1912.)
E3—Rhododendron catawbiense var. album (this has same compact habit as R. catawbiense, but flowers are white instead of magenta, early.).
E3—Rhododendron delicatissimum (blush-white, late).
E3—Rhododendron Everestianum (lavender, early).
EeHP1—Rhododendron Hinodigiri.
E3—Rhododendron, H. W. Sargent (red, late).
3—Rhododendron Kaempferi.
E3—Rhododendron, Lady Armstrong (pink, early to medium).
E4—Rhododendron maximum.
2—Rhododendron mucronulatum.
EeH1—Rhododendron myrtifolium.
2—Rhododendron nudiflorum.
E3—Rhododendron purpureum elegans (purple, bloom medium).
3—Rhododendron Vaseyi.
2—Rhododendron viscosum.
3—Rhodotypos kerrioides.
G2—Rhus canadensis (R. aromatica).
4—Rhus copallina.
4—Rhus glabra.
Rhus hirta.
4—Rhus typhina (R. hirta).
2—Ribes alpinum.
2—Ribes cereum.
3—Ribes odoratum (R. aureum) (Buffalo, Flowering, or Missouri Currant).
2—Ribes pinetorum.
2—Robinia hispida.
2—Robinia Kelseyi.
2—Rosa carolina.
2—Rosa cinnamomea.
2—Rosa Harisonii.
2—Rosa multiflora (5 to 6 feet or higher).
1—Rosa nitida (2 ft.).
2—Rosa rubiginosa.
2—Rosa rugosa.
2—Rosa rugosa var. Blanche de Coubert (beautiful semi-double white).
2—Rosa setigera (2 to 4 feet).
2—Rosa spinosissima var. altaica (often 5 feet).
1—Rosa virginiana (R. lucida) (2 feet).
GS1V—Rosa wichuraiana (1 foot).
2—Rubus allegheniensis.
2—Rubus cratægifolius.
GS1—Rubus hispidus (6 inches).
2—Rubus occidentalis.
2—Rubus odoratus.
GS1—Rubus spectabilis var. plena (R. Linkianus or R. ulmifolius) (18 inches).
G1—Rubus procumbens (R. villosus) (12 inches).
4—Salix Caprea.
4—Salix cordata.
4—Salix discolor.

3050. One value of the shrub lies in its bloom.—Clethra alnifolia

2—Salix humilis (sometimes reaches 6 to 8 feet).
4—Salix purpurea.
e1—Salix tristis (1 foot to 18 inches).
3—Sambucus canadensis (sometimes over 10 feet).
3—Sambucus racemosa.

3051. Deutzia Lemoinei.

GV—Schizophragma hydrangeoides.
4—Shepherdia argentea.
2—Shepherdia canadensis.
V—Smilax glauca.
V—Smilax rotundifolia.
3—Sophora viciifolia (new plant from China; will probably grow 10 feet under cultivation).
2—Sorbaria Aitchisonii (this plant is very handsome, but tender at Boston).
2—Sorbaria arborea (most handsome hardy sorbaria).
2—Sorbaria sorbifolia.
2—Spiræa alba (S. salicifolia).
2—Spiræa arguta.
3—Spiræa Billardii (S. Lenneana).
3—Spiræa bracteata.
eH1—Spiræa Bumalda, Anthony Waterer variety (2 feet).
3—Spiræa crenata.
3—Spiræa Douglasii.
3—Spiræa gemmata.
2—Spiræa japonica (S. callosa) (3 feet).
3—Spiræa prunifolia var. flore-pleno.
2—Spiræa salicifolia (S. alba).
2—Spiræa Thunbergii.
2—Spiræa tomentosa.
2—Spiræa trilobata.
3—Spiræa Van Houttei.
3—Staphylea Bumalda.
3—Staphylea trifoliata (sometimes 12 feet high).
2—Stephanandra incisa.
2—Stephanandra Tanakæ.
4—Stewartia Pseudo-camellia.
4—Styrax japonica.
2—Symphoricarpos albus.
2—Symphoricarpos orbiculatus (2 to 3 feet).
4—Symplocos cratægoides.
4—Syringa chinensis (S. rothomagensis) var. alba.
4—Syringa chinensis (S. rothomagensis) var. rubra.
4—Syringa japonica (small compact tree, to 30 feet).
4—Syringa oblata.
4—Syringa persica var. alba.
4—Syringa persica var. rubra.
4—Syringa villosa.
H4—Syringa vulgaris (there are many color varieties).
3—Tamarix.
De1—Taxus baccata var. repandens.
DG1—Taxus canadensis (good in shade but not so satisfactory as other forms in full sun).
DH3—Taxus cuspidata.
DH2—Taxus cuspidata var. nana.
EH4—Thuya occidentalis (dense pyramidal tree; very slow-growing, but may reach 50 to 60 feet in time).
EeH1—Thuya occidentalis var. nana (this may reach 3 to 4 feet, but is very slow-growing and easily restrained by clipping).
EH4—Thuya orientalis. More handsome than our native arborvitæ. The branches and branchlets are more distinctly vertical and the foliage is smaller and brighter green.
EeH1—Thuya orientalis var. Sieboldii or nana (this may reach 3 to 4 feet, but is very slow-growing and is easily restrained by clipping).
EeG1—Thymus Serpyllum (4 to 5 inches).
EH 3 or 4—Tsuga canadensis. The most graceful and effective evergreen tree for mass-planting. Takes up less room than white pine and is much slower-growing. Can be restrained easily and therefore is adapted to hedge and small-scale plantings
2—Vaccinium corymbosum.
eG1—Vaccinium pennsylvanicum (1 foot).
1—Vaccinium vacillans.
2—Viburnum acerifolium.
2—Viburnum alnifolium (V. lantanoides).
4—Viburnum americanum.
2—Viburnum Carlesii (first viburnum to flower, and very fragrant; buds are pink before opening; new plant from Korea).

3—Viburnum cassinoides.
H3 or 4—Viburnum dentatum (will reach 10 to 12 feet, but may be restrained easily by gradual renewal from the base).
3—Viburnum dilatatum.
H4—Viburnum Lantana.
4—Viburnum Lentago.
4—Viburnum Opulus.
1—Viburnum Opulus var. nanum (2 to 3 feet, very dense and compact; seldom has flowers).
4—Viburnum Opulus var. sterile.
H4—Viburnum prunifolium.
3—Viburnum pubescens.
EP2—Viburnum rhytidophyllum. Grows to 10 feet in China but needs protection in Boston and Rochester either by artificial covering or special location providing shade from the winter sun. Even when so protected the flower-buds are usually killed just like those of Andromeda japonica.
4—Viburnum Sieboldii.
3—Viburnum tomentosum (sometimes larger).
3—Viburnum tomentosum var. plenum.
H3 or 4—Viburnum venosum (V. molle). Similar to V. dentatum but more vigorous with broader leaves, rougher twigs and later bloom. Will grow to 12 feet but easily restrained by gradual renewal from the base.
3—Viburnum Wrightii.
EeG1—Vinca minor.
3—Vitex incisa.
V—Vitis Coignetiæ.
V—Wisteria chinensis.
V—Wisteria chinensis var. alba.
G1—Xanthorrhiza apiifolia.
1—Yucca angustifolia.
1—Yucca filamentosa.
S2—Zenobia pulverulenta (foliage and twigs blue-gray; very handsome).

RALPH W. CURTIS.

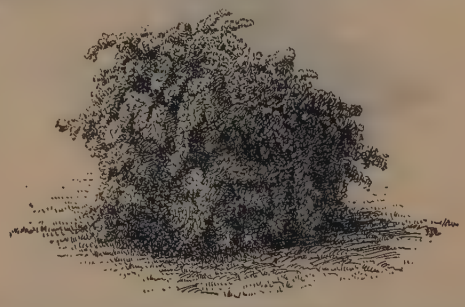
Shrubs for the Middle West.

The most popular shrubs in the Middle West, as in any new country, are usually of foreign origin. However, the native shrubs are beginning to play a great part in restoring and intensifying the characteristic beauty of this region. The dominant feature of middle western shrubbery is not apparent to all. This is largely due to the fact that the Middle West contains no unique species that compel universal admiration like the mountain laurel and rhododendrons, which are the crowning glory of the East. Every shrub of importance native to the Middle West is also native to the East. While the Middle West may rival the East in the luxuriance of its shrubbery, it is poorer in species, both native and foreign. About two-fifths of the middle western shrubs that are in general cultivation bear their flowers in flat clusters. These have been called "symbols of the prairie" since they repeat many times on a small scale the great line of the horizon, which is the strongest feature of the middle western scenery, whether wild or cultivated, treeless or forested. Repetition of the horizontal is conspicuous enough wherever hawthorns and prairie crab-apples (*Pyrus ioensis*) are abundant, owing to their strong horizontal branching. Few shrubs, however, have stratified branches. Their suggestion of the prairie is subtler and less insistent, because it appears only in the bloom. The boldest repeater of the prairie among the shrubs is the American black elder, with clusters 6 to 8 inches across. The viburnums and dogwoods have smaller clusters, ranging from 5 inches in diameter down to 2 inches. When wood and prairie meet, the prairie note is sounded more strongly by shrubs with horizontal branches, especially witch-hazel, and by juneberry and gray dogwood which, though erect when young, become intensely stratified when old. This is an important part of the prairie style of landscape gardening. The following lists are therefore classified according to this idea.

3052. Sambucus canadensis.

Stratified shrubs. (Those marked * have horizontal branches, at least when old. The others have flat clusters of flowers.)

Low shrubs, suitable for foundation planting and edging borders: *Ceanothus americanus* and *C. ovatus; Hydrangea arborescens; Viburnum acerifolium* and *V. pubescens.*



3053. Spiræa Van Houttei.

Medium-high shrubs, ordinarily 5 to 6 feet: *Cornus Amomum, C. racemosa** (or *C. paniculata*), and *C. stolonifera; Sambucus pubens, S. canadensis*, and its var. *acutiloba; Viburnum cassinoides, V. dentatum, V. molle*, and *V. americanum.* The last-named is considered by botanists to be the same as the European *V. Opulus*, but the American form is considered to be freer from plant-lice and is superior in other ways.

Tall shrubs, suitable for the back of a border, corner of a house, or high foundation: *Aralia spinosa*; Cornus alternifolia** and *C. rugosa** (or *C. circinata*); *Hamamelis virginiana*; Physocarpus opulifolius; Viburnum Lentago* and *V. prunifolium.*

Non-stratified shrubs.

Low shrubs: Amelanchier alnifolia and var. *pumila; Diervilla trifida; Evonymus obovata; Prunus pumila; Rhus canadensis* (or *R. aromatica*); *Ribes americanum; Rosa virginiana* (or *R. blanda*), *R. carolina, R. humilis*, and *R. setigera; Rubus hispidus; Symphoricarpos occidentalis* and *S. orbiculatus.*

Medium-high shrubs: Corylus americana; Evonymus americana; Ilex verticillata; Rhus copallina, R. glabra, and *R. typhina; Ribes aureum* and *R. Cynosbati; Spiræa alba; Symphoricarpos albus.*

Tall shrubs: Aronia arbutifolia and *A. melanocarpa; Benzoin æstivale; Cephalanthus occidentalis; Staphylea trifolia; Zanthoxylum americanum.*

The most significant plants in the above list, probably, are sumac and prairie rose. The sumac (*Rhus glabra*) was undoubtedly the most virile note on the wild prairie, where the summer foliage took on a wonderful gloss. It is still the most gorgeous color in the corn-belt, where brilliant reds are not commonly developed in autumn. The prairie rose, also known as the Michigan or Illinois rose (*Rosa setigera*), is now much planted beside front doors. The common wild rose of the open prairie is *Rosa humilis*, which, however, is familiar in the East, while *Rosa setigera* is decidedly more western in its range.

The middle western point of view may be indicated by brief notes on a few other species. *Ceanothus ovatus* is thought to be more refined in cultivation than New Jersey tea and has more "western color;" should combine well with *Lilium canadense* or *L. superbum.* *Cornus racemosa* has been called "sunset dogwood" because in autumn its countless red pedicels make a glow like the characteristic prairie sunset; this and

sumac are prominent in "sunset gardens." *Cornus rugosa* is a magnificent species, but must have shade. Although hazel (Corylus) may be considered "coarse" in the East, its rugged character pleases the Middle West and its autumn color is unique. *Hamamelis virginiana* is very popular because its yellow foliage lights up the autumn woods and because its stratified branches carry the prairie spirit into the woodland. *Sambucus pubens*, the red elder, will not thrive on clay or in full sun; it wants shade and prefers sandy soil. *Symphoricarpos orbiculatus* is commonly called "buckbush," and is a familiar sight in pastures. *Viburnum acerifolium* is useful for the shady side of the house. *Viburnum pubescens* is the most floriferous of the viburnums and formerly common near Chicago. *Zanthoxylum americanum* is almost as common in woodlots as buckbush; the scent of the foliage generally pleases.

3054. Gardenia.

WILHELM MILLER.

Shrubs for street and park planting.

Eastern United States, northern section.

Berberis Thunbergii.
Ceanothus americana.
Cercis canadensis.
Cercis japonica.
Chænomeles japonica (subject to San José scale).
Clethra alnifolia.
Cornus in variety (these are subject to scale insects).
Forsythia Fortunei.
Forsythia viridissima.
Hydrangea arborescens.
Hydrangea paniculata.
Kerria japonica.
Ligustrum Ibota.
Ligustrum Ibota var. Regelianum.
Lonicera Morrowii.
Lonicera tatarica.
Philadelphus in variety.
Physocarpus opulifolius.
Rhodotypos kerrioides.
Ribes in variety.
Rosa rugosa and other species.
Spiræa Billardii.
Spiræa Bumalda, including var. Anthony Waterer.
Spiræa japonica.
Spiræa japonica var. alba.
Spiræa carpinifolia.
Spiræa Van Houttei.
Symphoricarpos albus.
Symphoricarpos orbiculatus.
Syringa in variety.
Tamarix in variety (may be killed to the ground in the extreme North but will come again from the root).
Viburnum dentatum.
Viburnum Opulus.

Eastern United States, central section. (From Philadelphia and St. Louis southward, in addition to the shrubs for the northern section.)

Abelia grandiflora.
Buddleia variabilis varieties.
Callicarpa purpurea.
Caryopteris incana.
Deutzia in variety.
Evonymus in variety.
Forsythia suspensa.
Hypericum Moserianum.
Ilex in variety.
Jasminum in variety.
Ligustrum in variety.
Mahonia Aquifolium.
Spiræa in variety.
Staphylea pinnata.
Staphylea trifolia.
Stephanandra incisa.
Styrax japonica.

Eastern United States, southern section. (For use in addition to the two foregoing lists for points south of Wilmington, North Carolina, and Charleston, South Carolina, and westward in the southern half of the states on the Gulf of Mexico.)

Aucuba japonica.
Gardenia in variety.
Nerium Oleander.
Osmanthus Aquifolium.
Pittosporum Tobira.
Prunus caroliniana.
Prunus Laurocerasus.
Viburnum Tinus.

Shrubs for the seashore.

Berberis Thunbergii.
Hibiscus syriacus.
Hydrangea, both woody and semi-herbaceous.
Ilex opaca.
Juniperus virginiana.
Ligustrum in variety.
Myrica cerifera.
Rosa nitida.
Rosa rugosa.
Rosa Wichuraiana.
Spiræa in variety.
Symphoricarpos albus.
Symphoricarpos orbiculatus.
Tamarix in variety.

The ilex, the hibiscus, and some of the ligustrums will not be hardy on the extreme northern Atlantic seacoast but will be hardy much farther north on the shore than in the regions adjoining.

Shrubs for regions of little rainfall.

Berberis Thunbergii.
Elæagnus, especially E. angustifolia.
Lonicera, especially L. Morrowii and L. tatarica.
Philadelphus Lewisii.
Prunus serotina.
Ribes, especially R. aureum.
Rosa arkansana of cult.
Rosa caroliniana var. lucida.
Rosa nitida.
Rosa rugosa.
Rosa setigera.
Spiræa in variety.
Symphoricarpos in variety.
Syringa, especially S. chinensis.
Tamarix in variety.

In the northern sections the tamarix will kill to the ground every winter but will come from the root. The tender spireas should not be used north of Denver, Colorado.

Shrubs for the Pacific slope. (In addition to the plants suggested for the eastern United States. The lists for both the northern and central sections of the eastern states may be used on the North Pacific slope and all the eastern lists for the southern sections.)

Arbutus Unedo.
Ceanothus thyrsiflorus and other native species.
Cotoneaster in variety.
Cratægus in variety, especially C. Pyracantha (Pyracantha coccinea).
Elæagnus in variety.
Evonymus in variety.
Sambucus racemosa.
Spartium junceum.
Spiræa ariæfolia and others.
Veronica in variety.

Shrubs for the Southern section. (In addition to all these listed for the eastern United States and the above.)

Escallonia in variety.
Photinia arbutifolia.
Pittosporum in variety.
Prunus ilicifolia
Prunus integrifolia.

F. L. MULFORD.

Shrubs for midcontinental region.

The following list of shrubs for the most part consists of kinds known to be perfectly hardy and to succeed in the region of St. Louis if planted with usual care and subsequently given reasonably good treatment. Many choice sorts which are not likely to be hardy much north of central Missouri without some protection are indicated by an asterisk (*). A few may not be generally known to the trade and hence procured with some difficulty at present but their value for this region was demonstrated by being grown several years at the Missouri Botanical Garden. Azalea and certain other Ericaceæ, together with some allied genera like Kalmia that have formed attractive features in many plantations, are not included because they are generally short-lived and require more than ordinary care in planting and subsequent handling.

*Acanthopanax pentaphyllus.
Æsculus parviflora.
Alnus Mitchelliana.
Alnus serrulata.
Amelanchier canadensis.
*Amorpha canescens.
Amorpha fruticosa.
Aronia arbutifolia.
*Baccharis halimifolia.
*Benzoin æstivale.
Berberis Thunbergii.
Berberis vulgaris.
Berberis vulgaris var. atropurpurea.
Betula nana.
Betula pumila.
*Buddleia Davidii.
*Buddleia Lindleyana.
Calycanthus fertilis.
Calycanthus floridus.
*Calycanthus occidentalis.
Caragana arborescens.
*Caryopteris incana.
*Ceanothus americanus.
Cephalanthus octidentalis.
Cercis canadensis.
Chænomeles japonica.
Clethra alnifolia.
*Colutea arborescens.
*Comptonia asplenifolia.
Cornus alba.
Cornus alba var. sibirica.
Cornus alternifolia.
Cornus Amomum.
Cornus mas.
Cornus racemosa.
Cornus rugosa.
Cornus sanguinea.
Cornus stolonifera.
Cornus stolonifera var. flaviramea.
*Coronilla Emerus.
Corylus americana.
Corylus Avellana var. atropurpurea.
Corylus Avellana var. laciniata.
Cotinus Coggygria.
*Cotoneaster acuminata.
*Cotoneaster racemiflora.
Cratægus Crus-galli.
Cratægus Oxyacantha.
*Daphne Mezereum.
Deutzia gracilis.
Deutzia Lemoinei.
Deutzia scabra.
Deutzia scabra, "Pride of Rochester."
Deutzia scabra var. Watereri.
Diervilla floribunda.
Diervilla floribunda var. grandiflora.
Diervilla hybrida, "Eva Rathke."
Diervilla hybrida Kosteriana variegata.
Diervilla Lonicera.
Dirca palustris.
Elæagnus angustifolia.
Elæagnus argentea.
Elæagnus multiflora.
Elæagnus umbellata.
*Evonymus alata.
Evonymus americana.
Evonymus atropurpurea.
Evonymus Bungeana.
Evonymus europæa.
Evonymus obovata.
*Evonymus radicans.
*Evonymus radicans var. vegeta.
*Exochorda racemosa.
Forsythia intermedia.
Forsythia suspensa.
Forsythia viridissima.
Halimodendron halodendron.
Hamamelis virginiana.
Hibiscus syriacus, in variety.
Hibiscus syriacus var. Meehanii.
*Hippophaë rhamnoides.
Hydrangea arborescens var. grandiflora.
Hydrangea paniculata.
Hydrangea paniculata var. grandiflora.
*Hydrangea quercifolia.
*Hypericum Moserianum.
*Ilex decidua.
*Ilex serrata.
*Ilex verticillata.
*Itea virginica.
*Kerria japonica.
*Kerria japonica argenteo-variegata.
*Laburnum anagyroides.
*Lespedeza bicolor.
*Lespedeza Sieboldii.
Ligustrum amurense.
Ligustrum Ibota var. Regelianum.
*Ligustrum ovalifolium.
*Lonicera fragrantissima.
Lonicera involucrata.
Lonicera Ledebourii.
Lonicera Morrowii.
Lonicera Ruprechtiana.
Lonicera Standishii.
Lonicera tatarica.
Lonicera tatarica var. grandiflora.
Lonicera tatarica var. latifolia.
Lonicera tatarica var. punicea.
Lycium chinense.
Lycium halimifolium.
*Magnolia Soulangeana.
*Magnolia Soulangeana var. Lennei.
*Magnolia Soulangeana var. speciosa.
*Magnolia stellata.
Mahonia Aquifolium.
Philadelphus coronarius.
Philadelphus coronarius var. flore-pleno.
Philadelphus inodorus.
Philadelphus laxus.
Philadelphus Lemoinei.
Philadelphus Lemoinei var. erectus.
Philadelphus pubescens.
Physocarpus opulifolius.
Physocarpus opulifolius var. lutea.
Potentilla fruticosa.
Prunus Amygdalus, and white variety.
Ptelea trifoliata.
*Rhamnus alnifolia.
Rhamnus caroliniana.
Rhamnus cathartica.
Rhamnus Frangula.
*Rhodotypos kerrioides.
Rhus canadensis.
Rhus copallina.
Rhus glabra.
Rhus glabra var. laciniata.
Rhus typhina.
Rhus typhina var. laciniata.
Ribes aureum.
Ribes Gordonianum.
Ribes sanguineum.
Robinia hispida.
Rubus odoratus.
Salix discolor.
Salix humilis.
Salix pentandra.
Salix petiolaris.
Salix purpurea.
Salix rostrata.
Salix sericea.
Salix tristis.
Sambucus canadensis.
Sambucus nigra.
Sambucus nigra var. aurea.
Sambucus nigra var. laciniata.
Sambucus racemosa.
Shepherdia argentea.
Sorbus melanocarpa.
Spiræa arguta.
Spiræa Billardii.
Spiræa Bumalda.
Spiræa Bumalda, "Anthony Waterer."
Spiræa Menziesii.
Spiræa prunifolia.
Spiræa prunifolia var. flore-pleno.
Spiræa salicifolia.
Spiræa Thunbergii.
Spiræa Van Houttei.
Staphylea colchica.
Staphylea trifolia.
*Stephandra incisa.
Syringa persica.
Syringa villosa.
Syringa vulgaris, in variety.
Symphoricarpos albus.
Symphoricarpos orbiculatus.
Tamarix africana.
Tamarix gallica.
Tamarix gallica indica.
Tamarix hispida æstivalis.
Tamarix tetandra purpurea.
Viburnum acerifolium.
Viburnum cassinoides.
Viburnum dentatum.
Viburnum Lantana.
Viburnum Lentago.
Viburnum molle.
Viburnum Opulus.
Viburnum Opulus var. sterile
Viburnum tomentosum.
Viburnum prunifolium.
*Vitex Agnus-castus.
Xanthoceras sorbifolia.
*Xanthorrhiza apiifolia.

3055. Hydrangea paniculata var. grandiflora.

A few species commonly classed as woody are more herbaceous than most shrubs and hence more tender; top should be cut to the ground each spring and treated more as hardy perennials. Among these are the following:

Buddleia Davidii.
Buddleia Lindleyana.
Caryopteris incana.
Coronilla Emerus.
Lespedeza bicolor.
Stephanandra incisa.
Vitex Agnus-castus.

Trailing and climbing vines.

*Actinidia arguta.
*Akebia quinata.
*Ampelopsis heterophylla var. amurensis.
Aristolochia macrophylla.
*Aristolochia tomentosa.
*Bignonia capreolata.
Campsis radicans
Celastrus orbiculatus.
Celastrus scandens.
Clematis Flammula.
Clematis lanuginosa var.
Clematis Jackmanii. [Henryi.
Clematis paniculata.
Clematis virginiana.
*Evonymus radicans.
*Evonymus radicans var. vegeta.
Forsythia suspensa.
Lonicera Caprifolium.
*Lonicera japonica.
*Lonicera japonica var. aureo-reticulata.
*Lonicera japonica var. Halliana.
Lonicera Periclymenum var. belgica.
Lonicera sempervirens.
Parthenocissus quinquefolia.
Parthenocissus quinquefolia var. Engelmannii.
Parthenocissus tricuspidata.
*Periploca græca.
Vitis, native species.
Wisteria chinensis.
Wisteria magnifica.
Wisteria speciosa.

Shrubs suitable for hedges.

Berber s Thunbergi .
Berberis vulgaris
Berberis vulgaris var. atropurpurea.
Deutzia all species listed.
Elæagnus multiflora.
Forsythia intermedia.
Hibiscus syriacus in variety.
*Hippophaë rhamnoides.
Ligustrum, all listed species.
*Lonicera fragrantissima.
Philadelphus, all species listed.
Ribes Gordonianum.
Ribes sanguineum.
Rhodotypos kerrioides.
Shepherdia argentea.
Spiræa Billardii.
Spiræa Van Houttei.
Tamarix, all species listed.

Shrubs for shady places.

Berberis Thunbergii.
Berberis vulgaris.
Berberis vulgaris var. atropurpurea.
Ceanothus americanus.
Clethra alnifolia.
Cornus, all species.
Deutzia gracilis.
Deutzia Lemoinei.
Forsythia, all species.
Hydrangea arborescens.
Hypericum Moserianum.
Ligustrum, all species.
Lonicera Periclymenum.
Rhus canadensis.
Ribes sanguinea.
Rubus odoratus.
Viburnum acerifolium.
Viburnum dentatum.
Viburnum tomentosum.

Shrubs with twigs of striking color.

Cornus alba var. cerifera.
Cornus sanguinea.
Cornus stolonifera.
Cornus stolonifera var. flaviramea.
Elæagnus argentea.
Elæagnus multiflora.
*Kerria japonica.

Kinds with more or less conspicuous berries.

Berberis Thunbergii.
Berberis vulgaris.
*Evonymus alata.
Evonymus americana.

Evonymus Bungeana.
Evonymus radicans var. vegeta.
Ilex verticillata.
Ligustrum amurense.
Ligustrum Ibota var. Regelianum.
*Ligustrum ovalifolium.
Lonicera Ledebourii.
Lonicera Morrowi.
Lonicera Ruprechtianum.
Rhamnus cathartica
Rhamnus Frangula.
Rhus glabra.
Rhus typhina.
Sambucus, all species listed.
Sorbus arbutifolia.
Sorbus melanocarpa.
Staphylea trifolia.
Symphoricarpos albus.
Symphoricarpos orbiculatus.
Viburnum.

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Shrubs and climbers for the South.

Owing to the great diversity of soil, elevation, and climatic conditions found in the Mountain, Piedmont, and Coastal zones of the South, it is impossible to make or to give an absolutely accurate list of deciduous and broad-leaved shrubs and climbers adapted to the three above-mentioned zones. The planter must, therefore, make due allowances for local conditions.

1. *Piedmont Zone* extends from the Mountain Zone to the Fall Line, which follows approximately the following cities: Weldon and Raleigh, North Carolina, Camden, and Columbia, South Carolina; Augusta, Milledgeville, Macon, and Columbus, Georgia; Montgomery, Alabama; Columbus and Holly Springs, Mississippi.

Deciduous shrubs for the Piedmont Zone.

Acanthopanax pentaphyllus.
Acer japonicum.
Æsculus octandra.
Amelanchier atropurpurea.
Amelanchier canadensis.
Amelanchier rotundifolia.
Amorpha canescens.
Amorpha fruticosa.
Amorpha glabra.
Amorpha tennesseensis.
Aralia chinensis var. mandshurica.
Aronia arbutifolia.
Aronia melanocarpa.
Azalea arborescens.
Azalea gandavensis.
Azalea lutea.
Azalea mollis.
Azalea nudiflora.
Azalea pontica.
Azalea Vaseyi.
Azalea viscosa.
Baccharis halimifolia.
Benzoin æstivale.
Berberis aristata.
Berberis asiatica.
Berberis canadensis.
Berberis heteropoda.
Berberis Sieboldii.
Berberis sinensis.
Berberis Thunbergii.
Berberis vulgaris.
Berberis vulgaris var. atropurpurea.
Buckleya distichophylla.
Buddleia Davidii.
Buddleia Davidii var. magnifica.
Buddleia intermedia.
Buddleia japonica.
Buddleia Lindleyana.
Buddleia officinalis.
Cæsalpinia Gilliesii.
Callicarpa americana.
Callicarpa purpurea.
Calycanthus fertilis.
Calycanthus florida.
Calycanthus occidentalis.
Caragana arborescens.
Caragana Chamlagu.
Caryopteris incana.
Cassia macrantha.
Ceanothus americanus.
Ceanothus hybridus.
Cephalanthus occidentalis.
Cercis chinensis.
Cercis Siliquastrum.
Chænomeles japonica.
Chilopsis saligna.
Clerodendron trichotomum.
Clethra alnifolia.
Colutea arborescens.
Comptonia asplenifolia.
Cornus alba.
Cornus alba var. Spaethii.
Cornus Amomum.
Cornus Mas.
Cornus racemosa.
Cornus rugosa.
Cornus sanguinea.
Cornus stolonifera.
Cornus stolonifera var. flaviramea.
Coronilla Emerus.
Corylopsis pauciflora.
Corylus americana.
Corylus Avellana.
Corylus Avellana var. laciniata.
Corylus maxima var. purpurea.
Corylus rostrata.
Cotoneaster acutifolia.
Cotoneaster multiflora.
Cotoneaster racemiflora.
Cratægus coccinea.
Cratægus Phænopyrum.
Cratægus Oxyacantha.
Cratægus uniflora.
Cytisus præcox.
Cytisus scoparius.
Daphne Genkwa.
Daphne Mezereum.
Deutzia gracilis.
Deutzia Lemoinei.
Deutzia rosea.
Deutzia scabra.
Deutzia scabra var. candidissima.
Deutzia scabra var. flore-pleno rosea.
Deutzia scabra var. Pride of Rochester.
Deutzia Sieboldiana.
Diervilla florida.
Diervilla hybrida.

3056. English laurel.

Diervilla rivularis.
Diervilla sessilifolia.
Dirca palustris.
Elæagnus angustifolia.
Elæagnus argentea.
Elæagnus multiflora.
Elæagnus parvifolia.
Elæagnus umbellata.
Evonymus alata.
Evonymus americana.
Evonymus Bungeana.
Evonymus europæa.
Evonymus nana.
Evonymus patens.
Exochorda Korolkowii.
Exochorda racemosa.
Fontanesia Fortunei.
Fontanesia phillyræoides.
Forestiera acuminata.
Forestiera ligustrina.
Forsythia intermedia.
Forsythia suspensa.
Forsythia suspensa var. Fortunei.
Forsythia viridissima.
Fothergilla Gardenii.
Fothergilla major.
Fothergilla parviflora.
Genista germanica.
Genista tinctoria.
Halimodendron halodendron.
Hamamelis virginiana.
Hibiscus syriacus.
Hippophaë rhamnoides.
Hydrangea arborescens.
Hydrangea arborescens var. sterilis.
Hydrangea Hortensia.
Hydrangea paniculata.
Hydrangea paniculata var. grandiflora.
Hydrangea paniculata var. præcox.
Hydrangea quercifolia.
Hydrangea radiata.
Hypericum aureum.
Hypericum calycinum.
Hypericum densiflorum.
Hypericum glomeratum.
Hypericum lobocarpum.
Hypericum Moserianum.
Hypericum nudiflorum.
Hypericum prolificum.
Ilex decidua.
Ilex verticillata.
Indigofera Gerardiana.
Itea virginica.
Jasminum fruticans.
Jasminum humile.
Jasminum nudiflorum.
Jasminum officinale.
Kerria japonica.
Kerria japonica var. argenteo-variegata.
Kerria japonica var. flore-pleno.
Lagerstrœmia indica.
Lespedeza bicolor.
Lespedeza Sieboldii.
Ligustrum acuminatum.
Ligustrum amurense.
Ligustrum Ibota.
Ligustrum Ibota var. Regelianum.
Ligustrum ovalifolium.
Ligustrum vulgare.
Lonicera bella.
Lonicera fragrantissima.
Lonicera Morrowii.
Lonicera muscaviensis.
Lonicera pyrenaica.
Lonicera Ruprechtiana.
Lonicera spinosa.
Lonicera Standishii.
Lonicera tatarica.
Lonicera thibetica.
Lonicera Xylosteum.
Meratia præcox.
Muehlenbeckia complexa.
Myrica carolinensis.
Myrica cerifera.
Myrica Gale.
Myricaria germanica.
Neviusia alabamensis.
Paliurus Spina-Christi.
Philadelphus, Avalanche.
Philadelphus, Mont Blanc.
Philadelphus coronarius.
Philadelphus coronarius var. flore-pleno.
Philadelphus Falconeri.
Philadelphus floridus.
Philadelphus gloriosus.
Philadelphus grandiflorus (coronarius var. ?)
Philadelphus hirsutus.
Philadelphus inodorus.
Philadelphus laxus.
Philadelphus Lemoinei.
Philadelphus Lewisii.
Philadelphus pubescens.
Photinia villosa.
Physocarpus opulifolius.

3057. A good use of woody vines.

Physocarpus opulifolius var. aureus.
Pieris mariana.
Poncirus trifoliata.
Potentilla fruticosa.
Prunus japonica.
Prunus maritima.
Prunus pumila.
Prunus triloba.
Punica Granatum.
Rhamnus cathartica.
Rhamnus Frangula.
Rhododendron canadense.
Rhodotypos kerrioides.
Rhus canadensis.
Rhus Michauxii.
Ribes curvatum.
Ribes nigrum.
Ribes sanguineum.
Robinia hispida.
Rosa blanda.
Rosa carolina.
Rosa rubiginosa.
Rosa rugosa.
Rosa setigera.
Roses, Bourbon.
Roses, Brier and Penzance Sweetbriers.
Roses, Hybrid Perpetual.
Roses, Hybrid Tea.
Roses, Japanese.
Roses, Monthly or China.
Roses, Moss.
Roses, Polyantha.
Roses, Tea.
Rosmarinus officinalis.
Rubus laciniatus.
Salix discolor.
Salvia Greggii.
Salvia Greggii var. alba.
Spartium junceum.
Spiræa alba.
Spiræa albiflora.
Spiræa arguta.
Spiræa Billardii.
Spiræa Billardii var. longipedunculata.
Spiræa blanda.
Spiræa Bumalda.
Spiræa cantoniensis.
Spiræa cantoniensis flore-pleno.
Spiræa Douglasii.
Spiræa Fontenaysii.
Spiræa Fortunei var. semperflorens.
Spiræa Froebelii.
Spiræa japonica.
Spiræa macrophylla.
Spiræa nipponica.
Spiræa prunifolia.
Spiræa prunifolia flore-pleno.

Spiræa revirescens.
Spiræa Schinabeckii.
Spiræa Thunbergii.
Spiræa tomentosa.
Spiræa trilobata.
Spiræa Van Houttei.
Spiræa virginiana.
Staphylea Bumalda.
Staphylea colchica.
Staphylea pinnata.
Staphylea trifolia.
Stephanandra incisa.
Stewartia pentagyna.
Styrax americana.
Styrax japonica.
Styrax Obassia.
Symphoricarpos albus.
Symphoricarpos microphyllus.
Symphoricarpos occidentalis.
Symphoricarpos orbiculatus.
Syringa chinensis.
Syringa Josikea.
Syringa pekinensis.
Syringa persica.
Syringa villosa.
Syringa vulgaris.
Tamarix gallica.
Tamarix gallica var. indica.
Tamarix juniperina.
Tamarix odessana.
Tamarix parviflora.
Vaccinium arboreum.
Vaccinium corymbosum.
Viburnum dentatum.
Viburnum dilatatum.
Viburnum Lantana.
Viburnum macrocephalum.
Viburnum macrocephalum var. sterile.
Viburnum nudum.
Viburnum Opulus.
Viburnum Opulus var. nanum.
Viburnum Opulus var. sterile.
Vitex Agnus-castus.
Vitex incisa.
Xanthorrhiza apiifolia.
Zenobia speciosa.

Vines for the Piedmont Zone.

Actinidia arguta.
Actinidia chinensis.
Actinidia Kolomitka.
Akebia lobata.
Akebia quinata.
Ampelopsis arborea.
Antigonon leptopus.
Aristolochia macrophylla.
Berchemia racemosa.
Bignonia capreolata.
Campsis chinensis.
Campsis hybrida.
Campsis, Mme. Gallen.
Campsis radicans.
Celastrus orbiculatus.
Clematis apiifolia.
Clematis crispa.
Clematis Flammula.
Clematis hybrida.
Clematis texensis.
Clematis Viorna.
Clematis virginiana.
Decumaria barbara.
Dioscorea Batatas.
Elæagnus reflexa.
Evonymus radicans.
Evonymus radicans var. variegata.
Evonymus radicans var. vegeta.
Ficus pumila.
Gelsemium sempervirens.
Gelsemium sempervirens flore-pleno.
Hedera canariensis.
Hedera helix.
Humulus Lupulus.
Hydrangea petiolaris.
Kadsura japonica.
Lonicera americana.
Lonicera chinensis.
Lonicera flava.
Lonicera glaucescens.
Lonicera Heckrottii.
Lonicera japonica.
Lonicera japonica var. aureo-reticulata.
Lonicera Periclymenum var belgica.
Lonicera prolifera.
Lonicera sempervirens.
Lonicera Vilmorinii.
Menispermum canadense.
Parthenocissus Henryana.
Parthenocissus quinquefolia.
Parthenocissus quinquefolia var. Engelmannii.
Parthenocissus tricuspidata var. Veitchii.
Passiflora cærulea.
Periploca græca.
Polygonum baldschuanicum.
Pueraria hirsuta.
Solanum jasminoides var. grandiflorum.
Trachelospermum jasminoides.
Vitis æstivalis.
Vitis cordifolia.
Vitis Labrusca.
Vitis rotundifolia.
Wisteria chinensis.
Wisteria chinensis var. alba.
Wisteria chinensis flore-pleno.
Wisteria multijuga.
Wisteria speciosa.

Broad-leaved evergreens for the Piedmont Zone.

Abelia floribunda.
Abelia grandiflora.
Arbutus Unedo.
Ardisia crenulata var. rubra.
Aucuba japonica.
Aucuba japonica var. latimaculata.
Azalea amœna.
Azalea indica.
Azalea indica Kaempferi (Sargent's hybrids).
Azalea obtusa.
Berberis buxifolia.
Berberis Darwinii.
Berberis hakecides.
Berberis ilicifolia.
Berberis Neubertii.
Berberis Sargentiana.
Berberis stenophylla.
Buxus japonica var. aurea.
Buxus sempervirens.
Buxus sempervirens var. Handworthii.
Buxus sempervirens var. suffruticosa.
Callistemon lanceolatus.
Calluna vulgaris.
Calluna vulgaris var. alba.
Camellia japonica.
Cleyera ochnacea.
Cotoneaster horizontalis.
Cotoneaster microphylla.
Cotoneaster microphylla var. glacialis.
Cotoneaster rotundifolia.
Cotoneaster rotundifolia var. lanata.
Cotoneaster Simonsii.
Cotoneaster thymifolia.
Daphne Cneorum.
Elæagnus macrophylla.
Elæagnus pungens.
Elæagnus pungens var. Simoni.
Elæagnus variegata.
Eriobotrya japonica.
Escallonia montevidensis.
Escallonia virgata.
Evonymus japonica.
Evonymus japonica var. aureo-variegata.
Evonymus japonica var. microphylla.
Fuchsia corallina.
Fuchsia gracilis.
Gardenia jasminoides.
Gardenia jasminoides var. Fortuniana.
Gardenia jasminoides var. radicans.
Gardenia jasminoides var Veitchii.
Ilex Aquifolium.
Ilex Aquifolium var. aureo-regina.
Ilex Aquifolium var. ferox.
Ilex crenata.
Ilex glabra.
Ilex integra.
Ilex latifolia.
Ilex vomitoria.
Illicium anisatum.
Ixora chinensis.
Kalmia angustifolia.
Kalmia latifolia.
Laurus nobilis.
Leiophyllum buxifolium.
Leucothoë Catesbæi.
Leucothoë populifolia.
Ligustrum coriaceum.
Ligustrum excelsum superbum.
Ligustrum japonicum.
Ligustrum lucidum.
Ligustrum macrophyllum.
Ligustrum marginatum aureum.
Ligustrum nepalense.
Ligustrum Quihoui.
Ligustrum sinense.
Mahonia Aquifolium.
Mahonia japonica.
Mahonia repens.
Mahonia pinnata.
Michelia fuscata.
Myrtus communis.
Nandina domestica.
Nerium.
Osmanthus Aquifolium.
Osmanthus fragrans.
Osmanthus Fortunei.
Pernettya mucronata.
Pernettya speciosa.
Phillyrea angustifolia.
Phillyrea decora.
Photinia serrulata.
Pieris floribunda.
Pieris japonica.
Pittosporum Tobira.
Prunus caroliniana.
Prunus Laurocerasus var. schipkaensis.
Prunus lusitanica.
Pyracantha coccinea.
Pyracantha coccinea var Lalandii.
Raphiolepsis indica.
Rhododendron arboreum.
Rhododendron arbutifolium.
Rhododendron catawbiense.
Rhododendron catawbiense hybridum.
Rhododendron maximum.
Rhododendron myrtifolium.
Rhododendron ponticum.
Rhododendron punctatum.
Skimmia japonica.
Thea sinensis.
Veronica Traversii.
Viburnum odoratissimum.
Viburnum suspensum.
Viburnum Tinus.
Yucca filamentosa.
Yucca glauca.
Yucca gloriosa.
Yucca Treculeana.

3058. Berberis Thunbergii.

2. *Coastal Zone* extends from the Fall Line, as outlined under the Piedmont Zone, to the Atlantic Ocean and Gulf of Mexico, but exclusive of that part of Florida south of a line drawn across the state to St. Augustine and Cedar Keys.

Deciduous shrubs for the Coastal Zone.

Acacia Farnesiana.
Acanthopanax pentaphyllus.
Æsculus octandra.
Æsculus Pavia.
Amelanchier rotundifolia.
Amorpha canescens.
Amorpha fruticosa.
Aronia arbutifolia.
Azalea arborescens.
Azalea lutea.
Azalea nudiflora.
Azalea viscosa.
Berberis aristata.
Berberis sinensis.
Berberis Thunbergii.
Berberis vulgaris.
Berberis vulgaris var. atropurpurea.
Buddleia Davidii.
Buddleia Davidii var. magnifica.
Buddleia intermedia.
Buddleia japonica.
Buddleia Lindleyana.
Buddleia officinalis.
Cæsalpinia Pillesii.
Callicarpa americana.
Callicarpa purpurea.
Calycanthus fertilis.
Calycanthus florida.
Calycanthus occidentalis.
Caryopteris incana
Cassia macrantha.
Ceanothus americanus.
Ceanothus hybridus.
Cephalanthus occidentalis.
Cercis japonica.
Cercis Siliquastrum.
Chænomeles japonica.
Chilopsis saligna.
Clerodendron trichotomum.
Clethra alnifolia.
Cornus alba.
Cornus Amomum.
Cornus sanguinea.
Coronilla Emerus.
Corylus americana.
Cotoneaster multiflora.
Cotoneaster racemiflora.
Deutzia rosea.
Deutzia Lemoinei.
Deutzia scabra var. candidissima.
Deutzia scabra var. flore-pleno rosea.
Deutzia scabra, Pride of Rochester.
Deutzia Sieboldiana.
Diervilla florida.
Diervilla hybrida.
Dirca palustris.
Elæagnus angustifolia.
Elæagnus multiflora
Elæagnus parvifolia.
Elæagnus umbellata.
Erythrina Crista-galli.
Evonymus alata.
Evonymus americana.
Evonymus europæa.
Evonymus nana.
Evonymus patens.
Exochorda Korolkowii.
Exochorda racemosa.
Fontanesia Fortunei.
Fontanesia phillyræoides.
Forsythia intermedia.
Forsythia suspensa.
Forsythia suspensa var. For tunei.
Forsythia viridissima.
Halimodendron halodendron
Hamamelis virginiana.
Hibiscus syriacus.
Hippophaë rhamnoides.
Hydrangea arborescens.

Hydrangea arborescens var. sterilis.
Hydrangea Hortensia.
Hydrangea quercifolia.
Hypericum calycinum.
Hypericum densiflorum.
Hypericum glomeratum.
Hypericum lobocarpum.
Hypericum Moserianum.
Hypericum prolificum.
Ilex decidua.
Ilex verticillata.
Indigofera Gerardiana.
Itea virginica.
Jasminum fruticans.
Jasminum humile.
Jasminum nudiflorum.
Jasminum officinale.
Kerria japonica.
Kerria japonica var. argenteo-variegata.
Kerria japonica var. flore-pleno.
Lagerstrœmia indica.
Lespedeza bicolor.
Lespedeza Sieboldii.
Ligustrum acuminatum.
Ligustrum amurense.
Ligustrum Ibota.
Ligustrum Ibota var. Regelianum.
Ligustrum ovalifolium.
Ligustrum vulgare.
Lonicera bella.
Lonicera fragrantissima.
Lonicera gracilipes.
Lonicera Morrowii.
Lonicera Ruprechtiana.
Lonicera Standishii.
Lonicera tatarica.
Lycium halimifolium.
Meratia præcox.
Myrica carolinensis.
Myrica cerifera.
Myricaria germanica.
Neviusia alabamensis.
Paliurus Spina-Christi.
Philadelphus coronarius.
Philadelphus coronarius var. flore-pleno.
Philadelphus grandiflorus (coronarius var.).
Philadelphus inodorus.
Philadelphus pubescens.
Philadelphus laxus.
Philadelphus Lemoinei.
Philadelphus Lewisii.
Philadelphus pubescens.
Philadelphus, Avalanche.
Philadelphus, Mont Blanc.
Physocarpus opulifolius.
Poncirus trifoliata.
Potentilla fruticosa.
Prunus japonica.
Prunus maritima.
Prunus pumila.
Prunus triloba.
Punica granatum.
Rhamnus cathartica.
Rhodotypos kerrioides.
Rhus canadensis.
Rhus Michauxii.
Ribes curvatum.
Robinia hispida.
Rosmarinus officinalis.
Rosa carolina.
Rosa rugosa.
Rosa setigera.
Roses, Bourbon.
Roses, Brier and Penzance Sweetbriers.
Roses, Hybrid Perpetual.
Roses, Hybrid Tea.
Roses, Japanese.
Roses, Monthly or China.
Roses, Polyantha.
Roses, Tea.
Rubus laciniatus.
Salix incana.
Salix sericea
Salvia Greggii.
Salvia Greggii var. alba.
Sambucus canadensis.
Sambucus nigra.
Sambucus nigra var. laciniata
Spartium junceum.
Spiræa albiflora.
Spiræa arguta.
Spiræa Billardii.
Spiræa blanda.
Spiræa Bumalda.
Spiræa cantonensis.
Spiræa cantonensis flore-pleno.
Spiræa Douglasii.
Spiræa Fontenaysii.
Spiræa Fortunei var. semperflorens.
Spiræa Froebelii.
Spiræa japonica.
Spiræa macrophylla.
Spiræa prunifolia.
Spiræa prunifolia flore-pleno.
Spiræa revirescens.
Spiræa Thunbergii.
Spiræa Van Houttei.
Stephanandra incisa.
Stewartia pentagyna.
Styrax americana.
Styrax japonica.
Symphoricarpos microphyllus.
Symphoricarpos orbiculatus.
Syringa chinensis.
Syringa pekinensis.
Syringa persica.
Tamarix gallica.
Tamarix gallica var. indica.
Tamarix juniperina.
Tamarix hispida var. æstivalis.
Tamarix odessana.
Tamarix parviflora.
Viburnum macrocephalum.
Viburnum nudum.
Viburnum Opulus var. sterile.
Vitex Agnus-castus.
Vitex incisa.
Zenobia speciosa.

Vines for the Coastal Zone.

Akebia quinata.
Akebia lobata.
Ampelopsis arborea.
Ampelopsis heterophylla var. elegans.
Antigonon leptopus.
Berchemia racemosa.
Bignonia capreolata.
Campsis chinensis.
Campsis hybrida.
Campsis, Mme. Gallen.
Campsis radicans.
Clematis crispa.
Clematis Flammula.
Clematis paniculata
Clematis texensis.
Decumaria barbara.
Dioscorea Batatas
Elæagnus reflexa.
Evonymus radicans.
Evonymus radicans var. variegata.
Ficus pumila.
Gelsemium sempervirens.
Gelsemium sempervirens flore-pleno.
Hedera canariensis.
Hedera helix.
Jasminum primulinum.
Kadsura japonica.
Lonicera americana.
Lonicera chinensis.
Lonicera flava.
Lonicera glaucescens.
Lonicera Heckrottii.
Lonicera japonica.
Lonicera japonica var. aureo-reticulata.
Lonicera Periclymenum var. belgica.
Lonicera prolifera.
Lonicera sempervirens.
Lonicera Vilmorinii.
Parthenocissus Henryana.
Parthenocissus quinquefolia.
Parthenocissus quinquefolia var. Engelmannii.
Parthenocissus tricuspidata var. Veitchii.
Passiflora cærulea.
Periploca græca.
Polygonum baldschuanicum.
Pueraria hirsuta.
Pyrostegia venusta.
Solanum jasminoides var. grandiflorum.
Trachelospermum jasminoides.
Vitis æstivalis.
Vitis cordifolia.
Vitis rotundifolia.
Wisteria chinensis.
Wisteria chinensis var. alba.
Wisteria chinensis var. flore-pleno.
Wisteria multijuga.
Wisteria speciosa.

Broad-leaved evergreens for the Coastal Zone.

Abelia floribunda.
Abelia grandiflora.
Arbutus Unedo.
Ardisia crenulata var. rubra.
Azalea amœna.
Azalea indica.
Azalea obtusa.
Ilex integra.
Ilex latifolia.
Ilex vomitoria.
Illicium anisatum.
Ixora chinensis.
Kalmia latifolia.
Laurus nobilis.

3059. A Cherokee rose cover, in the South.

Berberis buxifolia.
Berberis Darwinii.
Berberis ilicifolia.
Berberis Neubertii.
Berberis stenophylla.
Buxus japonica var. aurea.
Buxus sempervirens.
Buxus sempervirens var. Handworthii.
Buxus sempervirens var. suffruticosa.
Callistemon lanceolatus.
Camellia japonica.
Cleyera ochnacea.
Cotoneaster horizontalis.
Cotoneaster microphylla.
Cotoneaster microphylla var. glacialis.
Cotoneaster rotundifolia.
Cotoneaster rotundifolia var. lanata.
Cotoneaster Simonsii.
Cotoneaster thymifolia.
Elæagnus macrophylla.
Elæagnus pungens.
Elæagnus pungens var. Simoni.
Elæagnus variegata.
Eriobotrya japonica.
Escallonia virgata.
Escallonia montevidensis.
Evonymus japonica.
Evonymus japonica var. aureo-variegata.
Evonymus japonica var. microphylla.
Fuchsia corallina.
Fuchsia gracilis.
Gardenia jasminoides.
Gardenia jasminoides var. Fortuniana.
Gardenia jasminoides var. radicans.
Gardenia jasminoides var. Veitchii.
Ilex cornuta.
Ilex crenata.
Ilex glabra.
Leiophyllum buxifolium.
Leucothoë Catesbæi.
Leucothoë populifolia.
Leucothoë racemosa.
Ligustrum excelsum superbum.
Ligustrum japonicum.
Ligustrum lucidum.
Ligustrum macrophyllum.
Ligustrum marginatum aureum.
Ligustrum nepalense.
Ligustrum Quihoui.
Ligustrum sinense.
Mahonia Aquifolium.
Mahonia japonica.
Michelia fuscata.
Myrtus communis.
Nandina domestica.
Nerium.
Osmanthus Aquifolium.
Osmanthus Fortunei.
Osmanthus fragrans.
Pernettya mucronata.
Pernettya speciosa.
Phillyrea angustifolia.
Phillyrea decora.
Photinia serrulata.
Pieris floribunda.
Pieris japonica.
Pittosporum Tobira.
Prunus caroliniana.
Prunus Laurocerasus.
Prunus Laurocerasus var. schipkaensis.
Prunus lusitanica.
Pyracantha coccinea.
Pyracantha coccinea var. Lalandii.
Raphiolepsis indica.
Thea sinensis.
Viburnum odoratissimum.
Viburnum suspensum.
Viburnum Tinus.
Yucca aloifolia.
Yucca filamentosa.
Yucca gloriosa.
Yucca Treculeana.

3. *Mountain or Upper Zone* includes all that territory above Harper's Ferry, Maryland; Roanoke, Virginia; Winston-Salem, Morganton, and Rutherfordton, North Carolina; Spartanburg and Pendleton, South Carolina;

Gainesville and Cartersville, Georgia; Huntsville, Alabama; Murfreesboro, Tennessee, and thence north to the Kentucky line.

Deciduous shrubs for the Mountain or Upper Zone

Acanthopanax pentaphyllus.
Acer japonica.
Æsculus octandra.
Æsculus Pavia.
Amelanchier atropurpurea.
Amelanchier canadensis.
Amelanchier rotundifolia.
Amorpha canescens.
Amorpha fruticosa.
Amorpha glabra.
Amorpha tennesseensis.
Aralia chinensis var. mandschurica.
Aronia arbutifolia.
Aronia melanocarpa.
Ascyrum hypericoides.
Baccharis halimifolia.
Benzoin æstivale.
Berberis asiatica.
Berberis canadensis.
Berberis heteropoda.
Berberis Sieboldii.
Berberis sinensis.
Berberis Thunbergii.
Berberis vulgaris.
Berberis vulgaris var. atropurpurea.
Buckleya distichophylla.
Buddleia Davidii var. magnifica.
Buddleia intermedia.
Buddleia japonica.
Buddleia Lindleyana.
Callicarpa americana.
Callicarpa purpurea.
Calycanthus fertilis.
Calycanthus florida.
Calycanthus occidentalis.
Caragana arborescens.
Caragana Chamlagu.
Ceanothus americanus.
Ceanothus Fendleri.
Ceanothus hybridus.
Cephalanthus occidentalis.
Cercis chinensis.
Cercis Siliquastrum.
Chænomeles japonica.
Chilopsis saligna.
Clerodendron trichotomum.
Clethra alnifolia.
Colutea arborescens.
Comptonia asplenifolia.
Cornus alba.
Cornus alba var. Spaethii.
Cornus Amomum.
Cornus mas.
Cornus racemosa.
Cornus rugosa.
Cornus sanguinea.
Cornus stolonifera.
Cornus stolonifera var. flaviramea.
Coronilla Emerus.
Corylopsis pauciflora.
Corylus americana.
Corylus Avellana.
Corylus Avellana var. laciniata.
Corylus maxima var. purpurea.
Corylus rostrata.
Cotoneaster acutifolia.
Cotoneaster multiflora.
Cotoneaster racemiflora.
Cratægus coccinea.
Cratægus Oxyacantha.
Cratægus Phænopyrum.
Cytisus præcox.
Cytisus scoparius.
Daphne Mezereum vars. alba and rubra.
Daphne Genkwa.
Deutzia gracilis.
Deutzia Lemoinei.
Deutzia rosea.
Deutzia scabra.
Deutzia scabra var. candidissima.
Deutzia scabra var. plena.
Deutzia scabra, Pride of Rochester.
Deutzia Sieboldiana.
Diervilla florida.
Diervilla hybrida.
Diervilla rivularis.
Diervilla sessilifolia.
Dirca palustris.
Elæagnus angustifolia.
Elæagnus argentea.
Elæagnus multiflora.
Elæagnus parvifolia.
Elæagnus umbellata.
Evonymus alata.
Evonymus americana.
Evonymus Bungeana.
Evonymus europæa.
Evonymus Maackii.
Evonymus nana.
Evonymus patens.
Exochorda Korolkowii.
Exochorda racemosa.
Fontanesia Fortunei.
Fontanesia phillyræoides.
Forestiera acuminata.
Forestiera ligustrina.
Forsythia intermedia.
Forsythia suspensa.
Forsythia suspensa var. Fortunei.
Forsythia viridissima.
Fothergilla Gardenii.
Fothergilla major.
Fothergilla parviflora.
Genista germanica.
Genista tinctoria.
Halimodendron halodendron.
Hamamelis virginiana.
Hibiscus syriacus.
Hippophaë rhamnoides.
Holodiscus discolor.
Hydrangea arborescens.
Hydrangea arborescens var. sterilis.
Hydrangea Hortensia.
Hydrangea paniculata.
Hydrangea paniculata var. grandiflora.
Hydrangea paniculata var. præcox.
Hydrangea quercifolia.
Hydrangea radiata.
Hypericum aureum.
Hypericum calycinum.
Hypericum densiflorum.
Hypericum glomeratum.
Hypericum lobocarpum.
Hypericum Moserianum.
Hypericum nudiflorum.
Hypericum prolificum.
Ilex decidua.
Ilex verticillata.
Indigofera Gerardiana.
Itea virginica.
Jasminum fruticans.
Jasminum humile.
Jasminum nudiflorum.
Jasminum officinale.
Kerria japonica.
Kerria japonica var. argenteo-variegata.
Kerria japonica flore-pleno.
Lagerstrœmeria indica.
Lespedeza bicolor.
Lespedeza Sieboldii.
Leucothoë racemosa.
Leucothoë recurva.
Ligustrum acuminatum.
Ligustrum amurense.
Ligustrum Ibota.
Ligustrum Ibota var. Regelianum.
Ligustrum ovalifolium.
Ligustrum vulgare.
Lonicera bella.
Lonicera fragrantissima.
Lonicera gracilipes.
Lonicera Morrowii.
Lonicera muscaviensis.
Lonicera pyrenaica.
Lonicera Ruprechtiana.
Lonicera spinosa.
Lonicera Standishii.
Lonicera tatarica.
Lonicera thibetica.
Lonicera Xylosteum.
Lycium vulgare.
Lyonia ligustrina.
Menziesia pilosa.
Meratia præcox.
Muehlenbeckia complexa.
Myrica carolinensis.
Myrica cerifera.
Myrica Gale.
Myricaria germanica.
Neviusia alabamensis.
Paliurus Spina-Christi.
Philadelphus coronarius.
Philadelphus coronarius var. flore-pleno.
Philadelphus Falconeri.
Philadelphus floridus.
Philadelphus gloriosus.
Philadelphus grandiflorus (coronarius var.).
Philadelphus hirsutus.
Philadelphus inodorus.
Philadelphus laxus.
Philadelphus Lemoinei.
Philadelphus Lewisii.
Philadelphus pubescens.
Philadelphus, Avalanche.
Philadelphus, Mont Blanc.
Photinia villosa.
Physocarpus opulifolius.
Physocarpus opulifolius var. aureus.
Pieris mariana.
Poncirus trifoliata.
Potentilla fruticosa.
Prunus Besseyi.
Prunus incana.
Prunus japonica.
Prunus maritima.
Prunus pumila.
Prunus triloba.
Punica Granatum.
Rhamnus cathartica.
Rhamnus Frangula.
Rhododendron arborescens.
Rhododendron canadense.
Rhododendron gandavensis.
Rhododendron japonicum.
Rhododendron luteum.
Rhododendron nudiflorum.
Rhododendron ponticum.
Rhododendron Vaseyi.
Rhododendron viscosum.
Rhodotypos kerrioides.
Rhus canadensis.
Rhus Michauxii.
Ribes aureum.
Ribes curvatum.
Ribes Cynosbatii.
Ribes glandulosum.
Ribes Gordonianum.
Ribes nigrum.
Ribes rotundifolium.
Ribes sanguineum.
Robinia hispida.
Rosa alpina.
Rosa blanda.
Rosa carolina.
Rosa rubiginosa.
Rosa rugosa.
Rosa setigera.
Roses, Bourbon.
Roses, Brier and Penzance Sweetbriers
Roses, Hybrid Perpetual.
Roses, Hybrid Tea.
Roses, Japanese.
Roses, Monthly or China.
Roses, Moss.
Roses, Polyantha.
Roses, Tea.
Rosmarinus officinalis.
Rubus laciniatus.
Rubus odoratus.
Rubus parviflorus.
Rubus rosæflorus.
Salix discolor.
Salix humilis.
Salix incana.
Salix lucida.
Salix sericea.
Salix tristis.
Sambucus canadensis.
Sambucus nigra.
Sambucus nigra var. laciniata.
Sambucus pubens.
Shepherdia argentea.
Spartium junceum.
Spiræa alba.
Spiræa albiflora.
Spiræa arguta.
Spiræa bethlehemensis var. rubra.
Spiræa Billardii.
Spiræa Billardii var. longipedunculata.
Spiræa blanda.
Spiræa Bumalda.
Spiræa californica.
Spiræa cantonensis.
Spiræa cantonensis flore-pleno.
Spiræa crenata.
Spiræa Douglasii.
Spiræa eximia.
Spiræa Fontenaysii.
Spiræa Fortunei var. semperflorens.
Spiræa Froebelii.
Spiræa japonica.
Spiræa Lenneana.
Spiræa macrophylla.
Spiræa Margaritæ.
Spiræa Menziesii.
Spiræa nipponica.
Spiræa prunifolia.
Spiræa prunifolia flore-pleno.
Spiræa Schinabeckii.
Spiræa Thunbergii.
Spiræa trilobata.
Spiræa Van Houttei.
Spiræa revirescens.
Spiræa syringæflora.
Spiræa tomentosa.
Spiræa virginiana.
Staphylea Bumalda.
Staphylea colchica.
Staphylea pinnata.
Staphylea trifolia.
Stephanandra incisa.
Stephanandra Tanakæ.
Stewartia pentagyna.
Stewartia Pseudo-Camellia.
Styrax americana.
Styrax japonica.
Styrax Obassia.
Symphoricarpos albus.
Symphoricarpos microphyllus.
Symphoricarpos occidentalis.
Symphoricarpos orbiculatus.
Symphoricarpos ovatus.
Syringa chinensis.
Syringa Josikea.
Syringa pekinensis.
Syringa persica.
Syringa villosa.
Syringa vulgaris.
Syringa vulgaris, named sorts.
Tamarix gallica.
Tamarix gallica var. indica.
Tamarix hispida var. æstivalis.
Tamarix juniperina.
Tamarix Odessana.
Tamarix parviflora.
Ulex europæus.
Ulex nanus.
Vaccinium corymbosum.
Vaccinium pallidum.
Vaccinium pennsylvanicum.
Viburnum acerifolium.
Viburnum alnifolium.
Viburnum cassinoides.
Viburnum dentatum.
Viburnum dilatatum.
Viburnum Lantana.
Viburnum macrocephalum.
Viburnum macrocephalum var sterile.
Viburnum nudum.
Viburnum Opulus.
Viburnum Opulus var. nanum.
Viburnum Opulus var. sterile
Viburnum Sieboldii.
Viburnum tomentosum.
Viburnum tomentosum var. plenum.
Vitex Agnus-castus.
Vitex incisa.
Xanthorrhiza apiifolia.
Zenobia speciosa.

Vines for the Mountain Zone.

Actinidia arguta.
Actinidia Kolomitka.
Akebia lobata.
Akebia quinata.
Ampelopsis arborea.
Ampelopsis cordata.
Ampelopsis heterophylla.
Ampelopsis heterophylla var elegans.
Aristolochia macrophylla.
Berchemia racemosa.
Bignonia capreolata.

Brunnichia cirrhosa (a somewhat shrubby, tendril-climbing plant native in eastern United States; allied to Polygonella).
Campsis chinensis.
Campsis hybrida.
Campsis, Mme. Gallen.
Campsis radicans.
Celastrus orbiculatus.
Celastrus scandens.
Clematis apiifolia.
Clematis crispa.
Clematis Flammula.
Clematis hybrida.
Clematis montana.
Clematis orientalis.
Clematis paniculata.
Clematis Viorna.
Clematis virginiana.
Clematis Vitalba.
Decumaria barbara.
Elæagnus reflexa.
Evonymus radicans.
Evonymus radicans var. variegata.
Evonymus radicans var. vegeta.
Gelsemium sempervirens.
Hedera helix.
Humulus Lupulus.
Hydrangea petiolaris.
Lonicera americana.
Lonicera chinensis.
Lonicera etrusca.
Lonicera flava.
Lonicera glaucescens.
Lonicera Heckrottii.
Lonicera japonica.
Lonicera japonica var. aureo-reticulata.
Lonicera Periclymenum var. belgica.
Lonicera prolifera.
Lonicera sempervirens.
Lonicera Vilmorinii.
Menispermum canadense.
Parthenocissus quinquefolia.
Parthenocissus quinquefolia var. Engelmannii.
Parthenocissus tricuspidata var. Veitchii.
Periploca græca.
Polygonum cilinode.
Pueraria hirsuta.
Vitis æstivalis.
Vitis cordifolia.
Vitis Labrusca.
Vitis rotundifolia.
Wisteria chinensis.
Wisteria chinensis var. alba.
Wisteria chinensis flore-pleno.
Wisteria multijuga.
Wisteria speciosa.

Broad-leaved evergreens for the Mountain Zone.

Abelia grandiflora.
Andromeda polifolia.
Arctostaphylos Uva-ursi.
Azalea amœna.
Azalea indica (hardy sorts).
Azalea indica Kaempferi (Sargent's hybrids).
Azalea obtusa.
Berberis hakeoides.
Berberis ilicifolia.
Berberis Neubertii.
Berberis Sargentiana.
Buxus japonica var. aurea.
Buxus sempervirens.
Buxus sempervirens var. Handworthii.
Buxus sempervirens var. suffruticosa.
Calluna vulgaris.
Calluna vulgaris var. alba.
Chamædaphne calyculata.
Cotoneaster horizontalis.
Cotoneaster microphylla.
Cotoneaster microphylla var. glacialis.
Cotoneaster rotundifolia.
Cotoneaster rotundifolia var. lanata.
Cotoneaster Simonsii.
Cotoneaster thymifolia.
Daphne Blagayana.
Daphne Cneorum.
Elæagnus macrophylla.
Elæagnus variegata.
Ephedra distachya.
Erica carnea.
Erica stricta.
Erica Tetralix.
Erica vagans.
Evonymus japonica.
Evonymus japonica var. aureo-variegata.
Evonymus japonica var. microphylla.
Evonymus patens.
Ilex Aquifolium.
Ilex Aquifolium var. aureo-regina.
Ilex Aquifolium var. ferox.
Ilex Aquifolium var. ferox variegata.
Ilex Aquifolium var. laurifolia.
Ilex cornuta.
Ilex crenata.
Ilex glabra.
Ilex vomitoria.
Kalmia angustifolia.
Kalmia glauca.
Kalmia latifolia.
Leiophyllum buxifolium.
Leiophyllum buxifolium var. prostratum.
Leucothoë Catesbæi.
Leucothoë populifolia.
Ligustrum coriaceum.
Ligustrum japonicum.
Ligustrum lucidum.
Ligustrum macrophyllum.
Ligustrum nepalense.
Ligustrum Quihoui.
Ligustrum sinense.
Mahonia Aquifolium.
Mahonia japonica.
Mahonia pinnata.
Mahonia repens.
Nandina domestica.
Osmanthus Aquifolium.
Osmanthus Fortunei.
Phillyrea angustifolia.
Phillyrea decora.
Photinia serrulata.
Pieris floribunda.
Pieris japonica.
Prunus Laurocerasus.
Prunus Laurocerasus var. schipkaensis.
Prunus lusitanica.
Pyracantha coccinea.
Pyracantha coccinea var. Lalandii.
Rhododendron arboreum.
Rhododendron arbutifolium.
Rhododendron catawbiense.
Rhododendron catawbiense var. hybridum.
Rhododendron maximum.
Rhododendron myrtifolium.
Rhododendron punctatum.
Rhododendron ponticum.
Rhododendron Wilsonii.
Skimmia japonica.
Veronica Traversii.
Yucca filamentosa.
Yucca glauca.
Yucca gloriosa.
Yucca Treculeana.

L. A. Berckmans.

Ornamental shrubs for California.

No pretensions have been made in compiling the following list to include every plant of desirable ornamental characteristics that will grow in California. Many exotics are being continually introduced, some of which have proved highly satisfactory, while others are little known. The effort has been rather to classify under various subheads those shrubs which are undoubtedly suited for the purpose indicated and which have proved themselves well adapted to the various sections of the state.

Many of the deciduous ornamental plants commonly employed in the eastern United States for landscape planting have purposely been omitted, as they fail to produce the same wonderful spring-flower effects under the different climatic conditions of California. Only such deciduous shrubs as bloom freely and seem to have become more or less adapted to the drier climate of this state are included.

Because of the great variety of climatic and soil conditions throughout the state, it has become necessary to think of it as divided into three general regions,—the interior valleys, the San Francisco Bay district, and that part of southern California in the vicinity of the coast.

Those kinds marked with a dagger (†) will thrive only in southern California; those with a star (*) will grow in the South and as far north on the coast as the San Francisco Bay region, while such kinds as have no abbreviation attached will probably grow in all the cultivated areas of the state, including the large interior valleys. With one exception, the shrubs in the lists are arranged in the order of their desirability for the purposes described by the subhead. By cross-reference, the lists should prove helpful in selecting species of certain characteristics for given climatic and cultural conditions to produce the results desired.

Group I. Shrubs which are more or less resistant to conditions created by full shade.

While the larger number of these shrubs will produce the best results in half-shade, or even in full sun if given sufficient water, they are more or less tolerant to conditions existing under live oak trees, in courts, or on the north sides of buildings.

Evergreen.

Vaccinium ovatum (3 feet).
*Tree ferns in variety (6 to 10 feet).
Aucuba japonica (4 feet).
*Coprosma Baueri (6 feet).
Evonymus in variety (6 to 8 feet).
Fatsia japonica (6 feet).
Mahonia in variety (4 feet).
Sollya heterophylla (3 feet).
†Asystasia bella (3 feet).
Hypericum calycinum (1 foot).
Ligustrum in variety (6 to 10 feet).
Osmanthus in variety (3 to 10 feet).
Buxus sempervirens (2 to 8 feet).
*Abutilon striatum (8 feet).
Abelia grandiflora (6 feet).
Azalea indica (4 feet).
Hydrangea Hortensia (5 feet).
Nandina domestica (6 feet).
Berberis Darwinii (5 feet).
*Trachelospermum jasminoides (3 feet).
Jasminum humile (6 feet).
*Fuchsia in variety (6 feet).
Myrtus communis (3 to 5 feet).
*Myrtus Ugni (4 feet).
Eugenia apiculata (8 feet).
*Philadelphus mexicanus (5 feet).
Cotoneaster horizontalis (2 to 3 feet).
*Reinwardtia trigyna (3 feet).

Deciduous.

Symphoricarpos racemosus (3 feet).
Ribes speciosum (3 feet).
Azalea sinense (3 feet).
Kerria japonica (6 feet).
Chænomeles japonica (6 feet).

Group II. Shrubs which thrive most successfully in half-shade in California.

Many plants will produce the best results in full sun if favorable moisture conditions can be maintained throughout the summer, but the amount of sun exposure that plants in this list will withstand depends largely

on the section of the state in which they are located and on the amount of water they receive. Because of neglect aided by the long dry season, they often do better, however, in half-shade where the soil does not dry out so rapidly.

Evergreen.

Daphne odora (3 feet).
Erica in variety (2 to 5 feet).
*Coprosma Baueri (6 feet).
*Philadelphus mexicanus (5 feet).
Abelia grandiflora (6 feet).
Sollya heterophylla (3 feet).
*Fuchsia in variety (6 feet).
Azara microphylla (8 feet).
Hydrangea Hortensia (5 feet).
Cotoneaster horizontalis (2 to 3 feet).
Camellia in variety (8 feet).
Hypericum calycinum (1 foot).
Hypericum Moseria-num (3 feet).
Mahonia in variety (4 feet).
Fatsia japonica (6 feet).
*Abutilon striatum (8 feet).
*Trachelospermum jasminoides (3 feet).
Aucuba japonica (4 feet).
Nandina domestica (6 feet).
Escallonia rubra (6 feet).
Pittosporum Tobira (12 feet).
Pittosporum heterophyllum (3 feet).
†Cuphea in variety (2 feet).
†Clerodendron in variety (6 feet).
Buxus in variety (2 to 8 feet).
*Cestrum in variety (8 feet).
Cornus capitata (10 feet).
Azalea in variety (4 feet).
Rhododendron in variety (5 feet).
Osmanthus in variety (3 to 10 feet).
Michelia fuscata (6 feet).
Pyracantha crenulata (6 feet).
Viburnum Tinus var. lucidum (10 feet).
Garrya elliptica (8 feet).
Arbutus Menziesii (25 feet).
*Myrtus Ugni (4 feet).
Ilex Aquifolium (6 to 10 feet).
Maytenus Boaria (10 to 20 feet).
*Heliotropium in variety (4 feet).
*Plumbago capensis (4 feet).
*Statice in variety (2 feet).
Chorizema ilicifolium (5 feet).
Ternstrœmia japonica (8 feet).
†Asystasia bella (3 feet).
*Tibouchina splendens (5 feet).
*Jacobinia in variety (3 feet).
†Strobilanthes Dyerianus (5 feet).
†Templetonia retusa (3 feet).
†Thevetia nereifolia (8 feet).
*Melianthus major (4 feet).
*Tree ferns in variety (6 to 10 feet).
Prunus Laurocerasus (8 to 10 feet).

Deciduous.

Chænomeles japonica (6 feet).
Diervilla in variety (8 feet).
Kerria japonica (6 feet).
Deutzia in variety (4 feet).
Berberis Thunbergii (3 feet).
Pæonia suffruticosa (3 feet).
Rhododendron, Hinodigiri (3 feet).
Rhododendron sinense (3 feet).
Ribes in variety (6 to 8 feet).
Philadelphus in variety (6 feet).
Spiræa Van Houttei (4 feet).
Spiræa cantoniensis (5 feet).
Viburnum Opulus var. sterile (8 feet).
Viburnum tomentosum var. plicatum (6 feet).
Syringa in variety (6 to 10 feet).
Magnolia in variety (6 to 10 feet).

Group III. Shrubs which thrive most successfully in protected sunny locations.

Many plants, native of countries warmer than California, require warm moist situations.

Evergreen.

Acacia in variety (5 to 20 feet).
†Acocanthera spectabilis (6 feet).
†Bauhinia in variety (8 to 10 feet).
Berberis Darwinii (6 to 8 feet).
†Bouvardia Humboldtii (5 feet).
*Buddleia Davidii var. Veitchiana (6 to 8 feet).
*Cantua buxifolia (8 feet).
*Carissa grandiflora (4 feet).
*Cassia in variety (4 to 10 feet).
Choisya ternata (6 feet).

3060. A bower or arbor of rustic work, with roses and clematis.—To show an English scene (Garden of S. Charrington, from "Gardening Illustrated").

Cistus in variety (2 to 4 feet).
Cotoneaster in variety (2 to 8 feet).
Cytisus in variety (6 to 8 feet).
*Diosma ericoides (4 feet).
†Dombeya natalensis (10 to 12 feet).
†Dombeya spectabilis (8 to 10 feet).
*Duranta Plumieri (6 to 8 feet).
Escallonia montevidensis (8 feet).
Escallonia pulverulenta (8 to 10 feet).
Escallonia rosea (8 feet).
Eugenia apiculata (8 feet).
†Eugenia jambolana (10 to 15 feet).
*Eugenia myrtifolia (10 to 15 feet).
†Eugenia uniflora (6 to 8 feet).
†Euphorbia pulcherrima (6 to 8 feet).
Feijoa Sellowiana (8 feet).
*Genista monosperma (6 to 8 feet).
*Grevillea Thelemanniana (4 feet).
*Hardenbergia monophylla (5 feet).
†Hibiscus heterophyllus (8 feet).
†Hibiscus Rosa-sinensis (8 to 10 feet).
†Iochroma in variety (8 to 10 feet).
Jasminum humile (6 feet).
*Lantana in variety (4 to 6 feet).
Leptospermum scoparium var. Chapmannii (8 feet).
Leptospermum scoparium var. Nicholii (4 to 6 feet).
Leptospermum scoparium var. bullatum (4 feet).
Leptospermum lævigatum (6 to 10 feet).
Lonicera nitida (4 to 6 feet).
*Malvaviscus mollis (6 feet).
Melaleuca in variety (6 to 10 feet).
Metrosideros lucida (6 feet).
Metrosideros robusta (8 feet).
Myrtus communis (3 to 5 feet).
Nerium Oleander (8 to 10 feet).
†Oxera pulchella (2 to 4 feet).
Photinia serrulata (10 to 12 feet).
Pimelea ferruginea (4 to 6 feet).
Pittosporum eugenioides (10 to 15 feet).
*Pittosporum rhombifolium (10 to 15 feet).
Pittosporum tenuifolium (10 to 15 feet).

*Pittosporum undulatum (10 to 15 feet).
*Pittosporum viridiflorum (8 to 10 feet).
Polygala Dalmaisiana (3 to 5 feet).
Prunus lusitanica (8 feet).
*Psidium Cattleianum (3 to 6 feet).
Pyracantha angustifolia (6 feet).
Pyracantha coccinea (6 to 8 feet).
Quillaja Saponaria (10 to 15 feet).
*Raphiolepis indica (6 to 8 feet).
Raphiolepis umbellata (4 to 6 feet).
*Rhodorhiza florida (6 feet).
†Salvia Sessei (6 feet).
*Sparmannia africana (8 feet).
Spartium junceum (6 to 8 feet).
†Sphæralcea umbellata (8 feet).
*Solanum Rantonnetii (6 feet).
*Streptosolen Jamesonii (3 to 6 feet).
*Tecoma capensis (8 feet).
†Tecoma Smithii (6 to 8 feet).
†Tithonia diversifolia (8 to 10 feet).
Veronica in variety (2 to 6 feet).
Viburnum suspensum (6 feet).
*Wigandia caracasana (8 to 10 feet).

Group IV. Shrubs resistant to soil and climatic conditions along the California seacoast.

The plants in this list are fairly resistant to the effects of strong prevailing winds and thrive in dry sandy soils containing more or less salt and are therefore valuable for windbreaks and shelter plantings. In general, the finer the foliage and the more willowy or wire-like the branches, the more easily do they withstand the trying conditions. A noticeable exception is some few kinds of hardy palms which thrive under such conditions because of the stiff character of their leaves and stems.

Evergreen.

Cupressus macrocarpa (10 to 20 feet).
Tamarix in variety (8 feet).
Myrica californica (8 to 10 feet).
Acacia longifolia (6 to 10 feet).
*Atriplex Breweri (6 feet).
Casuarina in variety (10 to 25 feet).
*Coprosma Baueri (6 feet).
Rhus integrifolia (6 feet).
Leptospermum in variety (6 to 10 feet).
Melaleuca in variety (6 to 10 feet).
Callistemon in variety (4 to 8 feet).
Myoporum lætum (8 to 12 feet).
Veronica in variety (2 to 6 feet).
*Anthyllis Barba-Jovis (4 to 6 feet).
Juniperus in variety (2 to 8 feet).
Ulex europæus (6 feet).
Rhamnus californica (8 to 10 feet).
Ceanothus thyrsiflorus (6 to 10 feet).
Acacia melanoxylon (10 to 25 feet).
Acacia Farnesiana (10 to 12 feet).
Acacia armata (6 to 8 feet).
Coronilla glauca (4 to 6 feet).
Pittosporum crassifolium (10 to 15 feet).
Pittosporum phillyræoides (10 to 15 feet).
Pittosporum Tobira (8 to 10 feet).
Escallonia rubra (6 feet).
Dodonæa in variety (8 feet).
Spartium junceum (6 to 8 feet).
Lyonthamnus floribundus var. asplenifolius (15 to 20 feet).
Medicago arborea (6 feet).
Cytisus in variety (6 to 8 feet).
Metrosideros tomentosa (6 to 12 feet).
Phillyrea latifolia (10 feet).
Polygala Dalmaisiana (3 to 5 feet).
Maytenus Boaria (10 to 20 feet).
Hakea in variety (8 to 10 feet).
Lycium chinense (6 feet).
Ceratonia Siliqua (8 to 12 feet).
Elæagnus pungens (6 feet).
Artemisia arborescens (6 feet).
*Statice in variety (1 foot).
*Ficus macrophylla (10 to 20 feet).
*Echium in variety (4 to 6 feet).

Palms.

Chamærops humilis (6 feet).
Phœnix canariensis (15 feet).
Phœnix dactylifera (20 feet).
Trachycarpus excelsus (20 feet).
Sabal Palmetto (12 feet).
Erythea armata (15 feet).
Washingtonia filifera (20 feet).
Erythea edulis (15 feet).

Group V. Shrubs resistant to heat, drought, and neglect.

In some semi-arid sections of California, it is necessary to use plants that will grow more or less successfully under conditions of severe heat, drought, and neglect. Plants in this list are especially useful in those situations where no attention can be given after the plant is once established.

Evergreen.

Casuarina in variety (10 to 25 feet).
Acacia in variety (5 to 20 feet).
*Atriplex Breweri (6 feet).
Pittosporum phillyræoides (10 to 15 feet).
Olea europæa (10 to 15 feet).
Pittosporum crassifolium (10 to 15 feet).
Tristania conferta (10 to 20 feet).
Photinia arbutifolia (8 to 10 feet).
Spartium junceum (6 to 8 feet).
Rhamnus californica (8 to 10 feet).
Ceanothus in variety (6 to 10 feet).
Cytisus in variety (6 to 8 feet).
Hakea in variety (8 to 10 feet).
Ligustrum in variety (8 to 10 feet).
Callistemon in variety (4 to 8 feet).
Melaleucas in variety (6 to 10 feet).
Cistus in variety (2 to 4 feet).
Albizzia lophantha (10 feet).
Parkinsonia aculeata (8 to 10 feet).
Nerium Oleander (8 to 10 feet).
Myoporum lætum (8 to 12 feet).
Raphiolepis umbellata (4 to 6 feet).
Carpenteria californica (6 to 8 feet).
Ceratonia Siliqua (8 to 12 feet).
Evonymus japonica (6 to 8 feet).
Arbutus Unedo (8 feet).
Cassia tomentosa (8 feet).
Cassia artemisioides (4 feet).
Leptospermum in variety (6 to 10 feet).
*Agonis flexuosa (8 to 10 feet).
*Calothamnus quadrifidus (5 feet).
Elæagnus pungens (6 feet).
Romneya Coulteri (6 feet).
*Buddleia in variety (6 to 8 feet).
Coronilla glauca (4 to 6 feet).
Dodonæa cuneata (6 to 8 feet).
Dodonæa viscosa (8 feet).
*Echium in variety (4 to 6 feet).
Phillyrea latifolia (10 feet).
Metrosideros tomentosa (6 to 12 feet).
*Malvaviscus mollis (6 feet).
Prunus ilicifolia var. integrifolia (10 to 12 feet).
Prunus caroliniana (10 to 12 feet).
Pyracantha crenulata (6 to 8 feet).

Deciduous.

Tamarix parviflora (6 to 8 feet).
Tamarix hispida var. æstivalis (6 to 8 feet).
Chænomeles japonica (6 feet).
Punica Granatum (6 feet).
Berberis vulgaris var. atropurpurea (6 to 8 feet).
Evonymus europæa (8 feet).
Prunus cerasifera var. atropurpurea (10 to 12 feet).

Group VI. Shrubs which are especially free-flowering.

Many species of ornamental shrubs are particularly free-flowering in California, while others possess several flowering periods throughout the year. Because of their tendency to bloom in the fall and winter seasons, they are especially useful in the more intensively developed gardens where all-the-year-round effects are desired.

Evergreen.

Choisya ternata (6 feet).
*Cestrum elegans (6 feet).
Veronica in variety (2 to 6 feet).
Polygala Dalmaisiana (3 to 5 feet).
*Grevillea Thelemanniana (4 feet).
*Rhodorhiza florida (6 feet).
*Lantana in variety (4 to 6 feet).
*Fuchsia in variety (6 feet).
Sollya heterophylla (3 feet).
Berberis Darwinii (6 to 8 feet).
Escallonia rubra (4 to 6 feet).
*Streptosolen Jamesonii (3 to 6 feet).
Spartium junceum (6 to 8 feet).
Abelia grandiflora (6 feet).
†Heterocentron roseum (1 foot).
*Genista monosperma (6 to 8 feet).
Pimelea ferruginea (4 to 6 feet).
†Bouvardia Humboldtii (5 feet).
Cistus ladaniferus var. maculatus (2 to 4 feet).
Statice in variety (1 foot).
*Anthyllis Barba-Jovis (4 to 6 feet).
*Reinwardtia trigyna (3 feet).
*Iochroma in variety (8 to 10 feet).
Escallonia pulverulenta (8 to 10 feet).
*Jacobinia pauciflora (2 feet).

†Dædalacanthus nervosus (2 feet).
Cytisus racemosus (2 to 3 feet).
*Duranta Plumieri (6 to 8 feet).
Coronilla glauca (4 to 6 feet).
Cassia artemisioides (4 feet).
*Malvaviscus mollis (6 feet).
†Cuphea in variety (2 feet).
*Philadelphus mexicanus (5 feet).
*Tibouchina splendens (5 feet).
Escallonia rosea (8 feet).
*Cestrum aurantiacum (6 to 8 feet).
Erica mediterranea (3 feet).
Erica melanthera (3 feet).
*Plumbago capensis (4 feet).
*Trachelospermum jasminoides (3 feet).
Cassia tomentosa (8 feet).
*Eugenia myrtifolia (10 to 15 feet).
†Hibiscus in variety (8 to 10 feet).
*Tecoma capensis (8 feet).
*Swainsona galegifolia var. albiflora (6 feet).
*Calothamnus quadrifidus (5 feet).

Group VII. Shrubs bearing ornamental fruits and berries.

The berried and fruit-bearing ornamental trees and shrubs form one of the most interesting classes of decorative plants. Not only do they produce a flower display throughout the spring and summer months but also add flashes of color for long periods in the fall and winter by their clusters of bright berries or fruits. Only those kinds bearing persistent fruit and of a color contrasting well with green foliage are acceptable in California. Such deciduous berried shrubs as have proved themselves adaptable are included in the list.

Those producing berried effects.

Pyracantha coccinea (6 to 8 feet).
Pyracantha crenulata (6 feet).
Pyracantha angustifolia (6 feet).
Cotoneaster Franchetii (4 to 6 feet).
Cotoneaster Dielsiana (4 to 6 feet).
Cotoneaster horizontalis (2 to 3 feet).
Cotoneaster pannosa (6 to 8 feet).
Cotoneaster acuminata (6 to 8 feet).
Cotoneaster buxifolia (2 to 3 feet).
Cotoneaster microphylla (2 to 3 feet).
Cotoneaster frigida (8 to 10 feet).
Photinia arbutifolia (8 to 10 feet).
*Myrtus Ugni (4 feet).
*Duranta Plumieri (6 to 8 feet).
Berberis Darwinii (6 to 8 feet).
Ilex Aquifolium (6 to 10 feet).
*Cestrum elegans (6 feet).
*Cestrum aurantiacum (6 to 8 feet).
*Pittosporum rhombifolium (10 to 15 feet).
*Pittosporum viridiflorum (10 feet).
Arbutus Menziesii (10 to 20 feet).
Lycium chinense (6 feet).
Rhamnus californica (8 to 10 feet).
Rhamnus crocea (4 feet).
Nandina domestica (6 feet).

Deciduous.

Elæagnus umbellata (10 feet).
Symphoricarpos albus (3 feet).
Cratægus cordata (10 feet).
Berberis Thunbergii (3 feet).
Sorbus Aucuparia (10 to 15 feet).
Symphoricarpos vulgaris (3 feet).
Sambucus racemosa (10 feet).

Those producing fruit effects.

Arbutus Unedo (8 feet).
*Eugenia myrtifolia (10 to 15 feet)
†Eugenia uniflora (6 to 8 feet).
Cornus capitata (10 feet).
*Psidium in variety (4 to 8 feet).
Aucuba japonica (4 feet).
Eriobotrya japonica (10 to 12 feet).
Feijoa Sellowiana (8 feet).

Deciduous.

Evonymus europæa (6 to 8 feet).
Evonymus alata (6 to 8 feet).
Ribes speciosum (4 feet).
Punica Granatum (6 feet).
Diospyros in variety (4 to 8 feet).
Rosa rugosa (3 feet).
Chænomeles japonica (6 feet).
Pyrus floribunda (10 to 12 feet)

Group VIII. Shrubs for hedges (California).

Many shrubs of a compact habit may be used as hedge-plants. There is, however, a fairly well-established group of desirable species that lend themselves more easily to training of this kind. Those listed below are used extensively for hedges and have been found to adapt themselves readily to the severe system of trimming and to produce the dense and compact form desired.

Low edgings or boxings (6 to 18 inches).

Berberis Darwinii.
Buxus sempervirens var. suffruticosa.
*Eugenia myrtifolia.
Lonicera nitida.
Veronica buxifolia.
Myrtus communis var. microphylla.
Myrtus Ugni.
Evonymus japonica var. microphylla.
Veronica Traversii.
Veronica carnea.
Cotoneaster microphylla.
Erica mediterranea.
*Diosma ericoides.
*Jacobinia pauciflora.
Cistus ladaniferus var. maculatus.

Small hedges (2 to 6 feet).

Berberis Darwinii.
*Eugenia myrtifolia.
Eugenia apiculata.
Buxus sempervirens.
Taxus baccata.
Lonicera nitida.
Osmanthus Aquifolium var. myrtifolius.
Prunus ilicifolia.
Pittosporum tenuifolium.
Pittosporum eugenioides.
Myrtus communis.
Escallonia rubra.
*Atriplex Breweri.
*Grevillea Thelemanniana.
Ligustrum sinense.
Ligustrum ovalifolium.
Choisya ternata.
Pyracantha crenulata.
*Aberia caffra.
Erica in variety.
Elæagnus pungens.
Pyracantha angustifolia.
Veronica decussata.
Veronica imperialis.
Veronica elliptica.
Pimelea ferruginea.
Viburnum Tinus var. strictum.
Leptospermum lævigatum.
Evonymus japonica.
Acacia longifolia.
Acacia armata.
Ceanothus spinosus.
*Psidium Cattleianum.
*Lantana, dwarf hybrids.

High hedges (6 to 12 feet).

Pittosporum tenuifolium.
Pittosporum eugenioides.
*Pittosporum undulatum.
Pittosporum crassifolium.
Prunus ilicifolia var. integrifolia.
Ligustrum ovalifolium.
Ligustrum japonicum.
Prunus caroliniana.
Escallonia pulverulenta.
Cupressus macrocarpa.
Hakea suaveolens.
Hakea saligna.
Acacia longifolia.
Acacia melanoxylon.
Acacia retinodes.
Acacia verticillata.
Pyracantha coccinea.
Spartium junceum.

Group IX. Shrubs for ground-covers (California).

There are often banks and slopes where a lawn would be too expensive to maintain and unless covered with green foliage would remain unsightly. Other situations, especially under and between trees and large shrubs would be materially improved if the ground-surface were covered with woody vines and trailing shrubs. It will be necessary to prune out the leader or upright stem of many of these shrubs to encourage their spreading or horizontal growth.

Juniperus chinensis var. procumbens (3 feet).
Juniperus Sabina var. tamariscifolia (3 feet).
Jasminum primulinum (6 feet).

Sollya heterophylla (3 feet).
Hypericum calycinum (1 foot).
Hypericum Moserianum (3 feet).
*Philadelphus mexicanus (5 feet).
*Trachelospermum jasminoides (3 feet).
†Cuphea micropetala (3 feet).
*Cuphea ignea (5 feet).
Clianthus puniceus (3 to 6 feet).
*Streptosolen Jamesonii (3 to 6 feet).
*Plumbago capensis (4 feet).
Myrtus communis (3 to 5 feet).
Cotoneaster microphylla (2 to 3 feet).
Cotoneaster horizontalis (2 to 3 feet).
*Coprosma Baueri (6 feet).
Evonymus radicans (2 feet).
Fuchsia Riccartonii (6 feet).
Leptospermum lævigatum (6 to 10 feet).
*Tecoma capensis (8 feet).
*Reinwardtia trigyna (4 feet).
*Capparis spinosa (3 feet).
*Swainsona galegifolia var. albiflora (6 feet).
Teucrium fruticans (6 feet).
Coronilla glauca (4 to 6 feet).
Melaleuca decussata (5 feet).
Cistus ladaniferus var. maculatus (2 to 4 feet).
Evonymus japonica var. viridi-variegata (4 feet).
Lantana Sellowiana (4 feet).
*Lantana Camara (4 to 6 feet).
Chorizema ilicifolium (5 feet).
*Melianthus major (4 feet).
*Buddleia madagascariensis (6 to 10 feet).
Jasminum humile (6 feet).
*Solanum Rantonnetii (6 feet).
Artemisia arborescens (5 feet).
Pentstemon cordifolius (5 feet).
*Heliotropium in variety (3 feet).
Pittosporum heterophyllum (3 feet).
*Fuchsia fulgens (5 feet).
*Fuchsia corymbiflora (6 feet).

Group X. Shrubs for quick effects (California).

Many shrubs are of rapid growth and if given heat and moisture will produce very quick effects. They are, therefore, especially suitable for screens, barriers, and nature effects in recently created gardens.

Myoporum lætum (8 to 12 feet).
Albizzia lophantha (10 feet).
Leptospermum lævigatum (6 to 10 feet).
Acacia in variety (5 to 20 feet).
Melaleuca in variety (6 to 10 feet).
Spartium junceum (6 to 8 feet).
Casuarina in variety (10 to 25 feet).
†Tithonia diversifolia (8 to 10 feet).
*Wigandia caracasana (8 to 10 feet).
*Lantana in variety (4 to 6 feet).
Cytisus in variety (6 to 8 feet).
*Iochroma in variety (8 to 10 feet).
*Cassia in variety (4 to 10 feet).
*Buddleia in variety (6 to 8 feet).
*Cestrum in variety (6 to 8 feet).
*Plumbago capensis (4 feet).
†Solanum Warscewiczii (8 feet).
Dodonæa cuneata (6 to 8 feet).
†Bocconia frutescens (8 feet).
*Pittosporum undulatum (10 to 15 feet).
Pittosporum eugenioides (10 to 15 feet).
Pittosporum crassifolium (10 to 15 feet).
*Coprosma Baueri (6 feet).
Veronica in variety (2 to 6 feet).
*Sparmannia africana (8 feet).
Coronilla glauca (4 to 6 feet).
*Anthyllis Barba-Jovis (4 to 6 feet).
*Agonis flexuosa (8 to 10 feet).
Fatsia japonica (6 feet).
Ligustrum ovalifolium (6 to 8 feet).
Escallonia in variety (6 to 10 feet).
Pimelea ferruginea (4 to 6 feet).
†Cuphea micropetala (2 feet).
*Streptosolen Jamesonii (3 to 6 feet).
*Grevillea Thelemanniana (4 feet).
*Atriplex Breweri (6 feet).
*Melianthus major (4 feet).
Parkinsonia aculeata (8 to 10 feet).
Ceanothus arborea (8 feet).
†Muehlenbeckia platyclada (6 feet).
†Clerodendron in variety (6 feet).
*Abutilon in variety (8 feet).
†Carica quercifolia (6 to 8 feet).

Agonis flexuosa, Schau. A tall shrub or tree from Austral.: lvs. lanceolate, smooth, dark green, the margins tinged with purple: fl.-heads white, axillary, surrounded by broad bracts; stamens long, numerous, white.

Group XI. Especially choice and neat shrubs.

Those shrubs which are free-flowering, compact, and possess interesting and well-arranged foliage, are much in demand for the more intensively developed parts of a garden. They are particularly suitable for use on small home grounds, in formal gardens, and around the base-line of buildings.

Erica in variety (4 feet).
Diosma ericoides (3 feet).
*Eugenia myrtifolia (10 to 15 feet).
Choisya ternata (6 feet).
Daphne odora (3 feet).
*Grevillea Thelemanniana (4 feet).
Leptospermum scoparium var. Nichollii (4 to 6 feet).
Lonicera nitida (4 to 6 feet).
Berberis Darwinii (6 to 8 feet).
Abelia grandiflora (6 feet).
Pimelea ferruginea (4 to 6 feet).
*Myrtus Ugni (4 feet)
†Templetonia retusa (3 feet).
†Asystasia bella (3 feet).
Sollya heterophylla (3 feet).
*Trachelospermum jasminoides (3 feet).
*Philadelphus mexicanus (5 feet).
Michelia fuscata (6 feet).
†Heterocentron roseum (1 foot).
†Dædalacanthus nervosus (2 feet).
Cassia artemisioides (4 feet).
Eugenia apiculata (8 feet).
Myrtus communis var. microphylla (2 to 3 feet).
*Coprosma Baueri (6 feet).
*Cneorum tricoccon (3 feet).
Cotoncaster horizontalis (2 to 3 feet).
Cotoneaster Franchetii (4 to 6 feet).
Cotoneaster microphylla (2 to 3 feet).
Ligustrum coriaceum (3 to 6 feet).
Ligustrum sinense (6 feet).
*Genista monosperma (6 to 8 feet).
†Rhodorhiza florida (6 feet).
Aucuba japonica (4 feet).
Azara microphylla (8 feet).
Buxus in variety (2 to 8 feet).
Camellia japonica (8 feet).
Cytisus racemosus (2 to 3 feet).
Evonymus japonica var. aureo-marginata (6 to 8 feet).
Evonymus japonica var. viridi-variegata (4 feet).
Mahonia japonica (4 feet).
Melaleuca decussata (5 feet).
Nandina domestica (6 feet).
Osmanthus Aquifolium (4 feet).
Veronica in variety (2 to 6 feet).
*Carissa grandiflora (4 feet).
Hardenbergia monophylla (5 feet).
Jasminum primulinum (6 feet).
Metrosideros lucida (6 feet).
*Tibouchina splendens (5 feet).
†Salvia Sessei (6 feet).
*Fuchsia corymbiflora (6 feet).
*Fuchsia fulgens (4 feet).
*Fuchsia arborescens (6 feet).
*Duranta Plumieri var. alba (3 to 6 feet).

Cneorum tricoccon, Linn., the spurge olive, is a native of S. Eu.: smooth, evergreen, 1 or 2 ft. high: lvs. narrow, entire, obtuse: fls. axillary; pedicels not adnate to the bracts. Cneorum is one of the Simarubaceæ, or by recent authorities made the sole representative of the family Cneoraceæ.

Group XII. Ornamental native shrubs.

While the native shrubs of California are not, in many cases, so effective and attractive for landscape purposes as most of the exotic material used, there is a growing interest in their ornamental qualities. They may be employed extensively to give character to the extremely naturalistic home grounds and to the typically Californian garden. Only the more ornamental species in general cultivation are listed below.

Carpenteria californica (6 to 8 feet).
Ceanothus thyrsiflorus (8 feet).
Photinia arbutifolia (8 to 10 feet).
Lyonothamnus floribundus var. asplenifolius (15 to 20 feet).
Prunus ilicifolia var. integrifolia (10 to 15 feet).
Arbutus Menziesii (10 to 20 feet).
Ceanothus arboreus (8 to 10 feet).
Ceanothus spinosus (6 to 8 feet).
Parkinsonia aculeata (8 to 10 feet).
Garrya Fremontii (6 feet).
Romneya Coulteri (6 feet).
Ribes speciosum (4 feet).
Vaccinium ovatum (3 feet).
Mahonia Aquifolium (4 feet).
Rhamnus californica (8 to 10 feet).
Rhus integrifolia (6 feet).
Rhus ovata (6 to 8 feet).
Rhamnus crocea var. ilicifolia (4 feet).
Umbellularia californica (15 to 30 feet).
Cercocarpus parvifolius (8 feet).
*Gaultheria Shallon (2 feet).

Arctostaphylos in variety (6 feet).
Fremontia californica (8 feet).
Calycanthus occidentalis (6 feet).
Dendromecon rigidum (6 feet).
*Lavatera assurgentiflora (6 feet).
*Mimulus glutinosus (4 feet).

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Vines for California.

In countries where there is a maximum of sunlight, vines become a most important class of plant-material. The many vines used in California are roughly divided into classes according to the climatic divisions of the state. Tropical and semi-tropical evergreen vines find most favor in southern California, where gorgeous coloring and luxurious growth appear most in harmony with the landscape; while the half-hardy evergreens and the choicest deciduous vines are most suitable for use along the central California coast. On the other hand, the vine which loses its foliage in winter finds the greatest favor in the interior sections of the state, although such few evergreens as withstand several degrees of frost are often employed for decorative purposes. When very quick effects are wanted, the annual vine is often used.

All vines except those clinging to rough surfaces need substantial support, while most vines require a certain amount of thinning and training. The tendency is to neglect the plant after it is once established and allow it to form thick unsightly masses of stems near the top of the support, thereby destroying such decorative beauty as the vine may possess. Vines should not be "headed back" or heavily pruned unless the plant is to be renovated, as a coarse rank growth is encouraged. If possible, choose strong stems as leaders and train in a fan-like manner so as finally to cover the desired area. Spring-flowering vines should be pruned soon after blooming, while summer- and fall-flowering vines may be thinned in the spring. The foliage of evergreen vines may be best reduced by careful selective thinning immediately after a blooming period. Always begin to train a vine as soon as possible; do not wait for it to begin to climb.

No climbing roses have been included in the following lists, as it is felt that they should be considered as a separate class of plant-material. Such vines as are not marked with "D" or "A" are evergreen, while those without an "o" or "x" are hardy. D=deciduous; A=annual; o=not resistant to frost; x=resistant to 10° to 12° of frost.

1. Vines which cover objects and surfaces densely.

The vines in this list have a tendency to cover their supports entirely, making a dense screen and thereby destroying architectural lines.

D—Actinidia chinensis.
D—Akebia quinata.
x—Buddleia madagascariensis.
D—Campsis chinensis.
D—Campsis radicans.
Cardiospermum hirsutum.
D—Clematis montana.
D—Clematis paniculata.
x—Dolichos lignosus.
Ficus pumila.
Gelsemium sempervirens.
Hedera helix.
Hedera helix var. chrysocarpa.
A—Humulus japonicus.
D—Ipomœa Learii.
x—Jasminum gracillimum.
x—Jasminum grandiflorum.
x—Jasminum officinale.
Kennedya rubicunda.
Lantana Sellowiana.
Lonicera japonica var. Halliana.
Lonicera Periclymenum var. belgica.
Melothria punctata.
Muehlenbeckia complexa.
x—Pandorea australis.
o—Pandorea Brycei.
x—Pandorea jasminoides.
x—Pandorea jasminoides var. alba.
D—Parthenocissus quinquefolia.
D—Parthenocissus tricuspidata.
Passiflora cærulea.
Passiflora cærulea var. alba.
o—Passiflora edulis.
x—Passiflora manicata.
Passiflora mollissima.
x—Pelargonium peltatum.
D—Periploca græca.
x—Pithecoctenium muricatum.
x—Plumbago capensis.
x—Plumbago capensis var. alba.
D—Pueraria hirsuta.
x—Salpichroa rhomboidea.
D—Senecio mikanioides.
o—Solandra guttata.
x—Serjania fuscifolia.
x—Steptosolen Jamesonii.
x—Tecoma capensis.
A—Tropæolum majus.
x—Vitis (Cissus) antarctica.
x—Vitis (Cissus) capensis.
D—Wisteria chinensis.
D—Wisteria multijuga.

2. Vines producing light open tracery.

Vines to be ornamental should decorate and not entirely cover. Their chief purpose is to soften and partially break hard architectural lines. It is the contrast between foliage and background which produces decorative effect. Vines of this section are especially good for columns, walls, and frames.

o—Abrus precatorius.
D—Antigonon leptopus.
o—Aristolochia triangularis.
x—Asparagus asparagoides.
x—Asparagus plumosus.
x—Asparagus plumosus var. comorensis.
Bignonia Unguis-cati (B. Tweediana).
D—Clematis Henryi.
D—Clematis Jackmanii.
D—Clematis montana var. rubens.
x—Cobæa scandens.
x—Dioclea glycinoides.
o—Dipladenia hybrida.
a—Eccremocarpus scaber.
x—Hardenbergia Comptoniana.
Hedera helix.
o—Hidalgoa Wercklei.
x—Hoya carnosa.
x—Jasminum azoricum.
x—Jasminum nitidum
D—Jasminum nudiflorum.
x—Linaria Cymbalaria.
D—Mandevilla suaveolens.
Maurandia Barclaiana.
x—Maurandia Lophospermum.
a—Momordica Balsamina.
x—Pithecoctenium cynanchoides.
x—Pithecoctenium muricatum.
x—Pyrostegia venusta.
Solanum jasminoides.
x—Solanum Seaforthianum.
Sollya heterophylla.
o—Stigmaphyllon ciliatum.
o—Stigmaphyllon littorale.
o—Thunbergia grandiflora.
x—Trachelospermum jasminoides.

3. Vines as ground-covers on slopes, embankments, and under trees.

Vines require little care, hold the soil and make a permanent effect in those situations where the soil is too poor or too shady to maintain a satisfactory lawn.

Bignonia Unguis-cati.
x—Duchesnea indica.
Fragaria californica.
Fragaria chiloensis.
Hedera helix.
a—Humulus japonicus.
x—Jasminum primulinum.
x—Lantana Camara.
Lantana Sellowiana.
Lippia canescens.
Lonicera japonica var. Halliana.
x—Lotus Bertholetii.
Mesembryanthemum cordifolium.
Mesembryanthemum roseum.
Muehlenbeckia chilensis.
Muehlenbeckia complexa.
x—Pelargonium peltatum.
D—Senecio mikanioides.
Sollya heterophylla.
A—Tropæolum majus.
Vinca major.
Vinca minor.
x—Vitis (Cissus) capensis.

4. Vines for stone, plaster, and brick surfaces.

Because of their various ways of clinging to rough surfaces, these vines need no support. They should not be grown on wood surfaces which are to be painted.

D—Bignonia capreolata.
Bignonia Unguis-cati (B. Tweediana).
x—Cissus striata.
x—Clytostoma purpureum.
D—Decumaria barbara.
Evonymus radicans.
Evonymus radicans var. roseo-marginata.
Ficus pumila.
Ficus pumila var. minima.
Hedera helix.
Hedera helix var. chrysocarpa.
D—Parthenocissus quinquefolia.
D—Parthenocissus quinquefolia var. Engelmannii.
D—Parthenocissus tricuspidata.
x—Phædranthus buccinatorius.

5. Vines for quick effects.

Useful to obtain mature effects in gardens. Rapid-growing deciduous vines are especially desirable for porches, pergolas, and arbors located in the large interior valleys.

D—Actinidia chinensis.
D—Aristolochia macrophylla (A. Sipho).
Bignonia Unguis-cati (B. Tweediana).
D—Boussingaultia basselloides.
x—Buddleia madagascariensis.
D—Campsis radicans.
D—Clematis montana.
D—Clematis paniculata.
Cobæa scandens.
x—Dolichos lignosus.
x—Dolichos lignosus var. alba.
A—Humulus japonicus.
D—Humulus lupulus.
D—Ipomœa Learii.
D—Ipomœa setosa.
x—Jasminum primulinum.
x—Lantana Camara.
Lathyrus splendens.
Lonicera japonica var Halliana.
Maurandia Barclaiana.
Melothria punctata.
x—Pandorea australis.
o—Pandorea Brycei.
Passiflora cærulea.
Passiflora cærulea var. alba.
o—Passiflora edulis.
x—Passiflora manicata.
x—Passiflora mollissima.

o—Passiflora racemosa (P. princeps).
x—Passiflora tubiflora.
x—Pelargonium peltatum.
x—Phædranthus buccinatorius.
D—Phaseolus Caracalla.
x—Philadelphus mexicanus.
D—Pueraria hirsuta.
x—Salpichroa rhomboidea.
D—Sechium edule.
D—Senecio mikanioides.
Solanum jasminoides.
D—Solanum Wendlandii.
o—Solandra guttata.
x—Tecoma capensis.
D—Thunbergia alata.
o—Thunbergia coccinea.
A—Tropæolum majus.

6. Free-flowering vines for California.

Many vines produce only foliage effects or bloom but once a year. The vines in this list bear flowers more or less continuously. They are especially suitable for arbors and trellises in the flower-garden.

o—Allamanda cathartica var. Hendersonii.
D—Antigonon leptopus.
o—Beaumontia grandiflora.
x—Bougainvillea braziliensis.
x—Bougainvillea glabra.
x—Bougainvillea spectabilis var. lateritia.
Cardiospermum hirsutum.
x—Chorizema ilicifolium.
A—Clitoria Ternatea.
x—Clytostoma callistegioides.
Cobæa scandens.
x—Dolichos lignosus.
x—Dolichos lignosus var. alba.
x—Hardenbergia Comptoniana
x—Jasminum azoricum.
x—Jasminum floribundum.
x—Jasminum gracillimum.
x—Jasminum grandiflorum.
x—Jasminum, Maid of Orleans.
o—Jasminum nitidum.
x—Jasminum simplicifolium.
Jasminum Sambac, Grand Duke.
x—Lantana Camara.
Lantana Sellowiana.
Lathyrus latifolius var. albus.
Lathyrus splendens.
Lonicera japonica var. Halliana.
Lonicera sempervirens.
D—Mandevilla suaveolens.
Manettia bicolor.
x—Pandorea jasminoides.
x—Pandorea jasminoides var. alba.
x—Passiflora militaris.
o—Passiflora racemosa (P. princeps).
x—Pelargonium peltatum.
x—Phædranthus buccinatorius.
D—Phaseolus Caracalla.
x—Pithecoctenium muricatum.
x—Plumbago capensis.
x—Pyrostegia venusta.
o—Schubertia grandiflora.
o—Solandra grandiflora.
Solanum jasminoides.
x—Solanum Seaforthianum.
D—Solanum Wendlandii.
x—Sollya heterophylla.
o—Stephanotis floribunda.
o—Stigmaphyllon ciliatum.
x—Swainsona galegifolia var. albiflora.
x—Tecoma capensis.
o—Thunbergia grandiflora.
x—Trachelospermum jasminoides.
D—Tropæolum majus.

7. Vines somewhat resistant to shade.

Good for courts, north sides of buildings, under trees and on shady slopes.

x—Asparagus asparagoides.
x—Asparagus plumosus.
x—Chorizema ilicifolium.
x—Clianthus puniceus.
x—Clytostoma callistegioides.
Ficus pumila.
Ficus pumila var. minima.
Hedera colchica (H. Rægneriana).
Hedera helix.
x—Hoya carnosa.
x—Jasminum azoricum.
x—Jasminum gracillimum.
x—Jasminum primulinum.
x—Linaria Cymbalaria.
Lippa canescens.
D—Micromeria Chamissonis.
x—Pandorea australis.
D—Parthenocissus quinquefolia.
D—Parthenocissus tricuspidata.
o—Quisqualis indica.
D—Senecio mikanioides.
x—Solanum Seaforthianum.
Sollya heterophylla.
o—Stephanotis floribunda.
o—Thunbergia laurifolia.
x—Trachelospermum jasminoides.
Tradescantia virginiana.
Vinca major.
Vinca minor.
x—Vitis (Cissus) antarctica.
x—Vitis (Cissus) capensis.
x—Vitis (Cissus) rhombifolia.

8. Vines somewhat resistant to drought.

Vines are largely natives of cool moist forest floors where the soil is deep and loose, but the following will endure a certain amount of drought and hard clay soils.

Bignonia Unguis-cati (B. Tweediana).
x—Bougainvilleas.
x—Buddleia madagascariensis.
x—Dioclea glycinoides.
x—Dolichos lignosus.
Evonymus radicans.
Ficus pumila.
Hedera helix.
x—Jasminum primulinum.
x—Lantana Camara.
x—Lantana Sellowiana.
Lathyrus latifolius.
Lathyrus splendens.
Lippia canescens.
Lonicera japonica var. Halliana.
Lonicera Periclymenum var. belgica.
Mesembryanthemum roseum.
Muehlenbeckia complexa.
x—Pandorea australis.
Pandorea jasminoides.
x—Passiflora manicata.
x—Passiflora mollissima.
x—Pelargonium peltatum.
D—Periploca græca.
x—Plumbago capensis.
x—Salpichroa rhomboidea.
D—Senecio mikanioides.
x—Serjania fuscifolia.
Solanum jasminoides.
Sollya heterophylla.
x—Streptosolen Jamesonii.
x—Tecoma capensis.
D—Tropæolum majus.
Vinca major.
Vinca major, variegated.
Vinca minor.

9. Vines for pergolas and arbors.

For this purpose vines should not be allowed to make too heavy top growth and they should be so trained that a certain amount of their foliage is pendent.

D—Antigonon leptopus.
D—Aristolochia macrophylla (A. Sipho).
o—Aristolochia elegans.
Bignonia Unguis-cati (B. Tweediana).
x—Bougainvillea braziliensis.
o—Beaumontia grandiflora.
D—Clematis montana.
D—Clematis paniculata.
x—Clytostoma purpureum.
x—Dioclea glycinoides.
Gelsemium sempervirens.
x—Hardenbergia Comptoniana.
Hedera colchica (H. Rægneriana).
Hedera helix.
Hedera helix var. chrysocarpa.
o—Hidalgoa Wercklei.
A—Humulus japonicus.
x—Jasminum azoricum.
x—Jasminum floribundum.
x—Jasminum grandiflorum.
x—Jasminum nitidum.
x—Jasminum officinale.
x—Jasminum primulinum.
x—Jasminum rigidum (J. ligustrifolium).
x—Lonicera Hildebrandiana.
Lonicera japonica var. Halliana.
D—Mandevilla suaveolens.
Muehlenbeckia complexa.
x—Pandorea jasminoides.
x—Pandorea jasminoides var. alba.
o—Pandorea Brycei.
D—Periploca græca (Silk Vine).
x—Phædranthus buccinatorius.
x—Philadelphus mexicanus.
x—Pithecoctenium cynanchoides.
x—Pithecoctenium muricatum.
o—Solandra guttata.
Solanum jasminoides.
x—Solanum Seaforthianum.
D—Solanum Wendlandii.
x—Stauntonia hexaphylla.
o—Stephanotis floribunda.
o—Stigmaphyllon ciliatum.
x—Tecoma capensis.
o—Thunbergia grandiflora.
x—Vitis (Cissus) capensis.
x—Vitis Romanetii.
D—Wisteria chinensis.
D—Wisteria multijuga.
D—Wisteria multijuga var. alba.

10. Foliage vines for California.

Many vines are especially ornamental because of their foliage effects. Those with smooth bright green closely arranged leaves are most desirable.

D—Actinidia chinensis.
D—Ampelopsis arborea.
D—Aristolochia macrophylla (A. Sipho).
x—Asparagus asparagoides.
x—Cissus striata.
x—Clytostoma callistegioides.
Cobæa scandens.
x—Dolichos lignosus.
Evonymus radicans.
Ficus pumila.
Gelsemium sempervirens.
A—Humulus japonicus.
x—Jasminum azoricum
x—Jasminum gracillimum.
x—Jasminum rigidum (J. ligustrifolium).
x—Pandorea australis.
x—Pandorea jasminoides.
o—Passiflora edulis.
o—Passiflora laurifolia.
o—Passiflora ligularis.
x—Phædranthus buccinatorius.
D—Pueraria hirsuta.
D—Senecio mikanioides.
x—Serjania fuscifolia.
x—Solanum Seaforthianum.
D—Solanum Wendlandii.
x—Stauntonia hexaphylla.
o—Thunbergia grandiflora.
x—Vitis (Cissus) antarctica.
x—Vitis (Cissus) capensis.
x—Vitis (Cissus) hypoglauca.
x—Vitis (Cissus) rhombifolia.

Millettia megasperma, Benth., the "evergreen wisteria" from Austral. is a promising plant in California: woody climber: lfts. 7–13, obovate or obovate-oblong: fls. purple, in racemes 4–6 in. long which comprise a terminal panicle.

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PLÁTANUS (its ancient Greek name). *Platanàceæ.* PLANE-TREE. BUTTONWOOD. Ornamental trees with handsome dense foliage, often planted as shade and street trees.

Deciduous, with the bark exfoliating in thin plates, but at the base of older trunks the bark is persistent, of darker color and furrowed: stipules conspicuous, usually connate into a tube, with spreading lf.-like margin; petiole with the enlarged base inclosing the axillary bud: lvs. palmately lobed, covered densely with stellate hairs when young: fls. monœcious, in dense globular heads, staminate and pistillate similar, but on separate peduncles; sepals and petals 3–8; staminate with 3–8 stamens, pistillate with 3–8 pistils with elongated styles: fr.-heads consisting of numerous narrowly obconical, 1-seeded nutlets surrounded at the base by long hairs.—Six or 7 species are known in N. Amer., south to Mex. and from S. E. Eu. to India.

The planes are handsome trees with large and

palmately lobed leaves and small greenish flowers in drooping heads, followed by similar heads of fruits remaining on the branches during the winter. The smooth light-colored often almost creamy white bark of the branches and limbs, usually mottled by darker blotches of the older bark, which peels off in large thin

3061. Platanus racemosa. (×⅓)

plates, gives the tree a very characteristic appearance in winter, while in summer the plane-tree, with its large head of dense bright green foliage and with its massive trunk is a beautiful and majestic shade tree. The native *P. occidentalis* is hardy North and *P. acerifolia* and *P. orientalis* hardy as far north as Massachusetts, while the southwestern and Mexican species cannot be cultivated in the North. From time immemorial, the oriental plane, which was well known to the ancient Greek writers, has been famous for the large size it attains—trunks of 30 feet in diameter and more are reported to exist—and has been planted as a shade tree in western Asia and southern Europe, and today it is still one of the favorite street trees throughout the temperate regions of Europe. It has also been recognized in this country as one of the best street trees, even to be preferred to the native plane, which, unfortunately, suffers from the attacks of a fungus, *Glœosporium nervisequum*, while the oriental is not injured by it. The plane-trees stand pruning—even severe pruning—well. To what extent they are sometimes pruned in European cities without losing their vitality is shown in an interesting illustration in "Forest Leaves," Vol. III, p. 97. They are also easily transplanted even as larger trees. They grow best in a deep and rich moist soil. Propagation is by seeds sown in spring and only slightly covered with soil and kept moist and shaded; also by cuttings of ripened wood and by greenwood cuttings under glass in June taken with a heel, and sometimes by layers. Varieties are also sometimes grafted in spring on seedlings of one of the species. The stellate hairs of the young leaves when detached by the wind, sometimes float in great quantities in the air and are liable to cause irritation and sometimes inflammation of the mucous membranes of the eye, nose, and mouth. But as this is likely to occur only during a very limited period late in spring it can hardly be considered as a serious objection to the use of platanus as a street tree.

A. *Fr.-heads 3 or more, in pendulous racemes.*

B. *Lobes 5–7, dentate or lobed.*

orientàlis, Linn. ORIENTAL PLANE. Tree, to 80 ft., with usually very broad and round head on a comparatively short trunk: bark of dull grayish or greenish white color: stipules small, usually with entire margin: lvs. usually broadly cuneate at the base, deeply 5–7-lobed, rarely 3-lobed, with the sinuses reaching almost to or below the middle; lobes longer or much longer than broad, coarsely toothed or entire, glabrous or nearly so at maturity, 4–8 in. long: fr.-heads 2–4 on long, drooping stalks, bristly, the nutlets narrowed at the apex into a persistent style to 2 lines long. May. S. E. Eu. to India. G.F. 4:91. G.C. III. 23:25, 27; 29:363. Gn. 1, p. 550; 20, pp. 369, 371, 373. F.S.R. 2, pp. 75, 77. F.E. 24:69. G.W. 14, pp. 688, 689. Var. **digitàta,** Janko (*P. umbraculifera,* Hort., var. *laciniàta,* Hort.). Lvs. cuneate or truncate or cuneate at the base, deeply 5-lobed, with narrow, elongated, coarsely toothed lobes. Gn. 1, pp. 572, 573; 20, p. 371. F.E. 18, p. 718, pl. 89. Var. **cuneàta,** Loud. (*P. cuneàta,* Willd.). Often shrubby: lvs. short-stalked, smaller, usually deeply 3-lobed and cuneate, with narrow-toothed lobes. Gn. 1, p. 618; 20, p. 371. G.C. III. 29:363.—The true oriental plane is rare in cult., the tree usually planted under this name being *P. acerifolia.*

BB. *Lobes 3–5, usually entire.*

racemòsa, Nutt. (*P. califórnica,* Benth.). Fig. 3061 (adapted from Pacific R. R. Report). Tree, to 100 or 120 ft., with a trunk often divided into several sts.: lvs. usually cordate or truncate, deeply 3–5-lobed, thick and firm, deep green above, paler beneath and covered with a pale tomentum, 6–10 in. diam.; lobes ovate-lanceolate, entire or sometimes remotely or sinuately toothed: fr.-heads bristly or rather smooth, sessile, 2–7; nutlets tomentose while young, becoming glabrous. S. Calif. and Low. Calif. S.S. 7:328.

AA. *Fr.-heads 1 or 2, rarely 3.*

acerifòlia, Willd. (*P. orientàlis* var. *acerifòlia,* Ait. *P. intermèdia, P. integrifòlia* and *P. macrophýlla,* Hort. *P. damascèna,* Dode). LONDON PLANE. Fig. 3062. Probably hybrid between *P. orientalis* and *P. occidentalis* and intermediate between the two, sometimes resembling

3062. Platanus acerifolia. (× about ⅓)

more the one and sometimes more the other parent. Tree, to 100 ft.: lvs. 3–5-lobed, usually truncate or broadly cuneate at the base, the lobes broadly triangular, coarsely toothed, the middle lobe as long or slightly longer than broad: fr.-heads usually 2, rarely 3, bristly or sometimes scarcely so. Of garden origin. G.C. III. 29:363. Gn. 1, p. 588; 20, p. 371 and probably 1, p. 486, and 20, p. 370 (as *P. occidentalis*). F.E. 24:69 (as *P. orientalis*). Var.

pyramidàlis, Jaen. (*P. pyramidàlis,* Bolle). Of pyramidal habit: lvs. usually 3-lobed, often longer than broad, with usually rounded base. Var. **tubífera,** Jaen. (*P. supérba,* Hort.). With very conspicuous elongated, tubular stipules. There are also some forms with variegated lvs. Var. **Súttneri,** Hort., with the lvs. spotted and marked white, and var. **Kelseyàna,** Schneid. (var. *aùreo-variegàta,* Hort.), with yellow-variegated lvs.—The London plane is more generally planted under the name of the oriental plane than the true *P. orientalis.* It resembles in foliage more the American plane and is of more pyramidal habit than the oriental plane, which in its typical form has a broad head, with wide-spreading branches, deeply divided, 5–7-lobed lvs., and the fr.-heads usually in 3's and 4's. It is somewhat hardier than the oriental plane.

occidentàlis, Linn. Buttonwood. Buttonball. American Plane-Tree. Also wrongly called Sycamore. Fig. 3063. Large tree, attaining 130 or occasionally 170 ft., with a round-topped oblong or broad head and with a trunk 10 ft. or exceptionally more in diam., often of considerable height: bark of limb and branches of very light often almost creamy white color, at the base of the trunks dark brown, fissured: stipules large, with toothed margin: lvs. as broad or broader than long, truncate or cordate, rarely cuneate at the base, usually 3-, sometimes 5-lobed, with shallow sinuses; lobes shorter than broad, coarsely toothed or entire, floccose-tomentose when young, at maturity only pubescent on the veins beneath, 4–9 in. broad: fr.-heads solitary, rarely in 2's, on 3–6-in.-long peduncles, about 1 in. across or more, comparatively smooth at length; nutlets with obtuse apex, with the rest of the style $\frac{1}{16}$ in. long or shorter. May. Maine to Ont. and Minn., south to Fla. and Texas. S.S. 7:326, 327. G.F. 2:354, 355; 9:55. Em. 1:261, 263. Gng. 4:343. Mn. 3, p. 69; 5, pp. 205, 209.—The most massive and perhaps the tallest of all deciduous trees of N. Amer. and an excellent street and park tree where it is not injured by fungous diseases. A doubtful variety is **var. hispánica,** Wesmael (*P. hispánica,* Lodd.). Lvs. large, 3–5-lobed, with very shallow sinuses, coarsely toothed, usually cordate at the base. Gn.1, p. 588; 20, p. 370.—The *P. densicòma,* Dode (B.S.D. 1908:68), described as having usually truncate or broadly cuneate lvs. and 1–3 heads with acutish nutlets is probably not different from *P. occidentalis* or may belong to *P. acerifolia.*

3063. Platanus occidentalis. (×¼)

P. vulgàris, Spach, comprises all species of the genus.—*P. Wrightii,* Wats. Tree, to 80 ft., often divided into several sts.: lvs. usually cordate or truncate, deeply 3–7-lobed, with lanceolate, acuminate, entire or dentate lobes, tomentose beneath or nearly glabrous at length, 6–8 in. long: fr.-heads racemose, rather smooth, each on a short stalk. New Mex. and Ariz. to Calif. S.S. 7:329.

The other species, as *P. mexicàna,* Moric., which is sometimes planted as a street tree in Mex., *P. Lindeniàna,* Mart. & Gal., and *P. glabràta,* Fern., all natives of Mex., are not yet intro.

Alfred Rehder.

PLATÒNIA (from a personal name). *Guttíferæ.* Trees, little known as yet in cult.: lvs. leathery, closely and finely feather-veined: fls. large, rose, solitary, terminal, perfect; sepals 5, imbricate; petals 5, much larger than the calyx, scarcely convolute into an ovoid corolla; stamens 5; ovary 5-celled: fr. a fleshy indehiscent 5-celled edible berry. Two species from Brazil. *P. insígnis,* Mart. Large tree: lvs. coriaceous, oblong, acute: fls. solitary, terminal, showy; sepals suborbiculate, 2 outer smaller; petals broad-ovate, rose outside, white inside; ovary ovoid: berry subglobose or oval. Brazil. Intro. and distributed by the U. S. Dept. of Agric.

PLATYCÀRYA (Greek for *broad,* and *nut;* alluding to the shape of the fruit). Syn., *Fortunèa. Juglandàceæ.* A monotypic genus distinguished from all other Juglandaceæ by its fertile fls. forming an upright cone-like spike. Small deciduous tree: the branches with solid pith: winter buds with imbricate scales: lvs. odd-pinnate, similar to those of *Carya Pecan,* but smaller: staminate catkins axillary; pistillate terminal, solitary: fr. a small, winged nut in the axils of densely imbricated, rigid and sharply pointed lanceolate bracts forming a terminal upright cone. Rarely cult. and not hardy north of the Middle states. It has graceful foliage, but its ornamental value is not great. Prop. by seeds and by layers, probably also by grafting on Carya.

strobilàcea, Sieb. & Zucc. (*Fortunèa sinénsis,* Lindl.). Small tree, with upright glabrous branches: lvs. 8–12 in. long; lfts. 9–17, sessile, oblong-lanceolate, falcate, acuminate, doubly serrate, pubescent only on the midrib beneath, 3–4 in. long: fr.-bearing cone about 1–1½ in. long, oval, brown. Summer. Japan, China. S.Z. 2:149. F.S. 4, p. 326*b.* R.H. 1888, p. 88. J.H.S. 1846, p. 151. S.I.F. 1:17. Alfred Rehder.

PLATYCÈRIUM (Greek, *broad horn;* alluding to the shape of the lvs.). *Polypodiàceæ.* Stag-Horn Fern. An anomalous genus of ferns with irregularly lobed thick lvs. with the sori forming irregular patches over one or both surfaces. The sterile lvs. are flat, rounded expansions closely adherent in layers to the substratum. In their native forests these ferns grow to the surface of trees and old plants and often form enormous nests. A few kinds of Platycerium are offered for sale in Amer. European growers list others, new ones appearing from time to time, but the whole group is grown in America only as specimens in large collections. The word "disk," as used below, refers to the widest unbranched portion of the fertile frond.

The stag-horn ferns are amongst the most beautiful and distinct of ferns—perhaps the most striking of all—because of their noble antlered appearance and their epiphytal habit. They have two kinds of fronds, barren and fertile, the former being rounded disks which clasp the tree trunk, while the fertile fronds generally hang down and look like antlers. Occasionally the barren fronds are more or less antlered, as in *P. grande,* but never give so perfect a suggestion as do the fertile fronds. The species are all tropical, except *P. alcicorne,* which is therefore the easiest to grow and the commonest in cultivation. This species can endure a night temperature of 50° F. or even less. The glory of the genus, however, is *P. grande* (Fig. 3064). The barren fronds are exceptionally large, rounded, and wavy margined at the base, deeply cut above, forming an erect or arching background to the pendent fertile fronds, which fork more times and have much narrower segments than the barren fronds. Unfortunately this

is the only species that does not produce suckers at the roots, by which all the others are easily propagated. It alone must be raised from spores, a long and anxious process. The only kind that has an erect and rigid habit is *P. Hillii*, which therefore is grown in pots while all the others may be grown on a block of wood, and some in baskets. *P. biforme* differs from all others in having a separate and specialized structure on which the sori are borne, the other kinds bearing their spore-masses on the under surface of the fertile fronds at or near the last forks. *P. biforme*, though it has been advertised, is probably nowhere in cultivation in the world. There is an improved form of the common type known as *P. alcicorne* var. *majus*, which is stronger-growing and has thicker fronds, enabling it to endure a drier atmosphere. It is therefore one of the best, if not the best, for exhibition purposes. At the other extreme from the slender grace of *P. alcicorne* and the rest is the bold and broad style of *P. æthiopicum*. The only one which bears no resemblance to antlers is *P. angolense*. All the species require a moist atmosphere, though the humidity should be reduced during the winter. With the exception of *P. alcicorne* they all demand a high temperature. All need perfect drainage, and in winter they should not have too much direct syringing, for they need a slight rest and are likely to spot or damp-off if water remains on the foliage too long. *P. æthiopicum* is said to be particularly sensitive. Stag-horn ferns are often grown on pieces of tree-fern stem. They are fastened to such support or to a board by means of wire, having first furnished the roots with a slit piece of peat for roothold and some sphagnum moss, to which may be added a little bone-meal for food and some charcoal for drainage. A little moss may be added every year or two. Eventually the barren fronds will entirely cover this material and the plants should then be left undisturbed for years. A stag-horn fern, with antlers spreading 6 or 8 feet, is a sight never to be forgotten. (W. H. Taplin and F. L. Atkins.)

A. *Plants not forked like a stag-horn.*

angolénse, Welw. (*P. æthiòpicum* var. *angolénse*, Welw.). Fertile lvs. wedge-shaped in outline and merely wavy at the margin, not divided into lobes. It is also distinct by reason of felt-like covering of rust-colored wool on the lower side of the lvs. Barren lvs. large, erect; fertile lvs. attaining a length of 18 in. and a width of 9 in. at the top: spore-mass nearly as broad as the lf. Angola (W. Afr.). G.C. III. 23:155 (repeated in 28:444).

AA. *Plants resembling a stag-horn.*

B. *Sori borne on a special receptacle.*

bifórme, Blume. According to Blume's plate and description, this differs from all other kinds in having the spores borne on a special appendage, which is kidney-shaped and attached below the first fork. Blume says there are 2 such appendages; that the barren lvs. are roundish, entire below, lobed above: fertile lvs. 3–5 ft. long, many times forked, pale green. Java.—The fertile lvs. of *P. biforme* are said to grow 15 ft. long sometimes. The picture in Gn. 4, p. 295, labeled *P. biforme* seems to be distinct and anomalous, though somewhat like *P. grande*.

BB. *Sori borne on the last forks or near their base.*

C. *Barren lvs. stag-horn-like above.*

D. *Fertile lvs. in pairs.*

E. *Plants glabrous or nearly so.*

grânde, J. Smith. Fig. 3064. This may be readily distinguished from *P. alcicorne* by its barren lvs., which are also stag-like, while those of *P. alcicorne* are not. Barren lvs. stalkless; segms. blunt, spongy, pale green, tomentose: fertile lvs. in pairs, 3–6 ft. long: sori not at the base of every ultimate fork but against the upper edge of the disk, with an infertile fork projecting beyond on either side. N. Austral. G.C. 1872: 1137; III. 8:97 (good, repeated in III. 10:698 and 28: 433). Gng. 5:169 (same as A.F. 6:701). F. 1850:47 (same as F.S. 6, p. 156). Not G.M. 40:135, which is *P. æthiopicum*. Mn. 1, p. 77 (erroneously as *P. alcicorne*).

EE. *Plants pubescent, with yellowish wool.*

Wállichii, Hook. As in *P. grande*, the sori are borne not at the base of the ultimate forks, but on a disk which is not squared off at its upper surface but rounded and projecting into the angle between the forks; sori roundish. Malay Penins. G.C. III. 28:435. Hook. Fil. Exot., pl. 97.

3064. Platycerium grande.

DD. *Fertile lvs. in 3's.*

Willinckii, Moore. Distinguished from *P. grande* by the sori, which nearly fill the last forks but do not approach the base of the sinus. The lvs. are thinly furnished with minute stellate hairs, at length glabrous and pale green. Moore says: "fertile fronds in 3's, elongate, pendent, with scarcely any disk, bipartite for about two-thirds of their length, one of the margins of each primary branch entire, the other bearing numerous lobes in about three series on a dichotomous plan." Strong features of this plant are the length, narrowness and acuteness of the forks, and also the narrowness of the "disk" or unbranched portion just below the primary forks. Java. G.C. II. 3:303 (repeated in III. 10:701 and 28:431). A.G. 15:111. Gn. 10, p. 383 (repeated in Gn. 30, p. 300).

CC. *Barren lvs. not stag-horn-like, entire or merely lobed.*

D. *Segms. and sinuses of the fertile lvs. very broad.*

æthiòpicum, Hook. (*P. Stemmària*, Beauv.). Barren lvs. rounded; fertile lvs. 2–3 ft. long, clustered, pendent, twice dichotomous (not twice trichotomous, as some writers say): sorus a V-shaped patch surrounding the sinus. Guinea, Angola. Hooker's Garden Ferns, pl. 9. A.G. 15:111. G.M. 40:135 (erroneously as

P. grande).—The fronds are said to be covered below with a thin cottony down.

DD. *Segms. and sinuses narrow.*

E. *Unbranched portion of fertile lvs. very long and narrow.*

Hillii, Moore (*P. alcicórne* var. *Hillii*). Barren lvs. like *P. alcicorne*, but the fertile lvs. are erect, the unbranched portion longer, the forks more numerous and compact, the segms. shorter and more acute. Lvs. clustered thinly, covered when mature with white stellate hairs; sori in oval or roundish masses, not at the base of the sinus but near the base of each of the last segms. The upper third of the fertile lf. is "15–18 in. across, 3-parted, the central segms. with 1 or 2 side lobes near the apex, the 2 lateral segms. broader and twice or thrice forked into 5–10 ultimate lobes."—T. Moore. Queensland. G.C. II. 10:51, 428, 429. J.H. III. 32:497.

EE. *Unbranched portion of fertile lvs. moderately long.*

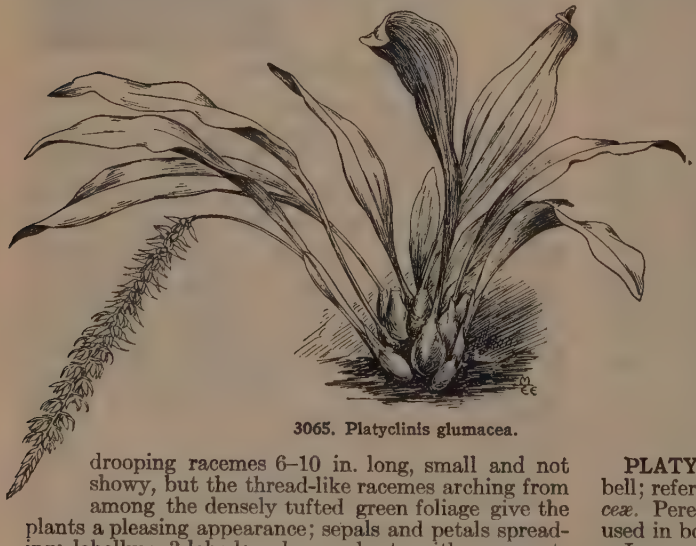
alcicórne, Desv. Barren lvs. rounded, convex, wavy margined; fertile lvs. clustered, attaining 2–3 ft., 2–3 times dichotomous, the unforked portion erect, the segms. pendent, rather narrow and sharply cut, under surface covered with thin cottony down: sori in irregular masses filling the last forks and a space across their bases, shown in B.R. 262, 263 (as *Acrostichum alcicorne*). Temp. Austral. A.G. 14:153; 15:111. Gn. 51, p. 259. G.C. III. 10:697. Not Mn. 1, p. 77, which is really *P. grande*.

Var. **màjus,** Moore, is stronger-growing, more upright, and with thick, leathery, dark green lvs. According to F. L. Atkins, the fertile lvs. are more broadly cut than the type and seldom forked more than once. Polynesia. Veitch's Catalogue in 1873, p. 13.

WILHELM MILLER. R. C. BENEDICT.†

PLATYCLÌNIS (Greek, *broad bed;* in allusion to the clinandrium). *Orchidàceæ*. Epiphytic orchids, suitable for a warm greenhouse. These plants are by recent orchid students referred to Dendrochilum. In this account, the names under that genus are given in the parentheses.

Pseudobulbs small, closely crowded, each with a single, narrow, evergreen lf.: fls. borne in graceful, drooping racemes 6–10 in. long, small and not showy, but the thread-like racemes arching from among the densely tufted green foliage give the plants a pleasing appearance; sepals and petals spreading; labellum 3-lobed; column short, with an erect-toothed clinandrium and a large, narrow, erect wing on each side of the clinandrium.—About 20 species in India, China, and the Malay Isls.



3065. Platyclinis glumacea.

The several species of Platyclinis are all small compact-growing plants, requiring but little root-space. They are of easy culture and readily adapt themselves to either pot or basket culture, the latter being preferable for those with pendulous flower-scapes. The roots do not like being disturbed, but when repotting is necessary it is best to do it just after the flowering period. The compost should consist of equal parts chopped live sphagnum moss and clean peat fiber. The roots should be carefully distributed and the compost pressed gently but firmly in around them, leaving the surface slightly convex when finished. At least two-thirds of the space should be devoted to free drainage with potsherds or bits of charcoal. A shaded location and moist atmosphere, with a temperature of 60° to 65° F. by night and 70° to 75° by day, will afford them satisfactory growing conditions. They require a liberal supply of water at the roots, with occasional syringing overhead in bright weather when growing, and should never be allowed to remain long dry even when at rest. The plants frequently produce side growths from the old pseudobulbs, which may be removed after the growths are matured, leaving three or more of the old pseudobulbs attached to each piece, thus increasing the stock. When no natural break occurs, however, the plants may often be induced to break by slightly twisting, or notching the rhizome with a sharp knife, thereby retarding the flow of sap at that point. (Robert M. Grey.)

glumàcea, Benth. (*Dendrochìlum glumàceum*, Lindl.). Fig. 3065. Pseudobulbs crowded, forming dense spreading masses, the young ones clothed with red scales: lvs. solitary, broadly lanceolate, tapering to a petiole which is inclosed by the sheath: peduncle from the top of the pseudobulb, slender, bearing a long drooping spike of small white fls.; sepals and petals spreading, oblong, acuminate; middle lobe of the labellum rotund, curved, base with 2 fleshy ridges. Spring. Philippines. B.M. 4853. G.C. III. 18:552. G.M. 48:385. Gn.W. 16:665.

filifórmis, Benth. (*Dendrochìlum filifórme*, Lindl.). Pseudobulbs crowded: lvs. linear-lanceolate: fl.-st. thread-like, bearing a long, pendulous raceme of small, pale yellow fls.; sepals and petals obovate; labellum cuneate-rotund, auriculate at the base. Summer. Philippines. I.H. 25:323 (as *Dendrochilum glumaceum*). G.F. 2:485.

Cobbiàna, Hemsl. (*Dendrochìlum Cobbiànum*, Reichb. f.). Lvs. oblong-lanceolate: fls. in a zigzag raceme, pale yellow, with an orange lip; sepals and petals triangular-oblong; labellum cuneate-fan-shaped, retuse. Nov., Dec. Philippines. O. 1914, p. 123.—This is offered in some catalogues under the name of *P. autumnalis*.

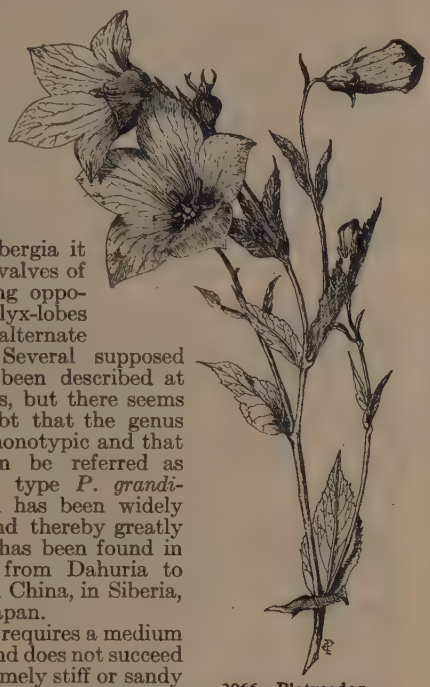
P. bárbifrons, Kränzl. Lvs. lanceolate, acute, 5–7 in. long, about 1 in. broad: racemes very slender, pendulous, many-fld.; fls. greenish white, about ⅛in. across; sepals and petals similar, ovate-lanceolate, acuminate; lip entire, obovate, apiculate. Sumatra. G.C. III. 31: 366 (desc.).—*P. cucumerinum*, Hort. (Dendrochilum cucumerinum, Reichb. f.). Lvs. long-petiolate, oblong, 5-nerved, up to 5 in. long, less than ½in. wide: scape slender, exceeding lvs., with a pendulous raceme; fls. pellucid-green; sepals oblong, acute, ⅛in. long; petals similar, denticulate, lip 3-toothed. Philippines.—*P. latifòlia*, Hemsl. Pseudobulbs 1-lvd.: lvs. elliptic-lanceolate, 10 in. long, 7-nerved: raceme many-fld., pendulous, on an erect scape; fls. greenish yellow; sepals triangular-lanceolate, acute, ⅔in. long; petals ovate-lanceolate, acute, denticulate; lip brown-striped. Philippines.

GEORGE V. NASH.

PLATYCÒDON (Greek, *platys*, broad, and *kodon*, bell; referring to the shape of the flower). *Campanulàceæ*. Perennial smooth erect glaucous herbs, which are used in border planting.

Leaves sparse, often opposite or whorled, subsessile, dentate: fls. large, solitary or few at the ends of the branches; calyx-tube adnate, turbinate, 5-lobed; corolla campanulate, 5-lobed; stamens free from the corolla; ovary inferior, 5-celled: caps. obovoid, top

conical, loculicidal within the lobes of the calyx, 5-valved.—One species, E. Asia and Japan. This plant was first placed in Campanula by Jacquin, and later, by Schrader, in Wahlenbergia; and it is still sometimes cult. under these names. In 1830 it was made a separate genus (Platycodon) by A. DeCandolle. It is distinguished from Campanula by its broadly cup-shaped fls., the stamens dilated at the base, and the caps. opening at the top and not at the sides. From Wahlenbergia it differs in the valves of the caps. being opposite to the calyx-lobes instead of alternate with them. Several supposed species have been described at different times, but there seems to be no doubt that the genus is distinctly monotypic and that all forms can be referred as forms of the type *P. grandiflorum*, which has been widely distributed and thereby greatly modified. It has been found in a wild state from Dahuria to Manchuria, in China, in Siberia, Korea, and Japan.



3066. Platycodon grandiflorum. (×⅓)

Platycodon requires a medium sandy loam, and does not succeed in either extremely stiff or sandy soils. It is particularly sensitive to ill-drained soils. Under suitable soil conditions it is perfectly hardy and will even stand considerable neglect. It is desirable to keep the stems tied during the season, for if once allowed to fall they can never be raised without breaking. In autumn the old stems should not be cut away, but the plant allowed to die off naturally; otherwise the crown may be injured. It can be propagated either by division or by seeding, the latter being more surely successful and therefore preferable; besides, a greater variety of flowers is obtained in this way. More care and skill are necessary in propagation by division, because of the fleshy rootstock. It is best accomplished in spring, when the plant is breaking into new growth.

One of the best single varieties of *P. grandiflorum* is "Die Fee," large and very free-flowering, sky-blue. Of the numerous semi-double and double sorts may be noted Goos & Koenemann's German introductions: Capri, deep blue, medium tall; Multiflora, with thickly set clear blue bells; Seidenball, lilac-purple, and the dark blue Vineta. Of French origin are Cloche bleue, navy blue, and Globe azurè, sky-blue. (Richard Rothe.)

grandiflòrum, DC. (*Campánula grandiflòra*, Jacq. *Wahlenbérgia grandiflòra*, Schrad.). Chinese or Japanese Bellflower. Balloon Flower. Fig. 3066. Plant 1–2 ft. high, forming a dense, branching bush of upright habit: lvs. lanceolate or ovate-lanceolate, glabrous, unequally toothed: fls. large and open, attaining 3 in. diam., produced from tips of branches, inflated in the bud, hence sometimes called "balloon flower;" corolla 5-lobed, blue, pale blue-white, or variegated. June, July. G.C. III. 28:223. J.H. III. 30:123; 54: 331. F.S. 22:2332. B.M. 252. F.E. 15:647. G. 30: 421. Gn.W. 6:713. R.B. 39:347. Var. **álbum,** Hort. A white-flowering form. Var. **autumnàle,** Voss. (*P. autumnàle*, Decne.). Later-flowering form from Manchuria. Gn. 45, p. 462. R.H. 1848:361; 1858, p. 547. G. 2:211. H.F. 8:172. J.F. 3:250.

Var. **japónicum,** Hort. (*P. japónicum*, Hort.), is of stronger and bushier growth and freer-flowering. The fls. average 2½ in. across; the inner and outer lobes alternate with one another, giving the fl. the appearance of a 10-pointed star.—This variety was first procured by Dreer in 1895 from Leonard Lille, Lyons, France, who offered it as a novelty that season. It proved to be a first-class and desirable sort and has been tested by Dreer since, who considers it one of the good hardy perennials.

Var. **Marièsii,** Hort. (*P. Marièsii*, Hort.). Originally intro. into England from Japan by Maries, and supposed to be identical with var. *glaucum* of Siebold. It does not exceed 1 ft. in height: growth stouter and more compact: lvs. thicker than in the type: fls. are as large or larger than the type and varying in color from deep purplish blue to pale blue or lavender and white. G.C. III. 14:163. G.M. 37:35. J.H. III. 35:29.; 63:152. Gn. 27:216; 45:462. A minor form of var. *Mariesii*, var. **nàna,** Hort., is frequently offered in the trade as being dwarfer and more compact, with white or blue fls. Var. **sémi-dùplex,** Hort. Two and one-half ft. high: fls. rich blue, darker veined, 2½–3 in. across, flattened, and with a second row of corolla-segms. G.M. 43:575. G.C. III. 28:223. Var. **sémi-plènum,** Hort. Fls. semi-double, and varying in color from purple to white; said to have been developed from var. *album*. Var. **striàtum,** Hort. A garden form with blue or white fls., striped with white or blue.

Arnold V. Stubenrauch.
F. Tracy Hubbard.†

PLATYCRÀTER (Greek, *platys*, broad, and *crater*, bowl; alluding to the broad enlarged calyx of the sterile fls.). *Saxifragàceæ*. A monotypic genus allied to Hydrangea. The species is a woody plant, with opposite serrate lvs. and white, comparatively large fls. in long-peduncled, loose cymes, the marginal ones sterile and with enlarged calyx; petals 4; stamens numerous: fr. a 2-celled many-seeded dehiscent caps. It is not hardy N. and of little decorative value. It thrives best in rather moist, porous soil and partly shaded position and is easily prop. by seeds, greenwood cuttings under glass, or layers.

argùta, Sieb. & Zucc. Prostrate shrub: lvs. oblong to oblanceolate, cuneate at the base, acuminate, glabrous except on the veins beneath, thin, light green, 3–6 in. long: cymes 3–10-fld., on a 1–2-in.-long peduncle; fls. slender-pedicelled, the sterile ones apetalous, 1 in. across, with broad, obtuse sepals; fertile smaller, with lanceolate sepals half as long as the oblong-ovate petals. July. Japan. S.Z. 1:27. Gt. 15:516. H.F. 1870:206. —Useful for rockwork in greenhouses.

Alfred Rehder.

PLATYLÈPIS (Greek, *broad scale;* presumably referring to the fact that the sepals are broad). *Orchidàceæ*. Terrestrial herbs with creeping rhizomes and ascending leafy sts., suitable for the warmhouse: lvs. petiolate, ovate or ovate-lanceolate, membranous: fls. narrow, shortly pedicelled, arranged in dense spikes; bracts ovate; sepals subequal, narrow, free, connivent round the column; lateral united at the base into a very short chin.; petals narrow, slightly cohering with the dorsal sepal into a hood; lip sessile at the base of the column, erect, channelled, broadly ventricose at the base, cohering with the margins of the column; limb very little dilated; column elongated, subterete, clinandrium oblong, erect behind the rostellum. About 6 species, Trop. and S. Afr. *P. austràlis*, Rolfe. Lvs. ovate, 2–4 in. long, 15–21-nerved: infl. erect scapes 6–12 in. long, bearing an oblong or elongated many-fld. raceme 2–5 in. long; fls. small, green, with the upper half of the lip white. S. Afr. *P. densiflòra*, Rolfe. Differs from the preceding in having narrower sepals, the

lateral not reflexed in the middle, narrower petals, and a lip not constricted in the middle. Mascarene Isls. Both species have been intro. at Kew Gardens, but probably are not in general cult. Stovehouse plants.

F. Tracy Hubbard.

PLATYLÒMA is a name for ferns of the genus *Pellæa* which have a narrow indusium and a broad sorus. For *P. Bridgesii* and *P. falcata*, see *Pellæa*.

PLATYSTÈMON (Greek, *broad, thread;* referring to the broadened filaments). *Papaveràceæ*. Low annual herbs generally branched at the base, sometimes grown in flower-gardens.

Stems erect or decumbent, glaucescent: lvs. alternate or subopposite, linear- or oblong-lanceolate: fls. usually erect and solitary; sepals 3, ovate, caducous; petals 6, sometimes more, yellowish white or yellow or white, caducous or rarely persistent; stamens numerous; ovaries 6–20, distinct: fr. at maturity many carpels totally distinct or slightly joined, carpels moniliform.—About 60 species natives of the Pacific Coast according to Fedde (Engler's Pflanzenreich, hft. 40. IV:104), or 1 species according to Gray and a large number of American authors. Platystemon grows wild throughout Calif., except in the mountains, and is said to prefer a loose soil.

californicus, Benth. (*P. leiocárpus,* Fisch. & Mey.). Cream-Cups. Lvs. appearing opposite, sessile, ligulate-linear: petals light yellow, cream-color or white: carpels linear, moniliform, sometimes hispid. B.M. 3579. B.R. 1679. B. 2:65. Gn. 30, p. 313. G. 34:397. —*P. leiocárpus*, Fisch. & Mey., is the smooth-fruited form and is considered by some to be a distinct species, but is said by Gray in the Synoptical Flora to be "a mere state." F.C. 2:76. B.M. 3750.—*P. californicus* is frequently improperly called the California poppy but the true California poppy is *Eschscholtzia californica*.

F. Tracy Hubbard.

PLATYSTÍGMA (Greek, *broad stigma*). *Papaveràceæ*. Low slender California annuals with pale yellow fls. less than 1 in. across. They are among the few plants of the poppy family with entire lvs. They are closely allied to Platystemon, but differ in having the filaments scarcely dilated, 3 stigmas instead of many, and the fr. a caps. which is 3-valved at the apex. Fls. commonly trimerous; stamens numerous, free; stigmas not confluent. Four species from Calif. and Ore. *P. linearis* is the only one with thick stigmas and also differs in its tufted habit, the others having leafy and branching sts. B.M. 3575, with pale yellow fls.; in B.R. 1954 it is shown with 3 white petals alternating with yellow ones. Platystigmas seem not to have been offered in Amer. By Fedde the species are referred to other genera.

PLATYTHÈCA (Greek, *broad anther-cells*). *Tremandràceæ*. Small shrub, somewhat heath-like, suitable for greenhouse culture.

Leaves whorled: fls. 5-merous, numerous, borne toward the end of the branches, light purple, about 1 in. across, center marked with a red star; stamens distinctly in 2 rows, anthers continuous on the same plane as the filament, with 4 parallel cells; disk inconspicuous: caps. loculicidally dehiscent, 4-valved. One species. Austral.—Platytheca belongs to a small beautiful and distinct family of Australian shrubs, composed of 3 genera, of which Tetratheca is the dominant type. The Tremandra family resembles the Polygala family in the structure of the caps., but differs in the regularity and estivation of the fl.; it resembles the Pittosporaceæ in having a very small embryo immersed in copious albumen, and particularly the genus Cheiranthera in having anthers which open by a pore at the top. The three genera of Tremandraceæ are distinguished from one another by the anthers; Tremandra differs from the other two in having the anthers jointed with the filaments; in Platytheca the anthers have 4 cells all in the same plane; in Tetratheca the anthers are 2-celled or 4-celled, with 2 cells in front of the 2 others.

galioìdes, Steetz (*P. verticillàta*, Baill.). Lvs. linear, ¾in. long, about 10 in a whorl, hairy. Said to bloom in June. P.M. 13:171 (as *Tetratheca verticillata*). G.C. III. 44:290.—This plant deserves to be better known. Cuttings of half-ripened wood root freely under a bell-glass in a shaded house at 60°. Cuttings rooted in February or March will make good plants in 5-inch pots in one year. In summer keep them plunged outside, but covered with shaded sash. By trimming frequently they will make well-shaped plants, needing no supports. Kept in a coolhouse (45°) during winter, they will be covered with bloom in March and April. The fls. last but a short time, but the plant is so free that it is always covered with the blue bloom.

H. D. Darlington and Wilhelm Miller.

PLECTOCÒMIA (Greek, *plaited hair;* application obscure). *Palmàceæ*. Six species of East Indian climbing pinnate palms which fruit once and then die.

One of the most interesting species is *P. khasyana*, which is figured in B.M. 5105 under the erroneous title of *P. assamica*. This species has a slender st. 60–80 ft. long, and about as thick as a man's arm, being slightly thicker above than at the base. The lvs. attain 30 ft. and are pinnate only in the lower half, the rest of the lf. being a long whip-like extension of the rachis of the lf. A singular feature of this palm is the device by which it climbs. This consists of a series of compound spines shaped like a downward-pointing human hand, the back of the hand being yellow and the 5 or 6 fingers composed of brown spines. These organs are scattered all along the lower side of the flattened rachis. They hook on the branches of trees and thus enable the palm to climb for light. Probably all the species possess these flagelliform lvs. and remarkable spines. The whip-like lf.-tips may act as tendrils. The genus is little known to cultivators. It is allied to the rattans (Calamus), which also are climbers.

elongàta, Mart. & Bl. Lvs. large; lfts. 1–1½ ft. x 2 in., sparsely white powdery beneath, with 3 very slender parallel nerves or costæ: fr. 1 in. diam., villous. Penang, Sumatra, Java.—Offered in 1890, but never much cult. in Amer. and probably not outside of botanic garden collections.

PLECTRÁNTHUS (Greek, *spur flower;* alluding to the swollen base of the corolla-tube). *Labiàtæ*. Herbs and subshrubs, bearing rather small flowers ranging from blue and purple to lilac; sometimes planted for ornament in warm countries.

Inflorescence various; calyx 5-toothed, the teeth equal or variously 2-lipped; corolla-tube exserted, swollen behind at the base; limb 2-lipped; stamens 4, filaments toothless, free: nutlets ovoid or oblong, smooth or minutely punctulate.—About 120 species from the tropical and subtropical regions of Afr. and Asia to Japan, Austral., and Polynesia. The genus is closely allied to Coleus, being distinguished by having the stamens free instead of united at the base into a tube, which is distinct from the corolla. In other respects the genus has wide limits of variation. Sometimes called cockspur-flower. Prop. by cuttings which root easily.

fruticòsus, L'Hér. South African shrub, 3–4 ft. high: lvs. 4 in. or more long, petiolate, broadly ovate, doubly dentate: racemes laxly panicled; whorls about 3–6-fld.; fls. blue; pedicels 1½ in. long; corolla-tube spurred above the base; fruiting calyx declinate.—Said to be an elegant shrub; a specimen reported at Los Angeles is 4 ft. high and 6 ft. through.

P. albocærùleus, N. E. Br. A tall branched herb with broadly ovate lvs. 2–4 in. long: racemes crowded, spike-like; corolla white

and bluish. Trop. Afr.—*P. chiradzulénsis*, Baker. About 3 ft. high, with slender branches: lvs. petioled, toothed not unlike those of the common nettle: fls. in terminal loose panicles 6 in. long, long-lipped and light blue; fls. in winter. Trop. Afr.—*P. ciliàtus*, E. Mey. St. covered with purple hairs: lvs. broad, bright green above, purple-red beneath: fls. white with purple spots. S. Afr. Intro. into Italy.—Said to be a showy autumn- and winter-flowering plant with a compact habit.—*P. Coppínii*, Neck. A quick-growing species with root-tubers and also aërial ones produced in the axils of the branch-nodes. Trop. Afr. This species is cult. and the produce sold for food in the Soudan.—*P. crássus*, N. E. Br. A stout subshrub, covered with velvety hairs: lvs. ovate, 3–6 in. long, short-petioled, crenate, upper surface rich velvety green, under surface gray with prominent reticulate venation: fls. in stout erect terminal panicles 1 ft. or more long, purple-blue. Trop. Afr. B.M. 8030. Gn. 73, p. 629.—*P. Mahònii*, N. E. Br. Sts. 3 ft. high: lvs. ovate, 3–4 in. long, petiolate, the lower cuneate, the upper cordate at the base, toothed: racemes 3–8 in. long, loosely many-fid.; fls. rather small, violet-blue. Trop. Afr. B.M. 7818.—*P. saccàtus*, Benth. Subshrubby and rather succulent, with horizontally spreading branches about 1 ft. long: lvs. 2–3 in. long, ovate, coarsely toothed: racemes erect, simple, lax-fid.; corolla large, pale blue. Natal. B.M. 7841. Intro. into English botanic gardens and said to be a very ornamental species with probably the largest fls. of the genus.

F. Tracy Hubbard.

PLECTRÒNIA (Greek, *cockspur;* referring to the spines). *Rubiàceæ*. Woody plants sometimes cultivated in warm regions for the ornamental flowers. They are more or less spiny and have somewhat funnel-shaped 5-parted fls., with reflexed segms. valvate in the bud, and a hairy or naked throat; calyx obovate or oblong; stamens 5, in the throat; style short; stigma subcapitate, of 2 approximate lamellæ: berry obovate-oblong, compressed, didymous, 2-stoned; stones indehiscent, 1-seeded.—About 150 species of shrubs or small trees, found in the Old World, mostly in the tropics.

spinòsa, Klotzsch. Very spiny S. African shrub, 5–8 ft. high: lvs. fasciculate, oval or obovate, obtuse, entire, 1–1½ in. long: racemes or panicles shorter than the lvs.: peduncles axillary, 5–12-fid.; corolla-tube shorter than the limb; throat naked.—Intro. into S. Calif.

PLEIOCÁRPA (Greek, *many fruits*). *Apocynàceæ*. Glabrous shrubs or small trees, grown under glass for the bloom: lvs. opposite or ternate, leathery: fls. in sessile axillary and often opposite clusters, very rarely in compact panicles or false umbels; calyx small, glandular; sepals 5, almost or quite free, obtuse or acute; corolla salver-shaped, tube slightly widened below the mouth, lobes 5, overlapping to the left; carpels 2–5, distinct: fr. fleshy, berry-like mericarps, leathery when dry, 1- or 2- (rarely 3-) seeded. About 10 species, Trop. Afr. *P. mùtica*, Benth. Shrub 5 ft. high: lvs. opposite, elliptic or oblong, 3–6 in. long, thinly coriaceous: fls. in dense axillary, globose clusters; sepals ovate; corolla pure white, tube cylindric, ⅔ to ¾ in. long, lobes ovate or oblong. B.M. 8343. G.C.III. 49:242. Cult. in botanic gardens abroad. The plant likes heat and moisture and about the same treatment as given ixoras.

PLEIOGÝNIUM (Greek, *many* and *wives*, meaning not clear). *Anacardiàceæ*. Tree recently intro. by the U. S. Department of Agriculture for experimental purposes. Lvs. odd-pinnate; lfts. ovate, wedge-shaped at base: fls. dicœcious, in numerous axillary racemes, those with male fls. as long as the lvs., those with female fls. shorter; petals obovate; stamens 10; ovary in female fls. 5–10–12-celled: drupe somewhat compressed, broad-top-shaped. One species, Queensland, Austral. *P. Solándri*, Engl. Tree, 40–60 ft. high: trunk occasionally very thick, 2–3 ft. diam.: lfts. 7–9, obliquely ovate or oblong, obtuse, 2–3 in. long, entire: fls. sessile, densely clustered in short axillary racemes, rarely panicles; petals 5, spreading. Queensland.—The timber when first cut is soft, but afterward becomes hard and tough. Possibly may be used as stock for less hardy anacardiaceous fr.-bearing trees. Its adaptabilities in N. Amer. are not yet known.

PLEIÒNE (from Greek mythology: *Pleione*, mother of the Pleiades). *Orchidàceæ*. A small group of orchids related to Cœlogyne, and requiring similar treatment.

Pseudobulbs soon dying: lvs. thin, deciduous, falling usually after the pseudobulbs are matured: fls. large, brightly colored, one or two borne on short scapes, produced from base of pseudobulbs.—About 13 species (Pfitzer & Kränzlin, Engler's Pflanzenreich, hft. 1907), of the mountains of India, extending to elevations where snow and frost are not uncommon. Few are cult. in Amer.

maculàta, Lindl. Pseudobulbs round, flattened, depressed at the top, forming a fleshy ridge around the summit: lvs. lanceolate, from inflated sheaths: fls. preceding the lvs., on short peduncles; sepals and petals lanceolate, spreading, white; labellum funnel-shaped, with 5–7 fringed lamellæ extending the entire length of the labellum side lobes streaked with purple, middle lobe ovate, wavy, white, spotted with purple and yellow. The lvs. fall in Sept.; fls. in Nov. B.M. 4691. F.S. 14:1470. F. 1851:97 (all as *Cœlogyne maculata*). Var. *Bermánica* was once offered by Wm. Mathews.

3067. Pleione præcox. (×⅙)

præcox, D. Don (*P. Wallichiàna*, Lindl. & Paxt.). Fig. 3067. Pseudobulbs flask-shaped, depressed, dull green, warted and covered with a network of the old split sheaths: lvs. broadly lanceolate, plicate: fls. large, on short peduncles; sepals long, lanceolate, spreading, pink; petals similar but narrower; labellum trumpet-shaped, indistinctly lobed, pink, white and yellow in the throat; disk with longitudinal fringed lamellæ, margin dentate-fimbriate. Oct., Nov. B.M. 4496. B.R. 26:24. P.M. 6:25 (all as *Cœlogyne Wallichiana*). G. 32:743. J. I. 2:153. O. 1914:72.

lagenària, Lindl. & Paxt. Pseudobulbs clustered and depressed, as in the other species, dull green, mottled with brown: fls. about 4 in. across, rose-lilac; sepals and petals narrowly lanceolate; labellum convolute, crisp on the margin, pale lilac, blotched with yellow and deep crimson in the throat and having several yellow crests. Aug.–Nov. Himalaya Mts. B.M. 5370. F.S. 23:2386. I.H. 14:510 (all as *Cœlogyne lagenaria*). Gn. 51, p. 64. O. 1914, p. 77.

Reichenbachiàna, T. Moore. Pseudobulbs 5–8-grooved, flask-shaped but suddenly contracted at the top: scape 1–2 in. long, closely sheathed; sepals and petals linear-oblong, pale purple to white; labellum nearly white, middle lobe white with few pale purple spots, with 3 crests; margin ciliate-toothed. Autumn. Rangoon. B.M. 5753.

P. Hookeriàna, T. Moore. Pseudobulbs seldom over 1 in. high: lvs. small, produced with the fls.: fls. 2–2½ in. across, rose-purple; lip lighter; throat pale yellow. Sikkim. O. 1914, p. 75.—*P. hùmilis*, D. Don. Pseudobulbs 1-lvd.: lvs. up to 8 in. long, 1½ in. wide: scape 1- or rarely 2-fid.; fls. nodding; sepals lanceolate, somewhat acute, white, 1½–2 in. long; petals similar, white, obovate from a cuneate base; lip emarginate, the disk yellow, brown-spotted. Trop. Himalayas. J.F. 2:158. B.M. 5674.—*P. pogonioìdes*, Rolfe. Fls. terminal, showy, rosy red with a whitish disk; sepals and petals somewhat connivent, oblong-lanceolate, about 1½ in. long; lip large, convolute around the column. China. B.M. 8588.—*P. Schilleriàna*, Pfitz. & Kränzl. Pseudobulbs 2-lvd.: fls. yellow, with

lip spotted purple or orange-red; lip deeply 3-lobed. Moulmein. O. 1914, p. 78.—*P. yunnanènsis*, Rolfe. Fls. rose or purple; sepals and petals similar, 1½ in. long, about ½in. broad, oblong-obovate; lip broadly cuneate, 3-lobed, about 1¼ in. long and broad. Yunnan. B.M. 8106. G.C. III. 41:152; 59:161. G.M. 49:781. J.H. III. 52:251. O. 1914, p. 79.

GEORGE V. NASH.†

PLEIOSPÉRMIUM (from the Greek for *many* and *seed*). *Rutàceæ*, tribe *Cítreæ*. Small trees distantly related to Citrus, but having fruits filled with mucilaginous pulp. Limonia § Pleiospermium, Engler, 1896.

Leaves trifoliolate, bifoliolate, or unifoliolate; spines straight, singly or in pairs in the axils of the lvs.: fls. in terminal panicles or axillary clusters; ovary 5-celled with 2 ovules in each cell.—Two species are known, ranging from India and Ceylon to Java. Both species of Pleiospermium are small trees, and both should be tested as stocks upon which to graft the common citrous frs. So far, attempts to intro. living seeds of *P. alatum* from India to this country have failed, possibly because of the large size and soft texture of the seeds.

alàtum, Swingle (*Limònia alàta*, Wight & Arn.). TUMPAT-KURUNDU. Small tree, common in S. India and Ceylon, especially in the dry regions: small branches, spineless or with spines 1 in. long: lvs. trifoliolate; lfts. obovate, petioles winged: fl.-buds downy: fls. 4–5-parted, short-pedicelled in terminal or axillary panicles: fr. globose, 5-celled with 2 rather large seeds or rudiments of seeds in each cell, imbedded in a mucilaginous pulp. Ill. Wight. Ill. Ind. Bot., pl. 41.—The wood is hard and close-grained, much like that of *Chalcas exotica*.

dùbium, Swingle (*Limònia diphýlla*, Houttuyn(?). *L. dùbia*, Blume. *Paramígyna Blùmei*, Hassk.). KIDJEROEKAN. A small tree, native to Java, 9–12 ft. in height, branching out about 4–5 ft. from the ground, and having numerous suckers at the base: branches spiny or spineless: lvs. unifoliolate, bifoliolate, or trifoliolate; petioles slightly winged: fls. in short axillary clusters of 5–15; ovary pubescent: frs. the size of a pigeon's egg, filled with unpleasantly aromatic resin secreted by pulp vesicles 3–4 mm. long. See Journ. Wash. Acad. Sci. 6, No. 13. WALTER T. SWINGLE.

PLEOCNÈMIA: *Dryopteris*.

PLERÒMA: *Tibouchina*.

PLEUROSPÉRMUM (Greek *ribs* and *seed*, referring to the strong ridges on the fr.). *Umbellíferæ*. Biennial or perennial herbs, tall or low, and glabrous, hardy and somewhat ornamental: lvs. pinnate or compound-pinnate, segms. ovate, dentate, incised, or divided into narrow segms.: umbel composite, many-rayed; involucre and involucral bracts many, often membranaceous or lf.-like: fls. white or dark purple; calyx-teeth small, ovate, or rarely obsolete; petals large for the family, obovate or cuneate: fr. oblong, ovoid, or subglobose.—About 45 species, a few in Eu., mostly in Asia, sometimes planted for ornament.

austrìacum, Hoffm. Perennial, 2–3 ft. high: st. upright, striate: lvs. dark green, rather thick, shiny, 2–3 times pinnatifid, the lower petioled, triangular in outline, the upper more or less sessile: umbel flat, up to 40 rays; calyx weakly toothed, the teeth short and obtuse; petals white, clawed, broad ovate, acutish. Eu.

PLEUROTHÁLLIS (Greek, *lateral branch;* referring to the inflorescence, which arises from the axil of the leaf). *Orchidàceæ*. Epiphytic orchids which on account of their small inconspicuous flowers are of no particular horticultural value, and not generally cultivated, although interesting.

Stems clustered on the rhizome, sheathed with scales below and bearing a single lf. at the summit: fls. in a nodding raceme from the axil of the lf.; sepals free or the lateral ones united at the base; petals smaller; labellum free, similar to the petals or 3-lobed; column short, without lateral branches.—One of the largest of the genera of orchids containing about 400 species, dispersed in the region extending from Brazil and Bolivia to Mex. and the W. Indies.

Roèzlii, Reichb. f. Lvs. oblong-lanceolate, 4–10 in. long: fl.-st. often a little longer than the lvs.: fls. purple-brown, in a 1-sided raceme. Columbia. Gt. 50, p. 272.

ornàta, Reichb. f. A very small cespitose plant with lvs. scarcely 1 in. long: fls. opening successively on erect, zigzag racemes a few inches long, inconspicuous, yellow with brown spots. B.M. 7094.—The plant is easily distinguished by the sepals, which are fringed with silvery pendulous hairs.

P. apiculàta, Lindl. Lvs. 1–2 in. long, linear-lanceolate: racemes 3–5-fld., about as long as lvs.; fls. pale yellow, about ¼in. long. Venezuela.—*P. attenuàta*, Rolfe. Lvs. elliptic, 1–1¼ in. long: scapes slender, 2–4-fld.; fls. about ⅔in. long; sepals and petals light green marked with purple; lip greenish white.—*P. barbosàna*, De Wild. Lvs. small, oblong-lanceolate: fls. small, yellow, rather nodding. Brazil.—*P. Birchenàllii*, Rolfe. Fls. 3–7 in a raceme; sepals dull reddish purple, the dorsal green-margined at base, lanceolate, long-acuminate, nearly 2 in. long; petals long-acuminate, about 1¼ in. long, light green striped brown at base; lip 3-lobed, less than ½in. long, the erect side lobes greenish white, the front lobe dull reddish purple. Colombia. G.C. III. 45:391.—*P. Cogniauxiàna*, Schlecht. Fls. densely hairy on outside, pale, densely covered with purple markings. Costa Rica.—*P. crinífera*, Hort. Very small: lvs. orbicular: infl. bearing 4 fls., each about ½in. long, covered outside with long whitish hairs; dorsal sepal light green, with pale brown dots; lateral sepals united, red-purple. Brazil.—*P. cuneifòlia*, Cogn. Lvs. very fleshy, lanceolate: fls. 1¾ in. long; lower half of sepals thin, pale yellow with red spots, upper half very fleshy, pale reddish brown. Brazil.—*P. dùbia*, A. Rich. Small, creeping: fls. yellow, with shining orange-yellow lip. Mex.—*P. pectinàta*, Lindl. Raceme distichous; fls. sea-green, with a few deep purple spots on base of lip; sepals pubescent, elongated, the dorsal linear; petals linear-lanceolate; lip clawed, oblong, toothed at base. Brazil. G.W. 14, p. 523; 15, p. 680.—*P. rèpens*, Ames. Lvs. 1½–2 in. long, elliptic-oblong: peduncles 1-fld.; fls. 3–3½ in. long, reddish brown. S. Brazil.—*P. rùbens*, Lindl. Raceme very long; sepals lanceolate, acuminate; petals obtuse; lip obovate, repand, obtuse. Brazil. G.W. 13, p. 367.—*P. subulifòlia*, Kränzl. Lvs. nearly 2 in. long, subulate: racemes slightly longer than lvs., 5- or more-fld.; fls. about ¼in. long, yellow, with purple lines. Brazil.—*P. venòsa*, Rolfe. Lvs. 5½–8 in. long, lanceolate-oblong: racemes many-fld., 4–6 in. long; fls. very small, greenish. Trop. Amer.

GEORGE V. NASH.†

PLÓCAMA (Greek, *bent hairs*, alluding to the pendulous branches). *Rubiàceæ*. Erect branched shrubs, usually fetid, to be grown under glass for the bloom or planted out far S.: branches very slender, pendulous: lvs. opposite or verticillate in 4's, linear-elongate, filiform, acute, flaccid; stipules connate into a short scarious sheath, persistent: fls. minute, axillary or terminal; calyx-tube globose, 5-lobed, persistent; corolla funnel-form-campanulate, short-tubed, pilose-throated, limb 5–7-lobed, lobes oblong-lanceolate with the tip bent and callous, valvate; stamens 5–7; ovary 2–3-celled: fr. a small globose, white, succulent berry. One species, Canary Isls. *P. péndula*, Ait., the only species, grows about 2 ft. high, has white fls. and linear-oblong filiform lvs. Intro. in S. Calif. and also cult. in greenhouses abroad.

PLUKENÉTIA (from Leonh. Plukenet, an English botanist of the 17th century). *Euphorbiàceæ*. Woody climbers, sometimes cult. in the tropics for the fr.: lvs. alternate, simple, often cordate, 3–5-nerved: fls. small, in lateral clusters, apetalous; calyx valvate; stamens 8–30; styles united to the apex into a swollen column; ovules 1 in each cell of the ovary. About 12 species in the tropics of both hemispheres. Related to Dalechampia and Tragia. The 4-lobed fr. of the following species is edible and has been utilized for hog-feed, for which they are frequently planted in their native land. *P. volùbilis*, Linn. Style-column long and slender: lvs. cordate, somewhat pointed, repand or serrate on margin. W. Indies. *P. corniculàta*, Smith. Style-column ovoid or hemispherical. Java; lvs. said to be aromatic and used as a pot-herb. J. B. S. NORTON.

PLUM. The tree and fruit of many species of Prunus. A few kinds are grown for the ornamental flowers and others for colored or variegated foliage. Prunes are cured dried plums.

It is probably more difficult to give specific practical advice for the management of the plum than for any other common fruit, for the reason that it represents

3068. Plum.—Peter Yellow Gage. (×½)

several distinct species which are not equally adapted to all parts of the country, and the same remarks will not apply to them all. There is no country in which the domesticated plum flora is so complex as in North America, for not only are the specific types of Europe and of Japan grown, but also species that are peculiar to this continent. In the northeastern states and on the Pacific slope the European or domestica types are the leading plums. In these same areas and also in the South and in parts of the mid-continental region, the Japanese plums also are now popular. In the cold North, in the great interior basin, and also in many parts of the South, various native types now constitute the leading cultivated plums. These native plums are developed from wild species of the country, and they are unknown in cultivation (except in botanical or amateur collections) in any other part of the world. These have been developed chiefly within fifty and sixty years, although a few varieties are older than this. For a history of this evolution, see Bailey, "Sketch of the Evolution of our Native Fruits;" also, as well as for culture and varieties of plums in general, Waugh, "Plums and Plum-Culture," and Hedrick, "The Plums of New York." See *Prunus*.

The plums cultivated in North America may be arranged in the following groups:

1. Domestica or European types, *Prunus domestica*. Native to western Asia, comprising the common or old-time plums, such as Green Gage, Lombard, Bradshaw, Yellow Egg, and the like. They are the leading plums from Lake Michigan eastward and north of the Ohio, and on the Pacific slope. Figs. 3068, 3069 are of this species. The Damsons (Fig. 3070) are small-fruited forms of this general species-type. Of late years, hardy races of *Prunus domestica* have been introduced from Russia. These have value for the colder parts of the plum-growing regions. Figs. 3071, 3072, show representative forms of the Russian type.

2. The Myrobalan or cherry-plum type, *Prunus cerasifera*. Native to southeastern Europe or southwestern Asia. The seedlings are much used for stocks upon which to bud plums; the species is also the parent of a few named varieties, as Golden Cherry; and DeCaradeuc and Marianna are either offshoots of it or hybrids between it and one of the native plums, probably hybrids.

3. Japanese types, *Prunus salicina* (*P. triflora*). Evidently native to China. The type seems to be generally adapted to the United States, and is of great value to both the South and North. This species first appeared in this country in 1870, having been introduced into California from Japan. For historical sketch, see Bulletin No. 62, Cornell Experiment Station (1894); also Bulletin No. 106 (1896); Hedrick, "The Plums of New York." Fig. 3073 shows one of these plums; also Fig. 3074, as to tree forms, which are very variable in the different pomological varieties.

4. The apricot or Simon plum, *Prunus Simonii*. Native to China. Widely disseminated in this country, but little grown except in parts of California. Introduced about 1881.

5. The americana types, *Prunus americana*, *P. nigra* (Figs. 3075, 3076), and *P. mexicana*. The common wild plum of the North, and extending westward to the Rocky Mountains and southward to the Gulf and Texas. Admirably adapted to climates too severe for the domestica plums, as the Plains and the upper Mississippi Valley.

6. The Wild Goose and Chickasaw types, *Prunus hortulana*, *P. angustifolia*, *P. Munsoniana* (Figs. 3076, 3077). A variable type of plums, comprising such kinds as Wild Goose, Wayland, Moreman, Miner, Golden Beauty, Newman, Caddo Chief, Lone Star, and many others. The species involved in this group are not yet clearly defined botanically, and what part the hybrid and intergradient forms play in the evolution of cultivated varieties is yet largely to be determined. In adaptability they range from Michigan to Texas, eastward and westward, but are essentially fruits of the great interior basin.

7. The Beach plum, *Prunus maritima*. Native to the coast from New Brunswick to Virginia. In cultivation, represented by the unimportant Bassett's American; also as an ornamental plant.

8. The Pacific Coast native plum, *Prunus subcordata*, wild in California and Oregon. Sparingly brought into cultivation, chiefly in the form known as the Sisson plum.

The welding of these many stocks will undoubtedly produce a wide range of fruits in the future, of which we yet see only the first promise. The experiments of Hansen in South Dakota in hybridizing *P. Simonii* and

3069. Plum.—Fellenberg or Italian prune. (×½)

P. americana, *P. salicina* and *P. americana*, *P. Besseyi* with plums, and others for a marginal climate, as well as the experiences of other workers in combining many of the species, all point to a wealth of plums for a continental area.

The plum of history is *Prunus domestica*. It is to this species that general pomological literature applies. It gives us the prunes (see *Prune*). These plums may

be thrown into five general groups, although any classification is arbitrary at certain points:

1. Prunes, characterized by sweet firm flesh, and capable of making a commercial dried product. They may be of any color, although blue-purple prunes are best known. Some of the prunes are grown in the East as ordinary market plums, being sold in the fresh state. Almost any plum can be made into dried prunes, but the varieties used commercially for this purpose constitute a more or less distinct class of sweet and thick-fleshed kinds (see definition, page 2719). In the East, prune is nothing more than a varietal name.

2. Damsons, comprising very small firm plums of various colors, usually borne in clusters, the leaves mostly small. The run-wild plums of old roadsides and farmyards are mostly of the general damson type (Fig. 3070).

3. The green gages, comprising various small green or yellow-green plums, of spherical form and mostly of high quality. Reine Claude is the commonest

3070. Damson plum. (×¾)

representative of this group in the East. The name green gage often stands for a group rather than for a variety.

4. Large yellow plums, such as Coe Golden Drop, Washington, and the like.

5. Large colored plums, including the various red, blue. and purple varieties, like the blue prunes, Lombard, Bradshaw, Quackenboss, and the like.

The Japanese plums (*Prunus salicina*) differ from the domesticas in having longer thinner smooth and mostly shining leaves, smooth twigs, a greater tendency to the production of lateral fruit-buds on the annual growth, and mostly rounder or shorter fruits with colors running more to cherry-reds and light yellows. Most of the varieties are as hardy as the domestica series. The Japanese varieties are important because they add variety to the list, and especially because they are rich in very early kinds, and the fruit is usually so firm that it carries well; aside from this, the trees are vigorous and very productive, and the species is less liable to injuries from black-knot and curculio than the domesticas.

The native plums, chiefly offspring of *Prunus americana*, *P. nigra*, *P. angustifolia*, *P. Munsoniana*, and *P. hortulana* represent a wide range of varieties. Those from *Prunus americana* and *P. nigra* parentage are very hardy and are adapted to regions in which the domestica and Japanese types are tender, as in northern New England, parts of Canada, and the northern plains states. Those partaking strongly of *P. angustifolia* parentage, and the greater part of the hortulanas, thrive well in the South, where the climate is too continuously hot for other plums or where the fruit-rot fungus is too prevalent.

The domestica varieties are mostly fertile with themselves, but the natives usually bear best in mixed planting so that pollination is assured. See *Pollination*. The Japanese varieties also usually profit by mixed planting. How far failure to set fruit is due in general to lack of pollination and how far to other causes, is yet largely to be worked out.

Plum-growing.

The plum thrives on a variety of soils. The domesticas commonly do best when planted in clay loam. They usually thrive well on lands which are suited to pears, or on the heavier lands to which apples are adapted. Yet many varieties grow well on lands that are comparatively light or even almost sandy, with good care. The americanas thrive best in a rather moist soil, and mulching is often very favorable to the size and quality of the fruit.

The stocks upon which plums are grown are various. By far the greater number of the trees in the North are now grown on Myrobalan, which is a species of rather slow-growing plum (*Prunus cerasifera*), native to southeastern Europe and southwestern Asia. This is the stock sometimes recommended in the older fruit-books for the making of dwarf trees; but unless the top is kept well headed in, the trees generally make normal growth upon it. Trees grown on this root are usually larger and finer at one or two years of age than those grown on other plum stocks, and the probability is that they are nearly as useful from the grower's standpoint as any other. However, there are some varieties that overgrow the Myrobalan, and the stock is likely to sprout from the ground and thereby cause trouble. The Myrobalan is variable from seed, and this fact may account for some of the unsatisfactory results now and then reported. St. Julien is perhaps a better stock, but is more expensive to import and less readily budded. The Myrobalan and St. Julien stocks are imported.

Probably the best stock for domesticas, from the standpoint of the grower, is the domestica itself, but seeds of it are more difficult to secure, the stock is more variable and it is more likely to be injured in the nursery row by leaf-fungi; therefore, as a matter of practice, the Myrobalan has very generally supplanted it. In the middle and southern states the peach is largely used as a stock upon which to grow plums, and it seems to be gaining favor in the North. It is undoubtedly a very excellent stock for sandy lands, and, in fact, is probably better for such lands than the Myrobalan itself. Some varieties—of which Lombard and French Damson are examples—do not take well on the peach. The Japanese plums are commonly worked on the peach. The Marianna stock, which is much recommended in the South, has not found favor in the North. Some varieties of plums are such slow and crooked growers in the nursery that it is advisable to top-graft or bud them on some strong and straight stock. The Lombard is no doubt the most adaptable stock for this purpose now grown by nurserymen. The old Union Purple is one of the best stocks, but is not much grown at present. Reine Claude, German Prune, and Copper are probably best when top-worked on some strong stock. For many native varieties, seedlings of vigorous natives, as of Golden Beauty and Wayland, make excellent stocks. Americanas should be worked on their own seedlings, at least in the North. In the South they are often budded on Marianna. The whole subject of plum stocks needs experimental study.

XC. Bavay or Reine Claude (Reine Claude de Bavay), one of the Green Gage plums of American orchards.

Plum trees are usually planted when two years old from the bud, although some of the strong-growing kinds may be planted at a year old with the very best results. As a rule, all plum trees are planted about as far apart as are peaches, that is, from 15 to 20 feet each way. Many growers prefer to plant them closer one way than the other and eventually to stop cultivation in one direction. If this system is used, they

3071. Early Red, one of the Russian plums. (×⅔)

may be placed 18 or 20 feet apart one way, and 8 to 12 feet the other way. When planted, the trees are pruned in essentially the same way as apple trees. It is usually advisable to start tops as low as possible and yet allow of the working of the curculio-catcher or other tools below them. This means that the limbs should start from 3 to 4 feet above the ground. With the modern implements and methods of tillage, there is little inconvenience in working the land if tops are started as low as this. The subsequent pruning of the plum tree has no special difficulties. About four or five main limbs are allowed to form the framework of the top, and in most varieties, especially those which are not very tall growers, the central trunk or leader may be allowed to remain. The fruit of the domesticas is borne mostly on spurs, as shown in Fig. 3078. These spurs, therefore, should not be removed unless it is desired to thin the fruit. In the americanas and the Japanese varieties, the fruit is borne both on spurs and on the annual axial growth.

Insects and diseases.—The black-knot is one of the most serious plum diseases. It is best kept in check by systematically cutting it out (several inches below the swelling) and burning it. The grower should go over his orchard for it in the summer and again as soon as the leaves fall. If trees are thoroughly sprayed every year with self-boiled lime-sulfur or bordeaux mixture for the leaf-blight fungus, the black-knot will make comparatively little headway in the orchard.

The blight, which causes the leaves to fall in August or September, is a damaging disease; but it can readily be kept in check by thorough spraying with self-boiled lime-sulfur or bordeaux mixture two or three times during the summer. The mixture for spraying plums should be weaker than for apples, particularly for the Japanese varieties.

The fruit-rot is the work of a fungus. Many times the dead and dried fruit may be seen hanging on the tree all winter, as shown in Fig. 3079; and in such cases it is very likely that the fruit-spur may be killed, as the upper one in the picture has been. In handling this disease, the first consideration is the fact that some varieties are much more susceptible to it than others. The Lombard is one of the worst. Again, if the fruit grows in dense clusters, the disease is more likely to be severe. The thinning of the fruit, therefore, is one of the best preventives of the spread of the disease, and at the same time, also, one of the most efficient means of increasing the size, quality, and salableness of the product. Thorough spraying with self-boiled lime-sulfur is a specific for the trouble and helpful in related troubles or diseases.

The curculio, which causes wormy fruit, can be held in check by the process described under Peach. Formerly, jarring the beetles on sheets or curculio-catchers (a wheelbarrow-like device with a large cloth hopper) was the prevailing practice with those who gave extra care to their fruit, and this method is still recommendable to amateurs and small plantations; but with the modern good tillage and the practice of keeping all parts of the plantation and the hedge-rows clean, and with the introduction of more effective spraying, the curculio is found to do much less damage and usually to be held sufficiently in check. Practising open pruning to let in the sun, and raking the dropped fruit out into the sun will also check the breeding. How far spraying with arsenicals will control the curculio on plums is not yet well understood, but growers usually feel that it is a distinct aid. To the bordeaux mixture or to self-boiled lime-sulfur, two and one-half pounds of arsenate of lead may be used to the fifty gallons, in one spraying soon after the petals drop, and another a week or ten days later.

L. H. B.

Native American plums.

Approximately 300 varieties of plums, derived chiefly from six native types, have been named, described, and introduced by American nurserymen and have found their way into American orchards and American pomological literature. The major part of this interesting development came in response to the urgent demand, most manifest in the years from 1870 to 1900, for the discovery of new types of garden fruits suited to the peculiar conditions of the middle western prairie states. Outside this area, the native American plums made much less impression, and while they have been widely tried, they have been generally discarded. Even in the area to which they are native and in which the need for them is greatest, they do not now play an exclusive rôle. A large part of the named varieties introduced by the nurserymen have already been lost to American horticulture. A creditable minority of these varieties, however, have qualities of absolute and considerable merit, and may be looked on as permanent additions to our pomological wealth. The native varieties are still propagated and planted by thousands annually, both for home use and for market. For certain culinary purposes, many of the natives are superior; and in many places, particularly in states of middle latitude, they are the most profitable market plums grown.

The americana plums are especially qualified to withstand the severity of northern winters. They are superlatively hardy. They are practically the only plums

3072. Voronesh Yellow, a Russian plum of somewhat recent introduction. (×⅔)

grown in the cold northwestern states (except the comparatively unimportant nigras and the Miners) and their usefulness in northern New England and middle Canada is limited only by the extent to which they are known. Their cultivation has been developed to a special degree in Iowa, Wisconsin, Minnesota, and adjacent states. For this region they must be propagated always on americana stock. This stock has other advantages besides its hardiness, and it is coming into extensive use for all sorts of plums in the Northwest. The sand cherry is sometimes used as a stock, but has not yet passed the experimental stage. It dwarfs americana plums worked on it. It is perfectly hardy.

The americana plums are wayward and awkward growers. With many varieties it is impossible to make a comely orchard tree. They do not appear to take kindly to pruning; and the usual method has been to let them very much alone. Careful pruning during the first few years, directed with a view to forming an open top on comparatively few supporting main branches, will do something toward shaping the trees; but with our present knowledge, no extensive pruning can be recommended for mature trees. The method of heading-in, as often practised with the domestica plums, is especially unadapted to the americanas.

The americana plums are early and very prolific bearers. Overbearing is a habit and a serious fault with most varieties. Extensive thinning of the fruit is indispensable. The trees are sometimes severely attacked by shot-hole fungus, and thorough spraying with bordeaux mixture or lime-sulfur is necessary. The fruit-rot (sclerotinia) attacks all the native plums more or less, and must be controlled by the usual remedies. See *Diseases and Insects*, Vol. II.

The nigra group has two or three important varieties of superor hardiness, as Cheney and Aitkin. In general, they bloom earlier and fruit less heavily than the americanas. Their habits and culture are the same.

The Miner-like varieties are hardly to be distinguished from the americanas in any way. They have practically the same geographical range, and may be given the same treatment in the orchard.

The hortulana group includes several varieties of great value, especially for the South. Of these, Wayland, Golden Beauty, Moreman, Benson, and Kanawha may be mentioned. They are not to be recommended generally for localities north of Massachusetts and Nebraska, their northern limit being determined less by their non-hardiness than by the very late ripening. This habit of late ripening, combined with very late blooming, makes them desirable for late marketing, particularly in southern markets. They are very prolific and constant bearers. The trees are free-growing, usually of rather spreading habit, and will bear heading-back better than the americanas. The pruning-knife, if used in season and with good judgment, will assist in making comparatively open-headed trees of these varieties.

The Wild Goose group (*P. Munsoniana*) includes varieties like Wild Goose, Milton, Wooton, and Whitaker, specially adapted to the latitude of Maryland, Kentucky, and Kansas. They succeed only less well southward; but are not generally valuable to the north of this line. For the section named, the varieties of this class have unquestionably been the most profitable plums grown up to the present time. They are propagated chiefly on peach, Marianna, and Myrobalan, but succeed even better on americana stocks. These stocks are all fairly satisfactory, though not equally good for all varieties; but, when peach stocks are used, the union should be made by whip-grafting on the peach root. Otherwise the peach stock comes above the ground and is a prey to the peach borer. The trees are mostly rapid willowy rather zigzag growers; and are amenable to the pruning-knife in about the same degree as the Wayland-like varieties already mentioned. Whitaker makes an open-headed tree without much trouble. So does Sophie. Wild Goose is more inclined to be thick and thorny in the top, but may be thinned carefully to make an accessible head. Milton is much like Wild Goose. Wooton makes a fine vase-form top, which, with a little timely pruning, is almost ideal. Wilder, James Vick, and some others, are prone to make thick bushy thorny tops, and are hard to manage. These varieties are all considerably subject to shot-hole fungus, which often strips them of their foliage in midsummer. They are mostly thin-skinned and liable to crack at ripening times, especially if the weather is wet. They should be picked rather green for shipment, the point to be observed being that they have attained their full size, rather than that they are dead ripe.

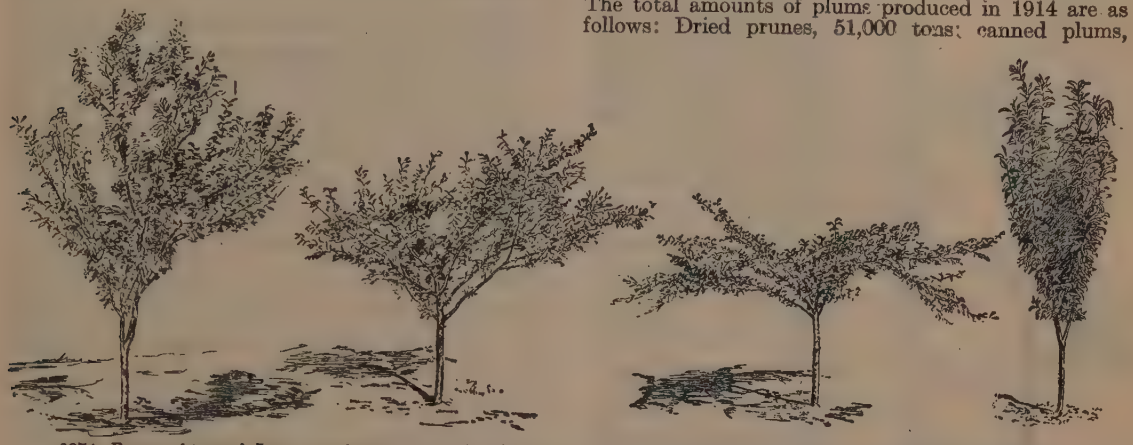
The Chickasaw varieties (*P. angustifolia*) are effective pollinizers for the Wild Goose and Japanese varieties blooming at same time; but very few of them have sufficient value in themselves to make them profitable orchard trees. A few varieties, like Munson and McCartney, are still planted for their own fruit; but in general they have been displaced by other types of plums. The trees are mostly bushy, thorny and thick-topped, sometimes so thick and thorny that the blackbirds can hardly get in to steal the fruit. It is difficult to prune them enough to make really satisfactory trees. The Chickasaw plums are specially adapted to the southern states, though Pottawattamie (probably a form of *Prunus Munsoniana*) succeeds as far north as southern Iowa and central Vermont. They propagate readily on any kind of stocks, but are very much given to suckering wherever they make roots of their own.

3073. The Japanese type (Prunus salicina).—Maru; once grown. (×½)

Other types of native plums, such as the Sand plum, the Beach plum, the Pacific plum, and the like, are not sufficiently numerous in cultivation for their treatment to have been determined.

Hybrid plums of various strains have been introduced in considerable numbers. Most of these hybrid varieties resemble rather strongly one or the other of their parent species; and the best that can be said regarding their culture at this early day is that they may be safely treated like the varieties which they most closely resemble. Wickson, President, and perhaps Climax, with some others, resemble the Simon plum, and ought to have much the same treatment, that is, practically the same treatment as the Japanese varieties. Gonzales, Excelsior, Golden, and Juicy, on the other hand, resemble the Wild Goose type, and may have the same general treatment as Wild Goose. Some of these hybrid varieties, especially crosses of Wild Goose and Chickasaw types with the Japanese plums, are making some stand commercially, especially in the South, West, and in the Rocky Mountain States.

All the native plums, with wholly negligible exceptions, require cross-pollination. For the most part, however, they are fully inter-fertile, so that one given variety will pollinate any other variety, providing the two bloom at the same time. Simultaneous blooming is of chief importance in adjusting varieties to one another for cross-pollination. To determine which varieties bloom together, careful observations should be made in the orchard and recorded, or recourse must be had to the published tables. Pollination is effected chiefly, if not exclusively, by the bees, so that their presence should be encouraged.



3074. Forms of tree of Japanese plums, at early bearing age.—Left to right: Abundance, Georgeson, Burbank, Wickson. The Wickson is probably a hybrid with P. Simonii.

Most of the native plums make comparatively small trees, so that they may be set somewhat close together in orchard planting, say 12 to 20 feet apart, usually about 15 feet. Some varieties, particularly in the South, need 20 to 30 feet space. Putting a plum orchard down to grass is not admissible under any circumstances; but cultivation should cease with the first of July, or certainly by the middle of July; for the native plums are especially liable to make too much late summer growth. High manuring of the soil is not usually necessary, or even desirable; yet something considerably short of starvation will be found the best treatment for native plums.

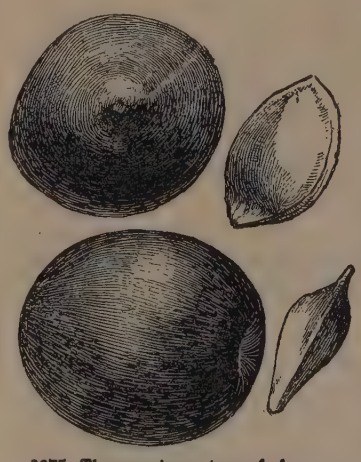
F. A. Waugh.

The plum in California.

The cultivation of the plum in California differs widely from that in the other plum-producing sections of the United States. Here the dreaded curculio is unknown, and while the equally dangerous black-knot has been found infesting a native wild cherry (*P. demissa*) it has never been observed in cultivated orchards. The most delicate varieties of the Old World find a very congenial home and form the basis of practically all orchard planting. In early mining days the California native plum (*Prunus subcordata*) was frequently cultivated, and before the introduction of European standard varieties attempts were made to improve the fruit by the usual methods of selection. Some very promising results were obtained; but since the demonstration of the great success of the more delicate and higher-flavored varieties, there has been little incentive to the use of the native species.

It seems hardly fair to make a distinction between "plums" and "prunes" in discussing this subject from the California standpoint. With the exception of the differences in the preparation for market, what may be said of the plum applies as well to the prune; for a prune is simply a plum which dries sweet without removing the pit. In most of the varieties of plums there occurs a fermentation around the pit in the process of drying, which prevents their being successfully dried without its removal; these are known as "plums." The prune varieties are, however, much richer in sugar which determines their adaptability to drying whole. As California has to find distant markets for most of its immense fruit crops, by far the greater portion of the plum areas are devoted to the production of prunes. The total amounts of plums produced in 1914 are as follows: Dried prunes, 51,000 tons; canned plums, 90,000 cases or 2,160,000 quarts; overland shipments, 7,906 carloads of fresh fruit.

The plum has an exceedingly wide range in California. It is thrifty and healthy on the immediate coast, in the interior and coast valleys, and well up into the foothills. This is perhaps most strikingly shown by the fact that every county in the state, except two perhaps (one being the city of San Francisco), contains plum or prune orchards, or both. When it is considered that this covers an area of nearly 160,000 square miles, extending through 9½ degrees of latitude, a fair estimate of the adaptability of this fruit to varying conditions of soil and climate will be obtained. By choosing varieties ripening in succession, the California plum season may be extended from May to December. It is not surprising, then, that the acreage devoted to plums and prunes is one of the largest in the state, reaching a total of nearly 142,000 acres, an aggregate of nearly 11,000,000 trees, of which about four-fifths are prunes. Placer County leads in the acreage of plums with 5,500 acres, and Santa Clara in prunes with 58,400 acres. This great industry has developed since the discovery of gold. The early Mission plantings (1769–1823) included varieties of European plums, a few of which were able to survive after the abandonment of the Missions in 1834, by reproducing themselves by suckers. One variety found at Mission Santa Clara was grown and marketed as the "Mission prune" as late as 1870. The



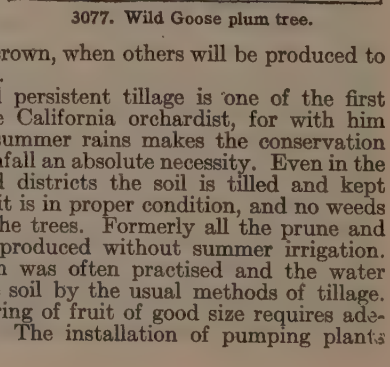
3075. The americana type of plum.—Weaver (Prunus americana). (×1)

introduction of improved plum varieties, however, dates back to 1851, when the first grafted fruit-trees were brought to the state by Seth Lewelling from Oregon, where he and his brother had established nurseries in 1847. Prior to this introduction, however, the miners were supplied with fruit of the native plums. The first importation of prune cions from France by the United States Patent Office in 1854 did not reach California. It was not until two years later that Pierre Pellier brought with him to San Francisco a small package of cions from the famous prune district of Agen, in France, which arrived in fairly good condition and were at once sent to Pellier's brother, Louis, who had already established a nursery and fruit-garden in the Santa Clara Valley, upon a portion of the site of the present city of San José. From these cuttings, a number of trees were produced which succeeded admirably, and eventually were distributed through different sections of the state, but principally in the Santa Clara Valley, which to this day remains the center of the California prune industry. In 1863, the first California-grown and -cured prunes were exhibited at the State Fair in Sacramento; but it was not until 1870 that planting on a commercial scale was begun. Through the seventies, and especially after 1878, numerous orchards were set out, until in 1881 some of the larger growers were producing between five and six tons of cured fruit. Since 1881 the growth of the prune industry has been marvelous, until now there are growers whose annual products reach hundreds of tons.

3076. Flowers of native plums. Prunus americana on the left; P. Munsoniana on the right.

Considerable difficulty was at first encountered in the selection of the proper grafting stocks. The native species, first used to some extent, were soon found to be unsatisfactory, on account of suckering, and dwarfing effect. Peach, apricot, and almond roots were used, the peach and almond proving best. The introduction of the Myrobalan or French cherry-plum (*Prunus cerasifera*) and its adoption as a grafting stock for plums and prunes have greatly simplified matters. It does not sucker, and experience has shown that in California it succeeds in low moist lands, in comparatively dry soils, if not too loose, and in stiff upland clay soils. It thus has become the all-round plum stock in California. On deep mellow loam soils, specially adapted to the peach, that root is still preferred for plum stock; but many varieties, e.g., the Columbia, Yellow Egg, and the Washington, do not unite well with it, and cannot, therefore, be worked directly upon it. The almond is widely used in loose, warm, or rocky foothill soils, and the deep light valley loams for the French and Fellenberg prunes. The Myrobalan seedling, then, is used almost entirely, except in special cases, as an all-satisfactory grafting stock for the plum in California. Propagating the Myrobalan stock from cuttings has been practically abandoned, and seedlings are now the rule. This is all-important in California, for there the roots of all plants must necessarily go deep for their moisture and nourishment. In fact, deep-rooting is the rule beyond all common expectation; thus almond roots the thickness of one's thumb have been found at a depth of 22 feet—one of the many instances of the characteristic conditions of California agricultural practice.

Propagation is by both buds and grafts. The usual practice is to bud the young stock in July and August, and then, in January and February following, all those which have not taken can be grafted, thus securing two chances. When peach or almond is used as stock, budding alone is done, as these stocks have been found to take the graft poorly. The trees are not allowed to remain in nursery longer than one year after budding, and in many cases are set out the spring following, as "dormant buds." In early days the tendency was to rather close planting, in some cases as close as 16 feet; but later plantings were made with wider distances, until from 20 to 24 feet has come to be the rule. The laying out of orchards has caused much discussion, some asserting that the quincunx, hexagonal, and triangular systems secure better use of the land and allow better access to plow and cultivator than do the plantings in squares. The square system, however, has come to be most generally used. The style of tree is the low-headed vase-form. The rule is to cut back the young trees at planting to 18 to 24 inches. Until the top is formed the stems are protected, by whitewashing or wrapping with burlap, from the hot afternoon sun. The first year from three to five branches are allowed to grow from the stem, and these used to form the main limbs of the tree. From this time the pruning is done according to the usual methods for the vase-form tree. Many plums, owing to the brittleness of the wood, are yearly pruned rather short but the French prune is able to carry fruit on much longer branches. After the third or fourth season, the growth of wood is much less and usually the pruning operations are confined to keeping the tree in shape, removal of dead or damaged branches, and shortening-in the current season's growth to keep the young twigs in a vigorous growing condition and to prevent overbearing. The long slender branches are not cut back. The long arching "canes" are allowed to remain until they have produced a crop (which they do in the second season with the greatest profusion), the ends resting upon the ground as the fruit gains weight. When these droop too low, they are cut back to the crown, when others will be produced to take their places.



3077. Wild Goose plum tree.

Thorough and persistent tillage is one of the first principles of the California orchardist, for with him the absence of summer rains makes the conservation of the winter rainfall an absolute necessity. Even in the summer-irrigated districts the soil is tilled and kept loose as soon as it is in proper condition, and no weeds allowed to rob the trees. Formerly all the prune and plum crop was produced without summer irrigation. Winter irrigation was often practised and the water conserved in the soil by the usual methods of tillage. But regular bearing of fruit of good size requires adequate moisture. The installation of pumping plants

and irrigation systems, therefore, has received a great impetus, and the use of summer irrigation when required is an established practice.

In some of the older orchards, the need of fertilizing is beginning to be felt. In a great many, the main deficiency has been found to be vegetable matter, and, consequently, nitrogen. The extremely fine tilth which has been maintained has resulted in the destruction of all natural green growth and the "burning out" of the humus, and has necessitated the call for a green-manure crop. This problem is rendered more difficult in California by the fact that any such crop must be produced during the winter months and be ready to plow-in with the beginning of tillage in March; for no summer-growing crop can be allowed in the orchard, unless the land is regularly irrigated and then alfalfa may be grown. On non-irrigated orchards, winter-growth of hardy legumes, as vetches, is undertaken.

As mentioned above, the plum has few serious enemies in California, and none which cannot be held in check by spraying and other treatment. Upon the leaves the plum aphis and the canker-worm have given some trouble. The "peach-moth" has been found at work on the prune trees, but not to any serious extent. The trees are subject to the attacks of the black scale (*Saissetia oleæ*), apricot scale (*Lecanium corni*), frosted scale (*L. pruinosum*) and pernicious scale (*Aspidiotus perniciosus*) being the most frequent; all of which, however, the California fruit-grower has learned to keep in check. The crown root-knot has also caused considerable trouble. Relief has been secured by cutting off the knots and painting the wounds with bordeaux mixture. In one district the peach root-borer has established itself and requires regular treatment. Thrips have also done some injury to blossoms and young fruit.

In California some fruit is usually borne the third year; in the fourth a fairly profitable crop is expected; the fifth, from 50 to 60 pounds to a tree should be produced, which ought to double in the sixth, and after that from 150 to 300 pounds is the rule. These figures apply mostly to the prunes. From 200 to 300 pounds are considered the average at full bearing in the Santa Clara Valley. In some instances 600 and even 800 pounds have been produced, and a six-year-old tree at Visalia (San Joaquin Valley) is credited with 1,102 pounds of fruit in one season.

3078. Fruit-spurs of a domestica plum. The letters indicate the termination of annual growths.

It would be impossible to enumerate a full list of the varieties actually in successful cultivation within the state. Such a list would probably include every noteworthy variety of domestica plum. Many, however, despite excellence of quality and flavor, are suited only for home-growing, or at most for local markets, on account of poor shipping qualities. For this reason the number of varieties planted on a large scale is being constantly reduced. At the head of the list stands the Prune d'Agen, the originally introduced French prune, which has proved itself adapted to more varying conditions than any other variety, and is therefore perhaps the most generally planted variety of fruit in the state. It is, of course, used chiefly for curing. In the same category belong the Robe de Sergeant, Imperial Epineuse, Silver, and Sugar—all drying varieties. The Robe de Sergeant (supposed to be a synonym of the Prune d'Agen in France) in California is grown as a distinct variety. The fruit is larger, usually more highly flavored, and has commanded higher prices in the San Francisco market. The tree, however, has not proved so widely adaptable, and is in disfavor on account of defective bearing. The Silver prune (an Oregon seedling of Coe Golden Drop) is also a defective bearer in some districts, and is used mostly in the preparation of "bleached prunes," for which it has proved very profitable in some instances. It is sometimes marketed in the fresh state also. The Imperial Epineuse, a recently introduced French variety was largely planted but though large, it has proved rather irregular in bearing, difficult to cure and very subject to thrip injury. Luther Burbank's Sugar prune bases its claims upon superior earliness, sweetness and flavor, together with fair medium size. It dries easily but is of coarse texture. The German prune, Italian (Fellenberg), Golden prune, Hungarian (Pond Seedling) and Tragedy are varieties sometimes used for curing, but are frequently shipped green as "plums." Of these the German is perhaps the most extensively used. The Italian succeeds well along the coast in places liable to fogs or sea winds, where the French is not at its best. It is valuable as a late variety, and is said to dry excellently, as does also the Golden, an Oregon seedling. The fruit of the Hungarian (Pond) is very handsome and showy, and is rated, on its style, a good seller as fresh fruit in both the local and distant markets, but is not suitable for drying. The Tragedy and the Clyman (California seedlings), Giant (Burbank's), Royal Hative, Simon, and Peacn, are popular for early market—especially for eastern shipment. For canning, Coe Golden Drop and the Imperial Gage are the most popular. The Jefferson, Washington, and Yellow Egg are all highly regarded, and planted more or less widely, as they suit the different climatic regions. Many of the Japanese plums are grown. Red June, Satsuma, Burbank, Wickson, Climax, Santa Rosa, and Formosa (all Burbank varieties) are prominent for eastern shipment, local market and domestic use.

3079. Plum-rot. The mummy plums hang on the tree all winter.

See Wickson's "California Fruits and How to Grow Them," the Reports of the California State Board of Horticulture, and the Reports and Bulletins of the California Experiment Station.

ARNOLD V. STUBENRAUCH.
E. J. WICKSON.†

PLUM, CHERRY: *Prunus cerasifera.* **P., Cocoa:** *Chrysobalanus Icaco.* **P., Date:** *Diospyros.* **P., Governor's:** *Flacourtia Ramontchi.* **P., Japan:** Properly *Prunus salicina;* improperly applied to the loquat, *Eriobotrya japonica.* **P., Marmalade:** *Lucuma mammosa.*

PLUMBÀGO (from Latin for *lead*, from the lead-colored flowers of some species, or because of some old tradition). *Plumbaginàceæ.* LEADWORT. Subshrubs or herbs, often cultivated, particularly under glass, for the handsome phlox-like flowers.

Mostly perennial, sometimes climbing, often more or less woody: lvs. usually alternate and entire, clasping (or auricled) by the blade or by base of petiole: fls.

spicate or racemose on the ends of the branches, blue, violet, red, or white, gamopetalous, salverform, the tube usually slender; calyx tubular, 5-toothed, and somewhat angled, glandular; stamens usually 5, free from the corolla-tube, the filaments mostly with a dilated base; ovary attenuated at the top, the single style with 5 stigmas: fr. a membranaceous 5-valved caps.—About 10 or a dozen species inhabiting warm countries, chiefly of Eu., Asia, and Afr. For *P. Larpentæ*, consult *Ceratostigma*.

3080. Plumbago capensis. (×⅓)

Two species of shrubby plumbagos, *P. capensis* and *P. rosea*, are deservedly well known. In the middle and northern states they are treated as greenhouse pot-plants and are usually turned out to flower in summer. They are readily prop. by cuttings taken either in autumn from plants growing in the open or in the spring from stock plants. They require an intermediate temperature.

A. *Fls. red.*

rósea, Linn. (*P. sanguínea*, Hort.?). St. zigzag, more or less climbing, glabrous even in the infl.: lvs. large, ovate-elliptic, the short petiole somewhat clasping: fls. purplish red, in long racemes, the corolla-lobes little if any exceeding the exserted part of the tube, the calyx glandular-hairy; base of style hairy. S. Asia. B.M. 230. Var. **coccínea,** Hook. (*P. coccínea*, Salisb.), is a form with larger scarlet fls. B.M. 5363. Gng. 1:183. H.T. II. 6:292. This is the form chiefly cult.—Like *P. capensis*, this species is useful for summer bedding. It is also an excellent subject for winter blooming in pots.

AA. *Fls. blue or white.*

B. *Perennials, with more or less scandent sts.*

capénsis, Thunb. Fig. 3080. Semi-climbing shrub but a straggling upright plant as grown under glass, somewhat glaucous, glabrous except in the infl.: lvs. scattered, oblong-ovate to oblong-spatulate, nearly or quite obtuse and short-mucronate, narrowed into a very short petiole: racemes relatively short, the fls. sometimes appearing as if umbelled; fls. azure-blue, with a very slender tube 1½ in. long and several times longer than the glandular-hairy cylindrical calyx-tube, the corolla-lobes obovate and phlox-like: caps. oblong-clavate, tapering and angled below. S. Afr. B.M. 2110. B.R. 417. Gn. 44, p. 380; 46, p. 245; 48, p. 344; 58, p. 20. G. 18:519; 27:41. Gn.W. 24:121. G.W. 10, p. 331. R.H. 1908:60. Var. **álba,** Hort., has white fls.—A well-known greenhouse plant. Old plants turned into the soil in late spring in a sunny exposure bloom profusely until frost. Plants struck from fall cuttings also give good bloom the following summer, but younger plants usually do not bloom so well. Plants can be kept in a cellar during winter, or they may be grown under glass for spring and summer bloom. It is an excellent rafter plant. In S. Calif. it climbs trees 15–20 ft. high if undisturbed. *P. capensis* and the white-fld. varieties are the commonest kinds.

zeylánica, Linn. Half-climbing, much branched, glabrous except the infl., which is glandular-hairy: lvs. ovate or oblong, obtuse or acute, the base of the short-winged petiole clasping the st.: fls. white, shorter than in *P. capensis*, the exserted part of the tube scarcely longer than the obovate retuse corolla-lobes, the calyx glandular-hairy: caps. long-oblong, 5-grooved above. Tropics of Asia and Afr., and east to Austral. and Hawaii. B.R. 32:23.—Little grown now, as it is inferior to the white-fld. form of *P. capensis*. Distinguished from that species by its shorter fls. and different lvs.

scándens, Linn. Somewhat woody, trailing or climbing, much branched, glabrous, the branches grooved: corolla white with mucronate lobes, the tube twice longer than the glandular-hairy calyx-tube; stamens 4, exserted: lvs. ovate-lanceolate to oblong-lanceolate, pointed, stalked. Trop. Amer., and also in southernmost parts of U. S.

BB. *Annual, with erect sts.*

cærùlea, HBK. Erect annual, 1–1½ ft. tall, with branched terete sts.: lvs. more or less rhomboidal, tapering to a winged and auricled petiole, glabrous and entire, the upper ones smaller: fls. small but rich in color, few and separate in a terminal spike, the tube purple and twice longer than the calyx, the segms. oval and acute, deep bluish purple with dark line in center; filaments not dilated. Peru. B.M. 2917 (as *P. rhomboidea*).

L. H. B.

PLUMÈRIA (Charles Plumier, 1646–1706, distinguished French botanist). Also spelled *Plumiera* and *Plumieria*. *Apocynàceæ*. Tropical trees grown for their showy and very fragrant flowers.

Leaves alternate, penninerved, the primary veins joined to a nerve running parallel with the margin: fls. in terminal 2–3-chotomous cymes: bracts usually large and covering the young buds but deciduous long before anthesis; corolla-tube cylindrical throughout; stamens included, near the base of the tube; disk wanting or fleshy and covering the tube of the calyx; ovules in many series: follicles 2.—About 50 species, all Trop. American, of which 2 kinds at present are offered in S. Calif. and 2 in S. Fla. The species are much confused and imperfectly understood.

Plumerias are amongst the most fragrant of tropical flowers, vying in this respect with the jessamine, Cape jasmine, and tuberose. They have large waxy funnel-shaped flowers with 5 spreading lobes of white, yellow, rose-purple, or combinations of the three colors. Choice specimens have been known to bear clusters 9 inches across, composed of more than twenty flowers each 3½ inches across. They are considerably cultivated in all tropical lands. In the Pacific islands, *P. acutifolia* is frequent in graveyards. The word frangipani is supposed to be from the French, *franchipanier*, coagulated milk, referring to the tenacious white juice which exudes plentifully from the wounded plant. Other accounts suppose it to have come from an Italian nobleman of that name who in the Middle Ages compounded a perfume of many ingredients and which the odor of these flowers resembled. All species are likely to be called frangipani. Plumerias are essentially summer-growing plants. Keep rather dry in

3081. Plumeria acutifolia.

winter. Propagation is by cuttings in February or March.

A. *Fls. more or less rosy.*

rùbra, Linn. FRANGIPANI. Low tree or shrub: lvs. 5–8 in. long: cymes spreading; corolla-lobes broadly oval, longer than the tube. Mex. to Guiana and Ecuador; naturalized in W. Indies. B.R. 780 (fls. chiefly golden, only the tips bright rose). B.M. 279.—In W. Indies sometimes called "West Indian red jasmine."

AA. *Fls. chiefly white or yellow.*

B. *Lvs. narrow, oblong-linear.*

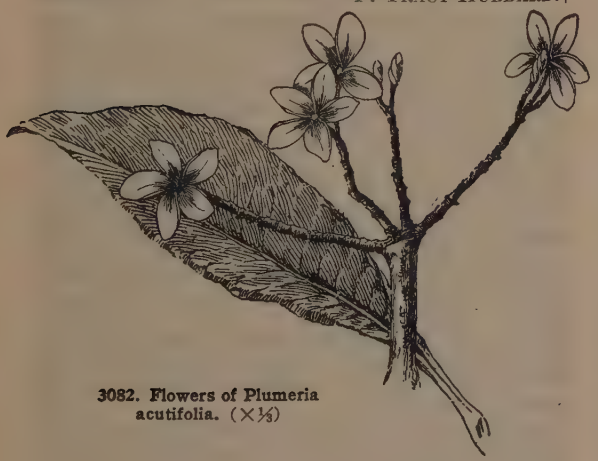
álba, Linn. Lvs. rounded or acuminate at top, revolute at margin, tomentose beneath; veins rectangular-transverse: fls. white. W. Indies.—*P. hypoleùca,* Gasp., is probably a color variety, with yellow fls.

BB. *Lvs. wedge-shaped to lanceolate.*

acutifòlia, Poir. (*P. acuminàta,* Ait.). FRANGIPANI. Figs. 3081, 3082. Lvs. acuminate, often 1 ft. or more long, 3 in. wide, broadly lanceolate, with a long tapering base: corolla-lobes oval. Mex. B.M. 3952 (fls. white, much flushed from the center with pale yellow). *P. acuminata* of B.R. 114. H.U. 4, p. 161, with its narrow oblong lobes and close well-defined golden center, may be a different species though commonly considered the same.—Cult. in all tropical countries for the fragrant whitish fls.; flowers all the year. Also known as the temple-flower and graveyard-flower.

The following species have been intro. and more or less cult. abroad: *P. bicolor,* Ruiz & Pav. Tree, up to 40 ft. high: lvs. oblong, acuminate, margins revolute: fls. white, yellow at throat. Peru. B.R. 480. J.H. III. 56:19.—*P. Jàmesonii,* Hook. Four feet high: lvs. mostly at tips of branches: fls. yellow, deeply tinged with red. Ecuador. B.M. 4751.—*P. Lambertiàna,* Lindl. Ten feet high: lvs. oblong, acuminate, flat: fls. white, yellow-throated, with broad-rhomboid obtuse segms. May to Aug. Mex. B.R. 1378.—*P. lùtea,* Ruiz & Pav. Ten to 20 feet high: lvs. crowded at ends of branches, 8–18 in. long, oblong-ovate: fls. white, flushed very pale pink with a broad pale golden yellow center. Peru. B.M. 5779. G.C. III. 39:406.—*P. tricolor,* Ruiz & Pav. (P. Kerii, Don). Fifteen feet high: lvs. obovate-oblong, tapering at both ends: fls. with a yellow throat, white above the yellow and bright rose around the segm. margin. July–Oct. Peru. B.R. 510.—*P. tuberculàta,* Lodd. Six feet high: branches tuberculate: lvs. coriaceous, narrow-oblong, tapering into the petioles: fls. white, scentless. Aug. Santo Domingo.

WILHELM MILLER.
F. TRACY HUBBARD.†



3082. Flowers of Plumeria acutifolia. (×⅓)

PÒA (ancient Greek name for grass or fodder). *Gramíneæ.* Mostly perennial grasses of low growth, several species of which are cultivated for forage and a few for ornament.

Spikelets 2–6-fld., in open panicles; glumes shorter than the lemmas, awnless; lemmas keeled on back, membranaceous, scarious-margined, awnless, 5-nerved, often cobwebby at base.—About 100 species, natives of temperate and cold regions.

A. *Plants tufted, without creeping rootstocks.*

triviàlis, Linn. ROUGH-STALKED MEADOW-GRASS. Resembles *P. pratensis,* from which it differs by having no creeping rootstocks, taller sts., scabrous sheaths, branches of panicle more slender and spreading, usually only 2-fld. spikelets, the lateral nerves of lemma much more conspicuous. Native of Eu., where it is a prominent pasture grass; rather sparingly cult. in this country, where it is recommended for wet pastures. Dept. Agric., Div. Agrost., Bull. No. 17:243.—A variegated form is described as var. **fòliis álbo-vittàtis.** F.S. 16: 1695.

3083. June-grass.—Poa pratensis. (×½; flower enlarged)

nemoràlis, Linn. WOOD MEADOW-GRASS. Panicle long and narrow, with short branches; culms 1–3 ft.; glumes 3-nerved, acuminate. Native of Eu.—Recommended for pasture or lawn in shaded situations.

AA. *Plants producing creeping rootstocks, thus forming a sod.*

B. *Fls. diœcious.*

arachnífera, Torr. TEXAS BLUE-GRASS. Culm 2–3 ft. high; panicle contracted, 3–8 in. long; spikelets ¼in. long; first glume 1-nerved, second 3-nerved; lemma copiously webby-hairy at base. A native of Texas, where it is a valuable forage grass.—It prop. by rhizomes and forms a dense sod. Recommended as a winter pasture-grass in the S. Easily distinguished from the other species by its contracted panicle and large spikelets. Dept. Agric., Div. Agrost., Bull. No. 17:246.

BB. *Fls. perfect.*

compréssa, Linn. Known in the trade as CANADA BLUE-GRASS (though it is probably not native to Canada) and ENGLISH BLUE-GRASS, but the latter name is often applied to *Festuca pratensis.* Distinguished from *P. pratensis,* which it resembles, by its blue-green foliage, distinctly flattened culms, and its short and much contracted panicles. Spreads by rhizomes. Native of Eu. and extensively naturalized in this country, being found in open and rather sterile soil. Dept. Agric., Div. Agrost., Bull. No. 17:248.—It is of little value as a pasture grass except possibly on sterile soil.

pratènsis, Linn. KENTUCKY BLUE-GRASS. JUNE-GRASS. Fig. 3083. Panicle pyramidal, open, usually 3–4 in. long; spikelets 3–6-fld., ⅛in. long; first glume 1-nerved, second 3-nerved; lemma cobwebby at base; culm usually 1–2 ft. high, forming a sod with its copious rootstocks, its long soft basal lvs. producing an abundance of foliage. Native in the cooler regions of the northern hemisphere. Dept. Agric., Div. Agrost., Bull. No. 20:148.—A common pasture-grass through the middle part of the U. S. Its most important horticultural use is for lawns, for which purpose its habit and aggressiveness are eminently adapted.

A. S. HITCHCOCK.

PODACHÆNIUM (Greek, *foot* and *achene*, alluding to the base of the achenes). *Compósitæ*. Tall shrubs, one of which in southern California is said to attain a height of 30 feet, cultivated chiefly for their large and fragrant leaves.

Leaves opposite, large and angular-lobed: heads small, disposed in a broad corymbose panicle; fls. with white rays and yellow disk: achenes sparingly pilose.—Two or 3 species, Mex. to Colombia. The principal species of Podachænium, *P. eminens*, is commonly cult. under the name of Ferdinanda, which is really the oldest generic name, but this name is also used for some species of Zaluzania. The distinguishing feature of Podachænium is the shape of the achene, which is contracted at the base into a 2-winged stipe suggesting the shape of a foot. In the N. and in Eu., they are grown in the warmhouse, but they are quite hardy in the open in the S.—The fl.-heads are about 1 in. across, and about 20 or more in terminal flat-topped clusters, borne in winter and spring.

éminens, Baill. (*P. paniculàtum*, Benth. *Ferdinánda éminens*, Lag. *Zaluzània éminens*, Hort. *Cosmophýllum cacaliæfòlium*, C. Koch). A tall shrub, 9–15 ft. high, slightly branched: lvs. opposite, suborbicular or broad-ovate, base short- or long-cuneate, slightly 5–7-lobed or subentire, rather scabrous above, cinerous or subtomentose pubescent beneath: ray-fls. white, disk-fls. yellow. Mex., Guatemala. R.H. 1862, p. 110. B.M. 8502.

andìnum, André. Lvs. large, coarsely lobed: fl.-heads in loose corymbs; ray-fls. white, disk-fls. yellow. Colombia. R.H. 1892, p. 414.—Said to be a useful plant for subtropical bedding. F. TRACY HUBBARD.

PODALÝRIA (named for Podalyrius, the son of Æsculapius). *Leguminòsæ*. Shrubs, with alternate simple lvs. which have subulate often deciduous stipules: infl. axillary, 1–2-, rarely 3–4-fld.; calyx broad-campanulate, toothed or subequally lobed; petals subequal in length, standard suborbiculate, emarginate, slightly longer than the wings, with a short recurved claw, wings obovate, oblique, keel shorter than the wings, broad-obovate, slightly incurved; stamens free or very shortly connate at base; ovary sessile, villous, many-seeded: fr. an ovoid or oblong turgid pod with leathery valves.—About 20 species, all of them S. African. **P. serícea,** R. Br. AFRICAN SATIN-BUSH. Erect or procumbent, 4–6 ft. high, the whole plant with a satiny or silvery luster, sometimes fulvous: branches silky: lvs. obovate or cuneate-oblong, acute at base, silky on both surfaces: fls. pale-purple, solitary on the peduncles; calyx silky, lobes subulate acute, as long as the carina: fr. a silky pod. Cape Colony. Intro. into S. Calif. and also cult. abroad. The following species are mentioned as having been cult.: *P. argéntea*, Salisb., *P. buxifòlia*, Willd., and *P. calyptràta*, Willd.

PODÁNDRIA (Greek, *foot* and *man* or *anther*, probably referring to long-stipitate anthers). *Orchidàceæ*. Terrestrial herb with radical petioled lvs. and large-fld. racemes: sepals free, lateral narrower than the dorsal, reflexed; petals simple, filiform-setaceous, erect, longer than the dorsal sepal and free from it; lip continuous with the column, shortly adnate to it, produced at the base into a long cylindrical spur; limb pendulous, 3-partite with narrow lobes, column with a short broad base, footless; anther long-stipitate, pollinia granular with very long slender caudicles; stigmas sessile, nearly confluent, situated within the side lobes of the rostellum and at their base, rostellum trilobed.—The only species is from W. Afr. The genus resembles Habenaria, in which it has been included, in habit but is remarkable for its enormously elongated anther and long narrow segms. *P. macrándra*, Rolfe (*Habenària macrándra*, Lindl.). Plant ¾–1¾ ft. high, apparently evergreen: lvs. elliptic-oblong, 2–5 in. long: racemes 2–9-fld.; fls. large, white with a green tint on the sepals. G.C. III. 54:182. Intro. abroad and cult. by some orchid fanciers.

PODOCÁRPUS (Greek, *pous, podos*, foot, and *karpos*, fruit; alluding to the conspicuous fleshy footstalks of most species). Including *Nagèia*, *Prumnópitys* and *Stachycárpus*. *Taxàceæ*. Ornamental woody plants grown for their evergreen foliage.

Resinous evergreen trees, rarely shrubs: lvs. alternate, sometimes opposite or 2-ranked, sessile or short-stalked, linear to elliptic, entire: fls. monœcious or dicœcious, axillary or subterminal, solitary or in spikes; the staminate catkin-like, consisting of spirally disposed, 2-celled anthers; the pistillate consisting of a scale inclosing the ovule, with several bracts at the base, which become usually much thickened at maturity, and form a fleshy receptacle bearing at the top the globular or ovoid drupe- or nutlike seed: cotyledons 2.—Fifty-five species, chiefly in tropical and subtropical mountains of S. Amer., W. India, Asia, Afr., and Austral. Some species with the fls. in spikes and the fr. without fleshy receptacle are separated by some botanists as Prumnopitys (Stachycarpus). Many species are valuable timber trees in their native countries, and the fleshy seed-stalks of some are eaten.

The podocarpuses are evergreen often tall trees with usually narrow, rarely elliptic, dense foliage, small flowers, the staminate yellow, the pistillate greenish and inconspicuous, and with rather small, berry-like fruit borne on usually much thickened fleshy footstalks of dark purple or purplish violet color. They are but rarely cultivated in this country and only adapted for the southern states and California, except *P. alpina*, which is the hardiest and may probably thrive as far north as Philadelphia, or even farther. They grow best in well-drained loamy soil. In the North they are sometimes grown as pot-plants in greenhouses on account of their handsome foliage; a sandy compost of loam and peat will suit the potted plants. Propagation is by seeds or by cuttings of almost ripened wood under glass; they are also sometimes grafted on any of the species which can be had in quantity.

A. *Lvs. 1–8 in. long.*

B. *Under side of lvs. pale green or glaucescent.*

C. *Midrib of lvs. distinct above; width of lvs. ½in. or less.*

macrophýlla, Don (*P. longifòlia*, Hort.). Tree, attaining to 50 ft., with horizontally spreading branches and pendent branchlets: lvs. alternate, pinkish when unfolding, more or less spreading, narrowly lanceolate, narrowed toward the apex and acute or obtusish, at the base gradually narrowed into a short petiole, bright green and lustrous and with a distinct midrib above, paler below, 3–4 in. long and more than ⅓in. broad: staminate fls. fascicled, sessile, about 1 in. long: seed ovoid, ⅓–½in. long, borne on a fleshy purplish violet receptacle. Japan. S.Z. 2:133. S.I.F. 1:13. G.W. 14, p. 322. Var. **Máki,** Sieb. (*P. chinénsis*, Wall. *P. macrophýlla* var. *chinénsis*, Maxim. *P. japónica*, Sieb.). Branches upright: lvs. more upright, linear-lanceolate, obtuse or obtusish, 1¾–3 in. long and ⅛–¼ in. broad, with distinct midrib above: seed globose-ovoid, ⅓in. long or slightly longer. Japan, China. S.Z. 2:134. R.H. 1848:41.—Several variegated forms of this variety are in cult.

neriifòlia, Don. Tree, to 70 ft., with spreading much-ramified branches: lvs. scattered, sometimes indistinctly whorled, spreading, lanceolate or narrow-lanceolate, gradually long-acuminate, at the base narrowed into a short petiole, dark green above and with the slightly raised narrow midrib in a groove, slightly glaucous beneath, 3–6 in. long, in young plants sometimes to 10 in. long, about ½in. broad: staminate fls. solitary or 2–3, sessile, 1–2 in. long: seed ovoid, ½in. long or slightly longer, with a fleshy receptacle nearly ½in.

long, on a stalk about ¾in. long. Himalayas and S. W. China to New Guinea. B.M. 4655. F.S. 8:768. J.F. 3:313.

cc. *Midrib of lvs. indistinct above; width of lvs. ¼in. or less.*

gracílior, Pilger. Tree, to 60 ft., with scattered or whorled branches: branchlets slender, winged by the decurrent lvs.: lvs. alternate, linear-lanceolate, gradually acuminate, more or less falcate, spreading, midrib indistinct above, 2–4 in. long and 1/16–¼in. broad: staminate fls. 1–3, axillary, ¾–1¼ in. long: seed subglobose, ½–¾in. long, on a scaly, not thickened stalk. Cent. Afr.

elongàta, L'Hér. Tree, to 70 ft., with more or less whorled, densely leafy branches: lvs. alternate, erect-spreading, narrowly linear-lanceolate, gradually narrowed at the apex and acute, nearly pungent; midrib inconspicuous above, 1½–2 in. long and about 1/16in. broad: staminate fls. solitary, axillary, sessile, about ¾in. long: seed globose, ⅓in. across, with a short fleshy receptacle on a slender stalk about ¼in. long. S. Afr.

BB. *Under side of lvs. with 2 glaucous lines.*

nubígena, Lindl. (*Saxegóthæa grácilis,* Hort.). Tree, or in cult., shrub: lvs. spreading, crowded, linear-lanceolate, acute and mucronate, pungent, somewhat revolute at the margins, dark green and with a prominent midrib above, with 2 white bands beneath, 1–1¾in. long: fls. dicœcious, the staminate clustered, ½–1 in. long: seed ovoid, ⅓in. long, on a fleshy receptacle, very short-stalked. Chile. G.C. III. 10:171.

AA. *Lvs. ⅓–¾in. long.*

alpìna, R. Br. Shrub or small tree, attaining 15 ft., with spreading branches: lvs. indistinctly 2-ranked, linear to linear-oblong, obtuse, mucronulate, dark green, grooved or flat above, pale green beneath, ⅓–¾ in. long: fls. dicœcious, the staminate solitary or clustered, about ⅓in. long: seed 1/5in. long, on a fleshy receptacle. Austral.

P. andìna, Poepp. (Prumnopitys elegans, Phil. Stachycarpus andina, Van Tiegh.). Tree, attaining 20 ft., with upright or somewhat spreading branches: lvs. indistinctly 2-ranked, linear, dark green above, slightly glaucous beneath, ½–1½ in. long: fls. in spikes; receptacle not fleshy. Chile. G.C. III. 31:121. J.H.S. 37, p. 52.—*P. Bidwillii,* Hoibr.=P. spinulosa.—*P. chilìna,* Rich.=P. saligna.—*P. coreàna,* Hort., incorrect spelling for *P. koraiana*=Cephalotaxus Harringtonia var. fastigiata.—*P. coriàcea,* Rich. Tree, attaining 50 ft., with spreading branches; allied to P. macrophylla: lvs. lanceolate, acuminate, 2–4 in. long: fr. ovoid. Jamaica. Sometimes Cephalotaxus drupacea is cult. under this name.—*P. dacrydioìdes,* A. Rich. Tall tree: lvs. dimorphic, on young plants linear, spreading, 2-ranked, 1/6–¼in. long, on older plants shorter, imbricate, appressed or spreading: seed ovoid, small: receptacle scarlet, ¼in. long. New Zeal. G.W. 6, p. 594.—*P. formoséns̀is,* Dümmer, from Formosa, allied to P. Nagi, but with smaller and thicker, lance-elliptic, obtusely truncate lvs., is not yet intro. G.C. III. 52:295.—*P. jamaicénsis,* Hort.=P. Purdieana.—*P. koraìna,* Sieb.=Cephalotaxus Harringtonia var. fastigiata.—*P. montàna,* Lodd. (P. taxifolia, Kunth. Prumnopitys taxifolia, Mast.). Tree, attaining 60 ft., with spreading branches: lvs. 2-ranked, linear, acute or obtuse, abruptly narrowed into a short petiole: fls. in spikes: no thickened receptacle. Peru, Colombia.—*P. Nàgi,* Pilger (P. Nageia, R. Br. Nageia japonica, Gaertn.). Tree, attaining 90 ft., with spreading, sometimes pendulous branches: lvs. mostly opposite, ovate to oblong-lanceolate, short-acuminate, 2–3½ in. long, bright green and glossy: fr. ¾in. across, subglobose. Japan. S.Z. 2:135. R.H. 1914, p. 77.—*P. pectinàta,* Panch. (Acmopyle Pancheri, Pilger). Tree, to 60 ft.: lvs. dimorphic, either linear, obtuse or acute, with 2 white bands beneath, about ½in. long, or minute, acuminate, scale-like, appressed: staminate fls. terminal: seed globose, ½in. across, with a thickened receptacle. New Caledonia. B.M. 7854.—*P. Purdieàna,* Hook. Tree, to 120 ft., with whorled horizontal branches: allied to P. macrophylla: lvs. oblanceolate, obtuse, mucronulate, bright green, 2–5 in. long, ¾in. wide. Jamaica. H.I. 7:624.—*P. saligna,* Don (P. chilina, Rich.). Tree, attaining 60 ft., allied to P. macrophylla: lvs. linear-lanceolate, acute, slightly falcate, 3–4½ in. long: staminate fls. clustered, about 1 in. long. Chile, Peru.—*P. spicàta,* R. Br. (Prumnopitys spicata, Mast.). Tree, attaining 80 ft.: lvs. 2-ranked, linear, obtusish, sessile, ¼–½in. long: fls. in spikes; receptacle not thickened. New Zeal. H.I. 6:543.—*P. spinulòsa,* R. Br. (P. Bidwillii, Hoibr.). Allied to P. macrophylla. Tree: lvs. upright, linear, acuminate and spiny-pointed, midrib distinct above, 1½–3 in. long. Austral.—*P. taxifòlia,* Kunth=P. montana.—*P. Totàrra,* A. Cunn. (P. Totara, Don). Tree, attaining 90 ft. with spreading branches: allied to P. alpina: lvs. linear, acute or acuminate, ½–1½ in. long. New Zeal.

ALFRED REHDER.

PODÓLEPIS (Greek, *foot* and *scale;* referring to the unusual fact that the involucral scales have a footstalk or claw). *Compósitæ.* Australian herbs with yellow, pink or purple rays, a few of which are cultivated as half-hardy annuals.

Plants 6–12 in. high and bearing fls. which are chiefly interesting as representing an intermediate stage between the common type of composite with showy rays and the "everlasting fls." like Helichrysum, in which the rays are aborted and the showy parts are the stiff involucral scales. In Podolepis the involucral scales are generally colored, but are thin and nearly transparent, and overlap one another instead of standing out like petals.—About 16 species belonging to an unfamiliar group of composites from Australia. Very little in cult. in America. The following species are annuals with linear or lanceolate lvs. and hemispherical involucres ½–¾in. diam. They need a porous soil with full exposure to the sun, and they also do well in pots. See *Annuals.*

3084. Podolepis aristata. (×½)

A. *Color of rays yellow.*

B. *Involucral bracts acute.*

canéscens, A. Cunn. (*P. affìnis,* Sond.). Rarely much exceeding 1 ft.: lvs. mostly all basal, linear or linear-lanceolate, 1–2 in. long: involucral bracts slightly or not at all rugose; claws with broad scarious margins: rays 3–4-lobed slightly longer than the disk-fls.

BB. *Involucral bracts acuminate.*

aristàta, Benth. (*P. chrysántha,* Endl.). Fig. 3084. Often exceeding 1 ft.: lvs. linear or lanceolate mostly st.-clasping and decurrent: involucral bracts not rugose, usually ending in a rigid point or awn, the claws of the inner ones narrow and glandular: rays longer than the disk-fls., 3–4-lobed. R.H. 1857, p. 263.

AA. *Color of rays purple or lilac.*

grâcilis, Graham. Often exceeding 1 ft., the smooth st. usually much branched: lvs. linear, st.-clasping and often slightly decurrent: involucral bracts obtuse; claws narrow, glandular: rays entire or 2-lobed, ½in. long: pappus not thickened upward. B.M. 2904 (disk-fls. mostly purple, some yellow).

WILHELM MILLER.
N. TAYLOR.†

PODOLÒBIUM: *Oxylobium.*

PODOPHÝLLUM (from Tournefort's *anapodophyllum,* duck's-foot-leaf; from a fancied resemblance in the foliage). *Berberidàceæ.* MAY APPLE. MANDRAKE (erroneously). Herbs common in rich woods and copses throughout the eastern United States, a colony of which is most desirable for a wild garden.

Hardy perennials herbs: sepals 6, petal-like; petals 6–9: stamens as many or twice as many as the petals;

pistil 1 (rarely several): berry with many seeds, which are inclosed in fleshy arils.—Podophyllum is a genus of about 5 species,—1 American, 1 Himalayan and 3 from China.

The May apple is one of the most prominent of the native low-growing spring herbs. The "apples" are yellowish egg-shaped fruits about 2 inches long, and have a rather mawkish taste. The leaves are very distinct, being shaped like a round shield with 5 to 7 lobes. The plant has two kinds of leaves, the solitary ones, and the others in pairs. The large centrally peltate leaves have no flower underneath. The flowers are nodding white waxlike cups which spring from the fork of the stem. They have a rather unpleasant smell.

Some parts of the May apple plant are emetic and poisonous. Extract of podophyllum is common in drug-stores. For the drug trade, the rhizomes are collected late in summer and dried, the supply coming mostly from the Central States.

The plants are offered by several dealers in hardy herbaceous perennials. They are of easy culture, re-

3085. Royal poinciana.—Poinciana regia.

quiring deep rich soil and partial shade. They are useful only for spring effects, however, as the foliage dies down by midsummer or before. Later-growing vigorous perennials, as *Polygonatum giganteum*, may be associated with a planting of May apple, to occupy the ground in the later part of the season. *P. Emodii* requires a moister situation, and some prepare a peaty soil for it. Propagation is by division or by seed. The mandrake of Old World history and romance, is *Mandragora*.

A. *Frs. yellowish.*

peltàtum, Linn. MAY APPLE. MANDRAKE (see *Mandragora*, Vol. IV, p. 1982). Height 1–1½ ft.: lvs. dark green, nearly 1 ft. across, 5–7-lobed, each lobe 2-cleft: fls. about 2 in. across. Also called wild lemon and hog apple. B.M. 1819. Gn. 21, p. 127. B.B. 2:92.—Blooms in April and fruits in May. It is a shade-loving species, although growing also in partial sun in moist and rich soil, from W. Quebec and W. New Eng. to Minn. and south to Fla. and Texas.

AA. *Frs. deep red.*

emòdi, Wall. Lvs. 3–5-lobed: fls. white or pale rose: fr. large as a hen's egg, brilliant red. Himalayas. G.C. II. 18:241.—The foliage is a fine bronzy red in early spring, said to be edible.

P. versipélle, Hance. A perennial herb, with sts. about 3 ft. high, 2-forked at top, each fork bearing a lobed peltate lf.: fls. pendulous, crimson, in clusters of 12–16 just under the lvs. China. Intro. into England. B.M. 8154. F. TRACY HUBBARD.†

PODOSTÍGMA (Greek words referring to the fact that the stigma has a foot or stalk). *Asclepiadàceæ*. This includes a half-hardy tuberous-rooted perennial herb which grows a foot high or less in low pine-barrens from N. C. to Fla. and bears in summer small greenish yellow fls. The genus is closely allied to Asclepias, and is distinguished by having the hoods remote from the anthers at the base of the long column, while in Asclepias the hoods are approximate to the anthers. **P. pedicellàta,** Vail. Lvs. opposite, linear-lanceolate, nearly sessile: peduncles terminal and axillary, umbellately several-fld. The only species.—Advertised in 1881, but presumably not hardy N.

POGÒNIA (Greek, *beard;* alluding to bearded labellum). *Orchidàceæ*. Hardy terrestrial orchids.

Mostly small perennial herbs, with erect slender sts.: fls. solitary or in racemes; sepals and petals free, erect or ascending; labellum sessile, with broad base, spurless, with longitudinal ridges.—About 40 species, N. and S. Amer., with exception of 2 Chino-Japanese species. Pogonias are delicate plants requiring care in planting. The woodland species should have rich leaf-mold, with deep shade; the swamp species require peat or suitable light, rich soil, moist yet not wet. All the species are preferably planted in spring.

A. *Sepals and petals nearly equal in length.*

ophioglossoìdes, Ker. St. 8–15 in. high, slender, 1–3-lvd.: lvs. 1–3 in. long, lanceolate or ovate: fls. solitary or in pairs, fragrant, pale rose, subtended by a foliaceous bract. June, July. In meadows and swamps, U. S. B.R. 148. G.F. 10:485. V. 2:269; 11:229.—This seems to be the only species that can be grown with success. It thrives in wet moss in boxes of sphagnum. Usually it is better to transplant from the wild each year than to attempt to prop. the plants. Sometimes it can be colonized in wet meadows.

AA. *Sepals longer than the petals.*

divaricàta, R. Br. St. 1–2 ft. high, slender, bearing a solitary fl.: fl. 1 in. long; sepals dark; petals flesh-colored; lip as long as petals, greenish, veined with purple. July. Swamps, N. J. to Fla. B.B. 1:468.

P. péndula, Lindl.=Triphora.—*P. verticillàta*, Nutt.=Isotria.

HEINRICH HASSELBRING.

POGOSTÈMON (Greek, *bearded stamen*). *Labiàtæ*. This includes the plant which produces the well-known perfumes called patchouli, or in India pucha-pat.

Herbs or subshrubs: lvs. opposite, rarely in 3's: fls. small, in solitary or panicled spikes formed of many dense whorls; calyx subequally 4–5-toothed; corolla-tube exserted or included; limb sub-2-lipped; lobes 4, lower usually longest; stamens 4, exserted, straight or declinate; filaments usually bearded; anther-cells confluent: nutlets smooth, ovoid or oblong.—About 40 species, 24 of which are distinguished in Flora of British India 4:631.

Patchouli has a peculiar dry moldy smell and is one of the commonest perfumes in India. In the 1840's its presence was considered the sure test of a genuine Indian shawl, but the French manufacturers of imitation Indian shawls imported the perfume in the 1850's. Patchouli is no longer fashionable. Fuller accounts of it will be found in the "Cultural Industries of Queens-

land," V. 8:247 and Gn. 27, p. 447. The plant has no ornamental value. Live plants were introduced into southern California, and were offered in 1900 in the East.

Heyneànus, Benth. (*P. Patchoùly,* Pellet.). PATCHOULI PLANT. Herb, 2–3 ft. high: lvs. long-stalked, ovate, acute, acuminate or obtuse, crenate, simply or doubly toothed: spikes terminal and axillary, forming a panicled infl.; whorls usually separate, forming interrupted spikes; fls. whitish, tinged purple. India and Burma.

POINCIÀNA (M. de Poinci, governor of the Antilles in the seventeenth century). *Leguminòsæ.* Small mostly broad-topped unarmed trees, with large and very showy flowers; one of the most conspicuous trees in southern Florida and the American tropics.

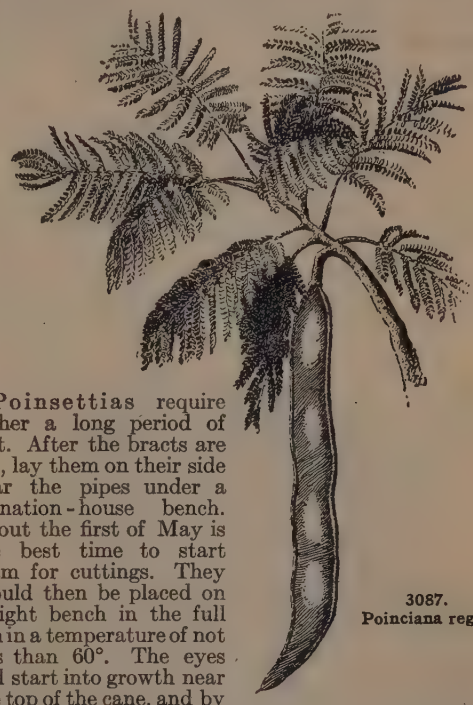
Leaves bipinnate with numerous small lfts. and with no stipels and inconspicuous stipules: fls. very showy, orange or scarlet, in large corymbose racemes, not papilionaceous, the 5 petals clawed and eroded or even fimbriate on the margin, the stamens 10 and free and exserted: fr. long and flat.—There are 2 or 3 species of Poinciana, all native to the oriental tropics. The genus has been confounded with Cæsalpinia, but the calyx-segms. are valvate, whereas they are strongly imbricate (or overlapping) in Cæsalpinia. The *P. pulcherrima,* known as "Barbados pride" and "bird-of paradise flower," is *Cæsalpinia pulcherrima; P. Gilliesii* is *C. Gilliesii. P. elata,* Linn., native to India, Arabia, and Trop. Afr., is planted in the Old World, but is not in the American trade. It reaches a height of 20–30 ft., with the petals scarcely exserted beyond the calyx.

Conzáttii, Rose. Small tree, with grayish bark: lvs. glabrous, large, with commonly 4 pairs of pinnæ; lfts. 4 or 5 pairs, oblong to obovate: infl. a sessile raceme; sepals highly colored, obtuse; petals yellowish red: pod scythe-shaped, pubescent. Mex.—Cult. in Mex. and S. Calif.

règia, Boj. ROYAL POINCIANA. PEACOCK FLOWER. FLOMBOYANT. Figs. 3085–3087. Rapid-growing tree, reaching 20–40 ft., and making a wide-spreading picturesque top: lvs. 1–2 ft. long, with 10–20 pairs of pinnæ, each pinna with numerous oval lfts.: fls. 3–4 in. across, bright scarlet (upper petal striped with yellow and more cuneate), the obovate petals very prominently clawed (or narrow below): pod 6 in. to 2 ft. long. Madagascar. B.M. 2884.—Now a popular tree in frostless countries, as in S. Fla., S. Calif., Bermuda, and the W. Indian Isls. It is deciduous. One of the most striking and gorgeous of tropical trees. Sometimes seen under glass in the N. *Cæsalpinia pulcherrima* is often confounded with it; but that plant is a shrub or at most only a small tree, with strongly overlapping calyx-segms. in the bud, smaller fls., and very long-exserted stamens. L. H. B.

3086. Poinciana regia. (×⅛)

POINSETTIA (*Euphorbia pulcherrima,* which see), is one of the most popular plants for the Christmas season. It is a shrub of tropical America with inconspicuous flowers but with flaming réd leaves or bracts (with variations to pink and white), clustered near the top. It is for these leaves that the plant is grown (Fig. 1440, Vol. II).



3087. Poinciana regia.

Poinsettias require rather a long period of rest. After the bracts are cut, lay them on their side near the pipes under a carnation-house bench. About the first of May is the best time to start them for cuttings. They should then be placed on a light bench in the full sun in a temperature of not less than 60°. The eyes will start into growth near the top of the cane, and by June 1 one can take the first batch of cuttings. These are found most suitable for stock plants as they grow rather tall to be of much use for decorative purposes. Pot the cuttings singly in small pots in sand. It is better to have a little sphagnum moss in the bottom of each pot for the roots to grip. Place them in a tight case shaded from the sun. The temperature should never be less than 65°. Water the cuttings every morning until they root, except on dull days. When rooted, pot them in 3½-inch pots in equal parts of loam, leaf-mold, and sand. The next shift may be a 6-inch pot, and a good fibrous loam with a sixth part of sheep-manure added. They will form a fine large bract in this size pot, and require no further potting although they should be fed with manure-water until the yellow flower appears in the center of the bracts. After the first batch of cuttings has been removed, the stock plants should be planted out-of-doors. One gets far firmer and as many cuttings by this treatment, and the cuttings now secured and rooted may be used in various ways. Twelve cuttings rooted as advised above and placed in a 10-inch pot make a fine specimen plant for Christmas. Others may be grown about 2 feet high for single-stem plants. The last cuttings to be rooted for the season should be secured not later than the middle of August, and they are excellent for making up shallow pans for centerpieces for Christmas. Poinsettias should at all times be grown as near the glass as possible, and during the summer months the house should have full air day and night. Never, however, allow the temperature to drop below 60°, and avoid draughts, as this will tend to make the foliage drop, and the retaining of the leaves is one of the attractive points in a well-grown plant of poinsettia. Insect pests that attack the poinsettia can be eradicated by the use of hydrocyanic gas, as advised for other plants.

GEORGE F. STEWART.

POISON BERRY: *Cestrum.* **P. Dogwood:** *Rhus vernix.* **P. Elder:** *Rhus venenata.* **P. Hemlock:** *Conium maculatum.* **P. Ivy:** *Rhus Toxicodendron.* **P. Oak:** *Rhus Toxicodendron.* **P. Sumac:** *Rhus vernix.*

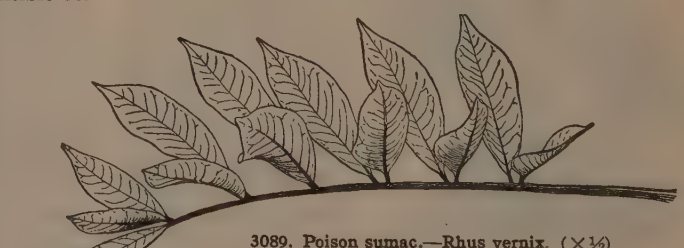
POISONOUS PLANTS. The plants that are injurious to man and the domestic animals may be divided into two groups: (1) those that cause injury by mechanical means; and (2) those that are poisonous.

3088. Leaf of poison ivy. (×½)

The first group includes those plants which are mainly harmful to farm cattle, causing serious troubles which may result eventually in the death of the animal. This group includes such plants as the crimson clover, *Trifolium incarnatum*, spiny cacti (Opuntia), the hairs and spines of which form the hair- and spine-balls known as phyto-bezoars. The branched hairs of the calyx of the crimson clover, if eaten by horses and cattle, when in full flower, are rolled together to form the hair-balls which have been responsible for the death of many animals. The spines of species of Opuntia in Mexico and the southwestern United States cause the laceration of the mouth and tongue of cattle and death has resulted in a number of cases, where these spines have been rolled into phyto-bezoars. Ægagropilæ are balls formed from animal hairs which have been licked off and swallowed. Through the peristaltic movement of the intestines these have been rolled into balls. The silex in the stems of the scouring-rushes (Equisetum) is responsible for inflammation of the digestive organs of cattle. The hygrometric structures attached to the fruits of such grasses as *Stipa capillata* (Russia), *S. spartea* (United States), *Aristida hygrometrica* (Queensland), and *Heteropogon contortus* (New Caledonia), by their spiral movements cause the pointed ends of the fruits to bore into the skin and flesh of animals in those regions of the earth. The blue-mold, *Aspergillus fumigatus*, which lives at blood temperature, penetrates the lung tissues of calves and pigeons, and its masses of spores fill up the air-cavities and lung-passages, causing asphyxiation. These are some of the illustrations of plants that kill, or cause injury, by mechanical means.

The poisonous plants, however, are those that contain some chemical poison which either produces irritation, disease, or death by its direct action. The season of the year has a direct influence on the activity of a poisonous plant. Melter (1899) records that his horse ate 500 pounds of the dried hay of *Passiflora incarnata* in August without injury, while in March, eight months later, 25 pounds of the hay of this plant killed another horse. The condition or age of the plant is important. The poisonous principle in the spotted hemlock, *Conium maculatum*, is volatile, and hence the dried plant is less poisonous than the fresh. The leaves of wild black cherry, *Prunus serotina*, are more poisonous when dry than when fresh, owing to the development of hydrocyanic acid. Some parts of a plant are more poisonous than others. For example, the seeds of the Jamestown weed, *Datura Stramonium*, are more deadly than the remainder of the plant. Again it may be said that the relative amounts of poisonous substance vary in different individuals of the same species and that small doses of some poisons are taken with beneficial results, for instance the use in medicine of belladonna, strychnine, and aconite. The toxic properties of plants are not due in all cases to the same chemical substance. It is well known that several plants contain a number of toxic bodies. For example, the green hellebore, *Veratrum viride*, contains the alkaloids jervin, cevadin, and veratrin. Sometimes the same poison is present in more than one species, as solanin in the tomato and the potato. Not all animals are equally affected by the same poison, as for example, the darnel which poisons men, dogs, horses, and sheep, but is innocuous to cows, pigs, and ducks. Some persons are susceptible to poison ivy, others are not. This susceptibilty may be increased by sickness, or a run-down condition. Some animals acquire a craving for certain injurious plants, as for example, the loco weeds of the United States, stemless loco weed, *Oxytropis Lambertii*, and in Australia, according to Maiden, the indigo plant, *Swainsona galegifolia*. Kobert divides poisonous plants into three groups: (1) irritants which cause gross anatomic changes, as croton-oil; (2) blood poisons, as ricin; (3) poisons which kill without anatomic changes, as morphin, digitalin, and the like; and a fourth class may be added, (4) skin-irritants, as poison ivy.

The most poisonous lower plants are fungi belonging to the genus Amanita. The two most virulent are the toadstools, *Amanita muscaria*, which contains muscarin, and *A. phalloides* with phallin. Fortunately, an antidote has been discovered for the first in the administration of hypodermic injections of atropin beginning with 1-100 of a grain, and increasing the dose to a strength of 1-60 of a grain. For phallin, no antidote is known. Of the higher plants, the most noted poisonous ones are: *Aconitum Napellus* (monkshood); *Delphinium Geyeri* (larkspur); *Oxytropis Lambertii* and *Astragalus mollissimus* (loco weeds); *Rhus radicans* (poison ivy), which is a serious skin-irritant; *Rhus vernix* (poison sumac), which is also decidedly toxic to the skin; *Cicuta maculata* (cowbane), which contains two poisons conin and cicutoxin; *Conium maculatum*, the classic poisonous plant, from which came the death-draught of the philosopher Socrates; *Kalmia latifolia* and *K. angustifolia*, the two poisonous laurels; *Datura Stramonium* (Jamestown weed); *Atropa Belladonna* (deadly nightshade) and others too numerous to mention.



3089. Poison sumac.—Rhus vernix. (×½)

Popular interest usually attaches to the poison ivy, *Rhus radicans* or *R. Toxicodendron* (Fig. 3088), a root-climbing vine with ternate leaves, and the poison

sumac, *Rhus vernix* (Fig. 3089), with pinnate leaves. Both of these plants have white fruits and hence are easily distinguished from the non-poisonous sumacs. The poison ivy is everywhere in the eastern states along roads, fence-rows and uncultivated ground, while the poison sumac grows in swamps and is less common. Both are skin-irritants, causing what physicians call dermatitis. If the susceptible person thinks he has come into contact with the plants, he should wash his hands and face with alcohol, as this dissolves and removes the non-volatile oil, toxicodendrol. Smoke from a brushwood fire containing these plants is toxic, and so is the Japanese lacquer made from the inspissated juice of a sumac, *Rhus vernicifera*. Unfortunately, all parts of these plants are virulent and at all seasons of the year. One of the best remedies is an alcoholic solution of sugar of lead, and the extract of grindelia (sold at drug-stores) is sometimes used. Local remedies are fresh bean leaves, stems of touch-me-not (Impatiens) and plantain leaves (*Plantago lanceolata*). At least, these leaves allay the burning sensation of the inflamed skin. An authoritative work on toxic plants is the "Manual of Poisonous Plants," by L. H. Pammel, professor of botany in Iowa State College of Agriculture, in two parts, Part I (1910) and Part II (1911) with a total of 977 pages. Other publications have been issued.

Two plants much in prominence at the present time in Wyoming on account of their poisonous effect on livestock are discussed by H. G. Knight, as follows: "Woody aster, *Xylorrhiza Parryi* (Fig. 3090), is found throughout the state of Wyoming, but is confined to certain districts characterized by a gumbo clay soil, more or less intermixed with gravel and containing more or less of alkali and other salts. This plant probably causes greater losses among sheep in the state of Wyoming than all other poisonous plants together, but may be easily recognized by those familiar with the range. So far as is known, sheep are the only species of range animal susceptible to poisoning by woody aster. No antidote is known and there is much question whether a satisfactory antidote will be obtained as the action of the poison is powerful and death comes speedily with many pathological changes."

Pammel writes, "Death camas, *Zygadenus intermedius*, is a near relative of the better known *Zygadenus venenosus*. In Wyoming the most common species is the *Z. intermedius* and the greatest losses noted have occurred in early spring when the plant is in bloom, and before early forage is plentiful. The plant grows on the sandy plain as well as in the drier and stonier foothills. It has been found that the poisonous properties are due to the presence of alkaloids, one of which at least is new to science. An antidote has not as yet been determined." JOHN W. HARSHBERGER.

POÍVREA (N. Poivre, 1719–86; intendant of Mauritius). *Combretàceæ*. Mostly climbing shrubs: lvs. opposite or alternate, entire: spikes axillary and terminal; calyx 5-lobed; petals 5; stamens 10, protruded; ovary 2–3-ovuled: fr. oval or oblong or 5-winged; seed solitary, pendulous, 5-angled. It includes a S. African shrub with orange-red fls. cult. in S. Fla. and Calif. The genus is referred by Bentham & Hooker to Combretum, a large genus containing some handsome plants that are little known. Poivrea differs from the other combretums chiefly in the convolute cotyledons. **P. bracteòsa,** Hochst. Unarmed shrub 8–10 ft. high: lvs. opposite or in 3's, 2½–3 x 1–1½ in.: petals clawed, reddish, 4 lines long: fr. oval, indistinctly 5-angled. Called "hiccup-nut" in Cape Colony. **P. comòsa,** Sweet. A large climber with great panicles of blood-red fls.: fr. short-stalked, notched at both ends. Trop. Afr. B.R. 1165 (as *Combretum comosum*).

POKER PLANT: *Kniphofia.*

POKEWEED: *Phytolacca.*

POLANÍSIA (Greek, *many, unequal,* referring to the stamens). *Capparidàceæ*. Annual herbs, mostly glandular and having an unpleasant odor: lvs. palmately 3–5-foliate, the uppermost reduced to bracts of the racemose fls.: fls. whitish or yellowish; sepals 4, lanceolate, deciduous; petals slender or clawed; receptacle depressed, bearing a gland at the base of the ovary; stamens 8 to numerous, somewhat unequal: fr. a nearly or quite sessile pod.—About 30 species, natives of temperate and tropical regions, of little value horticulturally. *P. trachyspérma,* Torr. & Gray. A branched glandular-pubescent viscous annual, 1–2 ft. high: lvs. petioled, with 3 oblong lfts.: fls. yellowish white in terminal racemes, rather large: fr. a caps. more or less contracted at base, not stipitate. N. Amer. Intro. abroad.

POLEMÒNIUM (ancient name, not explained; probably not from Greek *polemos,* war, but rather the philosopher Poleman). JACOB'S LADDER. GREEK VALERIAN. *Polemoniàceæ*. Flower-garden herbs, with pinnate leaves and pretty blue, purplish white or yellowish flowers.

3090. Woody aster (Aster, or Xylorrhiza, Parryi), a poisonous plant of the Plains.

Perennials, rarely annuals or biennials, tall or dwarf, often viscid, often with a creeping rhizome which is thick or slender: lvs. alternate, odd-pinnate or pinnatisect: fls. in racemes or thyrse-like panicles; calyx increasing after anthesis; corolla tubular, funnel-shaped, broadly bell-shaped or subrotate, 5-lobed, the lobes mostly obovate; stamens 5, alternate, with corolla-lobes inserted near the base, included or exserted: caps. 3-valved. Closely allied to Gilia and distinguished by the declinate stamens and the filaments usually pilose-appendaged at the base.—Brand, in the recent monograph (Engler's Pflanzenreich, IV. 250, hft. 27, 1907) accepts 29 species; mostly W. N. American, extending into Mex., but also in Eu., Asia and 2 in. S. Amer.

This genus includes the Jacob's ladder, *P. cæruleum,* an old-fashioned inhabitant of cottage gardens, which owes its popular name to the regular manner in which the numerous leaflets are arranged on the long leaves. It is a hardy perennial herb, growing 1 to 3 feet high and bearing five-lobed bell-shaped flowers of blue or white, and nearly an inch across. Probably the finest species, however, is the plant known to all gardeners as *P. Richardsonii,* which is a form of *P. humile* (or *P. lanatum*) that has doubled or trebled in size in cultivation. A fine specimen of *P. Richardsonii* may have a terminal cluster 6½ inches across and 5 inches deep, with two dozen flowers each 1¼ inches across. *P. confertum* differs in the great density of its inflorescence, and by connoisseurs in alpine plants may be regarded as a very fine species. Most of the yellow-flowered forms are disappointing. Polemoniums are of easy culture in any deep rich loamy soil. *P. cæruleum* and *P. reptans* do well in partly shaded places not too dry.

Polemoniums are easily raised from fall-sown seed. Also propagated by division. They are said to be impatient of soil on the leaves.

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A. *Corolla tubular or funnelform, the tube longer than the lobes.*

1. **pauciflòrum,** Wats. Perennial, erect and branched, somewhat villous, 1–2 ft.: lfts. 8–13 pairs, about 1 in. long: fls. yellowish, tubular, the tube 1–1¾ in. long, much longer than the lobes, solitary or loosely corymbose, long-pedunculate; stamens bearded at base, about equaling the corolla: caps. oblong. Mex.—The color is said to be a good clear yellow, tinged red outside. Offered by J. W. Manning in 1892, but subsequently dropped.

2. **confértum,** Gray. Perennial, with a thick woody rhizome, sticky, smelling of musk, 9–18 in. high: lfts. very small and so crowded as to seem whorled: infl. a dense head; fls. honey-scented, deep blue, ½–1 in. long; corolla narrowly funnel-shaped; filaments naked or nearly so and not dilated at base. Rockies and Sierras. Gn. 10:506. G.C. II. 24:12; III. 27:237. G.M. 55:459. G.W. 7, p. 356.—Intermediate between Polemonium and Gilia.

3. **mellìtum,** A. Nels. (*P. confértum* var. *mellìtum*, Gray). An attractive species with white or pale fls., the

3091. Polemonium reptans. The leaflets are often much broader. (×½)

plant usually taller than *P. confertum* and the infl. more lax and leafy and becoming racemose or spike-like: corolla fully 1 in. long, the lobes only one-third or one-fourth the length of the tube: herbage heavily musk-scented, fls. honey-scented (whence the name). Rocky Mts. Nev. Gn.W. 25:557.

AA. *Corolla campanulate to rotate, the tube mostly shorter than the lobes.*

B. *Plants low, with thickened rootstocks: lfts. seldom ½in. long.*

4. **hûmile,** Willd. (*P. Richardsonii*, Graham). Low, slender plant from somewhat creeping rootstocks, about 9 in. high: lfts. 15–21, 2–6 lines long: fls. bell-shaped, blue or purplish. July, Aug. Arctic regions. B.M. 2800 (yellow eye). G.C. II. 19:793. B.R. 1303 (as *P. cæruleum* var. *piliferum*).—It has the odor of ripened grapes. Brand combines this plant with *P. lanatum*, Pallas, of the Arctic Zone and the Altai region, making this form *P. lanatum* var. *humile*, Brand, with a wide range in the high N. *P. Richardsonii*, referred here, was raised from seeds collected at Great Bear Lake. The plant cult. as *P. Richardsonii* grows about 18 in. high, and bears profusely of bright blue fls. (varying to white in var. *álbum*, Hort.); probably the best of the genus, and in need of botanical study. Aside from references above, portraits occur in Gn. 78, p. 615; G.M. 45:494; Gn.W. 5:757; J.H. III. 54:101.

Var. **pulchéllum,** Gray (*P. pulchéllum*, Bunge. *P. lanàtum* var. *pulchéllum*, Brand). Differs in having smaller fls. ranging from violet and lavender to nearly white and in the viscid pubescence, which is minute. Arctic coast and southward according to Gray, but restricted by Brand to Asia (Altai region).

5. **pulchérrimum,** Hook. (*P. pùmilum* var. *pulchéllum*, Rydb.). By Gray considered to be a more viscid lax or diffuse and small-fld. form of *P. humile* var. *pulchellum*, the corolla violet varying to white, and with narrower lobes. By Brand it is made to comprise the American forms passing as *P. humile* var. *pulchellum*, with much smaller fls.: sts. erect, more or less pilose and glandular-viscid, 10 or 12 in. or less high: radical lvs. numerous, the lfts. 17–27, small, ovate, obtuse and entire; st.-lvs. few: fls. in terminal corymbs, the corolla very variable, usually bicolored (blue with white tube), 5–8 lines long, the lobes oblong and much exceeding the short tube: caps. ovoid, much shorter than the calyx. High Rocky Mts. and northward. B.M. 2979. B.R. 1304 (as *P. humile*). Gt. 9:292 (as *P. pulchellum*).

BB. *Plants weak and rather low, with a short rootstock: lfts. ½–1½ in. long.*

6. **réptans,** Linn. Greek Valerian. Fig. 3091. Height 1 ft. or less: slender, weak and diffuse but never creeping (as the name would indicate): foliage not viscid or glandular; lfts. 5–15, from lance-oblong to broad-ovate, acute, entire: fls. light blue, ½in. across, in a loose panicle-like cluster terminating the st.; corolla ½–¾in. long in cult., about ½in. or more broad; calyx-lobes acute or obtuse; stamens not exserted: caps. about 3-seeded. Open woods, N. Y. to Ala., west to Minn. and Kans. April, May. B.M. 1887.—Said to be an easy prey to snails, especially in winter, when they attack the rootstocks.

7. **cárneum,** Gray. St. lax or loosely branching, 1–2 ft. high, with a horizontal rootstock: lfts. 5–17, often 1½ in. long, ovate to oblong-lanceolate: fls. salmon or flesh-color fading to purplish, 1–1½ in. across, the corolla-lobes rounded-obovate; calyx deeply 5-cleft, with ovate-oblong lobes. Mountain woods, Calif., Ore. G.C. III. 48:134.—Offered in Ore., 1892, but probably not in cult. now. Closely allied to *P. reptans*.

BBB. *Plants strong and erect, mostly tall, with slender rootstocks or roots: lfts. usually large.*

C. *Fls. not blue (seldom running to violet), yellowish, cream-color or salmon.*

8. **foliosíssimum,** Gray. Sts. solitary and erect, 1–3 ft. tall, simple or branched, hairy at base and viscid above, from a woody short rootstock: herbage strong-scented; lvs. many; lfts. lanceolate to ovate-lanceo-

late, usually less than 1 in. long: fls. commonly white or cream-colored, rarely violet, an inch or less long, corymbose-cymose, the corolla twice the length of the calyx; stamens and style not exserted: caps. nearly globose. Rocky Mts.—Cult. some years ago, but perhaps never offered in Amer.

cc. *Fls. blue (to white).*

9. **cærùleum,** Linn. JACOB'S LADDER. CHARITY. Fig. 3092. Stout perennial herb, erect and leafy, 1–3 ft.: st. lightly hairy or nearly smooth, more or less glandular, angled: radical lvs. forming dense tufts, on petioles 6 in. or more long, the lfts. 11–21, lanceolate and mostly acuminate, entire; st.-lvs. smaller, very short-petioled or sessile near top of st.: fls. blue, many drooping in a panicle (frs. erect), 1 in. or less diam., the stamens not exserted; style protruded; corolla-lobes broad and spreading, subacute or mucronulate; calyx campanulate, with oblong acute lobes: caps. included in the calyx. Eu., mostly in copses and along streams, in moist or wet ground. Var. **álbum,** Hort. (*P. álbum,* Hort.), with white fls., is almost as popular as the type. Var. **variegàtum,** Hort., has variegated foliage. There is also a dwarf form.—*P. cæruleum* is widespread and variable, and the geographic forms are sometimes set off as species. Var. **himalayànum,** Baker (*P. himalayànum,* Baker. *P. grandiflòrum,* Hort., not Benth. *P. cærùleum* var. *grandiflòrum,* J. W. Manning), is the Himalayan form, with large fls. 1½ in. across, lilac-blue or darker, the rounded lobes nearly ½in. across; calyx and axis of panicle very hairy. In separating the American forms, much is made of the character of the rootstock. Greene, who has studied them, describes the true *P. cæruleum* of Eu. and of gardens as having a tap-root surmounted by a stout short simple or branching very leafy crown standing above ground. Hooker, however, speaks of the rootstock as short, creeping. The E. American representative, native in cold swamps and along streams, Vt. to Md., and probably not in regular cult., is now separated as **P. Van-Brúntiæ,** Brit.; from *P. cæruleum* it differs in having horizontal stout rootstocks, more leafy st., exserted stamens, rounded (not mucronulate) petals, accrescent calyx which becomes twice or three times the size of that of *P. cæruleum,* broader and fewer lfts., and fewer ovules. It bears considerable resemblance to *P. reptans,* but that species has a diffuse habit, fls. half the size, stamens included and calyx lobed only about one-third its length, the lobes obtuse. This species bears the name of Mrs. Van Brunt. The Rocky Mountain representative is separated as **P. occidentàle,** Greene, differing from *P. cæruleum* in having slender rootstocks, upper part of st. viscid-pubescent, lfts. narrower, lanceolate, stamens only the length of the corolla, the fruiting calyx not nearly so large and the lobes obtuse or obtusish. L. H. B.†

3092. Polemonium cæruleum.

POLIÀNTHES (name discussed below). *Amaryllidàceæ.* TUBEROSE. Tender summer-flowering bulb, producing long spikes of very fragrant blossoms; by successional plantings, it may be had at different seasons; commonly double-flowered.

Developed lvs. mostly basal, those on the st. short: perianth white; tube long, narrowly funnel-shaped, curved; segms. short, subequal; stamens affixed at the middle of the tube, not exserted; ovary 3-celled, free at apex; stigmas 3, ovate, falcate: fr. crowned by the persistent perianth; seeds flat.—As defined by Rose (1903), the genus contains about a dozen species, Mexican, and Bravoa is not clearly distinct. The common tuberose, *P. tuberosa,* is unknown in a wild state; if it had its origin from any of the Mexican species, it must have come from *P. gracilis.* Possibly it is native in the Andes of S. Amer.

The name Polianthes was given to the tuberose by Linnæus in 1737 in his "Genera Plantarum." Unfortunately he wrote "Polyanthes" in another work, published in 1737. This was probably an error. Some writers have changed the spelling to Polyanthus, supposing that Linnæus had in mind the idea of "many-flowered," from *polys* and *anthos.* Others have supposed he derived it from *polis,* a city. It seems probable, however, as Bentham & Hooker suggest, that Linnæus had in mind *polios,* "shining," "white," and *anthos,* "flower," which is much more applicable to the tuberose than are the other derivations. Consult *Polyanthus* for other meanings of the word Polyanthus. The name "tuberose" is derived from *tuberosa,* this plant being the tuberous hyacinth as distinguished from the bulbous hyacinth. The name therefore is *tuber-ose,* not *tube-rose.*

tuberòsa, Linn. TUBEROSE. Fig. 3093. Rootstock tuberous: sts. in clusters, 2–3½ ft. high: basal lvs. 6–9 to a st., 1–1½ ft. long, ½in. or less wide, bright green, reddish near the base: st. with 8–12 reduced lvs.: fls. 1½–2½ in. long, pure waxy white, borne in pairs in a lax spike; segms. ½–¾ in. long, the tube bent only near the base; filaments attached on upper part of corolla. B.M. 1817. B.R. 63. R.H. 1882, p. 429. F. 1881, p. 27. Gn. 47, p. 330. It runs into double forms. Gn.W. 16:10.

P. Blíssii, Hort., is a garden hybrid between Bravoa geminiflora and P. tuberosa.—*P. grácilis,* Link & Otto (P. tuberosa var. gracilis, Baker), supposed to be Mexican, is distinguished by slender habit and narrower lvs.: perianth-tube long and slender; segms. linear. Possibly the original form of P. tuberosa.—*P. maculàta,* Mart., is a Manfreda (p. 1983). L. H. B.†

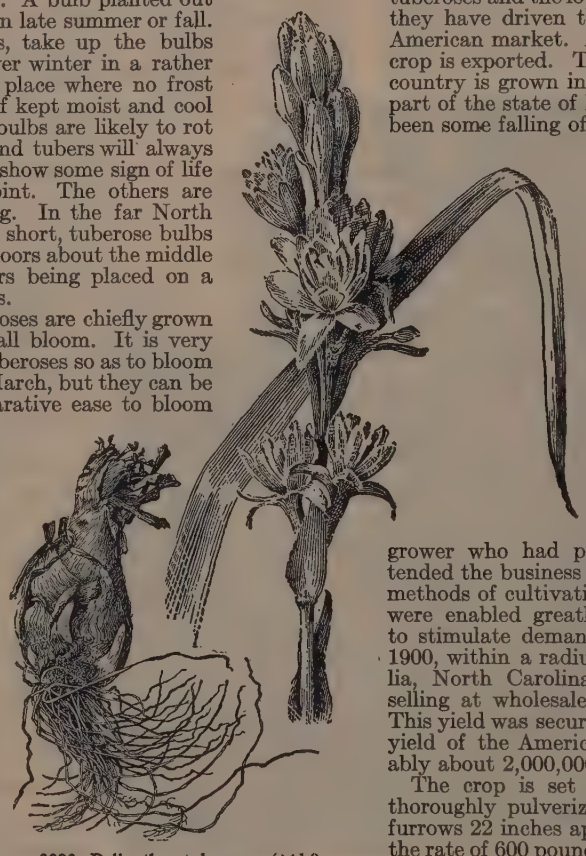
Culture of the tuberose for bloom.

There are only two objections to the tuberose: its odor is too powerful for many persons, and, like the calla lily, it has funeral associations. Therefore, fashion has deserted it, at least in North America. Nevertheless great quantities of the bulbs are grown in this

country, and a good part of them are used here as well as exported. The tuberose is more popular than ever in Europe. It will always be a standard florists' flower, for the people like it, whatever fashion may decree.

For the home garden, the bulbs are best procured in spring and planted outdoors after all danger of frost is over. The common tall-growing double sort is preferred for this purpose, largely because the fls. open better during the unfavorable dry weather which often occurs in October. Cover the bulb about an inch with fine light soil. A bulb planted out June 1 will bloom in late summer or fall. Before frost comes, take up the bulbs and store them over winter in a rather warm (50° F.) dry place where no frost will touch them. If kept moist and cool during winter the bulbs are likely to rot at the center. Sound tubers will always be green at top or show some sign of life at the growing-point. The others are not worth planting. In the far North where the season is short, tuberose bulbs may be started indoors about the middle of May, the tubers being placed on a layer of damp moss.

By florists, tuberoses are chiefly grown for summer and fall bloom. It is very difficult to force tuberoses so as to bloom from January to March, but they can be forced with comparative ease to bloom from April to June. Also flowers may readily be secured for November and December by retarding the bulbs. In forcing, the bulbs are started about the first of January, being placed close together in boxes only 3 inches deep, with 2 inches or so of moss on the bottom. These boxes are placed over the pipe where a temperature of 75° may be maintained. In four to five weeks the tubers will have sent roots all through the moss, and they should then be potted in 4- to 5-inch pots, or planted in a bench containing 4 or 5 inches of soil. The temperature should never be less than 75°, and 80° is better. For May and June bloom, successional batches may be planted at intervals of three or four weeks after New Year. The last crops will usually be the best.



3093. Polianthes tuberosa. (×¼)

For November florists' bloom the bulbs are retarded in a cool dry place until the middle of August. The second batch should not be planted until about the middle of September. This lot should give good December bloom.

For summer blooming in the open ground for florists, the form known as the "Tall Double" is the most to be preferred. In this variety, the flowers open better and are a clearer and purer white than those of the Pearl. The Albino is a single white tuberose, blooming in July and August. It is a very floriferous variety, with flowers that lack the brown or stained tint of some of the older forms. The odor is less powerful, and therefore more pleasant, than that of the ordinary tuberose. There are several interesting forms.

PETER HENDERSON & Co.

Commercial production of tuberose bulbs.

Tuberose bulbs were formerly grown extensively for commercial purposes in Italy, and are grown in a small way at the present time in South Africa, although the African bulbs are not in much favor with European florists because the bulbs ripen and are shipped in midsummer and a great number fail to bloom. The foreign-grown bulbs are not imported into the United States and, owing to the superiority of the American-grown tuberoses and the low price at which they are produced, they have driven the Italian-grown bulbs out of the American market. About 80 per cent of the American crop is exported. The larger part of the product of this country is grown in a limited area in the southeastern part of the state of North Carolina, although there has been some falling off in recent years.

Tuberose bulb-culture in the southern states was first attempted by F. A. Newbury in Duplin County, North Carolina, in 1868. Beginning with a dozen bulbs, he propagated stock until, in 1888, the yield was about 1,000,000 bulbs. During these years the crop was cultivated entirely by hand and consequently was very expensive. The prices received at first were $40 a 1,000, but since then prices have declined each year as quantity increased until, in 1888, bulbs were selling at $6 to $8 a 1,000, and in 1915 at $5 to $7. In 1888, the late H. E. Newbury, a brother, bought out the business, and he and J. F. Croom, another grower who had propagated considerable stock, extended the business greatly, introducing less expensive methods of cultivation. By use of the horse-plow they were enabled greatly to reduce the selling price and to stimulate demand for bulbs, so that the crop of 1900, within a radius of 20 miles of one point (Magnolia, North Carolina), amounted to 6,000,000 bulbs, selling at wholesale in carload lots at $3.50 a 1,000. This yield was secured from over 300 acres. The total yield of the American-grown stock in 1915 was probably about 2,000,000 first-size bulbs.

The crop is set in April, after the soil has been thoroughly pulverized. It is then laid off in rows or furrows 22 inches apart; into these is sown fertilizer at the rate of 600 pounds to the acre. About 400 pounds of cottonseed-meal and 20 bushels of good wood-ashes to the acre have given the best results, although any reliable fertilizer with a good percentage of potash is good. The fertilizer is thoroughly mixed with the soil by running a plow with point only in the furrow. Into this the sets or "seed," as they are called, are carefully placed upright by hand and covered with plow. Usually the bulblets are rather slow in starting off, and just as they begin to break through, the soil, which has become hardened or crusted, is raked or broken up. This assists the plant in getting up and also destroys any growth of grass which may have started. Cultivation is performed chiefly with a cotton-plow, using the sweeps to put earth to the plant and destroying any grass in the rows. Tillage is required every two weeks until August; an occasional hoeing between plants by hand is necessary in order to loosen the soil and destroy weeds and grass not reached by the plow. The crop is matured and gathered between October 15 and November 15. The tops by this time have reached a length of 18 to 20 inches; these are cut off at the ground with a sharp weeding-hoe and the bulbs are plowed out very much as potatoes are. Women then lift out and shake off the earth, and the offsets are removed by hand. These sets are the seed-stock for next season. The bulbs are graded

as to size, carried to curing-houses, and by some placed on shelves to dry or cure out. The bulbs must be stirred or have their position changed every few days to prevent mold and rot. This stirring wears or breaks off the roots and tops of a good percentage of the bulbs, making a less sightly bulb, though not injuring its flowering property. The better and more modern way is to gather them by the roots in bunches of about ten, tie them together with a small cord and hang them upon frames, walls, and overhead of house and allow them to cure without disturbing them during the process of drying. While this would seem a rather expensive way, it really costs but a few cents a thousand, being done by small negro children at nominal wages. In recent years, artificial heat of 80° to 100° by means of furnace and flues similar to those used in tobacco-barns has been introduced, to hasten curing. Four to eight weeks are required properly to cure the bulbs for shipping, so that the first shipments begin to move about December 1 to 10. Before shipment the bulbs are again sorted in order to get out any undersized bulbs that may have been overlooked; they are also counted and packed in paper-lined barrels, holding from 700 to 1,300, the number varying with size of bulbs and size of barrels. About 200 barrels, or 150,000 to 175,000 bulbs, constitute a carload. The bulk of the exports go through New York dealers. A few are exported direct.

The variety mostly grown is Dwarf Pearl. This sends up a flowering stem about 15 inches long, the blossom being double. The Tall Double is similar except that the flowering stem is longer, about 24 inches or over. The White or Orange Flower has a long stem, with the blossom single or resembling the blossom of an orange tree. The Albino, a freak from the Pearl, is a dwarf single or orange-flowered variety, but its tendency in other latitudes is to go back to the double type, and consequently is likely to disappoint the grower who expects a single blossom. The foliage of all the above is a rich green. The variegated-leaved variety has a beautiful stripe of golden or silver hue on the outer edge of the foliage. The blossom is single and the habit is dwarf. The tuberose is treated as an annual and has to be replaced each season.

A "number one" bulb (referring to size) is not less than 4 inches in circumference and measures up to 6 inches and over. "Mammoth" bulbs are 6 to 8 inches in circumference; only a very small part of the crop will attain such measurement. A "number two" bulb is less than 4 inches and over 3 inches in circumference, and while in the South these will bloom as well as the larger bulbs they are not much sought by the northern dealers. The tuberose is a rather slow grower; hence in the North, where the frosts are much earlier than in the South, it is likely to get caught before its spike of bloom matures. To succeed in getting flowers in the North they should be started in pots under glass or in rooms free of frost in April and transplanted to open ground in early June. The soil should be deeply pulverized. Choose a sandy loam if possible, and fertilize with manure containing a good percentage of potash. Keep the earth about the plant thoroughly stirred and do not let the plant suffer for moisture.

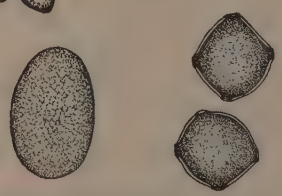
H. E. Newbury.
W. R. Newbury.†

POLIOTHÝRSIS (Greek, *polios*, white or grayish white and *thyrsos;* referring to the grayish white color of the inflorescence). *Flacourtiàceæ.* A deciduous tree allied to Idesia and differing chiefly in the valvate sepals, the 3 styles and in the capsular fr. Fls. monœcious, apetalous, with ovate to lanceolate valvate sepals; staminate fls. with many free short stamens and a minute rudimentary ovary; pistillate fls. with a superior ovary, 3 reflexed styles 2-parted at the apex: fr. a caps. dehiscent into 3–4 valves; seeds many, winged. Similar in habit to Idesia, but lvs. longer, purplish when unfolding; it is apparently of the same hardiness, as it has proved hardy in favorable localities at the Arnold Arboretum. Its cult. and prop. is the same as Idesia. The only species is **P. sinénsis,** Oliver. Slender tree, to 40 ft.: young branchlets pubescent: lvs. long-petioled, ovate to ovate-oblong, acuminate, 5-nerved at the base, dentate, pubescent below or nearly glabrous, 3–7 in. long: fls. in loose terminal panicles 4–8 in. long, greenish white, ¼–½in. across; sepals ovate to lanceolate, whitish tomentose outside: caps. ¾in. long, ovate-oblong. Cent. China. July. H.I. 19:1885.

Alfred Rehder.

POLLEN, POLLINATION. Pollen is the fecundating material contained in the anther, usually in the form of many very small grains. In many orchids it is in the form of masses of cohering parts or grains, termed pollinia. Pollen represents the male or fertilizing phase of reproduction in seed plants. Forms of pollen are shown in Figs. 3094–3097.

All gymnosperms (conifers, and the like) and angiosperms (true flowering or ovary-bearing plants) normally reproduce by means of seeds. For the fertilization of the ovule, in order that seed may result, the intervention of the pollen is necessary. The "dust of the flower" is therefore of far more interest to the horticulturist than this old popular name would imply. Studies in hybridization and self-sterility have long made evident the practical importance of a knowledge of pollen. Every plant provides for the production of this material, and usually in definite pollen-bearing parts termed stamens. The stamens are organs of the flower, and as essential as the carpels. The pollen is produced in definite sacs or compartments of the anther, comprising the tip of the stamens; and when the pollen is ripe, or mature, the fine grains are set free in quantity by the rupture of the inclosing sacs. The abundance of pollen produced may suggest wasteful management of the plant's resources, but a liberal supply of this substance is necessary. Although it requires but a single one of the small grains to fertilize a single ovule and produce a seed, pollen-grains are produced often a thousandfold more abundantly than ovules. The best offspring are usually produced when cross-fertilization occurs, and in the transfer of pollen from plant to plant it is only a small part which can reach its destination. There are many chances and such great losses that abundance of pollen is a necessary provision.



3094. Pollen-grains of Primula obconica (below) and Salvia. (Magnified)

3095. Pollen-grains of Browallia. (Magnified)

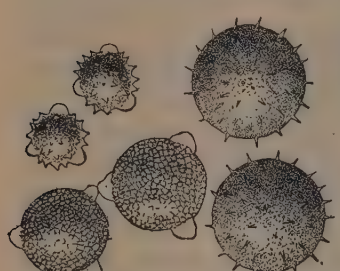
3096. Oddly marked pollen-grain of Schaueria flavicoma. (Magnified)

In general, flowers are pollinated by the wind and by insects; that is, pollen is transported by these two agencies. Flowers principally dependent upon the wind for pollination are termed anemophilous, while those visited by insects are designated entomophilous. These distinguishing terms may also be applied to the pollen itself. Anemophilous pollen is of a more or less spherical form, readily yielding to the wind, and correlated with this is a dry and inadherent outer surface. Such is the case, for example, in the various families to which the oak, willow, grasses, and pine belong, all of which plants are devoid of any stock of brilliant color or rich odors that might attract bug, moth, butterfly, or bee

The pollen of the pine has even developed bladders, so as to be borne more lightly upon the wind. On the other hand, those plants largely dependent upon the visits of insects for pollination may have the pollen-grains provided with some kind of spines, ridges, furrows, or viscid coatings that they may the more readily adhere to hairy limbs or other surfaces of the insect which may come in contact with them. Here, then, is to be found a reason for the beauty and specialization of external wall. In entomophilous pollen the elliptical form of grain predominates, but the general shape is extremely various; and the plants producing such pollen are usually provided with beauty of flower, fragrance, or other insect attraction.

In order that the pollen which has been transported to the stigma may be effective, it must be healthy. Experiments have shown that weak and poorly nourished orchard trees often produce ineffective pollen. The nature of the season may also have much influence upon its character, continued rains causing great losses by preventing the maturity of this product as well as by mechanical injury and by precluding the winged carriers. Most plants have some special provision for the protection of the pollen against rain; that is, either by the closing of the flower under moist conditions, or by the location of the anthers in a sheltered tube, under projecting hairs, lobes, or other corolla appendages.

The individual particles of pollen are in the form of delicate grains only readily visible in some quantity, as in powdery masses. At the time when they are set free, the grains are generally entirely distinct from one another, to be blown about by an accidental wind or carried by visiting insects. In some cases, however, the grains are bound together loosely or by means of delicate glutinous threads (Rhododendron); they may be closely united in fours (heath family); or the whole tissue of an anther or its divisions may remain intact as pollinia (some orchids, milkweed, and others). A particular species of plant will produce pollen quite constant in form and attire; but an aggregation of cultivated varieties originated from a single species may show considerable variation in this regard. Nevertheless, form, size, color, surface markings, texture of wall, and translucency of contents are not fixed qualities even for related genera or species. See Figs. 3094–3097 for different forms of pollen.



3097. Pollen-grains of Abutilon striatum (above). Bedding geranium (Pelargonium hortorum, on right). Chrysanthemum (on lower left). (All magnified)

When the healthy pollen of one plant falls upon the ripe stigma of a plant of the same species, the grains germinate in the sugary excretion of the stigma by the protrusion of a tube which penetrates the style and effects fertilization as described under *Fertilization* (Vol. III, page 1221). Furthermore, it is well known that while the flowers of many plants may be readily fertilized by their own pollen, the offspring are stronger when pollen from another plant or another variety has had access to the flower. Sometimes pollen from a foreign variety is absolutely essential to the best fruit-formation. This is particularly true of certain varieties of the pear. A poor quality of fruit can be prevented only by growing together different varieties. Again, although a plant may readily pollinate itself, yet the pollen from another plant or variety may be prepotent over its own. That is to say, if the plant be pollinated by its own pollen along with that of a foreign variety, that of the foreign variety will usually effect fertilization. This can be explained only on physiological grounds, and at present merely from a theoretical point of view. Any pollen penetrates and effects fertilization because it is attracted, first by substances in the style, and later by the egg-cell itself. When a foreign variety is prepotent it is so because it is more readily attracted, due, we may say, to a greater difference of potential between the two elements, the two elements from the same plant being more in equilibrium and less markedly attractive. As regards pollen from a foreign species, it seems to be the rule that hybridization does not occur so readily, and we must then assume that the differences have become so great as to cause repulsion.

The detailed development of pollen is highly interesting and instructive on morphological grounds, but in this place a very brief account of the formation of the grains will suffice. The developmental phases in *Bignonia* (*Pyrostegia*) *venusta* will serve as an example. A cross-section of the young flower-bud will show that in the anther-sac regions, semicircular layers of large well-nourished cells (called archesporial cells) are differentiated. These cells divide and the layer increases in extent, yet in this case it is always only one cell in thickness. When these cells have finally attained considerable size and provided themselves with a thick wall, they divide more or less simultaneously; and then each of these daughter-cells divides again by a division following quickly upon the first. Each cell has then formed four new cells within its original walls. The new cells remain thus united in fours until each is provided with a stout wall of its own, and then they separate. Each cell is then an immature pollen-grain, and technically a spore, that is, exactly homologous with the microspores of the vascular cryptogams. As a rule, before these pollen-grains are set free, another change occurs denoting maturity. This consists in the division of the nucleus of the spore in such a way that two cells of unequal size result (in some conifers several small cells are formed). On germination the large cell, which now incloses the smaller, protrudes the tube which penetrates the style; whereas the nucleus of the small cell divides into two, and one of these fuses with the egg-cell in the ovule, thus fertilizing it.

B. M. Duggar.

Pollination.

In botanical usage, pollination is the transfer of pollen from the anther to the stigma. In horticultural usage, particularly with reference to orchard fruits, the term is often applied in a general way to designate all the influences concerned in the setting of fruit. For the benefit of those who are uninformed in botany it may be said that pollination is concerned primarily with the "essential organs" of the flower,—the stamens and pistils. The stamens bear the pollen in their anthers, and they die after the pollen is shed. The pistils bear the ovary or seed-case, the style, and the stigma. The pollen falls upon the stigma. In some plants these organs are separated in different flowers or even on different plants. (Fig. 3098.)

Aside from those cases in which the stamens and pistils are so intimately associated that the pollen falls directly upon the stigma, flowers are pollinated mainly in two ways: by wind and by insects. The grasses, sedges, and pines are examples of wind-pollinated plants. The flowers of wind-pollinated plants are usually inconspicuous and without nectar or fragrance. They produce a great abundance of light dry pollen, which is wafted away by the slightest breeze and is often carried many miles by a strong wind. The pistils of these plants are long and feathery, and thus are well adapted to catch flying pollen.

The flowers of insect-pollinated plants, on the other hand, are usually showy, and have nectar or fragrance,

or both. The pollen is more or less moist or sticky, so that it is not easily blown away. Insects are probably attracted by the showy colors and by the perfume, both of which bespeak the presence of nectar. As the insect reaches down for the nectar, which is near the bottom of the flower, some parts of its body are almost sure to become dusted with pollen. When the insect visits another flower some of this pollen may be brushed upon the stigma and a fresh supply received. This pollen likewise may be carried to another flower, and so on. Thus cross-pollination, or the transfer of pollen from the anthers of one flower to the pistil of another, is accomplished.

Many flowers, notably the orchids, have special modifications of structure apparently developed for the purpose of securing cross-pollination by insects and preventing self-pollination. The bodies of some insects, also, have corresponding adaptations which insure the cross-pollination of certain flowers which they are in the habit of visiting most frequently. This correlation between flowers and their insect visitors has been the subject of extended observation. "Fertilization of Flowers," by Herman Müller, contains a bibliography of the subject up to 1886. For the distinction between fertilization and pollination, see the article *Fertilization*, page 1221.

The value of crossing to plants was first clearly proved by Charles Darwin in 1859. From the observations of Kolreuter, Sprengel, Knight, and his own exhaustive experiments, Darwin showed that continued self-fertilization is likely to result in inferior offspring; while cross-fertilization, within certain limits, gives greater vigor to the offspring. Cross-fertilization between different flowers on the same plant usually has no appreciable advantage. The probable reason for this is that the plant resulting from the union of unlike parents, as in cross-fertilization between flowers on different plants, is more variable than one resulting from self-fertilization or crossing between different flowers on the same plant, and hence has a better chance of fitting into new conditions.

Plants are endlessly modified to secure cross-fertilization and avoid self-fertilization. The principal means by which this end is gained are: (1) Special contrivances in the structure of the flower which favor cross-pollination. (2) A difference in the time at which the pollen matures and the stigmas become receptive in the same flower (dichogamy). This condition is very noticeable in some varieties of orchard fruits. The prematurity of the pistil is more common than the prematurity of the stamens. (3) Self-sterility, which is the inability of a flower to set fruit with its own pollen. Self-sterility is not usually due to a deficiency of pollen or to defective pistils. The pollen-grains often germinate on the stigma, but fertilization does not take place. The embryological reasons for this are not clearly understood. The ultimate cause of self-sterility in the grape

3098. Structure of the flower, to illustrate pollination.

1. Top.—The structure of a plum blossom: *se*, sepals; *p*, petals; *sta*, stamens; *o*, ovary; *s*, style; *st*, stigma. The pistil is composed of the ovary, style, and stigma. It contains the female part. The stamens are tipped with anthers in which the pollen, or male part, is borne. The ovary, *o*, ripens into the fruit.

2. Fuchsia, showing ovary at *a*, 3 stamens (one is removed) and the projecting style.

3. Buttercup, showing many small pistils in the center and stamens surrounding them.

4. Bottom.—Phlox, showing the 3-parted stigma, and the stamens included in the tube.

has been studied by Dorsey. Cytological studies of the pollen of self-sterile varieties showed distinct degenerative processes in the generative nucleus, or arrested development previous to mitosis in the microspore nucleus. Dorsey concludes that self-sterility in the grape is not due to hybridity alone, as suggested by Beach, since there are both fertile and sterile hybrid varieties; but is due also to deep-seated influences operating to produce declinism and dicœciousness, the native species of grapes being mostly dicœcious. Dorsey finds the nuclei of the pollen of many self-sterile varieties of native plums to be degenerated and disorganized. Degeneration of the pollen cannot be the main cause of self-sterility, however, since two self-sterile varieties may be mutually fruitful when planted together. About sixty species of plants are known to be more or less self-sterile. (4) The separation of the sexes in different flowers or on different individuals. It is thought by some that there is a gradual evolution among some kinds of plants toward unisexuality, and that adaptations for insect-pollination, dichogamy, and self-sterility are steps in this process.

Self-sterility has an important economic aspect in the culture of certain fruits. It is common in varieties of pears, apples, plums, and grapes; it is uncommon or unknown in cherries, peaches, raspberries, currants, gooseberries, and strawberries. Whenever isolated trees or large blocks of a variety blossom full year after year, but drop most of the fruit before it is half-grown, the variety may be self-sterile, provided the failure cannot be attributed to excessive vegetative vigor, marked lack of vigor, disease (especially scab, brown-rot, and fire blight), insect attack, unfavorable weather during the blossoming season, or other untoward circumstance. Self-sterile varieties are detected experimentally by inclosing the unopened blossoms in thin paper sacks, and dusting the pistils, when receptive, with the pollen produced by these blossoms; or by emasculating them and hand-crossing with pollen of the same variety. If very few fruits are produced from a large number of these selfed blossoms, but the variety fruits abundantly when crossed with other sorts, it is self-sterile. A few varieties of fruits are more or less self-fruitful, as distinct from self-sterile; they bear good fruit with their own pollen, but the fruits are seedless, as in the banana. Ewert found that many apples in Germany have this parthenocarpic development; that is, they grow without fertilization. It is not common in North American varieties of fruits.

Self-sterility is not a constant factor in any variety. It appears to be almost as easily influenced by the conditions under which the plant is grown as is the shape or color of the fruit. A variety is frequently self-sterile in one locality and self-fertile in another. Waite found several varieties of Japanese plums self-sterile, but concluded, "With plums, as

with other fruits, self-sterility is purely relative; under favorable conditions these varieties are able to set fruit without cross-pollination." Powell proved that in different parts of the Delaware-Maryland peninsula the Kieffer pear is self-sterile, partially self-fertile, or completely self-fertile. The Ben Davis apple is self-sterile in Vermont, according to Waugh, but self-fertile in Kansas, in the experiments of Greene. Bartlett pear is self-sterile in most of the Atlantic States, but usually self-fertile on the Pacific Coast. Beach found that varieties of grapes which are weakly self-fertile vary in this respect in different localities, and even in different parts of the same vineyard, being entirely self-fertile in one place and completely self-sterile in another. It is quite evident that the degree of adaptation of a variety to its environment of soil and climate has much to do with its ability to fruit abundantly with its own pollen.

It is not possible, therefore, to give a list of varieties that are self-sterile, and another list of those that are self-fertile, that would have more than local application. There are certain sorts, however, that are less dependable in this respect than others. Out of eighty-seven varieties of apples tested in Oregon by Lewis, fifty-nine were self-sterile, fifteen self-fertile, and thirteen partially self-fertile. Powell found practically all the commerical varieties of apples in Delaware self-sterile, except several summer sorts. Some of the prominent commercial varieties that are usually more or less uncertain are: Arkansas (Mammoth Black Twig), Gravenstein, Grimes, Jonathan, King (of Tompkins), Limbertwig, Paragon, Northern Spy, Ortley, Rome, Spitzenburg (Esopus), Twenty Ounce, Winesap. Among those generally quite dependable are Ben Davis, Baldwin, Oldenburg, Rhode Island Greening, Yellow Transparent, Yellow Newtown.

Anjou, Bartlett, Clairgeau, Clapp, Howell, Kieffer, Lawrence, Nelis, and Sheldon pears are frequently uncertain, while Angouleme (Duchess), Bosc, Flemish, and Seckel are usually self-fertile. Practically all the varieties of Japanese and native plums are self-sterile, the single exception, according to Waugh, being Robinson. Wild Goose and Miner are notoriously infertile. Hooper and Backhouse report that the European varieties are largely self-sterile in England, but in America the defection is confined chiefly to Coe, French Prune, and Italian Prune. The experiments of Close, Whitten, and Howard, indicate that all the leading varieties of peaches are self-fertile, and are not benefited by cross-pollination. In Germany, however, Ewart finds peaches "sparingly self-sterile." No cherries are known to be self-sterile, although Napoleon, Belle de Choisy, and Reine Hortense have that reputation among commercial growers.

Of one hundred and forty-five varieties of grapes tested by Beach, thirty-one were self-fertile, forty-one self-sterile, and seventy-three uncertain. Brighton, Herbert, Lindley, Merrimac, Salem, Wilder, and other hybrid varieties are decidedly unfruitful with their own pollen; while Concord, Delaware, Diamond, Niagara, Winchell, and Worden are among those strongly self-fertile. Reimer found the Scuppernong and other varieties of the Muscadine grape so defective in pollen that they are fruitful only when planted near male vines of the Muscadine. No varieties of the quince, raspberry, currant, gooseberry, or strawberry have been found self-sterile, but many varieties of strawberries lack well-developed stamens and so must be planted near perfect-flowered sorts.

A self-sterile variety often may be made fruitful by planting near it another variety to supply pollen; or by top-grafting part of the tree with cions of another sort. No benefit is derived from other trees of the same variety, even if brought from a distance, since all are but divisions of the same original seedling. In the selection of a pollinizer, several points must be considered: (1) The two sorts must blossom approximately at the same time in order that cross-pollination may be possible. The transfer of pollen from one variety to another is performed mainly by insects. Waugh and Backhouse have shown that practically none of the pollen of the plum and other stone-fruits is carried by wind, it being moist and sticky. The same is true of pears, but apple pollen is somewhat drier and is wind-blown to a slight extent. The honey-bee is the most important pollen-carrier. Hooper estimates that in England 80 per cent of the cross-pollination is done by the hive bee, 15 per cent by various wild bees, especially the bumblebee, and 5 per cent by miscellaneous insects. In tree-fruits it is necessary to select varieties that come into bearing at about the same age, otherwise one might be without cross-pollination for the first two or three years. Several state experiment stations have published lists of varieties blossoming at the same time, for the guidance of the planter. See New York (Geneva) Bulletin No. 407. (2) There should be an affinity between the two varieties, so that the self-sterile sort may find the pollen of the other acceptable. This can be determined only by hand-crossing. Beach found that the pollen of self-sterile varieties of grapes is practicably incapable of fertilizing other varieties; but this does not hold for tree-fruits since two self-sterile varieties planted together usually are mutually fruitful. Powell found no affinity between Paragon and Stayman apples; Kerr none between Wild Goose and Whitaker plums, and there are a number of other instances. Undoubtedly some varieties are more acceptable as pollinizers of a self-sterile variety than others. Spitzenburg apples produced by Lewis from Jonathan pollen averaged 144 grams in weight; from Baldwin pollen, 157 grams. In general, however, varieties of the same species that blossom simultaneously cross-fertilize readily, and there is no appreciable and constant difference in the fruit. (3) In commercial orchards the pollinizer should be a standard variety, valuable for market. (4) It should produce a large amount of pollen. Winesap produces little pollen; it would be unsatisfactory as a pollinizer for other sorts; Grimes, Ben Davis, and Rome are abundant pollen-bearers.

Cross-pollinated fruits may be larger and heavier than self-pollinated fruits, but there is rarely any other influence. The shape, color, flavor, and keeping quality remain the same, regardless of the variety selected as a pollinizer. Kieffer pears pollinated with Seckel look and taste no different from Kieffer pears pollinated with Le Conte. Many supposed instances of the immediate influence of pollen have been recorded, but in most cases proof is lacking that the changes were not due to bud-variation. It cannot be doubted that this influence is exerted occasionally, but certainly much less frequently than is commonly supposed.

In small orchards there is no need of mixing the varieties with special reference to cross-pollination. In orchards covering more than 10 acres, it is desirable to intersperse the varieties at regular intervals. It is more convenient in spraying, harvesting, and other orchard operations to plant the pollinizer in a solid row instead of mixing it in the rows with the self-sterile sort. If the pollinizer is not very valuable, one row in ten may be sufficient; but usually one in four to six is safer. If the pollinizer is a valuable variety, the two should be alternated in blocks of four to six rows each. It is not necessary to plant more than one variety as a pollinizer.

Orchard pollination, however, is a broader problem than the mere detection of varieties that are inclined to be unfruitful when planted alone, and discovering which are the best pollinizers for each of them. Experiments in crossing and observations in orchards indicate that nearly all varieties, whether self-sterile or self-fertile, will produce more or better fruit with foreign pollen than with their own. Powell found that some self-fertile trees of Kieffer in Delaware bore a light crop

with their own pollen, 4 per cent of the self-pollinated blossoms producing fruit; but bore a much heavier crop when pollinated with Duchess, Lawrence, and other varieties, 76 per cent of the crossed blossoms producing fruit. Yellow Newtown is distinctly self-fertile in Oregon, yet Lewis noted a decided improvement in the fruit when Jonathan and Grimes pollen was used upon it. He concluded, "All varieties of pomefruits, at least of apples and pears, even though they may be termed self-fertile, are benefited by having other varieties planted with them as pollenizers." The benefit will usually more than offset the slight inconvenience in orchard management occasioned by this mixed planting. The chief economic problem for the experimenter, therefore, is to determine what commercial varieties may be planted together for best results; and the rational course for the fruit-grower is to practise mixed planting on the basis of these experiments.

Those who wish to study the subject of fruit-pollination in greater detail should consult the following publications: Vermont Experiment Station Reports, 1896–1900; Delaware Experiment Station Reports, 1900–1902; Oregon Experiment Station Bulletin No. 104, Circular No. 20, Research Bulletin No. 1; New York (Geneva) Experiment Station Reports, 1892-1895; Bulletins Nos. 153, 157, 169, 223; Wisconsin Experiment Station Reports, 1894–1896; New York (Cornell) Experiment Station Bulletin No. 181; North Carolina State Experiment Station Bulletins Nos. 201, 209; United States Department of Agriculture, Division of Vegetable Pathology, Bulletin No. 5; Minnesota Experiment Station Bulletin No. 144; Missouri Experiment Station Bulletin No. 117; Virginia Experiment Station Report 1909–1910. S. W. Fletcher.

PÓLLIA (named after van der Poll). *Commelinàceæ*. Perennial herbs: sts. ascending from a creeping base or often erect, sometimes stout: lvs. very large: infl. terminal panicles either lax thyrsoid, or short and dense; sepals 3, persistent; petals 3, small, obovate, white or pale rose; stamens 6 or 3 and 3 staminodes; ovary 3-celled, 2- to many-seeded: fr. a globose or ellipsoid indehiscent caps.—About 18 species in Afr., India, Malaya, E. Asia, the Philippines, and Austral. *P. condensàta*, C. B. Clarke. Nearly glabrous: sts. 2–6 ft. long, thick: lvs. 12 x 3 in., lanceolate-obovate, acuminate at either end: panicle 20–40-fld., dense; stamens 3, fertile. Trop. Afr. Var. *variegàta*, Hort., differs from the type in having the long dark green, oblong-lanceolate lvs. variegated with yellowish white. Trop. Afr. R.B. 34:407.—Grown for ornament.

POLYANTHUS. In common speech Polyanthus means the florists' flower supposed to be derived chiefly from *Primula elatior* or its allies. The "Polyanthus Narcissus" of trade catalogues is one of the forms of *Narcissus Tazetta*, an old synonym of which was *Narcissus Polyanthos*. Polyanthus may also mean the tuberose, Polianthes, which see. There is no genus known as Polyanthus.

POLYBÒTRYA (Greek, *many* and *grapes;* referring to the massed sporangia). *Polypodiàceæ*. A small group of tropical ferns somewhat related to Dryopteris, but characterized by having the sporangia massed and covering the entire under side of the fertile lvs. as in Acrostichum, to which the species have been referred: lvs. 1–4 times pinnate, the fertile lvs. reduced so in tissue that they consist of little more than lf.-skeletons, affording space for the production of the sporangia.

osmundàcea, HBK. Rootstock wide, climbing, with long, linear scales: sterile lvs. 2–3 ft. long, the lower pinnæ 8–10 in. long, with numerous slightly stalked segms., veins free; fertile lvs. tripinnate, with the lower pinnæ 1–2 ft. long, 4–8 in. wide, with narrow, cylindric segms. ¼–¾in. long. W. Indies to Brazil.—Probably the handsomest of the climbing kinds. Another cult. species sometimes included in this genus is designated here *Olfersia cervina* (*Acrostichum cervinum*), which see.
R. C. Benedict.

POLYCALÝMMA: *Myriocephalus.*

POLYCÝCNIS (Greek, *many* and *swan*, probably referring to the lip and column which together bear some resemblance to a swan). *Orchidàceæ*. Epiphytic herbs with very short vaginate 1-lvd. sts., scarcely thickened to a fleshy pseudobulb: lf. broad, plicate-veined, contracted to the petiole: scapes erect from the rhizome, few-sheathed; fls. rather large, pedicelled; sepals subequal, free, spreading, narrow; petals similar to the sepals or at the base narrower and substipitate, labellum affixed to the base of the column, spreading, sometimes 2-auricled at the base, column elongated, slender: fr. a caps.—About 7 species in Trop. Amer. *P. Chárlesworthii*, Hort. Infl. long and arching, bearing about 50 fls. which are 1 in. across; sepals broad, yellowish, closely mottled with pale red-brown, the upper abruptly turned back; petals linear, twisted, yellow, slightly marked with red at the base; lip long, narrow, brownish with whitish hairs. British Guiana. Intro. abroad and offered for sale there. The following species may have been cult.: *P. barbàta*, Reichb. f. (*Cycnòches barbàtum*, Lindl.); *P. gratiòsa*, Endres & Reichb. f.; *P. lépida*, Lind. & Reichb. f.; *P. muscífera*, Reichb. f. (*Cycnòches muscíferum*, Lindl. & Paxt.); and *P. vittàta*, Reichb. f. (*Houllètia vittàta*, Lindl.). Warmhouse plants.
F. Tracy Hubbard.

POLÝGALA (Greek, *much milk;* from the old idea that some species increased the flow of milk). *Polygalàceæ*. Milkwort. Annual or perennial herbs, subshrubs, shrubs or very seldom trees, sometimes planted in the open or some kinds raised under glass for the bloom.

Leaves alternate or rarely opposite or verticillate, with or without stipules: infl. racemes or spikes, terminal, lateral, or forked, rarely axillary; fls. showy or

3699. Polygala paucifolia. (×⅔)

small, colors various; calyx with very dissimilar sepals, the lateral (inner) pair larger; petals rarely 5, usually reduced to 3; stamens 8; ovary 2-celled: fr. a compressed 2-celled wing-margined or wingless caps.—About 550 species scattered through the temperate and subtropical regions of the world and a few species in the tropics.

Polygalas from a cultural standpoint may be grouped as hardy and tender species and the latter are sometimes cultivated under glass, frequently outdoors in the South, as in southern California. There are about

forty North American species but only a few of them have been offered by dealers in native plants. The hardy species should be grown in rather light soil, but they require some moisture and are best adapted to partially shaded positions. They may be raised from seed sown in the fall or early spring. The more commonly cultivated species are the exotic ones, especially the shrubby Cape kinds which grow from 2 to 4 feet or more high, bearing subterminal racemes of large flowers.

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A. *Plants hardy.*

B. *Fls. showy, ½–¾in. long.*

C. *Keel beautifully fringed.*

1. **paucifòlia,** Willd. FLOWERING WINTERGREEN. GAYWINGS. FRINGED MILKWORT. FRINGED POLYGALA. Fig. 3099. Trailer, 3–6 in. high: upper lvs. clustered, ovate, 1½ in. long; lower lvs. distant, small, and becoming mere bracts at the base: fls. bright rosy purple, varying to white, 1–4 in the axils of the upper lvs. or appearing terminal. May, June. New Bruns. to Winnipeg, and Ga. Prefers moist woods and sphagnum bogs. B.M. 2852 (petals white). B.B. 2:361. Var. **álba** was once offered by a Mass. dealer in hardy plants, where it grows wild. One sometimes finds violet-fld. forms. The species bears cleistogamous fls.

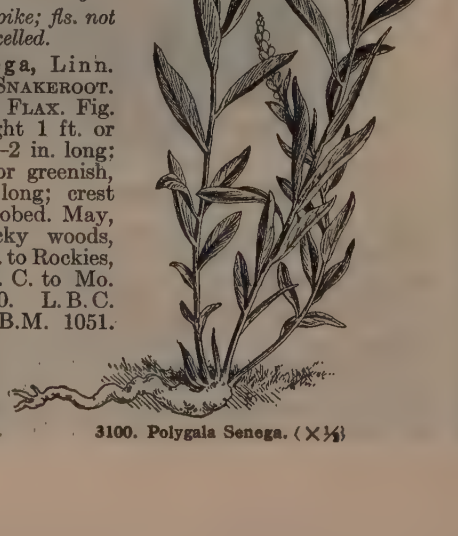
CC. *Keel merely 4-lobed.*

2. **Chamæbŭxus,** Linn. BOX-LEAVED MILKWORT. Evergreen trailer: upper lvs. lanceolate or elliptical, mucronate; lower lvs. smaller, obovate: peduncles axillary and terminal, about 2-fld.; fls. as many as 10 on a stalk, typically yellow, more or less reddish toward the end of the keel; stamens united only at the base. April–June. Eu., low heaths and woods to highest Alps. L.B.C. 6:593. B.M. 316 (wings white: petals white at base, yellow or red at tip). Var. **grandiflòra,** Gaudin (var. *purpùrea*, Neilr.), has purple wings, set off by yellow petals. Gn. 13:36; 30: 148 (charming: wings rosy pink).

BB. *Fls. not showy.*

C. *Infl. a spike; fls. not pedicelled.*

3. **Sénega,** Linn. SENECA SNAKEROOT. MOUNTAIN FLAX. Fig. 3100. Height 1 ft. or less: lvs. 1–2 in. long; fls. white or greenish, 1½ lines long; crest small, few-lobed. May, June. Rocky woods, New Bruns. to Rockies, south to N. C. to Mo. B.B. 2:360. L.B.C. 14:1380. B.M. 1051. —Bears no underground fls. Root used in medicine.



3100. Polygala Senega. (×⅓)

CC. *Infl. a raceme; fls. pedicelled.*

4. **polýgama,** Walt. Height 1 ft. or less: lvs. 1 in. or less long: fls. purple or rose, rarely nearly white, 2–3 lines long; crest relatively large, laciniate. June, July. Dry soil, Nova Scotia to Lake of the Woods, S. Fla. to Texas. B.B. 2:360.—Bears numerous underground fls.

AA. *Plants tender.*

B. *Habit shrubby, erect, 2–3 ft. high or more.*

C. *Lvs. opposite.*

5. **oppositifòlia,** Linn. Probably the only species in the genus with opposite lvs.; an abnormal feature in the whole family. Tall slender shrub: racemes few-fld.; fls. large, purplish. S. Afr. B.M. 492. B.R. 636.—Harvey gives 8 botanical varieties, of which probably the commonest in cult. is var. **cordàta,** Harv. (*P. cordifòlia*, Thunb., not Presl. *P. oppositifòlia* var. *màjor*, Lindl. *P. oppositifòlia cordifòlia*, Voss). Glabrous or downy: lvs. broadly cordate, acute or acuminate: fls. bright purple-red or purple-violet. B.M. 2438. B.R. 1146. L.B.C. 12:1189. Var. **latifòlia,** Ker (*P. grándis*, Hort.). Lvs. heart-shaped, acute, smooth: fls. large, beautiful purple-violet, bearded.

CC. *Lvs. alternate.*

D. *Lateral petals 2-cut.*

6. **myrtifòlia,** Linn. Readily told from *P. virgata*, its infl. being a few-fld., leafy raceme, while that of *P. virgata* is many-fld. and leafless. Densely branched shrub, 3–8 ft. high, with large, showy fls. near the ends of the branches: lvs. flat, variable in shape, but not subulate: lateral petals 2-lobed, the posterior lobe ear-shaped, reflexed. S. Afr. Var. **grandiflòra,** Hook. (*P. grandiflòra*, Hort., and L.B.C. 13:1227, not Walt. *P. longiflòra*, Dietr.). Fls. over 1 in. long. B.M. 3616. B.R. 669. G.W. 10, p. 629.

7. **Dalmaisiàna,** Hort. (*P. myrtifòlia* var. *Dalmaisiàna*, Hort.), also often wrongly offered in the trade as *P. dalmacìna* and *P. dalmatiàna*. It resembles *P. myrtifolia* var. *grandiflora* very closely: lvs. rather tending to be alternate, sessile, rather glaucous as in *P. myrtifolia:* fls. in terminal racemes, rather large, purple or rosy magenta with the base of the keel whitened or almost white. R.H. 1844:193. Gt. 5:161. R.B. 25: 145. G.W. 8, p. 316.—*P. Dalmaisiana* is said to be a hybrid *P. myrtifolia* var. *grandiflora* (*P. grandiflora*) crossed by *P. oppositifolia* var. *cordata* (*P. cordifolia*). The pictures show some slight verification of this, but many authorities treat the plant as a variety of *P. myrtifolia;* this species and its varieties are very commonly cult. in Calif., particularly the one known in gardens as *P. dalmacina* or *P. dalmatiana;* this flowers all the time and is very popular. The popularity of *P. Dalmaisiana* in Calif. is an example of the persistence of a good thing in gardens, though almost unknown to botanists. The spelling dalmatiana shows that some gardeners have thought the name a geographical one. The plant was named after M. Dalmais, a French gardener, who raised it from seed in 1839. As known in the trade, *P. Dalmaisiana* is a free-blooming plant with rosy or purplish fls. It goes under three or four names. It makes a good pot-plant, but is somewhat bare of foliage. It blooms from the ends of the ripened growth. It can be had in flower almost any time. The odd color and shape of the fls., and its free blooming, make it very attractive. It roots only fairly well from cuttings. Usually it propagates better by layering. Put in rich loam with well-rotted manure. It will stand considerable frost.

DD. *Lateral petals not 2-cut.*

8. **virgàta,** Thunb. Glabrous shrub, 2–5 or even 15 ft. high, with rod-like branches terminating in many-fld., leafless racemes of purple or flesh-colored fls.: anterior sepals distinct; wings obtuse. S. Afr.—The

typical form is advertised in S. Calif., but in Eu. probably the only form cult. is var. **speciòsa,** Harv. (*P. speciòsa,* Sims). Glabrous: lower lvs. obovate or cuneate, upper more linear, all obtuse: raceme long and lax: bracts soon deciduous. S. Afr. B.M. 1780. L.B.C. 7:621. B.R. 150. B. 1:43.

9. **apopétala,** T. S. Brandeg. Frutescent, 2–3 ft. high: branches slender, pubescent: lvs. lanceolate, entire, obtuse, alternate, remote, short-petioled, nearly glabrous: fls. large, pink, on slender pedicels ½in. or more long; sepals 4, the upper and lower small, equal, cymbiform, margins ciliate, the lateral very large, nearly orbicular; petals 5, separate, upper strap-shaped, two-thirds as long as keel, lateral pointed, less than one-half as long, embraced with the 8 stamens by the large cymbiform keel, which is opened on the upper and lower edge and not cristate, or appendaged: seeds 2, large, ovoid, pubescent. Low. Calif. B.M. 8065.—In S. Calif. *P. apopetala* is said to grow up to 15 ft. or more in height and to be valuable economically as its young branches contain a very strong fiber and the pea-sized brown seeds which are plentifully produced yield as much as 38 per cent of excellent oil. The root has the same properties in a higher percentage as are contained in *P. Senega.*

BB. *Habit dwarf, 1 ft. or less high.*

10. **amatýmbica,** Eckl. & Zeyn. (*P. acuminàta,* E. Mey. & Hort.?, not Willd.). Densely tufted, erect, 3–6 in. high: lvs. lanceolate-acuminate, pungently mucronate: racemes lateral, few-fld., spreading or reflexed; fls. small, wings green, keel and petals flesh-color to purple; keel with a many-parted crest. S. Afr. —*P. acuminata* of the trade is probably not *P. acuminata,* Willd., which is *Badiera acuminata.* Badiera differs from Polygala in having 2 of the sepals only a little larger than the others, instead of much larger.

Two other species have been recently intro. into cult.: *P. brachýpoda,* Tod., whose native country is not known, has erect growth, green very straight branches, long and very narrow lvs., and numerous reddish purple fls. Intro. into Calif.—*P. Vàyredæ,* Costa. A small plant 4 in. high, hardy or half-hardy in England, growing only a few inches high, with linear, evergreen lvs. and reddish purple fls. with a yellow keel. Spain. Closely resembles P. Chamæbuxus, but has narrower lvs.

WILHELM MILLER.
F. TRACY HUBBARD.†

POLYGONÀTUM (Greek, *many knee;* alluding to the numerous joints of the rootstock). *Liliàceæ.* SOLOMON'S SEAL. Perennial herbs, with simple stems from creeping knotted rootstocks, sometimes planted.

Stems naked below, above bearing nearly sessile or half-clasping nerved lvs. and axillary nodding greenish fls.: perianth cylindrical, 6-lobed at the summit; stamens 6; ovary 3-celled with 2–6 ovules in each cell: berry globular, black or blue.—About 60 species, widely distributed in the temperate regions of the northern hemisphere. The genus is distinguished from its nearest allies by the cylindrical perianth-tube with short lobes and small undivided style. Polygonatums are graceful in their habit, the unbranched arching sts. bearing pendulous, tubular fls. 1–10 in the axils. The name Solomon's seal is connected with the horizontal rootstocks which are scarred by the death of the annual stems, each scar being likened to a seal (see *Smilacina*).

Polygonatums are best suited for partially or wholly shaded positions, although they do well in the open in a well-prepared border. They like a deep rich soil not subject to drought. Easily propagated by division. They are among the best subjects for wild gardening. *P. multiflorum* is used abroad considerably for forcing and for house plants. Our native species are presumably equally desirable for all purposes. The Solomon's seal of English literature is *P. multiflorum,* which is probably the commonest species native to Europe. There are several Himalayan and Japanese species. The common Solomon's seal of our nurseries is the European, *P. multiflorum,* the American kinds being listed only by specialists in native plants. The others here described are offered by Dutch bulb-growers. For extended articles on the forcing of *P. multiflorum,* see Gn. 26, p. 236 (or V. 7:337); 30, p. 49, and F.R. 3:594.

A. *Lvs. all whorled.*

verticillàtum, All. St. 2–3 ft. high: lvs. in whorls of 4–8, linear, 3–6 in. long: fls. in 2's or 3's. Eu., Himalayas.—*P. macrophýllum,* Link, is perhaps a distinct variety with more robust habit and larger lvs.

3101. Polygonatum biflorum. (×½)

AA. *Lvs. alternate.*

B. *Perianth 2–3 lines thick.*

officinàle, All. Height 1–1½ ft.: fls. 1 or 2 in the axils: lvs. oblong, 2–3 in. long, firmer than those of *P. multiflorum:* perianth-segms. greenish. Eu., Siberia.—*P. ambiguum,* Link, is offered as a distinct form abroad.

latifòlium, Desf. (*P. Thúnbergii,* C. Morr.). Height 2–4 ft.: fls. 1–5 in the axils: lvs. oblong, 3–6 in. long: perianth-segm. greenish. Eu., Asia.—Intermediate in habit between *P. officinale* and *P. multiflorum,* but with earlier fls.

BB. *Perianth 1½–2 lines thick.*

C. *Plant glabrous.*

multifìòrum, All. Height 2–3 ft.: lvs. oblong, 3–6 in. long: perianth-tube white; segms. greenish; filaments densely pilose. Eu., N. Asia, Himalayas. Gn. 26, p. 236; 30, p. 49; 69, p. 172. V. 7:337. Var. **flòreròseo,** Hort., has rosy fls.—There are said to be varieties with double fls. and variegated foliage. The type seems to be more graceful than the varieties. This is the common Solomon's seal of Eu., where it is also called lady's seal and David's harp.

commutàtum, Dietr. (*P. gigantèum,* Dietr.). Taller and more robust than *P. biflorum,* 1–8 ft. high: lvs. 1½–6 in. long, 3–4 in. wide: fls. 1–8 in the axils; filaments somewhat flattened, smooth, not roughened.

May–July. Moist woods, N. H. to Man., S. Ga., La. to New Mex. and Utah.

cc. *Plant with lvs. pubescent beneath.*

biflòrum, Ell. Fig. 3101. Height 8 in. to 3 ft.: lvs. 2–4 in. long, ½–2 in. wide: fls. often 2 in axils, sometimes 1–4. April–July. Woods, New Bruns. to Mich., south to Fla. Mn. 8:49.

P. intermèdium as offered in the European trade is presumably P. intermedium, Dum., which is commonly considered nothing more than a form of P. multiflorum, All.—*P. macránthum* of foreign trade-lists is botanically unknown. The plant offered in the American trade as *P. màjus* is not known botanically, but it is said to grow 3 ft. high and bear pendent creamy fls. in May and June.

WILHELM MILLER.
F. TRACY HUBBARD.†

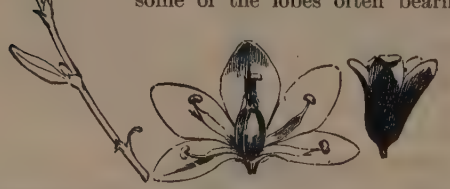
POLYGONÉLLA (diminutive of Polygonum). *Polygonàceæ.* About 7 species of American plants closely allied to Polygonum and of no horticultural standing, although one or two names may appear in the trade. *P. polygama* was offered in Mass. in 1881, but it is probably not hardy N. The genus differs from Polygonum in having only the inner sepals erect and the calyx enlarged in fr., while in Polygonum all the sepals are erect and the calyx is not enlarged in fr.

polýgama, Gray (*P. parvifòlia,* Michx.). Diffuse shrub: lvs. wedge-shaped, vertical, those on sterile shoots imbricated: racemes ½–1½ in. long, very numerous, in an oblong or corymbose panicle; fls. white, yellowish or rose-color; filaments all alike; stigmas nearly sessile. Aug., Sept. Dry sandy soil, Fla. to N. C.

americàna, Small (*P. ericoìdes,* Engelm. & Gray. *Gonopỳrum americànum,* Fisch. & Mey.). Perennial, frutescent: lvs. linear, persisting: racemes dense, divergent; calyx white or pink; pedicels divergent, jointed below the middle: achene elliptic-oblong, chestnut-brown. Dry soil, Mo. to Texas, east to Ga. and Ala.

POLÝGONUM (Greek for *many-jointed*). Including *Persicària, Bistórta, Tovàra. Polygonàceæ.* JOINTWEED. KNOTWEED. SMARTWEED. Erect or twining plants, grown for ornament, the flowers and foliage often attractive.

Mostly herbs, annual or perennial, with small fls. on jointed pedicels in racemes, spikes or heads (sometimes solitary): lvs. alternate, simple, jointed to an ocrea or sheath which clasps or surrounds the st. and may at length split and become indistinct: fls. apetalous; calyx gamosepalous, 4–6-parted; stamens 3–9, sometimes exserted; ovary 1-loculed, with 2–3-parted style or stigma (latter capitate), ripening into a triangular or lenticular achene.—The species are perhaps 200 (if the genus is held to include Persicaria), of very wide distribution from arctic to tropical countries, and they are of widely different habit, from small annuals, slender twiners, to subshrubs, and ranging in habitat from dry open lands to deep woods and watery swamps. The calyx is corolla-like, often large enough and with sufficient color to render the infl. showy. Polygonum is closely allied to Rumex, the docks, and also to Fagopyrum, the buckwheats. Rumex differs in uniformly having a 6-parted calyx, some of the lobes often bearing a grain-like tubercle on the back, the stigmas tufted. Fagopyrum differs in having an achene surpassing the calyx and in details of the embryo. Most polygonums are weedy plants, and only a very small proportion are of merit for cult. One of the commonest species is the doorweed (Fig. 3102), *Polygonum aviculare.* It is a



3102. Common doorweed or knotweed.—*Polygonum aviculare.* (×1; the details enlarged)

3103. Polygonum baldschuanicum. (Spray × ⅙)

decumbent wiry small-lvd. annual or perennial, growing along walks and in other hard dry soil, where it makes a sod-like mat. The axillary fls. are very small, seldom seen by others than botanists. Other polygonums are the common smartweeds of swales and damp grounds. For monograph of native and intro. species, see Small, "Monograph of the North American species of the genus Polygonum," in Mem. Dept. Bot. Columbia College, 1895.

Most of the cultivated polygonums are hardy border plants, requiring no special skill or care. They are propagated by seed and division, chiefly the latter. The rhizomatous species, as those of the East Asian region, produce readily divisible plants. Some of the cultivated kinds are annual, as *P. orientale,* and this species is the only one that is known as a familiar flower-garden plant, although it is now little grown and the seed is difficult to secure in the trade. *P. sachalinense* is a robust coarse plant of some value where screening foliage is desired and to occupy intractable ground; it was once extravagantly advertised as a forage plant. *P. baldschuanicum* is an attractive and worthy climber, hardy in the northern states. *P. Sieboldii* is one of the best of the species for the back or bold border and is useful for forming single clumps when strong herbaceous foliage effects are desired. The other species are employed mostly in wild gardening or for similar effects. The amphibious kinds make interesting subjects for bog-gardens. The pink or red often curved spikes of the Persicaria group are sometimes very ornamental. The

Asian set, from elevations in the Himalayan region and eastward to China and Japan, comprises very interesting plants for rock-gardens and herbaries. The polygonums provide good autumn-blooming plants.

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A. *Habit twining.*

1. **cilinòde,** Michx. Slender somewhat downy climber, mostly perennial: lvs. cordate-ovate to ovate-lanceolate, more or less angular or halberd-shaped at base: st. bearing a ring of retrorse bristles at the base of each sheath (whence the specific name): fls. white, in loose-panicled racemes from the upper axils. Nova Scotia south and west. R.H. 1913, p. 149.—Sold as a cover-plant for rocks and as a denizen of shrub-masses.

2. **baldschuánicum,** Regel. Fig. 3103. Tall perennial climber becoming woody at the base: lvs. cordate-oval or hastate, acuminate, slender-petioled: fls. small but very numerous, in terminal erect or drooping panicles, mostly rose-colored; fruiting calyx small, 3-sided, at first whitish and then becoming rose-colored: achene shining black. Bokhara. B.M. 7544. R.H. 1900, p. 35. Gt. 52, p. 381. G.C. III. 21:17; 41:399. Gn. 55, p. 454; 70, p. 274; 71, p. 19; 79, p. 41. G.M. 50:310. G. 35:657. G.W. 4, p. 253; 15, p. 626. Gng. 5:181.—A very vigorous and decorative hardy plant, climbing 20 ft. high, and, under favorable conditions, producing a profusion of pinkish, or sometimes whitish bloom; hardy N., and worthy greater attention. It was first described by Regel in 1884; bears the name of the town or place Baldschuan.

3. **Aùbertii,** Henry. Resembles *P. baldschuanicum*, but said to be inferior to it: climbing to 25 ft. and more, becoming woody at base: lvs. ovate-lanceolate, cordate, obtuse or very short-pointed, reddish bronze or pale green and when young red at the apex: fls. small, whitish, rose-colored or green, in slender axillary panicles 6–8 in. long. W. China, Thibet, discovered by P. Georges Aubert, missionary. R.H. 1907, pp. 82, 83.—Said to grow with great rapidity, and to cover a large space; blooms in spring and again in autumn.

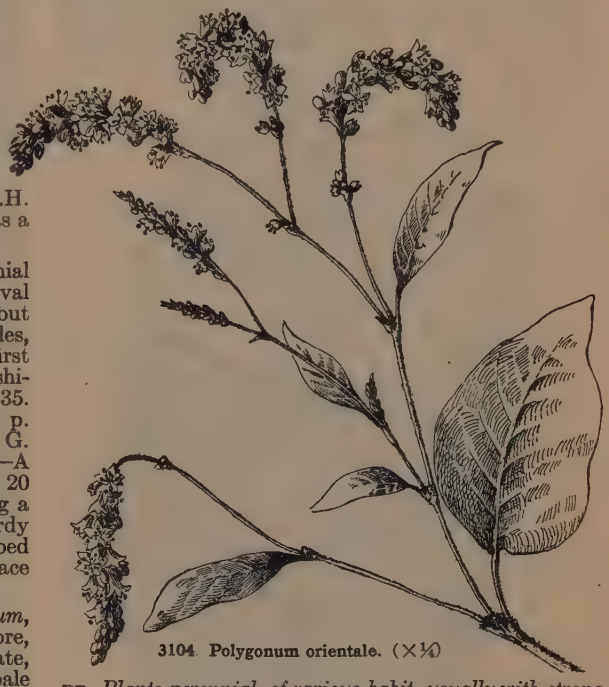
AA. *Habit erect, or at least not climbing.*

B. *Plants annual, of erect habit, to be treated as flower-garden subjects.*

4. **orientàle,** Linn. (*Persicària orientàlis*, Spach). Prince's Feather. Fig. 3104. Tall-growing annual, much branched above, hairy: lvs. large, ovate or cordate-ovate or broad-oblong, acuminate; sheaths short, ciliate and sometimes bordered at the summit: fls. bright pink, in close, cylindrical spikes that are arranged in open panicles, the stamens 7 and the achene lenticular. India. B.M. 213. J.H. III. 51:305. G.W. 6, p. 148.—An attractive old-fashioned plant growing as high as the fence. It is most easy of cult.; in fact, it usually self-sows in old gardens. In some places it has run wild. There are horticultural varieties, as var. **variegàtum,** Hort., with foliage marked with yellowish white, and var. **pùmilum,** Hort., with compact habit and the stature half that of the type.

5. **Persicària,** Linn. Lady's Thumb. One of the annual smartweeds, but sold by seedsmen as a suitable plant for backgrounds: glabrous or nearly so, erect or somewhat diffuse, 1–2 ft. tall: lvs. lanceolate to linear-lanceolate, slightly ciliate, usually with a triangular or crescent-shaped spot near the middle of the blade (whence the name lady's thumb); sheaths short, hairy on the margin: fls. in short spikes, pink or greenish purple, the stamens 6 and the achene lenticular or triquetrous. Eu.—Naturalized everywhere about dwellings.

6. **arenàrium,** Waldst. & Kit. (*P. élegans*, Ten.). Dwarf annual species with slender wiry branches and long internodes: lvs. small, linear-lanceolate, 1-nerved, bearing great numbers of little whitish fls. along the st., the terminal clusters leafless. S. Eu.—Offered in Calif. for rockeries and bouquets.



3104. Polygonum orientale. (×¼)

BB. *Plants perennial, of various habit, usually with strong rootstocks, sometimes shrubby.*

C. *Species native: smartweed-like plants, sometimes offered for naturalizing in bog-gardens.*

7. **amphíbium,** Linn. (*Persicària amphíbia*, S. F. Gray). Much spreading and creeping, rooting at the joints, at first more or less pubescent but becoming glabrous with age: lvs. rather thickish and large, oblong, elliptic or lance-elliptic, mostly obtuse or very nearly so; sheaths short, usually not fringed or bordered at the summit: fls. light rose-colored, in a short, dense, terminal spike, the stamens 5 and exserted, and the achene lenticular. In water or bogs, across the continent, and useful for planting in similar places.—When growing in water, the floating lvs. become long-petioled. Var. **Hártwrightii,** Bissell (*P. Hártwrightii*, Gray). Differs from the last in having many narrow-lanceolate lvs., bordered and fringed sheaths, and hispid sts., but the distinguishing mark is the foliaceous border on the sheath. Muddy places, across the continent.

CC. *Species exotic, used mostly for borders, and appearing regularly in the trade, largely Himalayan and E. Asian.*

D. *Whole plant white-woolly.*

8. **lanígerum,** R. Br. Sts. thick, creeping at the base, but the tops erect and standing 2–5 ft. high, much branched: lvs. narrow-lanceolate and more or less

recurved, acuminate, covered with down of the color of old silver; sheaths short, not ciliate: fls. small, red or copper-colored (varying to white), in racemes on slender forking peduncles, the stamens 6, and the achene flat and shining black. Tropics and subtropics of Old World and, according to Hooker, of Amer. R.H. 1891, p. 567. Gn. 62, p. 345; 70, p. 167. G.W. 2, p. 419; 13, p. 390.—Perennial and not hardy in the N., but seeds sown early will produce excellent lawn specimens, which are interesting because of the gray foliage and leafy habit.

DD. *Whole plant green or grayish, not white-woolly.*

E. *Fls. greenish or whitish, in very slender and long interrupted flexuose or curving wand-like spikes.*

9. **filifórme,** Thunb. Perennial, mostly somewhat hispid, 2–5 ft., with hollow branches: lvs. petioled, pubescent, ovate or oval, short-acuminate: fls. very small, whitish (or rose-colored?), remotely placed in

3105. Polygonum Sieboldii (P. cuspidatum). (×½)

spikes 5–8 in. or more long. Japan.—By some authors thought to be con-specific with the widespread *P. virginianum*, but lvs. less acuminate, bracts shorter-ciliate, fls. and frs. much smaller. Var. **variegàtum,** Hort., has lvs. marbled with yellow and pale green: an attractive plant, forming good clumps 1½ ft. high and persisting when well established. R.H. 1912, p. 259.

EE. *Fls. pink or red (sometimes varying to white), in erect usually simple stout spikes: plants grown for their fls.*

10. **Bistórta,** Linn. (*Bistórta officinàlis*, Raf.). BISTORT. SNAKEWEED. Perennial, with a thick more or less spreading rootstock: st. simple, slender but strict, 1–2 ft.: lvs. mostly radical, oblong-ovate and obtuse, undulate, glaucous beneath; st.-lvs. nearly sessile, broad at base; stipules ½–3 in. long: fls. white or pink, in a single dense cylindrical or oblong spike an inch or two long; stamens exserted; styles 3. N. Eu. and N. Asia.—The astringent rootstock was once used medicinally, and has provided food in famine times. Var. **supérbum,** Hort., is offered abroad, with conical heads of bright pink long-lasting fls.

11. **amplexicaùle,** Don (*P. oxyphýllum*, Wall. *P. multiflòrum*, Hort.). MOUNTAIN FLEECE. Strong-growing tufted green-stemmed perennial with slender fl.-sts. 2–3 ft. tall, from a woody branching rootstock: lvs. cordate-ovate to cordate-lanceolate, short-petioled or clasping, the margin wavy and crenulate, long-acuminate; sheaths 1–2 in. long and split or lacerate: fls. rose-red or white, rather large (sometimes ¼in. diam.) in strict long-peduncled spikes 2–6 in. long, the stamens 8 and exserted, the achene trigonous. Himalaya, from 6,000–13,000 ft. altitude. B.R. 25:46. B.M. 6500.—An excellent border perennial, blooming in mid-summer. Some, at least, of the plants that have been cult. as mountain fleece are a native polygonum (*P. Muhlenbergii*), which grows nearly throughout N. Amer., including Mex. Var. **speciòsum,** Hook. f. (*P. speciòsum*, Wall.), has larger deep purplish red or claret-colored fls.

12. **affine,** Don (*P. Brunònis*, Wall.). Tufted glabrous perennial, with flowering sts. 1½ ft. or less high, from a woody prostrate rootstock: lvs. mostly radical, oblanceolate to spatulate to lance-oblong; sheaths rather long, brown, split or entire: fls. bright rose-red, in dense, erect, terminal obtuse spikes 2–3 in. long, the stamens 8, the achene trigonous. Himalaya, at elevations of 9,000–14,000 ft. B.M. 6472.—An excellent little plant for cool places, blooming in autumn.

13. **vaccinifòlium,** Wall. Tufted glabrous perennial with trailing and creeping branches, 1 ft. or less tall, and stout twisted rootstocks: fl.-branches leafy: lvs. small (½–⅔ in. long), short-stalked, orbicular or elliptic, acute or acuminate, entire, somewhat glaucous beneath; stipules to ½in. long, brown, laciniate: fls. rose-red, ⅓in. diam., in subsessile racemes 2–3 in. long. Himalaya region, 9,000–14,000 and more ft. altitude. B.M. 4622. Gn. 39, p. 543; 43, p. 501; 45, p. 159. G.W. 9, p. 377. J.F. 2:117.

14. **Posúmbu,** Hamilt. Dwarf compact perennial, with long-creeping st. which is ascendent or decumbent and simple or branched: lvs. dark green and shining, 1–3 in. long, stalked, broad-lanceolate and narrow-acuminate, glabrous or somewhat hairy, ciliolate; stipules with stiff hairs longer than the sheath: fls. small, rose-colored, in many erect filiform racemes or spikes that are sometimes several inches long. Himalaya and to China and Japan.

EEE. *Fls. white to purplish, in panicled or corymbose heads.*

15. **chinénse,** Linn. (*P. cymòsum*, Roxbg. *P. polycéphalum*, Wall. *P. corymbòsum*, Willd.). Shrubby perennial of diffuse or erect habit, 5 ft. high, from glabrous to glandular-pubescent, the many sts. angled and grooved: lvs. 3–5 in. long, stalked, variable in shape, from linear-oblong to deltoid, ovate or even broader, entire or crenulate, the petiole usually 2-eared at base; stipules long and oblique at top: fls. white, rose-color or purplish, borne in many little heads that are panicled or corymbose with usually glandular-hairy peduncles; perianth 5-cleft; stamens 8. Himalaya region and Ceylon to China, Japan, and the Philippines.

EEEE. *Fls. white or greenish, in axillary clustered racemes or panicles or cymes: plants grown often for their general foliage effects and bold habit, mostly tall and sometimes woody. (More or less diœcious or polygamous.)*

F. *Lvs. mostly on the lanceolate order, sometimes ovate, usually taper-based.*

16. **polystàchyum,** Wall. Shrubby, glabrous, or pubescent perennial, 3–6 ft., the branches grooved: lvs.

petioled or nearly sessile, oblong-lanceolate, narrow-acuminate, usually contracted and more or less cordate or truncate at base: fls. white or pink, ¼in. diam., in large thyrse-like spreading terminal panicles with branches erect or decurved and very slender pedicels; 2 outer sepals much smaller than the inner. Himalaya, 7,000–14,000 ft. altitude; Afghanistan. G.C. III. 53, suppl. May 17. G.M. 52:929. M.D.G. 1896:373, 385. —An excellent plant for late autumn bloom, in moist places.

17. **lichiangénse,** W. W. Smith. Closely allied to *P. polystachyum*, but branches and stipules setose, lvs. setose above and densely cinereo-tomentose beneath: erect, with a woody base, 2–4 ft., the branches striate: lvs. very short-petioled, 2–5 in. long, lanceolate or oblong-lanceolate, caudate-acuminate, the margin more or less undulate; stipules about 1 in. long: fls. creamy white, in thyrsoid-paniculate clusters at nearly every node, the pedicels slender and about 1 line long. Lichiang Range, China, 10,000–11,000 ft. altitude.—A recent. intro., with fl.-sprays said to resemble those of *P. baldschuanicum*.

18. **campanulàtum,** Hook f. Pubescent or tomentose perennial, the sts. creeping or stoloniferous at base, forking above, 2–3 ft.: lvs. stalked, 3–6 in. long, elliptic, lanceolate or ovate, acuminate, the base narrow or rounded, more or less pubescent above and below; stipules large, mostly deciduous: fls. pale pink or red in autumn, in divaricately branched nodding or drooping terminal clusters; perianth campanulate, ⅛ in. long or somewhat larger; stamens 8, with very long filaments. Himalayan region. G.C. III. 52:489.—Variable.

FF. *Lvs. much wider, on the oval or broad-oval order, usually (or at least the lower ones) very broad-based.*

19. **Sièboldii,** De Vriese (*P. cuspidàtum*, Sieb. & Zucc., not Willd. *P. Zuccarínii*, Small). Fig. 3105. Strong stout handsome bushy somewhat woody perennial (stalks dying to the ground in winter), growing 4–8 ft. high, the sts. gracefully curving outward: lvs. short-oval to orbicular-ovate, truncate or slightly cordate at base, abruptly pointed, the strong side nerves uniting in marginal loops; sheaths short and flaring, deciduous: fls. small and whitish, very numerous, in drooping slender-panicled racemes, the stamens 8, and the achenes trigonous. Japan. B.M. 6503. R.H. 1858, p. 631; 1894, p. 54. Gn. 26, p. 317; 49, p. 238. G. 3:143. G.M. 47:861. G.W. 2, p. 76.—A very effective plant for bold mass effects, perfectly hardy in the northern states, and now frequently planted. It is everywhere known in the trade as *P. cuspidatum*. It produces clouds of bloom. Var. **compáctum,** Hort. (*P. compáctum*, Hook. f.), is of very compact habit, remaining sometimes only 2 ft. high, bearing many erect panicles of whitish fls.: a good subject. B.M. 6476. G.C. III. 47:123. Gn. 63, p. 56. Gn.W. 20:926. Var. **spectábile,** Hort. (*P. cuspidàtum* var. *spectábile*, de Norter). Shrubby, 3–5 ft.: lvs. marbled with green, white, and red. R.B. 35, p. 233.

20. **Wèyrichii,** F. Schmidt. Tall herb (3 ft.): sts. hispid, in the upper part tomentose: sheaths elongated, membranous, pilose, finally fissured and falling off: lvs. short-petioled, ovate, acuminate, dull green and rugose above, whitish tomentose beneath, to 7 in. long, the lower ones broader and truncate at the base, the upper ones attenuate at the base, revolute at the margin: racemes axillary and terminal, forming a large terminal panicle; rachis fulvo-tomentose; pedicels articulate about the middle; bracts hyaline, glabrous, 2-lobed, 3–6-fld.; stamens 8: achenes 3-angled. Saghalin.—A good hardy perennial for moist ground.

21. **sachalinénse,** F. Schmidt. SACALINE. Fig. 3106. Exceedingly vigorous plant, spreading rapidly from the tips of strong underground shoots, the reddish glabrous dead stalks often standing 8–12 ft. high through the winter: lvs. very large, frequently 1 ft. or more long, soft dull green, the blade oval-oblong, 1½–2 times as long as broad, shallow-cordate at base, scarcely pointed, the prominent side veins uniting by the ends: fls. greenish, in relatively small axillary clusters, the achene trigonous. Isl. of Sachalin, north of Japan, in Russian territory. B.M. 6540. R.H. 1876, p. 36; 1893, pp. 394, 395; 1894, p. 55. Gn. 21, p. 280; 62, p. 439. G. 5:311. G.C. II. 26:813 and III. 14:159 (in. fr.). G.M. 31:176. V. 17:161.—Recently intro. (in N. Amer. in 1894) for forage and for ornament. It is inveterately persistent when once established, and may easily become a pest. For forage it has little merit where other things can be grown, for it is too coarse. For planting in rough places, where a thick cover is required, it is one of the best of all coarse herbaceous perennials. It is perfectly hardy in the N. and seems to thrive anywhere. *P. Sieboldii* was once distributed as sacaline, but that species is much smaller, with smaller shorter and square-based lvs., and with more profuse bloom.

3106. Polygonum sachalinense. (×⅓)

22. **Spaèthii,** Damm. St. erect, 10 ft. and more, thick, minutely puberulent but becoming glabrous, the young growth densely pubescent or somewhat hirsute: lvs. petioled, cordate-ovate, acute or acuminate, the upper ones lanceolate, and attenuate at base, margin somewhat undulate and ciliate; sheath salver-shaped, densely pilose outside, the limb foliaceous, crenate and pilose: fls. in few-fld. paniculate spikes, short-pedicellate, carmine-red; stamens 5–6: achene lenticular. China.—Much like *P. sachalinense*, but differs in its fls., and the pubescence or hairiness.

P. crispulum, Sims=Atraphaxis buxifolia.—*P. cymòsum*, Trev. (Fagopyrum cymosum, Meissn.). Puberulous perennial: lvs. triangular: fls. white, secund on long recurved branches of cymes. Himalaya to China.—*P. mólle*, Don. Shrubby perennial, allied to P. polystachyum, the branches stout, terete and villous: lvs. elliptic-lanceolate, pubescent or tomentose beneath: fls. white, in large thyrse-like tomentose terminal panicles. Himalaya.—*P. multiflòrum*, Thunb. Tuberous-rooted climber, with reddish sts.: lvs. cordate-ovate, acute, shining: fls. small and whitish, in spreading panicles. China and Japan.—*P. platycaùlon*, Hort.=Muehlenbeckia platyclada.—*P. scándens*, Hort., as once described, is a twiner, with firm lvs., cordate at base, dark green above and claret-colored beneath. G.C. III. 28:187.—*P. sericeum*, Pall. Stout perennial, 4 ft., free-branching, with spirea-like panicles in July and Aug. of white fls.: densely pubescent: lvs. subsessile, oval-oblong, lanceolate, attenuate at base: fls. in short simple racemes terminal or in upper axils. Siberia.—*P. sphærostàchyum*, Meissn. Allied to P. affine, from which it differs in the "dense broad cylindric or globose spike of blood-red pendulous fls.": tufted perennial, suitable for small rock-gardens. Himalaya. B.M. 6847.

L. H. B.

POLÝMNIA (the muse Polyhymnia). *Compósitæ.* American composites, mostly coarse, viscid and heavy-scented.

The N. American species are tall branching perennials, with usually opposite thin lvs., and the S. American shrubby or tree-like. They have loose panicles of yellow or whitish fls. borne in summer. Heads broad, many-fld.; rays several, pistillate; disk-fls. perfect but sterile.—About 10 species.

canadénsis, Linn. CANADA or SMALL-FLOWERED LEAF-CUP. Height 2–5 ft., the st. clammy-hairy: lvs. deltoid-ovate to hastate, thin, deeply angulate-lobed; lobes dentate, 4–10 in. long: heads few in terminal clusters, 4–6 lines broad; rays minute or none. June–Sept. Damp, rich, shaded places, Vt., Ont. to Minn., south to Ga. and Ark. B.B. 2:405. Var. **radiàta,** Gray, with whitish rays sometimes ½in. long, is also offered by one dealer in native plants: st.-lvs. are more perfectly 3-lobed than in the type.

N. TAYLOR.†

POLYPÒDIUM (Greek, *many feet;* alluding to the extensive rootstocks). *Polypodiàceæ.* A large group of ferns, some hardy and some tender; the latter are often grown in under-glass collections.

Ferns with naked rounded sori, and with the lvs. jointed to the rootstocks, leaving a scar when they separate. As here treated the veins may be free or united to form areoles. The genus is a very extensive one, growing in all parts of the world, and has frequently been divided into a series of genera based on habit and the nature of venation, which is probably a more

3107. Polypodium vulgare. (×¼)

3108. Sori and a single sporangium of Polypodium vulgare. (Sori about natural size.)

logical treatment; some of these genera, indeed, as Phymatodes and Phlebodium, have here been separated; the genus would be more homogeneous were others placed by themselves. See comments in connection with *P. Làngua* and *P. Phyllìtidis*. For culture, see *Fern*.

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A. *Veins free: lvs. once pinnate.*

B. *Sori large, conspicuous.*

1. **vulgàre,** Linn. WALL FERN. POLYPODY. Figs. 3107, 3108. Lf.-blades 4–10 in. long, on pale stalks half their length, 1–3 in. wide, cut nearly or quite to the rachis into entire or slightly toothed blunt pinnæ. New England to Ala. and westward to Ore.; also common throughout Eu., where many forms are in cult.

3109. Polypodium vacciniifolium. (×½)

Var. **cámbricum** (Fig. 3110) occurs in N. Y. and New England. Very many other varieties are cult. in England but unknown to American trade.

2. **falcàtum,** Kellogg. Lvs. 12–15 in. long, 4–8 in. wide, on long, straw-colored stalks; pinnæ numerous, tapering to a slender point, sharply serrate. Calif. to Wash.

BB. *Sori smaller.*

3. **Plùmula,** HBK. Lvs. 9–18 in. long, narrow-lanceolate, 1–2 in. wide; pinnæ numerous, narrow, entire, blunt, the lower pairs scarcely smaller than those above; stalks blackish. Fla. and Trop. Amer.

4. **pectinàtum,** Linn. Lvs. elliptic-lanceolate, 1–2½ ft. long, 2–6 in. wide, cut to the rachis into horizontal entire or toothed pinnæ, the lower ones gradually reduced to short, triangular lobes. Fla. and Trop. Amer.

AA. *Veins uniting, forming regular areoles each with a single free included veinlet.*

B. *Lvs. simple, undivided.*

5. **vacciniifòlium,** Langs. & Fisch. Fig. 3109. Lvs. small, of two sorts, rising from slender, wide-creeping rootstocks; sterile lvs. roundish or elliptic; sporophylls linear or ligulate, with large sori in a single row. Trop. Amer., from the W. Indies southward.

BB. *Lvs. pinnate.*

C. *Fronds covered with flat scales underneath.*

6. **polypodioìdes,** Hitchc. (*P. incànum,* Swartz). Lvs. 2–6 in. long, an inch or more wide, with entire pinnæ which are usually more or less revolute; veins indistinct, from the thick texture. Va. and S. Ill. to Brazil; commonly growing on trees in the southern states.—Known as resurrection fern from its ability to revive after long drying.

CC. *Fronds smooth beneath.*

D. *Pinnæ broad at base and often confluent.*

7. **californicum,** Kaulf. Lvs. 4–9 in. long, 1–5 in. wide, cut into finely toothed pinnæ which are mostly confluent at the base. Calif.—Has much the habit of the European forms of *P. vulgare.*

8. **Catharìnæ,** Langs. & Fisch. Lvs. 6–12 in. long, 3–5 in. wide, with numerous nearly opposite pinnæ which are dilated at the base, contracted just above the base, and slightly enlarged and bluntly rounded at the tip; sori large near the midrib. Brazil.

DD. *Pinnæ narrowed and distinct at base.*

9. **fraxinifòlium,** Jacq. Lvs. 2–4 ft. long, 12–18 in. wide, on firm stalks 1–2 ft. long; pinnæ 4–9 in. long, with a tough, somewhat leathery texture and entire margin. Columbia to Brazil and Peru.

10. **subauriculàtum,** Blume. Stalks 6–12 in. long, glossy, from wide-creeping rootstocks: lf.-blades 2–3 ft. or more long, 8–12 in. wide; sori in a single row immersed in the leaf. India to Austral.

AAA. *Veins (primary) distinct from midrib to the edge, connected by parallel transverse veinlets forming rows of similar areoles.*

B. *Lvs. elongate, simple, smooth beneath.*

11. **Phyllítidis,** Linn. (*Campyloneùron Phyllítidis,* Presl). Lvs. 1–3 ft. long, 1–4 in. wide, with an acute point, and the lower part narrowed gradually; areoles in rows of 6–12, usually with 2 sori each. Fla. to Brazil.—This species might more justly be placed in the genus Campyloneuron.

3110. Polypodium vulgare var. cambricum. (×⅓)

BB. *Lvs. with under surface tomentose.*

12. **Língua,** Swartz. Lf.-blades 4–8 in. long, 1–2 in. wide, the apex often cuspidate, the base narrowed or rounded; upper surface naked, the lower matted with reddish brown cottony scales, the sori in close rows of 4–6 each. Japan to Ceylon.—This species and the next are often more properly listed in the genus Cyclophorus. There are a few crested and other horticultural forms.

13. **tricúspe,** Swartz. Lvs. hastate, 2–4 in. each way, with a central lanceolate-triangular lobe and spreading lateral ones which are more or less auricled at the base. Japan and Korea.

P. aùreum=Phlebodium.—*P. Dryópteris*=Phegopteris Dryopteris.—*P. glaùcum*=Phymatodes.—*P. hexagonópterum*=Phegopteris.—*P. Kerandreànum*=Phegopteris.—*P. lepidópteris,* Langs. & Fisch. (P. sepultum, Kaulf. Lepicystis sepulta) is a very scaly pinnatifid form from Trop. Amer., of some interest for collectors.—*P. musæfòlium*=Phymatodes.—*P. nigréscens*=Phymatodes.—*P. Phegópteris*=Phegopteris polypodioides.—*P. Phymatòdes*=Phymatodes.—*P. plumòsum* is a form of Asplenium Filix-fœmina.—*P. quercifòlium*=Drynaria.—*P. rigidulum*=Drynaria.—*P. Swàrtzii*=Phymatodes.

L. M. Underwood.

POLÝPTERIS (Greek words meaning *many-winged* or *feathered;* referring to the pappus). *Compósitæ.* This includes a handsome, rosy-flowered hardy annual known to the trade as *Palafoxia Hookeriana.*

Polypteris is a genus of 4 species of N. American herbs: lvs. mostly entire: alternate heads of peduncular, rose-purple or flesh-colored fls. borne in summer and autumn: involucre broadly bell-shaped or top-shaped; bracts commonly in 2 series, more or less colored and petal-like toward the tips: rays wanting except in *P. Hookeriana:* achenes linear to club-shaped, 4-sided; pappus of 6–12 equal scales. Distinguished from Palafoxia by the colored tips of the involucral bracts and the deeply divided limb of the corolla. By some the genus is united with the older genus Palafoxia, which is also American.

Hookeriàna, Gray (*Palafóxia Hookeriàna,* Torr. & Gray). A stout annual 1–4 ft. high, sticky pubescent: lvs. lanceolate, mostly 3-nerved below: heads 1 in. or more across; rays 8–10, deeply 3-cleft, rose-red, about ½in. long and showy. Sandy plains, Neb. to Texas. B.M. 5549.—Handsome plant; sometimes treated as an everlasting.

N. Taylor.†

POLYRRHÌZA (Greek, *many roots*). *Orchidàceæ.* Epiphytes: sepals and petals spreading, labellum 3-lobed, lateral lobes small, angular, middle one with spreading lobes; spur long, filiform; column short; pollinia 2. The following are intro. into American horticulture:

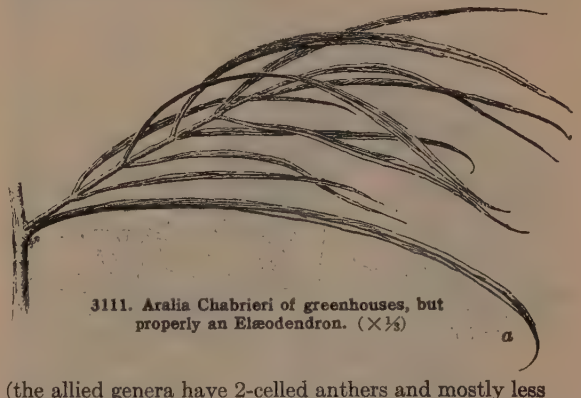
Líndenii, Rolfe (*Dendrophỳlax Líndenii*). Scape leafless, bearing a single white fl.; sepals and petals lanceolate; divisions of midlobe of labellum lanceolate: caps. smooth. On *Oreodoxa Regia,* and live oaks, S. Fla.

funàlis, Pfitz. (*Dendrophỳlax funàlis,* Hort. *Œcoclàdes funàlis,* Lindl. *Angræcum funàle,* Lindl.). Leafless, roots numerous, fleshy: peduncles 2-fld.; fls. white; sepals and petals oblong-lanceolate; labellum 3-lobed, with a long horn. Mountains of Jamaica.

Oakes Ames.
George V. Nash.†

POLÝSCIAS (*many* and *shade;* referring to the abundant foliage). *Araliàceæ.* Large shrubs or trees, glabrous, comprising the pinnate-leaved tender aralias of greenhouses, grown for the ornamental foliage.

Leaves pinnate, with variable lfts., in many horticultural forms much cut, modified and often variegated: fls. very small, usually 5-merous (sometimes 4-merous), the calyx truncate or toothed, the petals valvate, the ovary 5–8-loculed; the styles usually of the same number and distinct.—About 70 species are described, from India, Trop. Afr., and Pacific Isls., some of which probably belong in other genera. Recent introductions from New Caledonia and other islands have given interesting forms for the cultivator. In cult. very rarely flowering; some specimens of *P. fruticosa* known to be 15 years old or more have never blossomed. From the temperate Aralia, comprising the Hercules' club, the genus is easily told by its lack of spines and also by the technical floral characters of little value to horticulturists, as the tender sorts rarely flower. From Panax, the ginseng, the genus is separated by its woody habit. From Fatsia, the true Polyscias is distinguished by having the pedicel usually articulated beneath the fl. The genus Dizygotheca is distinguished by digitate lvs. of many lfts., and 4-celled anthers and 10-celled ovary



3111. Aralia Chabrieri of greenhouses, but properly an Elæodendron. (×⅓)

(the allied genera have 2-celled anthers and mostly less than 10-celled ovary).

The glasshouse aralias are much confused botanically. The genus Aralia as understood by the older botanists turns out to be a polymorphous group, and in the segregation of other genera it is often difficult properly to redistribute the species. This is particularly true

of the cultivated forms, many of which are not only variable but the flowers and fruits may be unknown. Any arrangement of these forms must be considered to be tentative.

Four distinct types or forms of tender greenhouse aralias are illustrated herewith. Fig. 3111 is the *Aralia*

3112. Dizygotheca elegantissima. The Aralia elegantissima of greenhouses. (×¼)

Chabrieri of gardens. It has very long glossy stiffish long-pointed leaves with a dark red midrib, the margin entire or remotely denticulate and more or less revolute. These leaves are opposite or nearly so on short side branches, as if parts in a compound leaf, and apparently confusion has arisen in descriptions. In the illustration, a leaf is shown at *a*, in the axil of which is a branch bearing the leaves. This plant, which is cultivated in its juvenile state, has been little understood botanically. It is not an aralia nor of the aralia family, although referred doubtfully to Polyscias. It is now considered to be *Elæodendron orientale* (see page 1107, where the matter is left in doubt). Harms, an authority on these plants, has recently gone over the question (Gt. 62, pp. 533–5, and 63, p. 117), and has concluded that the plant is *E. orientale*. Guillaumin (R.H. 1912, p. 491) considers it to be an Elæodendron but not *E. orientale*. The long linear leaves with red mid-nerves are merely the young form of the species, and they pass into the broad-lanceolate or shorter oval or obovate thick leaves of the mature plant. *Aralia Chabrieri* apparently appeared first under this

3113. Terminal leaflet of Polyscias fruticosa. Adapted from Blanco, Flora de Filipinas; much reduced.

name in 1881 in the catalogue of Van Geert, Ghent. For portraits of it, see R.B. 13:20 (1887); R.H. 1891, p. 224; Gn. 39, p. 576.

The florists' plant shown in Fig. 3112 is *Dizygotheca elegantissima*, Vig. & Guill. (*Aralia elegantissima*, Veitch). Very similar plants are *Aralia Veitchii*, Hort. Veitch, and its var. *gracillima*, Hort. Bull. (*A. gracillima*, Hort. *A. gracilina*, Lind. R.H. 1877, p. 38), its var. *robusta*, Hort., and *A. Kerchoveana*, Hort. It is not unlikely that all the plants mentioned above in this paragraph are foliar forms of one species, representing a juvenile state of a Dizygotheca (page 1062), although it is possible that other generic disposition will be made of these things when the different forms and the flowers and fruits are known. These names, as represented in plants in the trade, however, are of two groups: (1) *Aralia Veitchii*, *A. Veitchii robusta*, and *A. gracillima* with undulate nearly or quite entire leaflets, which may be tentatively called *Dizygotheca Veitchii*, Hort.; (2) the other group is *A. Kerchoveana* and *A. elegantissima*, with strongly notch-toothed leaflets, which are about 1 in. broad in the former and about half as wide in the latter; the former is *Dizygotheca Kerchoveana*, Hort., and the latter *D. elegantissima*, Vig. & Guill.

The plants shown in Figs. 3113 to 3117 are by some referred to Nothopanax; but until their position is better determined, they may be described tentatively under Polyscias. Nothopanax as understood by Harms has leaves primarily digitate whereas Polyscias has leaves on the pinnate order; as defined by others, however, Nothopanax comprises species with leaves simple, pinnate or pinnately decompound. As in many of the araliads, the leaves in this general group are very variable. Harms calls attention to the fact that in Nothopanax the leaves may be different on the same plant in successive ages. On the young plants the leaves are mostly digitate with the leaflets often once-pinnatisect; older plants have simple leaves and the leaflets entire or toothed or once-pinnatisect, or sometimes only digitate leaves.

3114. Polyscias Guilfoylei.

The culture of the several kinds of plants known to florists and greenhouse men as aralias is not difficult. Among the most desirable tropical kinds, are those known in the trade as *Aralia* (*Elæodendron*) *Chabrieri*, *A. elegantissima*, *A. Veitchii*, *A. gracillima*, *A. leptophylla* (all Dizygotheca), *A. monstrosa*, *A. Victoriæ*, *A. plumatum*, (all Polyscias) and others. Aralias are increased by cuttings and by grafts. *A. leptophylla*, and the forms of *A. Veitchii*, are rarely propagated except by grafting. The stock considered by many to be the best to use is *A. reticulata* (probably *Oreopanax reticulatum*, Fig. 2676, Vol. IV, which is *Meryta Denhamii*). Cuttings of it about the thickness of an ordinary pencil may be secured, and established in small pots, when they may

be cut back to a little above the base, and the cion inserted. Either the cleft or wedge method has been successful. They must be kept in a night temperature of not less than 70°F., and placed in a tight moist case until they unite. Aralias may also be propagated from cuttings, eyes, or pieces of the root. A plant that has become bare of leaves may be cut down near the pot; the stem should be cut in 2-inch lengths, and put in as eye-cuttings, in a brisk heat in the propagating-bed. The old stool may be put in bottom heat, when many of the varieties will throw several nice cuttings from the base. These should be removed with a heel, when about 6 inches long, and put in as cuttings, in a bottom heat of about 75°, and potted off when rooted. To procure root-cuttings, one of the strongest plants should be turned out of the pot, and the soil washed out of the roots with a hose. Cut the stronger parts of the roots in 2-inch lengths, and place in small pots. The end nearest the stem should be nearest the surface of the pot. Plunge the pots in a tight case, in 70° to 75° bottom heat, and water carefully until they throw up shoots.—A sandy peat is the best soil in which to grow the finer rooting varieties. The stronger-growing kinds thrive in a richer compost,—say two parts fibrous loam, one part leaf-mold, a little well-rotted manure, charcoal, and sand enough to keep the whole porous. Greenhouse kinds should be in a night temperature of not over 50° when established in their pots. They may be set outdoors in a shady position in summer. The tropical kinds must be kept at not less than 60° night-temperature. Aralias must at all times be shaded from strong sunshine. Watering with soot-water gives a nice gloss to the foliage. *Aralia*, or *Panax*, *Victoriæ* may be treated the same as the other aralias. Insect pests can be kept in check on aralias by the syringe and by fumigating with hydrocyanic gas, one-half ounce to the thousand cubic feet. The usual precautions of lowering the temperature to 60°, and having the foliage dry when the operation is performed, should be observed. (George F. Stewart.)

3115. Polyscias Guilfoylei. (×⅓)

paniculàta, Baker (*Terminàlia élegans*, Hort. *Gilibértia paniculàta*, DC.). Erect glabrous shrub: lvs. pinnate, 6–9 in. long, usually with 7 lfts. of which the terminal one is 7–9 in. long, oblong and obtuse, shining, deltoid or somewhat rounded at base: fls. in somewhat spicate (not paniculate) racemes 2–4 in. long, on very short and thick pedicels and not articulated; petals and stamens about 16: fr. hemispherical, with 6 styles and as many grooves. Mauritius.—This is another example of the confusion which arises from the naming of garden plants before their fls. or frs. are known. For several years this plant was supposed to be a Terminalia (cf. G.C. III. 2, p. 366).

pinnàta, Forst. (*Aràlia latifòlia*, Wight & Arn.). Lfts. orbicular to oblong, either nearly entire or with small and remote teeth, the base obtuse or heart-shaped, the apex acuminate: fls. 5–7 in each umbel of the panicle. Malaya.—The *Aralia latifolia* of gardeners may not be the above plant, and it seems to be little cult.

fruticòsa, Harms (*Pànax fruticòsum*, Linn. *Aràlia fruticòsa*, Hort. *Nothópanax fruticòsum*, Miq. *Pànax excélsum*, Hort., at least in part). Fig. 3113. Erect shrub, to 6 or 8 ft. high, glabrous, the young branches with prominent lenticels: lvs. more or less irregularly pinnately 3-compound, the petiole and rachis more or less spotted, and the petiole-base expanded and clasping; lfts. stalked, with the segms. also stalked and parted or cut into narrow-ovate or oblong or lanceolate ultimate segms. with scariously spinulose-toothed margins and very acute apices, the whole lf. having a much-divided soft appearance: infl. terminal and in the upper axils, 3–6 in. long and many-fld., the fls. umbellate and short-pedicelled: fr. broad-ovoid, compressed, more than 1 in. long. Polynesia to India, commonly cult. and in many lf.-forms. In some cases the lvs. are much cut and the segms. are reduced to very narrow even to linear or thread-like forms. Var. **plumàta,** Bailey (*Pànax plumàtum*, Hort. *Nothópanax fruticosum* var. *plumàtum*, Merr.), has smaller lvs., 8 in. or less long, the ultimate segms. much smaller and finer and mostly lanceolate or linear-lanceolate. See also *Panax Deleauanum*, suppl. list, p. 2748.

Guilfòylei, Bailey (*Aràlia Guilfoylei*, Bull. *Nothópanax Guilfoylei*, Merr.). Figs. 3114, 3115. Erect glabrous shrub, to 15 ft. and more, not much branched, with bright green usually white-edged foliage: lvs. large, often 16 in. and more long, regularly pinnate, with more or less spotted or lined petiole which is expanded and clasping at base; lfts. stoutly short-petiolate, well separated from each other, ovate to elliptic-ovate to nearly orbicular, tapering or rounded or truncate at base, with distinct and mostly rather remote short teeth which are sharply acuminate-pointed, in the usual cult. forms with white margins or variously white-shaded and blotched; terminal lft. large, often 6 in. long and 5 in. broad. Planted in tropical countries about yards and for screens or hedges, and probably native somewhere in the Pacific Isls.; often called "wild coffee" and "coffee tree," probably from the foliage. It may be seen now and then in greenhouses, although mostly in the smaller and cut-lvd. forms. It appears rarely to produce flowers. Its origin is not traced; by some it is thought to be a modified form of *P. pinnata* or some related recognized species. F. M. 1874:100.—*A. Guilfoylei* appears to have been first described in Bull's Catalogue for 1873 under "new plants announced for the first time," as fol-

3116. Polyscias Guilfoylei var. laciniata.

lows: "This fine and distinct ornamental stove plant is a native of the South Sea Islands. It is of shrubby habit, with an erect stem, copiously dotted with lenticular markings, and having pinnate leaves on longish smooth terete petioles, and made up in the case of young plants of from three to seven stalked oblong-elliptic bluntish leaflets which are sometimes obscurely lobed, and irregularly spinose-serrate; these leaflets vary in size from two to three inches long, and are neatly and evenly margined with creamy white, the surface being in addition occasionally splashed with gray."

Var. **laciniàta,** Bailey (*Pànax laciniàtum,* Hort.), Fig. 3116, has the white margins of the lfts. deeply cut into very narrow spreading divergent teeth. Var. **monstròsa,** Bailey (*Aràlia monstròsa* and *Pànax monstròsum,* Hort.), has the lfts. irregularly cut and jagged, often very oddly so and of different sizes and shapes, the margins white and deep-toothed: one of the many lf.-forms which are named *laciniata, monstrosa,* etc. R.H. 1891, p. 225. Gn. 39, p. 565. A form with golden green variegation is *Panax monstrosum aureum* of the lists. Var. **Victòriæ,** Bailey (*Pànax Victoriæ,* Rod. *Aràlia Victòriæ,* Hort. *Nothópanax fruticòsum* var. *Victòriæ,* Merr.). Fig. 3117. A small close-growing plant (as seen in cult.) with much-divided lvs., the lfts. or segms. small and of different sizes and shapes. A good compact form, frequent in greenhouses, which constantly sends up new stalks and yields recurving tasselled light green white-margined foliage; recommended as a good table plant. G.C. II. 19:405. I.H. 31:521.

Balfouriàna, Bailey (*Aràlia Balfouriàna,* Sander. *Pànax Bálfourii,* Sander). Compact and bushy shrub, in cult. well furnished with foliage from base to top: st. bronze-green, speckled with gray: lvs. with long slender petioles (3–5 in. long) which are more or less marked and lined and dilated-clasping at base; lfts. usually 3, long-stalked, orbicular or reniform in outline, cordate at base, very obtuse or broad at apex, coarsely

3117. Polyscias Guilfoylei var. Victoriæ.

crenate or crenate-dentate, the teeth apiculate and sometimes with minor spinulose serratures, margined or blotched with white. Intro. from New Caledonia.—Thought to be a form of *P. pinnata* by some. *R. Rumphiàna,* Harms, is to be studied in this connection.

filicifòlia, Bailey (*Aràlia filicifòlia,* Moore. *Pànax filicifòlium,* Hort. *A. spectábilis,* Hort.). Fig. 3118. Strong erect glabrous shrub, with large lenticels and usually with purplish branchlets: lvs. variable, even on the same plant as it attains age (as in Fig. 3118); as commonly seen in cult. young plants, the lfts. are long-lanceolate or narrowly oblong-lanceolate, narrowed at base, and deeply pinnatifid, the narrow acute segms. being spinulose-serrate; on older shoots or plants, the lfts. may be much larger and broader, still narrow at the base, and merely spinulose-dentate; as the plant matures it produces also very broad-ovate or broad-oblong thick nearly or quite entire lfts., with broad or truncate or even subcordate base, very unlike those already described. Pacific Isls. I. H. 23: 240. J. H. III. 48:337. R. H. 1891, p. 224. Gn. 39, p. 565.—Known in some places in tropics as "angelica."

3118. Polyscias filicifolia. All leaflets from the same plant. (×⅛)

The above account comprises the cult. aralias that are most likely to be met with and to be referred to this group. Undoubtedly some of the garden names under Panax belong in Polyscias. The following are names under Panax (not under Polyscias) which are in doubt or of which combinations appear not to be recognized under Polyscias: *Pànax cochleàtum* DC. (Nothopanax cochleatum, Merrill). Erect shrub, to 10 ft.: lvs. simple, 2–5 in. across, nearly orbicular, cordate, somewhat concave above, remotely spinulose-dentate. Cult. in Pacific tropics.—*P. crispàtum,* Bull (Nothopanax crispatum, Merrill). Shrub, to 6 ft.: lvs. triangular, decompound, the lfts. deeply incised and toothed, oblong-obovate to broad-ovate, green, the lateral ones overlapping. Probably Brazil, but widely disseminated in tropics.—*P. Deleauànum,* Hort., is properly P. fruticosum var. Deleauanum, N. E. Br. A variation with irregularly pinnate lvs. and digitately cut segms., the ultimate segms. variable, but cuneate at base, toothed and cut and white-toothed. Polynesia. I.H. 30:492. Known also as Aralia Deleauana.—*P. difùsum,* Bull. Form of P. fruticosum, with bright green, crisped lfts., which are linear-oblong and spiny-toothed. Polynesia.—*P. dissèctum,* Bull. Erect, branching, the 2-pinnate lvs. drooping, the lfts. cuneate-obovate and toothed and often 2-lobed.—*P. divaricàtum,* Sieb. & Zucc.=Acanthopanax divaricatus, p. 193.—*P. dumòsum,* Bull. Short-stemmed: lvs roundish ovate, pinnately divided, the variable ultimate divisions spiny-toothed.—*P. fissum,* Bull. St. marked with pallid spots: lvs. 3-pinnate, the lfts. linear-lanceolate and whitish toothed. Polynesia.—*P. lèpidum,* Bull. Compact: lvs. biternately divided, the end division largest; pinnules or ultimate lfts. obliquely obovate, the central one in each case small (sometimes almost rudimentary) and more or less covered by its 2 lateral ones, the margins spiny-toothed and cut. Brazil.—Recent. Scarcely known in cult. in Amer.—*P. Mastersiànum,* Sander. Of climbing habit, with long-stalked drooping pinnate lvs. about 3 ft. long, the petiole greenish, tinged with pink and marked with white, the lfts. oblong-lanceolate and toothed. Solomon Isls. G.C. III. 23:242.—*P. multifidum,* Hort., is properly P. fruticosum var. multifidum, N. E. Br. Compact plant, with 3-pinnatisect lvs. and linear or linear-lanceolate segms. ½in. or less long, with bristly teeth.—*P. Murrayi,* Muell. (Aralia splendidissima, Hort.). Tree in its native place, with drooping, shining green pinnate lvs. 3–4 ft. long, and many oblong-lanceolate lfts. 3–6 in. long: umbels of brownish fls. in long, terminal panicles. S. Sea Isls. Austral. B.M. 6798. Perhaps true Aralia.—*P. nìtidum,* Bull. Compact: lvs. roundish obovate, toothed and somewhat spiny, sometimes with deep incisions. Brazil.—*P. ornàtum,* Bull (Nothopanax ornatum, Merrill). Slightly branched shrub, to 10 ft.: lvs. long, pinnate, the 11–17 lfts. narrow-lanceolate and deeply blunt-toothed, sometimes pinnately lobed, irregular in shape: fls. greenish white, the panicles terminal or in the upper axils: fr. about ⅛in. long, purple. Probably Brazil, but widely cult. in tropics.—*P. sessiliflòrum,* Rupr. & Max.=Acanthopanax sessiliflorus, p. 192.

L. H. B.

POLYSTÀCHYA (Greek, referring to the many spikelets). *Orchidàceæ.* Tropical epiphytic orchids, few of which have showy flowers.

Sepals connivent or subpatent, the lateral ones connate with the short foot of the column into a mentum; column short: flowering sts. short, few-lvd., pseudobulbous.—About 80 species. For cult., see *Orchid*.

lutèola, Hook. (*Dendròbium polystàchyon*, Swartz). Height 6–12 in.: lvs. oblong-linear or lanceolate-oblong, exceeded by the st.: fls. small, greenish yellow; lip 3-lobed to the middle. S. Fla. and Trop. Amer.

P. appendiculàta, Kränzl. Fls. small, yellow; upper sepal with short, subulate, spur-like appendage attached to back a little above base. Trop. Afr.—*P. bicolor*, Rolfe. Plant very small: sts. tufted: lvs. lanceolate-oblong: scapes 3–5 in. long; fls. small; sepals light purple; petals cream-white. Seychelles.—*P. campyloglòssa*, Rolfe. Lvs. oblong or linear-oblong, 2–4 in. long: scape 2 in. long, 1- or few-fld.; fls. green, with brown on foot of column and base of lip. Trop. Afr.—*P. coriàcea*, Rolfe. Lvs. linear-oblong, 4–6 in. long: racemes densely-fld., sparingly branched at base; fls. minute, deep yellow. Cent. Afr.—*P. dendrobiiflòra*, Reichb. f. Fls. up to 20 together, in a short corymb, white, suffused with pale rose, resembling in size and shape Dendrobium Fytchianum.—*P. ensifòlia*, Lindl. Sts. erect, bearing linear-oblong lvs. 4–6 in. long: fls. numerous, tawny yellow, borne on an erect infl. Trop. Afr.—*P. flexuòsa*, Schlecht. Scape slender, about 1 ft. long, terminated by a lax raceme of small white fls. with a purple-spotted lip. E. Trop. Afr. G.C. III. 44:276.—*P. golungénsis*, Reichb. f. Plant about 4 in. high: infl. branched, with many small light yellow fls.—*P. Haroldiàna*, Hort. Fls. white, sepals tinged with green, borne on a short spike. Trop. Afr.—*P. Laurèntii*, Wildem. Plant trailing: lvs. fleshy, green: fls. in panicles, white or cream-white. Congo.—*P. Lawrenciàna*, Kränzl. St. pubescent: raceme 4–8-fld.; fls. yellowish green, the lip rose-pink; sepals spreading, puberulous, the dorsal ovate, acute, about ⅛in. long; petals incurved, oblong-oblanceolate, subobtuse, about as long as sepals; lip 3-lobed, about ½in. long, the front lobe fleshy, nearly orbicular. Trop. Afr. B.M. 8211.—*P. mystacidioides*, Wildem. Sts. branched, over 3 ft. long: lvs. lanceolate, dull green, covered with tiny dots: fls. lurid purple and flesh-colored, ½in. long, solitary. Congo.—*P. paniculàta*, Rolfe. Pseudobulbs flattened, the young shoots blotched with purple: racemes panicled; fls. from coppery yellow to reddish orange. Trop. Afr. G.C. III. 48:462; 58:85. B.M. 8618.—*P. rèpens*, Rolfe. Small, creeping: fls. about ¼in. long; sepals and petals buff-yellow striped with brown; lip deep red-brown. Uganda.—*P. stricta*, Rolfe. Panicle erect, 9 in. long; fls. ½in. long, light greenish yellow, with faint purple streaks. Trop. Afr.

GEORGE V. NASH.†

POLÝSTICHUM (Greek, *many rows;* referring to the sori). *Polypodiàceæ*. A group of ferns mostly of temperate regions, some species of which do well in living-rooms.

Veins free and the roundish sori covered by indusia that are peltate and attached to the leaf by a short central stalk. They are mostly easily grown and thrive best in shade. One species is very commonly grown for fern-dishes. All the species have also been described by some authors under the genus Aspidium. For culture see *Ferns*.

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A. *Lvs. simply pinnate throughout.*

B. *Lower pinnæ gradually reduced to mere lobes.*

1. **Lonchìtis,** Roth (*Aspídium Lonchìtis*, Swartz). HOLLY FERN. Lvs. 9–20 in. long, rigid, the pinnæ broadly lanceolate-falcate, the lowest triangular. N. Eu. and Amer., mostly in high latitudes.

BB. *Lower pinnæ scarcely if any smaller than those above.*

2. **acrostichoìdes,** Schott (*Aspídium acrostichoìdes*, Swartz). CHRISTMAS FERN. DAGGER FERN. Figs. 3119, 3120. Lvs. growing in dense crowns, with stalks 6–8 in. high, the pinnæ linear-lanceolate, somewhat falcate, and serrulate with appressed teeth; spore-bearing pinnæ contracted, with confluent sori. E. U. S.—One of our commonest species. The common name is due to the evergreen character of the lvs. which are picked by the thousand and sold in bales to florists.

3. **munìtum,** Kaulf. (*Aspídium munìtum*, Kaulf.). Stalks 4–12 in. long, chaffy at base or throughout; pinnæ long, linear-acuminate, serrate or doubly serrate; sori in a single row midway from midrib to margin. Utah northward and westward.

4. **lepidocaùlon,** Hook. Stipes densely clothed with large, heart-shaped scales: lf.-blades short, with 12–15 pairs of pinnæ, unequal-sided, scarcely toothed; sori usually in two rows. Japan.

3119. Christmas fern.—Polystichum acrostichoides.

AA. *Lvs. with auricles of pinnæ forming distinct lfts.*

5. **vivíparum,** Fée. Lf.-blades 12–18 in. long, 4–6 in. wide, with numerous lanceolate pinnæ; lower basal margin obliquely truncate; sori in 2 or 4 rows. W. Indies.

AAA. *Lvs. bipinnate in the lower two-thirds.*

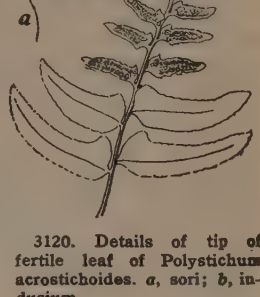
B. *Pinnules auricled.*

6. **aculeàtum,** Roth (*Aspídium aculeàtum*, Swartz). Lf.-blades 2 ft. or more long, 6–8 in. wide; pinnules twice as long as wide, with very conspicuous basal auricles. Eu. and Calif. Hardy.—*P. proliferum*, Hort., is an Australian form producing buds on the lvs. A large number of varieties are grown and offered for sale by English florists, but they are not of a sort to be of value in American trade.

7. **Tsus-sinénse,** J. Smith (the name is often incorrectly spelled *tensemense* in the trade). Fig. 3121. Lvs. commonly 6 in. long, 2–3 in. wide, the petioles slender, dark, the lvs. dark green.—Somewhat like *P. aculeatum* but well distinguished both in size and general appearance. This is one of the ferns commonly used for fern-dishes.

8. **angulàre,** Willd. Lf.-blades 1–2 ft. long, rather narrowly lanceolate; pinnules nearly triangular, two-thirds as broad as long, more or less incised. Eu.—Another favorite with English growers who offer many varieties. Hardy. See *P. aculeatum* above.

9. **Braùnii,** Lawson. Lf.-blades 18–24 in. long, narrowly elliptic-lanceolate; pinnules 7–10 pairs to each pinna, broad, the upper basal edge parallel with the rachis. Europe and mountain regions of eastern America.—Sometimes considered a variety of *P. aculeatum*.



3120. Details of tip of fertile leaf of Polystichum acrostichoides. *a*, sori; *b*, indusium.

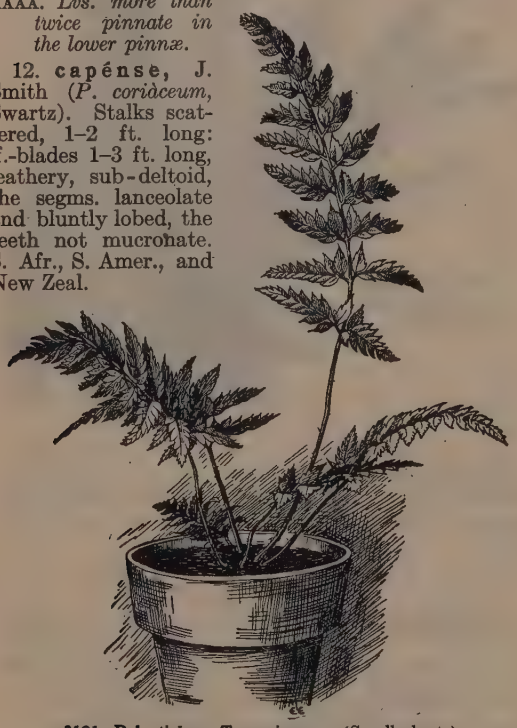
BB. *Pinnules scarcely auricled.*

10. **Richárdii,** Hook. Lf.-blades 9–18 in. long, ovate-deltoid, with 12–15 pairs of pinnæ; pinnules deeply toothed, texture coriaceous. New Zeal.

11. **amábile,** Blume. Lf.-blades 1 ft. or more long, 6–9 in. wide, with a lanceolate terminal pinna and 3–6 pairs of lateral ones; pinnules sub-rhomboidal, the upper and outer portions sharply spinulose serrate. India, Japan, and E. Indies.

AAAA. *Lvs. more than twice pinnate in the lower pinnæ.*

12. **capénse,** J. Smith (*P. coriàceum,* Swartz). Stalks scattered, 1–2 ft. long: lf.-blades 1–3 ft. long, leathery, sub-deltoid, the segms. lanceolate and bluntly lobed, the teeth not mucronate. S. Afr., S. Amer., and New Zeal.



3121. Polystichum Tsus-sinense. (Small plant.)

13. **aristàtum,** Swartz. Stalks scattered, 12–18 in. long, scaly below: lf.-blades 1–2 ft. long, 9–12 in. wide, 3–4-pinnatifid, the lower pinnæ largest; texture firm, glossy; sori in 2 rows near the midrib. Japan to Ceylon and Austral.

14. **vàrium,** Presl. St. partly creeping: lvs. 1½–2 ft. long, 9–12 in. wide, narrowly triangular, 3-pinnate in lowest pinnæ, somewhat leathery. Japan, China.—Similar to *P. capense.*

L. M. Underwood.
R. C. Benedict.†

POMADÉRRIS (Greek, *lid* and *skin,* said to allude to the membranous covering of the capsule). *Rhamnàceæ.* Shrubs, more or less covered with hoary or ferruginous stellate tomentum. The Victorian hazel, *P. apetala,* is included here.

Leaves alternate: fls. numerous, in small cymes usually forming terminal or axillary corymbs or panicles; calyx-tube adnate to the ovary, limb 5-parted, deciduous or reflexed; petals 5 or wanting; stamens 5, the filaments elongated and often suddenly attenuate and inflexed at the top; ovary more or less inferior: caps. small, the upper portion protruding above the calyx-tube, 3-valved.—About 22 species confined to Austral., New Caledonia and New Zeal. Several species have been cult. in England at different times but *P. apetala* seems to be the one most commonly cult. Prop. by cuttings of half-ripened shoots.

apétala, Labill. Shrub or small tree, 6–15 ft. high, rarely more: lvs. 2–4 in. long, oblong-ovate, obtuse or subacute, irregularly crenulate: panicles 3–7 in. long, terminal and axillary; calyx-tube short, stellate-tomentose; petals wanting: caps. obtuse, sparsely stellate-tomentose. Austral. and New Zeal.—Cult. in Calif. for ornament. Von Mueller in his "Select Extra-Tropical Plants," says it is "a tree attaining a height occasionally of 60 ft., but mostly smaller. The foliage is devoured with avidity by pasture animals, often in preference to ordinary good feed."

P. vacciniifòlia, Reiss, an Australian species with ovate or nearly orbicular lvs., cream-colored fls. in ovoid terminal panicles and with broad petals, has been cult. in England. G.C. III. 35:339.

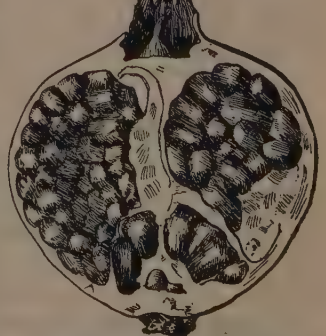
F. Tracy Hubbard.

POMEGRANATE is the vernacular of *Punica Granatum,* a small tree of southern Asia, grown both for ornament and for its edible fruit (Fig. 3122). See *Punica.* It is somewhat grown in the open in the southern states, and also as a pot- or tub-plant in greenhouses in the North.

The natural habit of the pomegranate is of rather bushy growth, but by careful training a tree 15 to 20 feet may be produced. This, however, seems possible only in the southern sections of the United States. A great many shoots spring from the base of the plant; these should be cut out, as it is contended that they withdraw the nutriment which should go to the fruit-bearing stems. The branches are slender, twiggy, nearly cylindrical, somewhat thorny. The leaves are lanceolate, long, narrow, glossy green and with red veins. The flowers have a red thick fleshy calyx, crowned with bright scarlet crumpled petals and numerous stamens. The fruit is globular, topped with a crown-like calyx, and the interior consists of numerous seeds enveloped in a bright crimson or pink-colored pulp, seeds being arranged in segments, separated by a thin skin, and very acid in the typical variety. A cooling acescent drink, known as granadine, is made from the pulpy seeds, with the addition of water and sugar. This is much used in the South, and in certain parts of Europe, and is especially grateful in fevers. This plant will succeed as far as the 35th degree of latitude north, but during extreme cold periods, the plants are sometimes injured by cold in that latitude. For higher latitudes it should be cultivated in tubs, and given a conservatory during winter. For some sections of the South it is used for hedges. The fruit begins to ripen about September and can be kept for several weeks.

The pomegranate is multiplied by hardwood cuttings planted in open ground during February, or by layers and also by softwood cuttings during summer. As the plant forms many shoots, these are often used, as they usually are provided with rootlets. In Florida, Georgia, Alabama, Louisiana, and some of the other southern states, pomegranates are grown commercially and are shipped to the northern and eastern markets. There is a growing demand for the fruit of the pomegranate.

The pomegranate is supposed to have been introduced into southern Europe by the Carthaginians, whose Latin name of "Punicus" was thus given and derived. A reference is also found in the sacred scriptures. Theophrastus described it 300 years before the Christian era, and Pliny considered it one of the most valuable fruits, both as to its beauty and medicinal properties. The bark of the



3122. Pomegranate, in lengthwise section. (×½)

root is a well-known astringent employed in therapeutics, in dysentery and diarrhea; the rind of the fruit, when boiled, has for many generations past been the remedy for tenia, and a jet-black smooth writing ink is also made of it.

The pomegranate is a native of some parts of Asia, and by some botanical authors is said to be found also in northern Africa and China. Although of such ancient origin and cultivation, there are but few varieties of the fruit-bearing section disseminated in this country and Europe, but, according to Firminger, several fine varieties have been grown in Bengal from seed brought from Cabul, one being seedless, another growing to the size of "an ordinary human head" and still another as large as a small shaddock.

Varieties grown for fruit.

Acid, or *Wild.*—With a sharp acid pulp: fruit often very large, from 3 to 4 inches diameter and with a bright-colored rind.

Dwarf.—A form of the Acid variety, of very low and bushy growth: flowers single: fruit from 1½–2 inches diameter; pulp very acid. This can be grown in a pot, as it fruits very abundantly.

Paper Shell.—Very large, juicy, very sweet, and of excellent quality; skin thin, pale yellow with crimson cheek; sides crimson: fine grower: good bearer and ships well.

Rhoda.—Fruit crimson, of large size; skin thin but tough; crisp, sweet, and of exquisite flavor.

Spanish Ruby, or *Purple-seeded.*—As cultivated in Louisiana, seems to be only a form of the Subacid. Fruit large and bright-colored with deep crimson pulp. It is considered the best of its class.

Subacid.—Differs only from the Sweet in the more acidulated pulp.

Sweet.—Fruit usually somewhat smaller than the Acid and with a darker-colored rind; pulp sweet.

Wonderful.—This is said to be the largest of all pomegranates: fruit sometimes 5 inches diameter, bright crimson; pulp highly colored; very juicy; fine flavor: ripens early: good shipper.

All these varieties are very ornamental from their abundant yield of bright scarlet flowers, which are produced upon the extremities of the young branches of the same year's growth. When the plant is grown in a tree form, the branches should be annually cut back after the leaves drop.

Varieties grown for ornament (non-fruiting).

Double Dwarf, or *Punica nana racemosa.*—Of dwarf growth, with bright scarlet double flowers, which are borne in clusters. This is especially desirable for growing in pots, as its flowers are abundant and lasting.

Double Red.—With a very large calyx, from which protrude numerous large bright scarlet petals, larger than those of the common single type. These are produced in abundance during summer and fall and resemble a bright scarlet pompon.

Double Variegated, or *Legrellei.*—A very handsome variety with very large flowers, the petals being striped and mottled with yellow and scarlet. Double red blooms will frequently be found on the same stem with variegated blooms. As this is a sport of the Double Red it frequently reverts.

Double Yellow.—Similar to the above in shape of flower, but latter are of a pale yellow color.

Double White.—Form of flower is similar to Double Red, but color is pure white. L. A. Berckmans.†

POMELO (contraction of *pomplemoose?*). A name sometimes used in the East Indies for pummelo and in the United States for the grapefruit. Inasmuch as there are very many different varieties of *Citrus grandis*, it seems best to retain pummelo in its common East Indian sense as a generic term for all of them and to apply to the special form grown in the West Indies and the United States its old name grapefruit. The use of pomelo (a mere variant of pummelo) for the grapefruit is likely to lead to confusion, especially as growers, shippers, dealers, and consumers all continue to use the name grapefruit. See *Pummelo.*

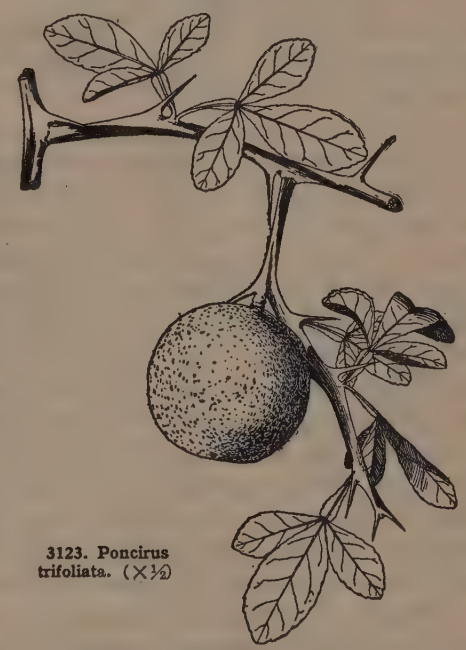
Walter T. Swingle.

POMOLOGY: *Fruit-growing*, page 1290.

POMPLEMOOSE (Dutch, *pomplemoes*, perhaps from Dutch *pompoen*, pumpkin, and old Javanese, *limoes*, a citrous fruit). A name sometimes used in East India instead of the more common pummelo for forms of *Citrus grandis.*

PONCÌRUS (French, *poncire*, a kind of citron). *Rutàceæ*, tribe *Citreæ.* Small spiny deciduous tree native to North China, extensively used as a stock for oranges, also grown for hedges and often for ornament in regions too cold to permit of the culture of citrous fruits.

This plant has been usually referred to Citrus, although DeCandolle, Rafinesque, Miquel, Penzig, Hance, Makino, and other botanists referred it to other genera. It differs from Citrus in having deciduous trifoliolate lvs.: fl.-buds formed in early summer and passing the winter protected by bud-scales: fls. borne on old wood in early spring and nearly sessile, with petals opening flat and narrowed to a claw-like base;



3123. Poncirus trifoliata. (×½)

stamens entirely free; ovary 6–8- (usually 7-) celled: fr. densely and finely pubescent, the pulp vesicles containing oily matter in drops and having hair-like appendages which secrete a viscous fluid, the ovary wall showing orange-colored cellular eruptions between the bases of the pulp vesicles; pith with transverse plates of thick-walled cells; stomata of the green twigs situated at the bottom of deep narrow pits; and seedlings with spirally arranged cataphylls, the lowest bract-like, the uppermost gradually merging into foliage-lvs. In view of these numerous differences, all of them of taxonomic importance, there can be no doubt of the validity of the genus Poncirus.

trifoliàta, Raf. (*Citrus trifoliàta*, Linn. *Citrus fúsca*, Lour. *Pseudægle sepiària*, Miq. *Pseudægle trifoliàta*,

Makino. *Æglè? sepiària*, DC. *Limònia? trichocárpa*, Hance. *Citrus triptera*, Carr.). Trifoliate Orange. Figs. 3123–3125. A small tree, spines long and stout: lvs. deciduous, trifoliolate, often borne in tufts on old wood (see Fig. 3123); terminal lfts. 1½–2½ in. long, lateral ones 1–2 in. long, sessile, petiole slightly winged: fls. 1½–2 in. across, white, the corolla opening nearly

3124. Flowers of Poncirus trifoliata. (×½)

flat, and the petals narrowed to a claw at base (Fig. 3124), stamens free, ovary 6–8- (generally 7-) celled: fr. very fragrant, dull lemon-colored, like a small orange in shape, but only 1½–2 in. diam., and covered with fine downy hairs, oil-glands of peel abundant, filled with a very disagreeably flavored oil, pulp scanty, very aromatic, seeds ovoid, plump, very numerous, leaving little space for pulp. Illus. Kaempf. Amoen. 801. B.M. 6513. G.C. III. 27:269. Penzig, Studi sugli Agrumi, Atlas, pls. 13, 14. U. S. Dept. Agric. Yearbook 1904, pl. X. U. S. Dept. Agric. B.P.I. Circ. No. 46, figs. 1–6, pl. 1. Comptes rendus 4 me Confer. Internat. Génét, p. 386.—The trifoliate orange has been known in N. China since ancient times, being repeatedly referred to in early works, and it was described and figured in the Chêng lei pen ts'ao, printed in 1108 A.D. It was early intro. into Japan and definitely referred to in the *Mannyô shû*, a Japanese MSS. work dating from the 8th century. Var. **monstròsa,** Swingle (*Citrus trifoliàta* var. *monstròsa*, T. Ito in Encyclopedia Japonica, 2:1056). Hiryô, or Flying Dragon. This is a curious, very dwarf variety with tortuous branches and curved spines. The lvs. are very small and inconspicuous as the lfts. are often reduced to mere filaments on which the oil-glands appear as node-like thickenings. This variety is esteemed in Japan for cult. as a dwarfed pot-plant. The writer introduced it from Japan into this country in 1915.

The hybrids between *Poncirus trifoliata* and the common orange are called citranges. A number of varieties, Rusk, Colman, Morton, and so on, are grown for home use in the cotton-belt, north of the limit of successful orange-culture. See *Citrange*. Promising hardy hybrids have been made at the Department of Agriculture under the writer's direction between *P. trifoliata* and a number of other species of citrous fruits, such as the sour orange, mandarin, grapefruit, lemon, lime, calamondin, kumquat (Fortunella sp.), and others. These are being tested in the field.

The principal use of the trifoliate orange is for stock upon which to graft the commonly cultivated citrous fruits. It is especially well adapted to rather rich somewhat moist, sandy loam soils, preferably with a clay subsoil, such as are common around the Gulf Coast. It is not at all adapted to light sandy soils, nor to strongly calcareous soils. Almost all kinds of citrous fruits grow readily on trifoliate stock but are dwarfed somewhat and usually forced into early bearing. The Satsuma orange as grown commercially in this country is practically limited to this stock as it does not grow at all on sour orange stock and succeeds only very imperfectly on sweet orange stock. Trifoliate stock is also very widely used in Japan. In the states south of the Potomac and Ohio rivers the trifoliate orange is sometimes used for hedges, for which purpose it is well adapted because of its dwarfed habit, strong thorns, handsome flowers, foliage, and fruits. Even in winter after the leaves have fallen its twigs remain green. It is very widely used for hedges in Japan. *P. trifoliata* is also of value as an ornamental tree for lawn planting, for which purpose care should be taken to secure large-flowered forms. It can be grown for this purpose as far north as Philadelphia. The trifoliate orange shows surprisingly little variation. Millions of seedlings are grown every year in the larger citrous nurseries of this country but it is rare to see any perceptible variation in the character of the leaves and twigs. The flowers, however, do show variation, often having a partial staminody of the petals (rarely complete) which makes them smaller and less handsome than the normal large flowers. The fruits are usually nearly spherical but rarely are somewhat elongate and papillate, much like a very small lemon.

Walter T. Swingle.

POND-APPLE: *Annona glabra.* **P. Lily:** *Nuphar.* **P.-weed:** *Potamogeton.*

PONGÀMIA (a native Malayan name). *Leguminòsæ.* A single arborescent or shrubby species of tropical Asia and Australia, little known in this country.

Leaves odd-pinnate; lfts. opposite: fls. racemed; calyx campanulate, nearly truncate; corolla much exserted; standard broad; keel obtuse, the petals cohering at the tip; stamens monadelphous, the upper filament free low down; anthers oblong, versatile; ovary subsessile, 2-ovuled; style incurved, glabrous; stigma capitate: pod flattened, oblong, indehiscent, not at all winged or thickened at the sutures. It is related

3125. Poncirus trifoliata.

to Piscidia but differs from it by having the pods short, compressed, smooth, and 1-seeded instead of elongated, winged, and several-seeded.

pinnàta, W. F. Wight (*Cytisus pinnàta,* Linn. *P. glàbra,* Vent. *Póngam pinnàta,* Wight. *Galedùpa indica,* Lam.). A tall erect tree or climber, with glabrous branches and lvs.: lfts. 5–7, opposite, subcoriaceous, oblong or ovate, pointed, stalked, 2–4 in. long: fls. in a simple peduncled axillary raceme, nearly as long as the lvs.; pedicels 2–4 joined together, ¼–⅓in. long, with a pair of minute bractlets in the middle; corolla ½in. long, standard silky on the back: pod woody, glabrous, ⅛–¼in. thick, 1½ in. long, with a short decurved point. Intro. into U. S. in 1910.—Suitable as an ornamental in the southern states. The ash of the wood is used for dyeing. The seed yields a thick red-brown oil used for illuminating and medicinal purposes. The foliage is bright and very handsome. The tree sometimes reaches a height of 40 ft. Grown in S. Calif.

P. L. Ricker.

PONTEDÈRIA (G. Pontedera was an Italian botanist, 1688–1757). *Pontederiàceæ.* Perennial herbs of bogs and ponds with strong horizontal rootstocks, frequently used in water-gardens, and for naturalizing in wet places.

Leaves long-petioled, root-lvs. with a sheathing stipule within the petiole: infl. a 1-lvd. st. bearing a spike of violet-blue ephemeral fls.; perianth funnel-form, 2-lipped, the 3 upper segms. united to form the 3-lobed upper lip, the 3 lower spreading and clawed; stamens 6; ovary 3-celled, 2 of the cells empty.—Two or 3 species from N. and S. Amer.

Pontederias are well worth cultivation in bog-gardens and shallow ponds, and *P. cordata* is offered by dealers in native plants. It thrives best in water 10 to 12 inches deep. It transplants with ease. Propagated mostly by division. It grows as far north as Nova Scotia and Minnesota, and therefore is perfectly hardy in all parts of the country.

cordàta, Linn. Pickerel-Weed. Growing in clumps: lvs. heart-shaped, blunt, from a spathe-like bract: upper lobe of perianth marked with a pair of yellow spots (rarely all white); calyx-tube in fr. crested with 6-toothed ridges. Nova Scotia to Ont., Minn., and Texas. B.M. 1156. Mn. 7:1. V. 2:196; 3:336. G.C. III. 52:466. Var. **lancifòlia,** Morong (*P. lancifòlia,* Muhl. *P. lanceolàta,* Nutt.), differs from the type in having lanceolate lvs. N. Amer. B.M. 8108.

For *P. crássipes,* Mart., see Eichhornia crassipes, Vol. II, p. 1105. —*P. montevidénsis,* Hort., has appeared in the foreign journals but its botanical characters are unknown. G.W. 3, p. 619.

F. Tracy Hubbard.

PONTHIÈVA (named in honor of M. de Ponthieu). *Orchidàceæ.* Terrestrial, glabrous or pilose herbs which are not in common cultivation, though sometimes grown in gardens.

Roots fascicled in a short rhizome: lvs. subradical, ovate or lanceolate, membranaceous, more or less petioled: infl. a lax raceme borne on a simple elongated scape; the pedicels often glandular-pubescent: fls. medium-sized; sepals free, spreading; petals adnate to the column, narrower than the sepals; labellum adnate to the base of the column by a claw, ascending, with the lateral lobes winged; column short or rather long, terete, apex broadened: caps. oblong, erect, beakless. —About 30 species, Trop. and Subtrop. Amer.

glandulòsa, R. Br. Plants 1–1½ ft. high, with lanceolate-elliptical, pointed and short-petioled lvs. which are 3–5 in. long: raceme 3–6 in. long; fls. green or greenish brown; outer sepal ovate-oblong, lateral ones flat; petals half-cordate-deltoid; labellum abruptly dilated above the claw, roundish with a terminal, linear appendage. W. Indies and S. Amer. B.M. 842 (as *Neottia glandulosa*).—Formerly offered by a dealer in native plants. Probably not hardy N. F. Tracy Hubbard.

POPCORN: *Corn.*

POPLAR: *Populus.* **P., Yellow:** *Liriodendron.*

POPPY: *Papaver.* **California P.:** *Eschscholtzia.* **Celandine P.:** *Stylophorum.* **Corn P.:** *Papaver Rhœas.* **Horned P.:** *Glaucium.* **Opium P.:** *Papaver somniferum.* **Prickly P.:** *Argemone.* **Shirley P.:** an improved strain of *Papaver Rhœas.* **Tulip P.:** *Hunnemannia.* **Welsh P.:** *Meconopsis cambrica.*

PÓPULUS (ancient Latin name, of disputed origin). *Salicàceæ.* Poplar. Aspen. Cottonwood. Soft-wooded trees of rapid growth, some kinds of which are much planted on roadsides and in grounds, particularly when quick results are desired.

The poplars are dicœcious, with both staminate and pistillate flowers naked but from a cup-shaped disk, and in slender mostly drooping precocious catkins in which the subtending scales are toothed, cut or cleft at the apex: stamens few or many, usually numerous, on distinct filaments: pistillate fls. with mostly a single 1-loculed mostly sessile ovary with short style and 2–4 often lobed long stigmas: fr. a small 2–4-valved caps., containing cottony seeds, the mature catkin sometimes with a necklace-like or moniliform character: lvs. alternate, stalked, mostly broad: buds scaly, often resinous.—Species probably about 35–40, in the northern hemisphere, mostly extra-tropical, although very many more than this have been described, some of them being hybrids. The poplar of lumbermen is the tulip tree. (See *Liriodendron.*)

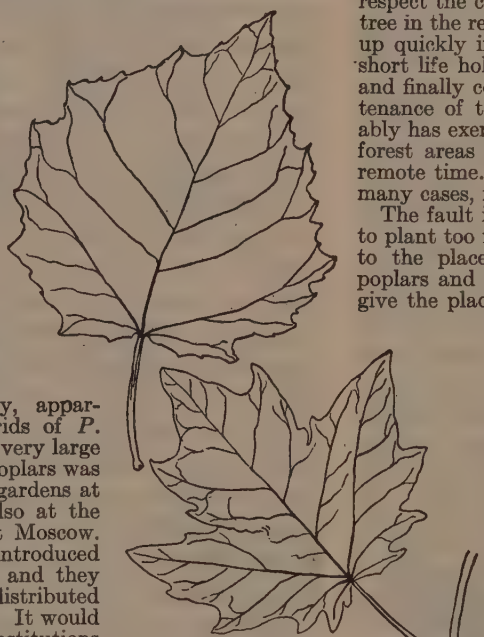
Botanically the poplars comprise a most bewildering group, and there is wide divergence of opinion and practice as to the limits and names of species. Many of the cultivated forms are assumed to be hybrids, but the origin of most of them, so far as parentage is concerned, can be little more than conjectured. It is likely that seedlings of some of these hybrids break up into forms much resembling the parents, and thereby still further contribute to the bewilderment. The trees being dicœcious, the herbarium specimens may not represent both sexes; as the catkins appear in advance of the foliage, the specimens may not represent the same plant or type; the foliage is very various, sometimes even on the same tree, and specimens are likely to be taken from the lower part of large trees where the leaves are small or from the terminal shoots of young trees on which the leaves are large and have a different character. Of some kinds only one sex is known. The habit of growth is also very characteristic even in species or forms on which the foliage is very similar, but this character is of course not represented in botanical specimens. It will be seen, therefore, that the usual herbarium collection may not have full value in the determination of species. There is naturally a tendency to place great stress on leaf-forms in the description of species, even though in some groups practically the whole range of forms may be found on single trees. These difficulties are particularly marked in this country in the *P. deltoides-angulata* group.

With regard to the variability of the leaves of Populus, Schneider writes in "Plantæ Wilsonianæ," "it is helpful to keep the following in mind. L. A. Dode was the first who clearly described the variation of the leaves according to the age of the plants, the position of the branches, and the climatic and other conditions under which they were produced. . . . I think it sufficient if we distinguish three different kinds of leaves: (1) the leaves of the offshoots or suckers (folia turionum radicalium); (2) the leaves of the normal but not the vigorous shoots of the young plants (folia ramorum [sed non turionum] plantæ juvenilis); and (3) the leaves of the old trees (folia arboris adultæ fructiferæ). The leaves of the third kind we usually find at the ends of vigorous branches of young plants when they are growing well and becoming mature. If we compare leaves of different species it is necessary to be very careful only to compare the same kinds of leaves."

What has been said about the dependence on leaf-characters in descriptions applies also to the horticultural description; it is much needed that the cultivated poplars shall be studied with the purpose to correlate the characters of habit, leaves, buds, twigs, bark, flowers, and fruit.

Probably some of the difficulty in distinguishing native species of Populus is due to the fact that we have not recognized the presence of European or other hybrids in this country. It is not unlikely that some of these forms appear even in places remote from habitations, as do the introduced tree willows, and that they have been confused with the native kinds.

There appear to be few important growing collections of poplars in this country, nor have the important cultivated examples in different parts been looked up and studied. Many of the European nursery forms have been introduced here and there; but for ornamental planting practically only two kinds are much called for, the Lombardy and the so-called Carolina, with "Russian poplars" and "Norway poplars" in the prairie and plains country. This is a pity, seeing that some of the forms are most interesting in habit and foliage, and in the red coloring of petioles and midribs, combined with other good features. The hybrid poplars have not been given sufficient attention in North America. Some of the first-generation hybrids are remarkably vigorous. The Russian poplars are undoubtedly of several kinds, mostly, apparently, forms or hybrids of *P. balsamifera* allies. A very large collection of Asiatic poplars was made at the botanic gardens at St. Petersburg and also at the agricultural college at Moscow. The late J. L. Budd introduced many of these forms and they have become widely distributed in the prairie regions. It would not be strange if substitutions had been made in the course of time.



3126. Populus canescens above, and P. alba var. pyramidalis (P. Bolleana). (×½)

The Norway poplar of the interior region is very like *P. Sargentii* in foliage, but it holds its leaves three weeks later in autumn than the native cottonwood and the central trunk does not break up so quickly, thereby making a better timber tree; it is a very rapid grower. It has proved to be a very valuable tree for Minnesota and the Dakotas and other parts, and is hardy in Manitoba. On account of its very rapid growth and the straight strong trunk, it has been called the "Sudden Sawlog poplar." It appears to have been introduced into North America from Russia by Budd, and is said to have been discovered on the eastern slope of the Altai Mountains. It was disseminated in part in this country by Norwegian settlers and thereby got the name of Norway poplar. Its botanical position or name is undetermined.

Poplars of various kinds are considerably planted on the prairies and plains and form characteristic features on the landscape. Many of them withstand the trying climatic conditions and also grow very rapidly. The many kinds of cultivated poplars, which have been largely introduced or tried in these regions, stretching into Canada, need careful study by the systematist. They are particularly numerous in the tacamahac or balsam-poplar group and are not well understood. In the irrigated regions of the Rocky Mountain country, the Lombardy poplar has long been a familiar object along ditches and thoroughfares.

The poplars are amongst the easiest of all trees to propagate and to grow. They come readily from hardwood cuttings, as do willows and currants. The weeping varieties are grafted head-high on erect kinds, *P. grandidentata* or its derivatives apparently being used as a stock. Poplars thrive in almost any soil, although the cottonwood is most at home in lowlands and along streams, at least in the East. For shelter-belts they are very useful because of rapid growth and great hardiness. In Europe, where fagots and other similar materials are desired, poplars are often headed-back severely or pollarded, but this practice is very little known in North America. The poplars are also useful for temporary shelter for other trees and bushes. In this respect the common aspen (*P. tremuloides*) is a valuable tree in the reforestation of American lands. It springs up quickly in clearings, and during its comparatively short life holds the soil and protects other vegetation and finally contributes its own substance to the maintenance of the stronger forests. In this way it probably has exerted an effect upon the configuration of our forest areas and upon the fertility of the land from remote time. The same qualities make it valuable, in many cases, in extensive ornamental plantings.

The fault in the planting of poplars is the tendency to plant too many and to allow them to give character to the place. About summer resorts, for example, poplars and willows are used much too freely. They give the place a look of cheapness and temporariness. They are planted in such places because they grow rapidly and thrive in unfavorable conditions; but it is better to use them for temporary effects, allowing better trees, that are planted with them, gradually to take their places. The legitimate common use of poplars in ornamental grounds is the production of minor or secondary effects. As a rule, they are less adapted to isolated planting as specimen trees than to use in composition,—as parts of general groups of trees,—where their characters will serve to break the monotony of heavier foliage. The poplars are "gay" trees, as a rule, especially those, like the aspens, that have a trembling foliage. Their leaves are bright and the tops thin. A few of them in judicious positions give a place a sprightly air. This is particularly true of the common aspen, *P. tremuloides*, of the woods. Its light twinkling foliage and silver-gray limbs are always cheering and its autumn color is one of the purest golden yellows of our landscapes. It is well to have a tree of it standing in front of a group of maples or evergreens. Its whole expression is then one of familiarity.

On the other hand, the poplars have their interest as specimen trees as distinctly as do other kinds of trees, but one seldom sees well-grown mature examples. The age characters of some kinds of poplars, both in structure and in bark, are as interesting as are those of maples and oaks or other trees. Of many of the planted poplars, old specimens are practically unknown to the public.

The cottonwood (*P. deltoides*) is one of the best poplars for permanent planting. It makes a noble tree, of durable and substantial appearance. But like the aspen, it is cheerful and restive. One is not moved to lie under it, as one is under a maple or an oak. Its leaves

rustle with the lightest movement of air. The ripple of its foliage recalls the play of wavelets on a pebbly shore. The day is never so dark but the cottonwood reflects a flood of light. One should take care, however, to plant only the staminate tree, for the "cotton" of the seeds is very disagreeable on lawns and about dwellings when carried by the wind. In the plains and mountain states, the western cottonwood (*P. Sargentii*) is a characteristic tree.

Some of the forms of the black poplar of Europe are especially satisfactory for the production of lively effects in planting. Of these, one of the most distinct is the form known to nurserymen as *Populus elegans*. It has a most pleasing light and tremulous foliage, the effect of which is heightened by a twiggy character of growth and a reddish cast to the leaf-stalks and young shoots. It is an elegant tree, and well adapted to planting in front of heavier foliage in the most conspicuous part of the grounds.

Some of the silver- or white-leaved poplars produce the most striking contrasts of foliage, especially if set near darker trees. Bolles' poplar (*Populus Bolleana* of the nurseries) is one of the best of these trees. Its habit is something like that of the Lombardy. The upper surface of the deeply lobed leaves is dark dull green, while the under surface is almost snowy white. Such emphatic trees as this should usually be partially obscured by planting them amongst other trees so that they appear to mix with the other foliage, or else they should be seen at some distance. Other varieties

3127. Populus tremula. (×⅙)

of the common white poplar or abele are frequently useful, although most of them sprout badly and may become a nuisance. The Lombardy poplar (*P. nigra* var. *italica*) is probably the most striking and distinct tree that is suited to planting in the North. As single specimens scattered here and there in mixed plantings, or when seen over or behind buildings, it may be most picturesque and satisfactory; but the tendency is to plant it too freely. The very fact that it is emphatic is the reason why it should be planted sparingly when artistic effects are desired.

The catkins of poplars, particularly the staminate ones, are usually attractive, as they appear in early spring; but they are of short duration. Fig. 3130.

The following sketch includes all the poplars known to be offered by American nurserymen or to be subjects of rather general planting, together with exotic forms that are likely to appear in this country. For literature, see Wesmael, DC. Prodr. 16, pt. 2, pp. 323–31; Sargent, Silva of North America, vol. 9 (quoted below as S.S.). A very recent careful treatment of the poplars appears in Volume VII of Elwes & Henry, "Trees of Great Britain and Ireland;" from this work some of the following characterization is drawn. Subsequently, the black poplars (*P. nigra-deltoides* group) have been worked over by Henry in Transactions of the Royal Scottish Arboricultural Society, 30, pt. 1. Discussions of the genus of recent date will be found in C. K. Schneider, "Handbuch der Laubholzkunde" (1906) and Dode in Mémoires Société d' Histoire Naturelle d'Autun (1905). For an account of the new and old Chinese species, see Schneider in "Plantæ Wilsonianæ," Vol. III.

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For the purposes of this popular treatment, the species of Populus may be thrown into six groups:

I. The white poplars; Nos. 1–3.

II. The aspens; Nos. 4–7.

III. The black poplars and cottonwoods; Nos. 8–14.

IV. The large-leaved poplars and cottonwoods; Nos. 15, 16.

V. The balsam poplars and tacamahacs; Nos. 17–28.

VI. The variable-leaved poplars; No. 29.

I. White Poplars. *Lvs. mostly strongly angled or lobed and broader than ovate in shape, the mature lvs. on the long or verdurous shoots usually white-tomentose or gray-canescent beneath (at least in the cult. forms), lvs. on the short or small shoots often becoming glabrous or nearly so and often of different shape from those on the strong-growing shoots; petiole usually cylindrical: terminal buds relatively small and not glutinous.*

1. **álba,** Linn. (*P. tríloba* and *P. Morisetiàna*, Dode). White Poplar. Abele. Large much-branched tree, with whitish bark on the young branches becoming dark-colored and rough on the mature parts: lvs. much like those of *P. grandidentata* in form, but smaller, usually thicker and more angular, the under surface—especially early in the season—woolly white, in shape from broadly ovate to orbicular, irregularly short-lobed or sinuate, short-truncate or somewhat cordate at base: catkins short (mostly about 2 in. long, the males longer), sessile, with thin dentate or erose scales; stamens 6–10; stigma linear-lobed. Eu. and

Asia.—The typical form of *P. alba* is less grown here than the varieties with lobed and very white-bottomed (and sometimes variegated) lvs. In old places and yards it is sometimes found, but var. *nivea* and in newer grounds var. *pyramidalis* are more frequent. Var. **globòsa,** Spaeth. Dense small tree or shrub, oval in outline of head: lvs. small, deltoid-cordate, slightly lobed, gray beneath and pinkish when young. Of horticultural origin. Var. **péndula,** Loud. Branchlets drooping. Var. **Richârdii,** Hort. Lvs. yellow on upper surface.

Var. **nívea,** Wesm. (*P. nívea,* Willd. *P. argéntea,* Hort. *P. arembergiàna,* Hort.). This is the commonest form of white poplar in this country. It is known by the

3128. Populus tremula var. psendograndidentata. (×¼)

snow-white under surfaces of its foliage and the 3- or 5-lobed maple-like lvs. It is far too frequent about old yards, where its inveterate brood of suckers make it a perpetual nuisance. It is sometimes called "silver maple," from the resemblance of its foliage to that of the maple. As a street tree in cities it is particularly offensive, for the cottony covering of the under side of the leaves and of the shoots holds soot and dust, and it looks repulsively dirty. Useful for foliage effects in large plantings.

Var. **subintegérrima,** Lange (*P. subintegérrima,* Dode. *P. monticola,* Brandegee. *P. Brándegeei,* Schneid.). Lvs. coriaceous, those on the long shoots ovate or orbicular, somewhat cordate or cuneate at base, nearly entire to somewhat toothed, white underneath; those on short shoots nearly circular, entire or slightly sinuate, gray underneath. Spain, N. Afr. Early intro. into Mex. and apparently naturalized in Low. Calif. G.F. 4:330; 6:190; 7:313 (descs.).

Var. **pyramidàlis,** Bunge (*P. Bolleàna,* Carr. *P. álba* var. *Bolleàna,* Lauche). Bolle's Poplar. Fig. 3126. A very tall narrow-topped tree, with cottony lvs. rather more deeply lobed (palmately 3–5-lobed) than those of var. *nivea,* those on the short shoots circular, coarsely triangular-toothed. The tree was intro. into Eu. from Asia in 1872 from Turkestan, and it was named for Dr. C. Bolle, an arboriculturist. It bears about the same relation to *P. alba* that the Lombardy poplar bears to *P. nigra.* Its fastigiate habit, combined with the white foliage and shoots, makes it a most emphatic tree, and there is great danger of planting it too freely. It is said to be much attacked by borers.

2. **canéscens,** Smith (*P. álba* var. *canéscens,* Ait. *P. megaleùce,* Dode. *P. hýbrida,* Reichb. *P. Steiniàna,* Bornm.). Gray Poplar. Fig. 3126. Lvs. broad or nearly circular in general outline, prominently notched but not lobed, the under surfaces and the young shoots very gray-woolly, those on young or long shoots ovate-deltoid, cordate and acute, grayish tomentose beneath, the margin few-toothed and ciliate; those on short shoots nearly circular or broad-ovate, subcordate and obtuse, not ciliate, the lower surface light green. Var. **péndula,** Hort., is a fine form with pendulous branches. This tree is met with occasionally. Its horticultural value is not greatly different from that of *P. alba* var. *nivea.* According to Elwes & Henry, *P. Bogueana,* Dode, is a vigorous form of this species in which the lvs. on long shoots are 5 in. or more in length and breadth; appears to be sold by some nurserymen abroad as *P. tomentosa.* Forms of this species are probably hybrids with *P. tremula.* Eu.

3. **tomentòsa,** Carr. (*P. álba* var. *tomentòsa,* Wesm. *P. álba* var. *denudàta,* Maxim. *P. pekinénsis,* L. Henry. *P. glabràta,* Dode). White Poplar of China. Large tree, similar to *P. alba:* lvs. thick, on long shoots of mature trees large (4–6 in. long), triangular-ovate, not lobed, the broad base truncate or subcordate, acuminate, margin sparingly sinuate-toothed, shining dark green above and glabrescent beneath; on short shoots small, ovate or triangular, cuneate, sinuate-toothed, glabrous beneath; on vigorous shoots white-tomentose beneath. N. China, where it makes a large tree, and is planted in temple gardens; the restless lvs. suggest the sound of falling rain. R.H. 1903, p. 355.—Hardy in Mass., but is said not to prop. from cuttings.

II. Aspens. *Lvs. not lobed, broader-based than ovate-form; mature lvs. green or at least not white-tomentose, glabrous or nearly so beneath, those on strong-growing and short shoots not prominently different; petiole usually distinctly flattened: terminal buds not large or glutinous: trees of small or intermediate stature, usually with trembling foliage.*

4. **trémula,** Linn. European Aspen. Fig. 3127. Open-headed light-lvd. tree, becoming 50–60 ft. tall, but mostly small and of relatively slow growth, producing suckers: lvs. small and thin, round-oval, more or less whitened beneath when young, bordered with deep and rounded incurved teeth; lf.-stalks long, slender and flattened, giving a restless motion to the foliage: lf.-buds small: catkins small, with hairy scales and stigma deeply divided; stamens usually 6–8. Widely distributed in Eu. and Asia, in this country known chiefly in its grafted weeping form (var. **péndula,** Hort.). The eastern Asiatic and Chinese form is made var. *Davidiàna* by Schneider: always a slender tree, rarely exceeding about 60 ft.: young lvs. reddish purple and handsome as they unfold: suckers freely: there is a pubescent form of this variety.—The drooping form of the European aspen is perhaps the best weeping tree amongst the poplars. The spray is light, airy, and fountain-like, quite unlike the more common weeping forms of the native *P. grandidentata,* which present a stiff angular form, a combination that is rarely pleasing. A characteristic feature of this tree is the profusion of its very long catkins that appear in earliest spring, even before our native poplars are in bloom. The staminate or male catkins are particularly pleasing, and planters should choose that sex, if possible. Var. **pyramidàlis,** Hort., is a slender pyramidal form. Var. **Frèynii,** Herv. Lvs. rhombic in outline, cuneate at base, ciliate, pubescent beneath when young. France, Germany. Var. **villòsa,** Wesm. Hairy on young growths. Var. **pseudograndidentàta,** Aschers. & Graebn., see description under No. 5. **P. adenópoda,**

3129. Populus tremuloides. (×½)

Maxim. (*P. trémula* var. *adenópoda*, Burkill *P. Silvéstrii*, Pampan.), is a recent Cent. Chinese species (allied to *P. tremula*) not in the trade: lvs. long-stalked, broad-ovate, long-acuminate, serrate, soft-pubescent at least on young trees, those on old mature trees closely crenate, greenish beneath. It is growing at the Arnold Arboretum and in the Rochester parks, where it is doing well.

5. **grandidentàta,** Michx. Large-toothed Aspen. Tall straight tree, becoming 75 ft. high, with brittle wood and dull gray bark which with age is marked by plates but scarcely by ridges: lvs. roundish ovate, at the apex blunt or gradually narrowed and acute, with large irregular sinuate teeth, white-woolly when young but becoming glabrous: catkin-scales 5–6-divided: fr. slender, long-pedicelled. Distinguished from *P. tremula* by much larger and thicker lvs., which are bluish or rusty white beneath, more ovate in outline, with larger and more spreading teeth, stouter lf.-stalks and larger lf.-buds. Nova Scotia to Minn., Tenn., and N. C. S.S. 9:488.—The lf.-form is variable and botanical varieties have been made from them. In its normal or erect form it is rarely cult., but the weeping kinds, under a variety of names, are frequently seen. Most, and perhaps all, of these varieties originated in Eu., where the tree, like the cottonwood and the common aspen, were early intro. The winter twigs of the weeping varieties have a characteristic weak or zigzag growth. These weeping forms are very likely hybrids, sometimes distinguished as *P. tremula* var. *pseudograndidentàta*, Aschers. & Graebn. (*P. pseudograndidentàta*, Dode). Fig. 3128. Buds at maturity short, thick and somewhat viscid: lvs. much like those of *P. tremula* but larger, 3–4 in. diam., thicker, the margin with cartilaginous edge at maturity. The forms known as *P. græca pendula* and Parasol de St. Julien are by some referred to *P. tremuloides*, but these names have been applied in this country at least to plants of the above series. The *P. græca* of authors is confused. *P. grandidentata* is a common tree in the E. U. S., growing under a variety of conditions, as on dryish banks and slopes and near swamps and streams.

6. **tremuloìdes,** Michx. American Aspen. Fig. 3129. Small weak tree, abundant northward and springing up in clearings: lvs. small, roundish ovate with a slightly tapering or a truncate or sometimes even a semi-cordate base, abruptly contracted to a short usually apiculate point, finely crenate-serrate, downy when young but becoming smooth on both surfaces, the petioles long and slender so that the foliage twinkles in the slightest breeze: catkins drooping, with silky deeply 3–5-cleft scales or bracts, the pistillate becoming 3–4 in. long: caps. oblong-conical, not hairy or pubescent: the species is very like *P. tremula*, but the lvs. are usually less circular and more abruptly acuminate, the margins are small-crenate rather than deeply toothed, and the lvs. are green on the under side. Generally distributed in N. Amer., north of Pa., and Ky., and extending to Mex. in the mountains. S.S. 9:487.—The bark of the young trees is whitish gray, rendering the saplings very conspicuous in a coppice. In woods the tree is said sometimes to reach a height of 100 ft., but it is usually much smaller than this. The far western form has been separated as var. *aùrea*, Daniels (*P. aùrea*, Tidest.). Several lf.-varieties have been described. Var. **péndula,** Schneid., is a drooping or weeping form. **P. cercidiphýlla,** Brit., is a form or a closely related species in Wyoming with small entire or undulate lvs. which bear a peculiar concave gland on the blade on either side of the petiole attachment. *P. atheniénsis* is an old name said to have been given from a N. American Athens, and as it is a very early name it is used by Koch in place of *P. tremuloides*. The *P. græca*, of some authors perhaps applies to this species through some error; see No. 5. The name *P. græca* appears to have originated with Aiton, who apparently gave the name because he found it cult. as the "Athenian poplar;" it is probably the same as *P. atheniensis*, Ludw.

3131. Populus Sieboldii. (×⅓)

7. **Sièboldii,** Miq. Fig. 3131. Tree, 20–30 ft., of spreading habit, suckering freely, with rather dark and heavy foliage: lvs. large, round-ovate, with a short triangular subacute apex, at the base truncate or gradually narrowed into a short petiole, dentate-serrate, with shallow glandular-incurved teeth, more or less whitened beneath. Japan; the wood used for matches and the tree less abundant than formerly.—Hardy in W. N. Y. Said by Wilson to be a tree of medium size in Japan, very like *P. tremula* in general appearance, and suckers freely. **P. rotundifòlia,** Griff. (*P. microcárpa*, Hook. f.), is very similar, but the lvs. of old branches are more or less cordate at base: lvs. 3–4 in. across, long-petioled, orbicular, sinuate: fruiting catkins 3–5 in. long and very slender, with a tomentose rachis: caps. only ⅛in. long, with a very short pedicel. Himalaya region; probably not in cult. in this country. *P. rotundifolia* var. *Ducloux*iàna, Gombocz. (*P. Ducloux*iàna, Dode. *P. macranthèla*, Lev.), of S. W. China, has still longer fruiting catkins (6–10 in. long) and longer-pedicelled caps.

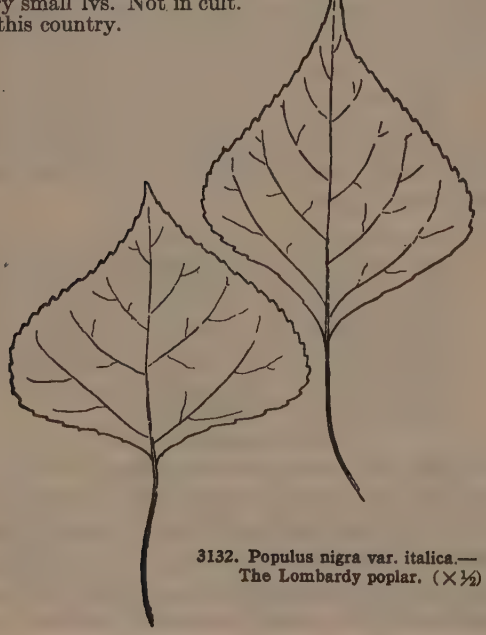
III. Black Poplars and Cottonwoods. *Lvs. not lobed, mostly wider and broader-based than ovate in form; mature lvs. hard or firm in texture, green on both surfaces, mostly with a clearly marked translucent or hyaline edge (which may appear as a thin indurated line in the dried specimen); petiole commonly flattened, at least toward the blade: terminal buds medium-large and more or less viscid, but not markedly odorous: mostly large trees.*

A. *Lf.-margins not ciliate.*

8. **nìgra,** Linn. Black Poplar. Tree of medium to large size, with smooth twigs and lvs. somewhat resembling those of the cottonwood, but generally smaller and much less deeply toothed, longer in proportion to their width and often with a tapering or rounded base, with no cilia or hairs on margin and no basal glands; lf.-stalk much flattened, so that the foliage moves freely in the wind: stamens 12–25; stigmas and

3130. Staminate catkins of an aspen. (×⅓)

placentæ 2. Eu., Siberia.—The tree usually has a pyramidal habit of growth and a dark cast to the foliage. It is a less lustrous tree than the cottonwood and grows more slowly. Var. **betulifòlia,** Torr. (*P. betulifòlia,* Pursh. *P. hudsónica,* Michx. *P. nìgra* var. *hudsónica,* Schneid.), has the young growth and the petioles downy. B.M. 8298. Specimens of this plant were found along the Hudson by Michaux, who thought it an American species and published it early in the century as *Populus hudsonica.* Pursh, in 1814, published it again as the "birch-leaved poplar," *Populus betulifolia,* from trees found near Lake Ontario. Although it was found half wild in N. Y. about a century ago, it does not appear to have increased itself in Amer., and the variety is probably of European origin. *P. nigra* is rarely seen, even in cult. grounds. It is sometimes spontaneous in the E. Variable in cult. and grown in European collections under a variety of names. With the exception of var. *italica,* these forms are little known in this country. *P. vistulénsis,* Dode, is a form of moderately strong growth; branches spreading: lvs. rhomboidal, dark green. The two main forms or types of the black poplar are the glabrous or smooth (var. *typica,* Schneid.), S. Eu., and the pubescent (var. *betulifolia*). The English or downy black poplar makes a wide-spreading attractive large tree, and forms great burs on its trunk. Var. **élegans,** Bailey (*P. élegans* of nurserymen, and probably some one of the well-known European forms), is a tree of pronounced strict or pyramidal habit, but considerably broader than the Lombardy poplar, with thinly pubescent twigs and petioles: foliage small and light-colored and very versatile in a breeze, with a handsome reddish tint to the lf.-stalks and young shoots. It is worth growing in every well-kept place, especially if placed against a planting of heavier foliage. *Populus canescens* of some American nurserymen (not of botanists) is very like this, although it has less color and brightness. *P. charkowiénsis,* Schroed., is probably a hybrid in this group, by some supposed to be Lombardy poplar×*P. nigra;* apparently allied to *P. Eugenei.* Var. **Viàdri,** Aschers. & Graebn. Tree narrow-pyramidal with ascending branches: lvs. like those of *P. nigra* but more cuspidate. **P. afghánica,** Schneid. (*P. nìgra* var. *afghánica,* Aitch. & Hemsl.), of Afghanistan, has exceedingly slender branches and very small lvs. Not in cult. in this country.



3132. Populus nigra var. italica.—The Lombardy poplar. (×⅓)

Var. **itálica,** Du Roi (var. *pyramidàlis,* Spach. *P. itálica,* Moench. *P. dilatàta,* Ait. *P. fastigiàta,* Poir. *P. pyramidàlis,* Borkh. *P. pyramidàta,* Moench. *P. sinénsis,* Dode). Lombardy or Italian Poplar. Figs. 3132, 3133. Differs from the typical black poplar (*P. nigra*) in its tall narrow growth, glabrous young shoots, a confirmed habit of suckering from the root and generally a more tapering base to the lvs.: buds small: lower branches of the head taking a strong upward direction so that it has no hanging or drooping spray; holds its green foliage late in autumn. It is a staminate sport from *P. nigra* var. *typica,* originating in the plains of Lombardy about 1700–20 and now widely spread over the world by means of cuttings. Pistillate Lombardies have been reported but they are of different origin and are usually broader-headed trees. With age, the Lombardy poplar becomes one of the most striking and picturesque trees, particularly when some of the sprouts are allowed to grow about the old stock, as in Fig. 3133. In the northernmost states it is not long-lived. *P. thevestìna,* Dode, from Morocco, is apparently a form of the Lombardy poplar type with whitish or gray bark: tree very large: lvs. very large, almost triangular, toothed, shining, with carmine petioles.

3133. An old clump of Lombardy poplar.

Var. **plantierénsis,** Schneid. (*P. plantierénsis,* Dode). Similar to Lombardy poplar but with reddish pubescent petioles and short-pubescent branchlets. Of horticultural origin, in the nursery of Simon-Louis at Plantières, near Metz, France. This is the fastigiate form of *P. nigra* var. *betulifolia;* probably not in commerce in this country. Both sexes are known.

aa. *Lf.-margins more or less distinctly ciliate.*

9. **Fremóntii,** Wats. Western Cottonwood. Large tree with trunk sometimes 5–6 ft. diam., very large head of stout spreading somewhat pendulous branches, and bark on mature trunks deeply and broadly ridged: lvs. deltoid or roundish (on young shoots reniform or rhombic), broader than long, with a broad acute apex or sometimes even rounded at apex, cuneate or truncate at base, coarsely irregularly serrate with incurved gland-tipped teeth, thick, firm and shining at maturity, 2–3 in. long; petiole to 2½ in. long and often pubescent; glands absent at base of lf.: catkins 1½–4 in. long, the pistillate fls. on short pedicels and with thin brown filiform-lobed scales; stamens 50–70: caps. ovate, to 1½ in. long. Banks of streams. W. Texas, S. Colo., Utah, Nev., Calif. S.S. 9:496.

10. **Wislizènii,** Sarg. (*P. Fremóntii* var. (?) *Wislizènii,* Wats.). Valley Cottonwood of the Rio Grande Valley, W. Texas, New Mex., and adjacent parts of Mex., differing in having slender-pedicelled pistillate fls.: lvs. deltoid, sharply acuminate, truncate or slightly cuneate at base: pistillate catkins very slender (2–6 in. long). S.S. 14:732.—A similar tree of Mex., where it is also often planted for shade (and to be looked for in

New Mex., Ariz. and S. Calif.), is **P. mexicàna**, Wesm. (*P. MacDoùgalii*, Rose): a tall tree, sometimes 80 ft.: lvs. longer-pointed, the petioles not flattened: fls. shorter-stalked than in *P. Wislizenii* and longer than in *P. Fremontii:* caps. ¼–½in. long: it is closely related to *P. Fremontii*, differing chiefly in the larger disk of the pistillate fls., in the rhombic lvs. of the young shoots and which often appear with the deltoid lvs. on old shoots. S.S. 14:71.

3134. Eastern cottonwood.—Populus deltoides var. monilifera. (×½)

11. deltoìdes, Marsh. (*P. deltoìdea*, Auth.). SOUTHERN COTTONWOOD. CAROLINA POPLAR. Large native tree with deeply furrowed or ridged dark-colored or gray-brown bark in mature specimens, and a deliquescent habit (top breaking up into many strong branches of about equal importance), the branches wide-spreading and the top relatively thin and open: branchlets usually terete except on very strong shoots: lvs. large, triangular-ovate, very broad in proportion to their length, mostly truncate or nearly straight on the base, abruptly acuminate, coarsely crenate-dentate with mostly curved sinuses, but the margin plane or flat, the petiole long, much flattened near the blade and commonly with 2 or 3 glands at the top, the stipules small and falling early: catkins long and loosely fld., the scales large, dilated at apex and filiform-lobed; stamens 40–60; stigmas and placentæ 3 or 4: fr. an ovoid acute caps. Generally distributed from Que. to the plains region and south to Md. and possibly farther. S.S. 9:494, 495.—A variable group; although familiarly known, the specific characters are not clearly defined. The species takes on somewhat unlike forms in the S. and N. and W. Marshall meant to designate the southern form, which has the following characters (*P. deltoìdea* var. *missouriénsis*, Henry. *P. angulàta*, Auth., not Ait. *P. deltoìdea* var. *angulàta*, Sarg.): twigs angled: lvs. deltoid-ovate, 5–6 in. wide and about the same length, at the base shallowly cordate or truncate, at the apex short-acuminate and cuspidate, when young and even to midsummer pubescent on both surfaces and petiole; margins sinuate-dentate, the teeth few and coarse and with incurved tips; basal glands 3 or 4. S. E. U. S. and in the Mississippi Valley, from Mo. southward.

3135. Winter buds of Populus deltoides var. monilifera. (×½)

Var. **monilifera,** Henry (as *P. deltoìdea* var. *monilifera*. *P. monilifera*, Ait.). NORTHERN COTTONWOOD. Figs. 3134–3137. Twigs usually not angled: lvs. smaller, on average normal shoots about 3–4 in. wide and of similar length, glabrous on both surfaces and petiole (or only a few evanescent hairs along midrib and nerves), the basal glands usually 2. Canada to Pa. and probably farther south.

Some of the cult. forms of this group are fairly distinct in foliage and aspect, and they appear to be associated with particular horticultural names in the nurseries. A golden-lvd. tree is known as var. *Van Geertii* or var. *aurea* (really a form of *P. serotina*). This is one of the best of yellow-lvd. trees, and generally holds its color throughout the season. Like all trees of this unusual character, it should be used cautiously, and the best effects are obtained when it is planted against a group of trees so as to appear as if naturally projecting from the other foliage. Some of the most ornamental specimens of cottonwood are those with reddish lf.-stalks and midribs. Taking all things into consideration, the cottonwood is one of the best of the poplars for general ornamental planting. It grows rapidly and in almost every soil, and yet it possesses elements of strength and durability which most of the poplars lack. Its foliage is always bright and glossy, and the constant movement of the broad rich green lvs. gives it an air of cheeriness which few trees possess. This tree or *P. Sargentii* has been much used on the prairies and in western towns, much too abundantly for good landscape effects. The rapid growth of the tree gives a feeling of luxuriance to plantations even when most other trees appear to be weak or starved. The cottonwood thrives best on rather low lands, and yet it is generally an admirable tree for high and drier areas. Spontaneous forms of introduced hybrids have probably been confused with *P. deltoides*, obscuring the definition of the species, as, particularly, *P. Eugenei* and *P. angulata*.

3136. Young tree of Populus deltoides var. monilifera, showing the spreading open growth.

A poplar in Mont. and Idaho allied to this species has been provisionally referred to *P. Besseyana*, Dode (Bull. Torr. Club, 39:302). The lf.-bases are rounded or subcuneate and more or less serrate; glands small; petioles flattened. "In *P. Sargentii*, the lvs. are flabellate-cordate, with an open concave sinus at base, which is toothless. The lvs. much resemble *P. acuminata* but are broader and less cuneate at the base, and in the latter species the petioles are terete." It is probable, however, that *P. Besseyana*, Dode, is *P. angulata*, Ait.

12. **Sárgentii,** Dode (*P. deltoìdes* var. *occidentàlis*, Rydb. *P. occidentàlis*, Brit. *P. monilífera* var. *occidentàlis*, Henry). GREAT PLAINS COTTONWOOD. Lvs. usually smaller and with relatively longer abrupt acumination, broader at base and with fewer rather coarser teeth: young branches light yellow, shining: buds often pubescent: pedicels shorter than the caps. The Great Plains or xerophytic form, Neb. to Dak., Sask., Alberta and to New Mex.; frequent along stream-beds. S.T.S. 2:583.—Doubtfully specifically separable from *P. deltoides*.

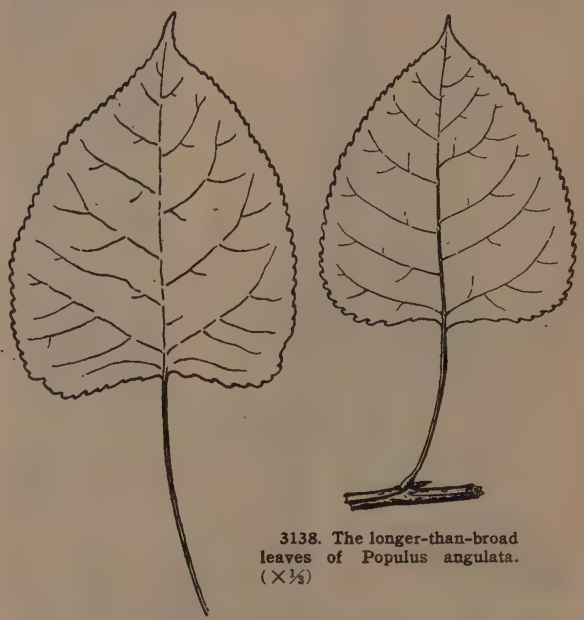
(*a*) **P. Ándrewsii,** Sarg. (*P. acuminata* × *P. Sargentii*). Raised by E. H. Andrews, Colo., from a cutting taken from a wild tree: lvs. oblong-ovate, gradually or abruptly long-pointed and acuminate, rounded or occasionally abruptly cuneate at the broad base, finely serrate except at apex, thin, bright green and shining above and

rather paler below; petiole nearly terete: branchlets light orange-brown: winter-buds acuminate, resinous.

13. **angulàta,** Ait. HYBRID CAROLINA POPLAR. Fig. 3138. For more than a century considered to be a native tree in the S., although by most botanists not clearly separated from *P. deltoides*, but Aiton's original specimens are interpreted by Henry to represent a hybrid of *P. deltoides* and *P. nigra* var. *typica;* similar forms are known in Europe and are planted in this country: known in both sexes: strong-growing tree with mostly prominently ridged or angled branchlets: lvs. triangular-ovate, always longer than broad, at the base truncate or more or less cordate, at the apex acute or short-acuminate, at maturity glabrous and firm in texture but slightly pubescent when young, glands 2–6 at base of blade or on apex of petiole, the margin except at apex with narrow translucent border, crenate-glandular and ciliate with the teeth close together; petiole flattened: catkins 2–3 in. long, with small cucullate or concave-dentate (not filiform-lobed) scales; stamens 30–40. Henry suggested that the floral characters (as seen in Aiton's type) may be a mutation under European conditions, inasmuch as catkins with the scales of the species described by Aiton appear not to have been identified from the wild in N. Amer., but later he has proposed the hypothesis of the hybrid origin and this seems to go far toward clearing up the difficulties of this perplexing group. The tree is still recognized as cult. in England and France, where it was known as early as 1750. In general, the longer-than-broad lvs. which are merely acute or short-acuminate rather than long-acuminate, and with deeply cordate or truncate base, distinguish this form. It is a loose open grower, with nothing of the strict narrow shape of the common Carolina poplar of the streets, which is probably *P. Eugenei*. It is hardy in N. Y. How extensively *P. angulata* occurs as a planted tree in N. Amer. should be made a subject of inquiry.

14. **Eugènei,** Simon-Louis. EUGENE POPLAR. Figs. 3139–3141, but known apparently to horticulturists as Carolina poplar: strict-growing strong staminate tree mostly with a markedly excurrent trunk (st. or bole continuing through the top or head) and with many strongly ascending branches, making the top narrow and almost columnar or pyramidal and densely foliaged, but with more or less hanging small spray on the under side or bottom of the head, the tree shedding its branchlets or little twigs freely: lvs. mostly triangular-ovate (broadest below the middle) and long-acuminate-pointed, truncate or slightly cuneate-truncate at base, crenate-serrate with close mostly incurved teeth, petioles flattened: autumn buds long, only slightly viscid, those in the upper axils slender and often curved-pointed.—This interesting and valuable rapid-growing poplar was found in 1832 as a chance seedling in the Simon-Louis nursery, near Metz, France; it is supposed to be a hybrid between Lombardy poplar (male) and *P. regenerata* (female) and it has the marks of the two. It is now one of the horticultural poplars and is often confounded with the native cottonwood. Henry writes that the original tree is, in his opinion, "the most wonderful tree in Europe in point of vigor, as it measured in 1913, when 81 years old, no less than 150 ft. in height and 25 ft. in girth at 5 ft. above the ground, and appears to be still growing rapidly. Another tree, a cutting of the last, planted in 1870, was 140 ft. high by 15 ft. in girth." Some of the tall Carolina poplars planted in the eastern parts appear to be *P. Eugenei*, or a very similar hybrid.

3137. Eastern cottonwood, Populus deltoides var. monilifera.—The Lafayette tree at Geneva, N. Y., named for General Lafayette, and one of the largest trees in the state.



3138. The longer-than-broad leaves of Populus angulata. (×⅓)

In this account, the poplars of this group in E. N. Amer. (east of the Mississippi) are assumed to be of a single species, *P. deltoides*, and what has been thought to be *P. angulata* of the southern states is taken as the type of the species, and the true *P. angulata* is considered to be a hybrid that is more or less planted. Whether other species are involved is to be determined by much further study of the unquestioned native forms. It is not unlikely that there are unrecognized natural hybrids. Tidestrom considers that there are 3 species in Maryland, *P. virginiana*, *P. deltoides*, and *P. angulata* (Rhodora, xvi. 208, 1914). The lf.-forms in cult. are very confusing if one desires to find separable types without numberless intermediates. Taken in a broader sense, *P. deltoides* may be considered to range through the country east of the Rocky Mts., being represented in the S. by the type form, and in the W. by var. *occidentalis* (*P. Sargentii*). In a still wider sense, *P. Fremontii* and *P. Wislizenii* may be regarded as geographical forms.

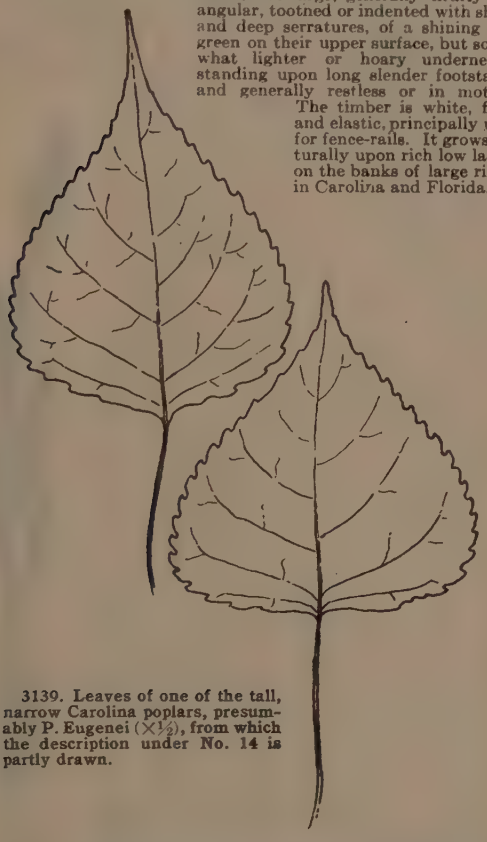
Very recently, A. Henry has distinguished 3 forms of the eastern cottonwood, and has taken up the name *P. deltoidea* although not certain as to the original application of it. The 3 forms are: (1) *P. deltoidea* var. *monilifera*, Henry (*P. monilifera*, Ait.), the form of the northeastern country: lvs. deltoid-ovate, about 3 in. long and wide, abruptly contracted into a long non-serrated apex, the base wide and shallowly cordate, bearing 2 glands at the junction with the petiole in front, the margin densely ciliate, both surfaces and petiole glabrous except for a few evanescent hairs on midrib and main nerves. G.C. III. 56:4 (tree in winter). (2) *P. deltoidea* var. *occidentalis*, Rydb. (See *P. Sargentii*, No. 12). (3) *P. deltoidea* var. *missouriensis*, Henry (*P. angulata* var. *missouriensis*, Henry). Lvs. similar in shape to those of var. *monilifera* but larger, being 5 or 6 in. wide and long, both surfaces and the petiole pubescent with some of the pubescence remaining in summer, the basal glands 3 or 4. La. to Mo., also in Ga.

The botanical names of these native poplars are confused. If it is assumed that there is only one species in this group, then we may apply to it the name *P. deltoides*, modified from Marshall, 1785, or *P. canadensis*, Moench, 1785; but the descriptions under these names are not sufficient to designate the species if we undertake to define them closely. *P. virginiana*, Foug., and *P. carolinensis*, Moench, are undeterminable from the descriptions. There is every probability that Marshall in his "Arbustum Americanum" (1785) meant to designate the Carolina poplar by his *P. deltoide*

(which has recently been taken up by botanists under the forms *deltoidea* and *deltoides*). Koch, in his Dendrologie, however, suggests *P. grandidentata* as the species meant by Marshall, but the range of this species forbids. The full account in Marshall is as follows:

"Populus deltoide. *White Poplar, or Cotton Tree of Carolina*
"(Bartram's Catalogue).

"This becomes a tall tree, with a large erect trunk, covered with a white, smoothish bark, resembling that of the Aspen tree. The leaves are large, generally nearly triangular, tootned or indented with sharp and deep serratures, of a shining full green on their upper surface, but somewhat lighter or hoary underneath; standing upon long slender footstalks, and generally restless or in motion. The timber is white, firm, and elastic, principally used for fence-rails. It grows naturally upon rich low lands, on the banks of large rivers in Carolina and Florida."



3139. Leaves of one of the tall, narrow Carolina poplars, presumably P. Eugenei (×½), from which the description under No. 14 is partly drawn.

The first undisputed binomials, reinforced by specimens, appear to be those of Aiton, 1789, *P. monilifera* and *P. angulata*. It is unfortunate that Marshall's *P. deltoide* has been revived in order to satisfy the demand for priority: it is not Latin; it may be rendered either in the form *deltoides* or *deltoidea*, thereby introducing confusion; the only way of determining what plant he had in mind is by habitat and range,—"rich lowlands" "in Carolina and Florida." As we now define the poplars of Carolina and Florida there is only one species, but it is not unlikely that others will be separated. Marshall's name, as the other very early names, should be disregarded and Aiton's *P. monilifera* taken as the starting-point. The name *P. canadensis* has been variously applied by succeeding authors; it is probably a female hybrid; at least some of the stock once grown in N. Amer. under this name was *P. deltoides:* the name should be discarded. *P. virginiana*, Foug., 1786, is fairly well defined by Castiglioni (Viaggio Negli Stati Uni . . . pub. at Milano, 1790), and appears to be the species named *P. monilifera* by Aiton, 1789, but to take up the name would contribute nothing to clarity.

The Carolina poplar was early planted in this country. It was apparently known to John Bartram. It is mentioned by M'Mahon in his "Gardener's Calendar," 1806. It is listed in the catalogue of William Booth, of Baltimore, 1810; also by William Prince of Flushing, Long Island, in 1823, 1825, 1829, by Landreth, of Philadelphia, in 1828. What form of poplar all these early planters had is not now to be determined. To what extent the hybrid Carolina poplar (*P. angulata*) is now planted in this country is unknown to the writer. It is apparent that European hybrid poplars are useful here and they have been intro. from time to time. The prevailing "Carolina poplar" of present planting in the northeastern states is probably *P. Eugenei*, but others may be involved. The binomials that have been applied more or less loosely or erroneously to the *P. angulata* group on the supposition that it is a species of the S. U. S. are as follows: *P. angulòsa, P. macrophýlla, P. deltoidea* var. *angulàta, P. carolìna, P. caroliniàna*, and *P. caroliniénsis*, Hort.; *P. deltoides* var. *caroliniénsis*, Bailey; *P. deltoidea* var. *missouriénsis*, Henry. If *P. deltoides* is itself taken to be this southern form, then all these synonyms must now be ranged under that name, so far as they may apply to the plant in question.

Supposed or accepted hybrids in the black poplar group (*P. nigra-deltoides-angulata*) are recognized as follows (only two or three of which are likely to be found in this country unless in special collections):

(*a*) **P. serótina,** Hartig (*P. helvética*, Poed. *P. serótina*, Koehne). BLACK ITALIAN POPLAR. *P. angulàta* var. SWISS POPLAR in France. A valuable timber tree: very strong staminate tree with a broad head and wide-spreading but ascending branches and regularly furrowed bark: buds brownish and viscid: lvs. appearing very late (hence the name *P. serotina*), reddish tinged and glabrous, larger than those of *P. Eugenei*, ovate-deltoid with broad truncate base and short cuspidate or acuminate apex, with few crenate serrations rather far apart and toward the base of the blade, the glands 1, 2 or 0, near the apex of the reddish petiole: young plants and vigorous growths with ridged shoots, and lvs. 5–6 in. or more long. G.C. III. 56:47.—A very old hybrid, having been described by Duhamel in 1755. *P. deltoides* var. *monilifera* is probably one of the parents, and *P. nigra* var. *typica* the other. Very likely one of the planted poplars in this country and apparently sometimes passing as *P. deltoides*.

3140. Winter buds of Populus No. 14. (×1½)

(*b*) **P. marilándica,** Bosc (*P. eùxylon*, Dode). Pistillate tree that originated early in the 19th century: buds small and viscid: lvs. (resembling those of *P. nigra*) 4 x 3 in., rhomboid, cuneate at base, tapering above into a long-acuminate apex, glabrous, crenate-serrate with incurved teeth, the margins with minute scattered hairs. Appears to be a hybrid of *P. deltoidea* var. *monilifera* and *P. nigra*.

(*c*) **P. Henryàna,** Dode. Of unknown origin: of branching open habit similar to that of *P. deltoides* var. *monilifera:* a staminate tree, with lvs. cuneate at broad base: "of no particular vigor," and little known. G. III. 56:46.

(*d*) **P. robústa,** Schneid. Probably the issue of *P. angulata* × *P. plantierensis:* of narrow columnar habit but short branches much more divaricate than in the Lombardy, of very rapid growth: twigs hairy: staminate. G.C. III. 56:66.

(*e*) **P. regeneràta,** Schneid. (*P. Eucalýptus*, Hort.). Pistillate tree like *P. serotina* in twigs and foliage but lvs. opening 2 weeks or more earlier, of narrow outline and bearing pistillate fls.: catkins similar to those of *P. marilandica*, but with usually only 2 stigmas.

(*f*) **P. Lìòydii,** Henry (probably *P. nigra* var. *betulifolia* and *P. serotina*). Tall pistillate tree with pubescent branchlets, described by Henry as follows: Bark similar to that of *P. serotina:* young branchlets with minute pubescence, glabrous and yellowish brown the second year; buds small, viscid: lvs. about 2½ in. wide and long, truncate, rounded or cuneate at base, with a short non-serrated, acuminate or cuspidate apex, crenate-serrate, teeth incurved-ciliate till late summer; glands minute, often absent; petiole reddish with minute pubescence: pistillate catkins 2–2½ in., glabrous; pedicels short, ovary globose, in a cup-shaped oblique entire disk with 2, rarely 3, dilated spreading stigmas: fruiting catkins 4 in.; caps. 2-valved. G.C. III. 56:67.

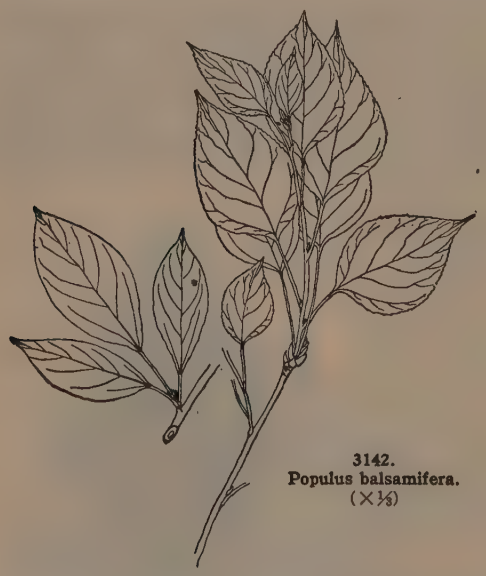
(*g*) **P. generòsa,** Henry. Intermediate between the parents (*P. angulata*, pistillate, and *P. trichocarpa*) in width and color of lvs., the under surface pale gray; resembles *P. angulata* in having coarsely serrate often cordate translucent-bordered lvs., but *P. trichocarpa* in bearing rounded petioles. A plant of "astounding vigor," issued from a cross made at Kew in March, 1912. G.C. III. 56:258, 259. See also Henry, Trans. Roy. Scott. Arbor. Soc. 30, p. 25, fig. 10; and Journ. Dept. Agric., Ireland, 15:44.—A tree of much promise. It originated from hand-pollination, *P. trichocarpa* furnishing the pollen, four seedlings resulting.

3141. The tree commonly known as Carolina poplar. Probably Populus Eugenei.

IV. Heavy or Large-leaved Poplars or Cottonwoods. *Lvs. large and broad, rounded or cordate rather than truncate at base, not lobed, the petiole cylindrical or channelled, not flat, more or less pubescent but becoming mostly glabrous at least above: terminal buds medium to large size, more or less glutinous but scarcely balsamic: trees, mostly of good size.*

15. **lasiocárpa,** Oliver (*P. Fárgesii,* Franch.). Tree, 50–60 ft., with angular stout more or less pubescent young shoots and large viscid buds: lvs. very large (often 10–14 in. long and 8–9 in. wide), ovate or broad-oblong, acute or short-acuminate, evenly glandular-crenate-serrate, red-veined, deeply cordate at base and biglandular, more or less tomentose beneath but becoming glabrous above; petiole nearly cylindrical, red; stipules oblong-lanceolate: catkins 4–6 in. long or longer in fruit, the polygamous fls. short-pedicelled; bracts ovate or obovate, finely laciniate; stamens 23 or more in the male fls. and 3–6 in the hermaphrodite fls.: caps. ovoid and densely woolly, to ½in. long. China, common at 4,000–6,000 ft. B.M. 8625. R.H. 1911, p. 565. R.B. 35, p. 312. G.M. 51:763.—**P. Wilsonii,** Schneid., is a rare tree in W. China, with a pyramidal or columnar head of short spreading branches and strikingly handsome dark bluish green paper-like broad-ovate or roundish or broadly ovate-oblong more or less cordate-based and obtuse lvs. which are less deeply cordate than those of *P. lasiocarpa,* and less broadly oblong; it is also distinguished by its habit, the glabrous and purple rather than tomentose and yellowish branchlets, and the lvs. bluish green above and rather whitish gray beneath.

16. **heterophýlla,** Linn. Swamp or Black Cottonwood. Downy Poplar. A swamp species of irregular branching habit, only rarely planted, reaching 80 ft. and diam. of trunk of 3 ft.: lvs. densely tomentose when young, but becoming glabrous with age or remaining floccose beneath, 4–7 in. long, broad-ovate in outline, obtuse or somewhat acute at apex, more or less truncate or subcordate or rounded at base, serrate, the petiole terete and tomentose or nearly glabrous: staminate catkins stout but rather short, stamens 12–20 and scales filiform-lobed; pistillate catkins slender but rather short, becoming erect or spreading: caps. ovoid-acute, on slender pedicels. Conn. to Ga., La., Ark. and S. Mo.; near the coast in the northern states. S.S. 9:489.



3142. Populus balsamifera. (×⅓)

V. Balsam Poplars. Tacamahac. *Lvs. not lobed, varying from broad-ovate to narrower; mature lvs. whitish but not cottony-tomentose beneath, not clearly translucent-edged; petioles cylindrical or 4-angled, mostly grooved on upper side: terminal buds large to very large, very viscid and balsamic in odor: mostly large trees.*

a. *Branchlets terete, without projecting ridges or ribs (except sometimes on strong young shoots).*

b. *Petioles and branchlets mostly glabrous.*

17. **balsamífera,** Linn. Balsam Poplar. Tacamahac. Figs. 3142, 3143. Tall upright tree, with a narrow top and glabrous twigs: lvs. thick and firm, erect, whitened beneath, usually smaller than in most poplars of this group, glabrous except that petioles are slightly pubescent, ovate-lanceolate or oval, tapering toward the top and obtuse or narrowly rounded at base, finely and obtusely toothed: catkins drooping, slender but rather densely fld., appearing in very early spring; ovary 2-carpelled: caps. pedicelled. Mackenzie River to Newfoundland and to Brit. Col., southward in the northern tier of states; not in Asia. S.S. 9:490. Var. **Michaûxii,** Henry (*P. Michaùxii,* Dode. *P. cándicans,* Amer. Auth. in part, not Ait.), is a form with slightly cordate or rounded-based ovate lvs. and slightly pubescent on petioles, veins beneath and twigs. G.C. III. 59:230.—The native *P. balsamifera* is sometimes seen about farm buildings and roadsides, where it makes a durable and interesting tree. The dull whiteness of the under side of the leaves affords a pleasant variety and contrast in its foliage, and the fragrance of the resinous buds in spring is agreeable to most persons. It is a desirable tree for occasional planting, but, like the Lombardy, it generally appears to best advantage when placed amongst other trees. It is a hardier tree than the Lombardy, and does not run quickly to such extravagant heights. In cult., it seems to present a variety of forms or else enters into a number of hybrids. The true *P. balsamifera* is said to be rare in cult. in Cent. Eu., and only in the male sex.

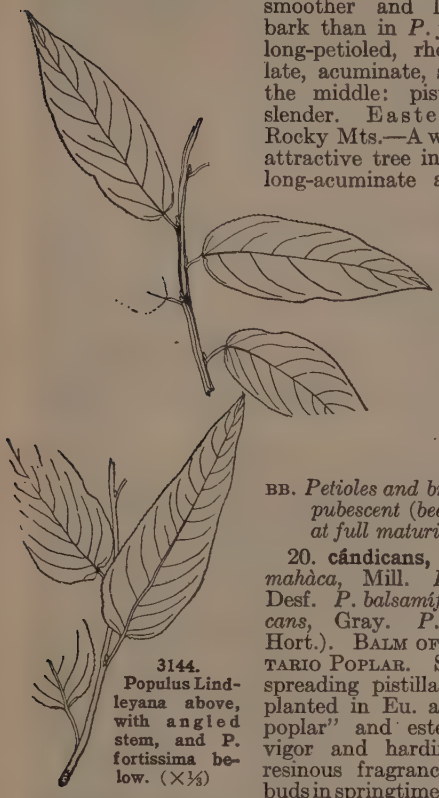
3143. Winter buds of Populus balsamifera. (×½)

In Mont. and Idaho is a balsam poplar with sessile 3-carpelled caps., as in *P. trichocarpa,* although differing in other fr. characters from that species: lvs. usually broader than in *P. balsamifera* and often subcordate, glabrous. This form Rydberg considers to be *P. hastata,* Dode.

In the Himalayan region, *P. ciliàta,* Wall., belongs to this group, but it is probably not in cult. in this country: lvs. ovate or ovate-cordate, acuminate, glabrous except for the gland-ciliate unequal teeth, the base 3-nerved: a large tree, with lvs. 3–7 in. long.

18. **fortíssima,** Nels. & Macbr. (*P. angustifòlia,* James, not Weinm. *P. balsamifera* var. *angustifòlia,* Wats.). Fig. 3144. Narrow-leaved Cottonwood. Small pyramidal or conical tree (reaching 60 ft. in the wild), with slender twigs and small buds, and soft clear green foliage: bark rough-furrowed: lvs. small for the genus, lanceolate or ovate-lanceolate, short-stalked, green on both surfaces, finely and evenly serrate: catkins short, densely fld.: ovary somewhat 2-lobed. Interior region from Assiniboia to Neb. and Ariz., and westward; common along mountain streams at middle altitudes in the Rocky Mts. S.S. 9:492.—Common street tree in parts of the W. and sometimes planted in the E. for ornament.

19. **acuminàta,** Rydb. (*P. coloradénsis,* Dode). SMOOTH-BARKED COTTONWOOD. Tree slender, with smoother and lighter-colored bark than in *P. fortissima:* lvs. long-petioled, rhomboid-lanceolate, acuminate, serrate only at the middle: pistillate catkins slender. Eastern slopes of Rocky Mts.—A well-shaped and attractive tree in cult., the lvs. long-acuminate and somewhat drooping. **P. Tweèdyi,** Brit., is allied to this species and perhaps a variant of it, with mature lvs. broadly ovate or some of them even orbicular, and cordate at base. Wyo.



3144. Populus Lindleyana above, with angled stem, and P. fortissima below. (×⅓)

BB. *Petioles and branchlets mostly pubescent (becoming glabrate at full maturity).*

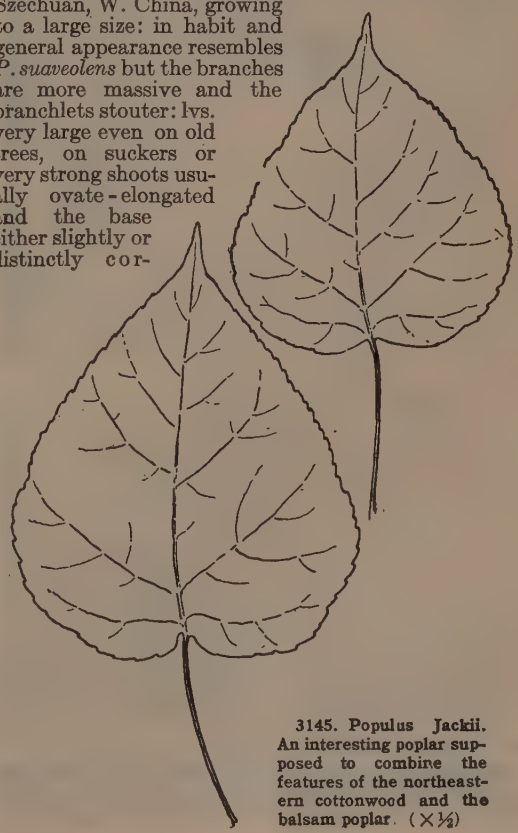
20. **cándicans,** Ait. (*P. Tacamahàca,* Mill. *P. ontariénsis,* Desf. *P. balsamífera* var. *cándicans,* Gray. *P. macrophýlla,* Hort.). BALM OF GILEAD. ONTARIO POPLAR. Strong-growing spreading pistillate tree, much planted in Eu. as "the balsam poplar" and esteemed for its vigor and hardiness and the resinous fragrance of its large buds in springtime: lvs. broad and heart-shaped, very hairy (as are also the twigs), the lf.-stalk usually hairy and somewhat flattened. G.C. III. 59:230. Apparently a hybrid, the origin of which is in doubt; the native tree usually confused with this is *P. balsamifera* var. *Michauxii,* and sometimes also the supposed hybrid, *P. Jackii.*—Said to be sometimes grown under the names of *P. suaveolens* and *P. balsamífera.* It is very different from the balsam poplar in method of growth, as it has none of the pyramidal or spire-like tendency of that species, but usually makes a broad and irregularly spreading top. The Balm of Gilead makes a good street tree, and is perhaps the best of the older poplars for shade, but it is not known how extensively it is planted in N. Amer.; it is probably of European origin. Well-grown trees of the form passing under this name in the U. S. have the darkest and richest foliage of any common poplar, and this character makes the tree valuable in heavy groups about the borders of a place. The top is liable to become open and broken with age, however, and the tree often sprouts profusely. It is not well adapted to smoky and dusty locations, as it soon becomes grimy.

21. **Jáckii,** Sarg. (*P. Baileyàna,* Henry). Fig. 3145. A supposed hybrid of *P. deltoides* var. *monilífera* and *P. balsamífera,* found as if native in Mich. and Que.: intermediate between the two parents, with terete glabrous twigs: lvs. large, broad-ovate, cordate at base, biglandular, slender-acuminate, the margin with scattered deciduous hairs and a translucent border, the under surface pale but scarcely whitish, the petioles channeled but not compressed, 4-angled in cross-section. G.C. III. 59:231.—The buds are less viscid than those of *P. balsamífera,* and the leaf-serratures are not so sharp. It makes a broad-headed branching tree. The range of this tree is not known.

22. **trístis,** Fisch. Small tree with viscid pubescent buds which are often attended by persistent ovate-acuminate stipules: lvs. narrowly ovate, 4 in. long and one-half as broad, ciliate, acuminate, subcordate or rounded at base. Cent. Asia, Himalaya.

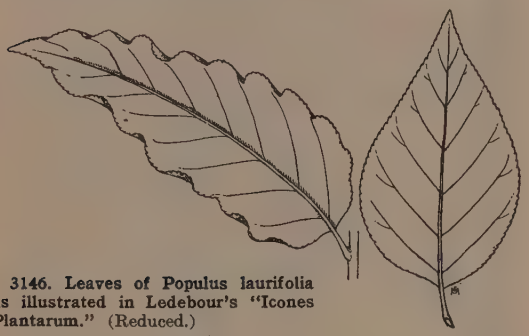
23. **Maximòwiczii,** Henry. JAPAN POPLAR. Very large tree, to 100 ft., and 3–4 ft. diam., with densely pubescent pale brown branchlets: lvs. about 4 in. long, nearly orbicular, oval or broad-elliptic, broadest above the middle, subcordate, cuspidate, pubescent on ribs and nerves of both surfaces, whitish or slightly rusty beneath, finely and sharply serrate and ciliate: fruiting catkins 7–10 in. long, remaining unopened on the tree till late summer or autumn, the caps. glabrous. E. Siberia, N. Japan.—Hardy and desirable, making a shapely head and bearing attractive foliage. It is sometimes confused with *P. suaveolens.* Wilson speaks of this tree as a magnificent poplar, the largest in eastern Asia, the trunk reaching 5 or 6 meters in girth.

24. **suavèolens,** Fisch. (*P. balsamífera* vars. *suavèolens* and *intermèdia,* Loud.). A comparatively slow-growing tree of close, upright habit: young branches slightly pubescent above nodes: lvs. very thick and hard, finely serrate, oval to ovate and ovate-lanceolate in outline, and prominently whitened beneath, commonly rather small for this group, the margin ciliate, and finely crenate-serrate: twigs hard and cylindrical. Siberia, Mongolia, China.—It is considered to be a valuable tree for hot and dry interior climates; and it also has distinct merit for ornamental planting. It eventually becomes a large tree. The *Populus laurifolia* and *P. sibirica pyramidalis* of some American nurserymen are apparently variations of this type. *P. Przewálskii,* Maxim., is probably a form of this with glabrous branchlets and petioles. **P. szechuánica,** Schneid., a common tree in forests of Province Szechuan, W. China, growing to a large size: in habit and general appearance resembles *P. suaveolens* but the branches are more massive and the branchlets stouter: lvs. very large even on old trees, on suckers or very strong shoots usually ovate-elongated and the base either slightly or distinctly cor-



3145. Populus Jackii. An interesting poplar supposed to combine the features of the northeastern cottonwood and the balsam poplar. (×⅓)

date or rounded and sharply glandular-crenate-dentate, on the old branches broad-ovate or ovate-orbicular with rounded or more or less cordate base and the margin more or less distinctly glandular-dentate. Growing at the Arnold Arboretum and the Rochester parks. *P. yunnanénsis*, Dode, is allied to *P. szechuanica* but is insufficiently understood.



3146. Leaves of Populus laurifolia as illustrated in Ledebour's "Icones Plantarum." (Reduced.)

AA. *Branchlets prevailingly with projecting narrow ridges.*

25. **laurifòlia,** Ledeb. (*P. balsamífera* var. *laurifòlia*, Wesm.). Fig. 3146. Tall tree with gray-brown bark and smooth angled twigs: lvs. ovate to ovate-oblong to ovate-lanceolate or even narrower, acuminate, sometimes undulate, rounded at base, finely toothed and somewhat ciliate, green above, more or less pubescent on midrib at maturity, whitish beneath: stamens 20–30; pistils sessile, 2-valved; staminate catkins about 3 in. long, pistillate 4–5 in. Siberia.

26. **Lindleyàna,** Carr. (*P. laurifòlia* var. *viminàlis*, Dipp.). Fig. 3144. Lvs. mostly willow-like, long-elliptic, distinctly acuminate, or oval-elliptic on the older shoots, roundish at base, with pubescent petioles, fls. and fr. Perhaps a horticultural group, to which are probably to be referred the garden names *P. crispa* (with more or less crisped or crinkled margins), *P. Dudleyi* and *P. salicifolia*. As seen in cult. in this country (and very infrequent) it is a small or medium-sized tree, of slender growth and with a somewhat weeping habit when old. It is very like the native *Populus fortissima*, but is readily distinguished by its angled or furrowed sts., and less tapering and crisped lvs. which are conspicuously finely reticulated and whitened beneath. The color of its foliage is grayish green, and in this respect it affords a contrast to the native species. *P. fortissima* seems to be rather the better tree of the two, although *P. Lindleyana* has a more striking appearance. The botanical status of these trees is not clearly defined. By some, *P. Lindleyana* is referred to *P. laurifolia*, but the tree in cult. seems to be distinct.

27. **Simònii,** Carr. (*P. laurifòlia* var. *Simònii*, Regel. *P. balsamífera* var. *Simònii*, Wesm. *P. brevifòlia*, Carr.). A strong strict tree, not large, with lvs. differing from those of *P. candicans* in having a rounded or tapering base and much finer teeth, but otherwise they are somewhat alike: shoots reddish brown and spotted, deeply grooved, somwhat drooping: lvs. small, mostly oval and tapering both ways, hanging on slender petioles. Amoor Valley to China, where it is common. G.W. 15, p. 246.—Intro. into France about 1861 by M. E. Simon, and somewhat planted in this country. It has been planted as far north as Man. with entire success. It is a very rapid grower, and is useful where quick-growing windbreaks are desired. There are fastigiate and weeping forms. Shape of lvs. variable, those on vigorous shoots being round-obovate, acute-based, and mostly rounded at apex.

28. **trichocárpa,** Torr. & Gray. BLACK COTTONWOOD. Very large tree, to 200 ft. and trunk to 8 ft. diam., with wide head or top and upright branches: lvs. varying from narrow- to broad-ovate, truncate or cordate at base, acute or taper-pointed at apex, finely serrate, to 8–10 in. long, shining green above and rusty but becoming whitish beneath: catkins 2–5 in. long; stamens 40–60; pistillate catkins loose-fld., in fr. becoming as much as 10 in. long; ovary 3-carpelled: caps. nearly sessile. Calif. to Brit. Col. and Alaska, reaching an elevation of 6,000 ft. S.S. 9:493. G.F. 5:281.—Aside from the conifers, it is said to be the largest tree in Ore. to Brit. Col. For *P. hastata*, see No. 17.

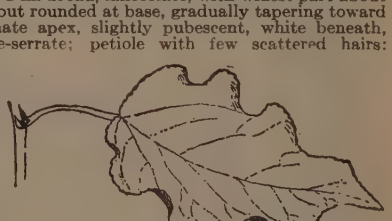
Following are supposed hybrids in the balsam poplar group:

(*a*) **P. berolinénsis,** Dipp. (*P. certinénsis*, Dieck. *P. pseudo-balsamífera*, Fisch.). Columnar tree supposed to be of hybrid origin, with short ascending branches, the growths densely pubescent and the young ones slightly winged but often becoming nearly or quite smooth at maturity: buds greenish, pointed, viscid: lvs. on strong shoots 3–4 in. long, ovate or ovate-rhombic, mostly rounded but sometimes cuneate at base, contracted into a long glandular acuminate point, glabrous on both surfaces, greenish or slightly whitish beneath, the margin not ciliate and with a very narrow translucent edge visible under a strong lens, the margins usually regularly crenate-serrate and sometimes with irregular shallow lobes. Perhaps a hybrid between Lombardy poplar and *P. laurifolia*. The name *P. certinensis* was applied to the staminate plant.

Whether the *P. certinensis* grown in N. Amer. (Fig. 3147) all belongs with *P. berolinensis* is very doubtful. Some of it seems to have many of the characters of *P. deltoides*. As grown in nurseries and collections here, it is a very rapid-growing and hardy tree, with a strong central leader and very heavy dense foliage; differs from *P. monilifera* as follows: lvs. broad-ovate in outline, with a rounded or tapering base and rather short point at the apex; the margin rather closely-toothed, wavy; lf.-stalk comparatively short, only moderately flattened, glandless at the top; stipules present and conspicuous: bud long; shoots slightly hairy.—The foliage on the old wood or upon slow-growing shoots is very unlike that upon the vigorous branches and is almost identical with that of the balsam poplar, being broadly oval, with finely serrate margins, and whitish beneath. The twigs, also, are cylindrical. But the strong shoots are strongly angled or grooved and the foliage is much like that of the native cottonwood, but darker; and the growth is more close and erect. The sketch in Fig. 3147 distinguishes the lvs. The Certinensis poplar is a more rugged tree than the cottonwood, with healthier foliage in the presence of lf.-rust, and its wood is said to be valuable. It has been much planted in the N. W., and deserves to be widely distributed. Its effect in the landscape is considerably unlike that of the cottonwood. Its lvs. stand out more horizontally, while those of the cottonwood hang loosely and often vertically and therefore give the tree-top a heavier look. The terminal spray of the two is particularly distinguishable in this regard. The lvs. of Certinensis upon the strong, erect shoots stand almost at right angles to the shoot, and, at some distance, therefore, present only their ruffled edges to the eye, producing a unique and picturesque effect. The illustration (Fig. 3147) represents a top leaf of *P. certinensis* as grown in this country, but the name may not be correctly placed.

(*b*) **P. Wóbstii,** Schroed. (*P. Wóbsky*, Hort.?). Buds very viscid: lvs. 4–6 in. long and 2 in. broad, lanceolate, with widest part about the middle, narrow but rounded at base, gradually tapering toward the bluntly acuminate apex, slightly pubescent, white beneath, ciliate and crenate-serrate; petiole with few scattered hairs: branchlets glabrous.

(*c*) **P. Rasumowskyàna,** Schroed. Buds pointed, viscid: lvs. on young trees and vigorous shoots 4 x 3 in., orbicular-ovate, rounded or subcordate at base, contracted above into a gland-tipped acuminate apex, very nearly glabrous, pale beneath, the margin glandular-crenate and not ciliate; petiole terete, grooved above: branchlets glabrous, ridged. *P. Nolestii*, as it has been grown in this country, is either this form or very like it, but is little understood.



3147. Populus certinensis of American plantations. (×¼)

(*d*) **P. Petrowskyàna,** Schroed. Very like *P. Rasumowskyana*, but with minute pubescence on branchlets and petioles; lvs. on vigorous shoots 5 x 4 in., ovate, cordate, the apex long-acuminate, pale beneath; serrations deeper than in last.

VI. VARIABLE-LEAVED POPLARS. *Lvs. remarkably polymorphous or diverse on the same plant, from very narrow to broad, coriaceous and reticulate, the petiole more or less cylindrical, the buds little if at all viscid: stamens few (about a dozen): caps. pedicellate, elongated; stigmas 3.*

29. **euphràtica,** Oliver (*P. diversifòlia*, Schrenk. *P. ariàna* and *P. Litwinowiàna*, Dode). Medium-sized tree,

to 50 ft., attaining 2 ft. or more in diam., with pubescent not viscid buds and terete branches: lvs. on young shoots broad-linear (3–6 in. long) or oblong, short-stalked, entire; on short shoots or older parts half as long, ovate to rhombic to orbicular and more or less lobed or cut, at base rounded, cordate or cuneate, the stalk 1–2 in. long: catkins loose; stamens 8–12, scales cut, and disk orbicular; pistillate disk tubular and cleft: caps. to ½in. long. Egypt and Syria to Cent. Asia and China. Gt. 7, p. 170.—It is the "willow" of the Children of Israel; perhaps planted within our range. **P. pruinòsa,** Schrenk, is a related tree of Turkestan and S. W. Siberia, with bark on the old trunks distinctly and deeply grooved as in ash and elm, whereas *P. euphratica* has a shaggy bark: lvs. ovate-elliptic to reniform, never lanceolate, entire. **P. Denhardtiòrum,** Dode, a tree 60–80 ft. high in E. Trop. Afr., from sea-level to 1,500 ft. altitude, differs from *P. euphratica* in female racemes being shorter, perianth more deeply divided, ovary larger, and with a very large plane stigma: petioles twisted, so that the lvs. hang vertically. Tree used by the natives for dug-out canoes.

L. H. B.

PORÀNA (native name). *Convolvulàceæ.* Large twining annual herbs or shrubs, sometimes grown for ornament.

Leaves petioled, ovate, entire: infl. cymose or racemose; fls. purple, steel-blue or white; sepals in fl. small, narrow, in fr. all or 3 much enlarged; corolla campanulate or funnel-shaped, wide- or narrow-mouthed; limb 5-plaited, nearly entire or lobed; ovary 2-celled, 4-ovuled: fr. a globose membranous oblong or obconic caps. indehiscent or 2-valved.—About 15 species from Trop. E. Afr., oriental tropics and N. Austral.; 1 species reported from Mex. The two following species have been intro. into S. Calif., but are said to be hardly worth growing. **P. paniculàta,** Roxbg. Strong shrubby climber often 30 ft. high: lvs. 5x3 in., pubescent above: panicles terminating every branchlet with innumerable fls.; sepals in fl. linear-oblong; corolla glabrous, campanulate, white, very short-lobed: caps. globose, hairy. India, Malaya. Gn. 61, p. 323. **P. racemòsa,** Jacq. f. An annual, forming dense, not lofty masses: lvs. 2–3 x 1½ in.: racemes lax; bracts at the forks leafy, sessile, scarious in fruit: sepals in fl. linear-oblong, puberulous; corolla lobed nearly half-way: caps. apiculate, glabrous. India. Called the "snow-creeper" by the English as the masses of white fls. resemble snow in the jungle.

F. Tracy Hubbard.

PORANTHÈRA (Greek, referring to the anthers opening by 4 pores). *Euphorbiàceæ.* Plants rarely grown in greenhouses as ornamental subshrubs. Heathlike, herbaceous to somewhat woody: lvs. alternate or rarely opposite, small, narrow, margin recurved: fls. small, in dense, short-peduncled racemes or heads, monœcious; calyx imbricate, petals present, at least in the staminate fls.; anthers 4-celled, opening by 4 pores; ovules 2 in each cell. Five species in Austral. There are no well-known related genera. *P. ericifòlia,* Rudge. Six to 12 in. high: lvs. linear, crowded, ¼–½in. long: fls. white, in a dense terminal corymb. E. Austral. In cult. in Eu. Peat soil is suitable for its cult. It is prop. from seeds.

J. B. S. Norton.

PORTENSCHLÀGIA (named for F. von Portenschlag-Ledermayer, an Austrian botanist, 1772–1822). *Umbellíferæ.* Perennial herb, tall, much branched: lvs. ternately pinnatifid with filiform ultimate segms.: infl. a many-rayed composite umbel; fls. polygamous: fr. ovate-cylindrical, in cross-section almost circular. One species from Dalmatia. There is also another Portenschlagia which belongs to the Celastraceæ and is included in Elæodendron. **P. ramosíssima,** Vis. Tall and much branched: ultimate segms. of lvs. ½–1 in. long: fls. yellowish white; involucral bracts numerous, often membranous at the margins; petals hairy: fr. shortly hairy. Probably sparingly cult. abroad.

PORTLÁNDIA (named in honor of a duchess of Portland). *Rubiàceæ.* Glabrous shrubs and small trees, useful for the ornamental bloom.

Leaves opposite, thick-leathery, petiolate, oblong or linear-oblong; stipules between the petioles, connate with the petiole forming a sheath, deciduous: fls. large, 1–3-fld. on axillary peduncles; calyx 5-lobed, persistent; corolla large, subcampanulate or funnelform, 5-lobed; stamens 5; ovary 2-celled: fr. an obovoid-oblong caps., turbinate or clavate, leathery.—About 10 species. Mex., W. Indies, but little known as horticultural subjects; probably useful far S.

3148. Portlandia pterosperma. (×½)

platántha, Hook. Low shrub 1½–3 ft. high, glabrous: lvs. opposite, nearly sessile, elliptical-ovate, acute, evergreen, subcoriaceous; stipules broadly triangular, obtuse: calyx-lobes 4, spreading, leafy, lanceolate; corolla white, broadly funnelform approaching to campanulate, 5-lobed, the lobes spreading, ovate. Amer. B.M. 4534.—Requires moist tropical greenhouse heat and a mixture of loam and leaf-mold or peat-soil. Prop. by cuttings.

pterospérma, Wats. Fig. 3148. Shrub or small tree, 2–10 ft.: lvs. thin and deciduous: fls. numerous upon the young slender branches, 2 at nearly every node, pure white, funnelform, nearly 3 in. long; lobes of the corolla triangular, folded edge to edge in the bud so that it is strongly angled. Mex. G.F. 2:209 (adapted in Fig. 3148).—Probably hardy in the Gulf states and possibly in cult.

Other species which may appear in cult. are *P. coccínea,* Swartz, a Jamaican species with scarlet fls. and yellow anthers, and *P. grandiflòra,* Linn., a native of the W. Indies with white fls., reddish inside at the throat and 5 in. long, growing 10–14 ft. high.

F. Tracy Hubbard.

PORTULÁCA (Latin name, of uncertain history). *Portulacàceæ.* PURSLANE. Low fleshy often trailing annual or perennial herbs, one of which is a common flower-garden plant, and one of which is sometimes grown in its horticultural form as a pot-herb.

3149. Capsules of Portulaca grandiflora. (×½)

Leaves mostly alternate, thick, sometimes terete, entire: fls. mostly terminal, usually with 5 distinct petals and with several to many stamens, both borne on the calyx or receptacle-rim: fr. a small conical circumscissile caps. (Fig. 3149), containing many small seeds.—About 40 species in the tropical and temperate regions, mostly American. The fls. of portulaca open in direct sunshine, but close in shadow. Two annual species are in cult., both thriving in the hottest exposures.

grandiflòra, Hook. ROSE MOSS. Fig. 3150. St. slender and terete, prostrate or ascending, not rising over 6–12 in., hairy in tufts at the joints: lvs. scattered or somewhat clustered, short and terete: fls. large (usually 1 in. or more across in the cult. forms), terminal and subtended by clustered lvs., in many bright colors, soon withering: seeds small, metallic-gray or gray-black. Brazil and S. B.M. 2885. R.H. 1877:90. Gn. 45, p. 436. G. 31:719.—Said to be perennial under glass. Runs into many garden forms, as: Var. **Théllusonii,** Hort. (*P. Théllusonii,* Lindl.), with handsome orange-scarlet fls. B.R. 26:31. R.H. 1852:5. Var. **spléndens,** Hort. (*P. Gilliesii,* Hook.), light red-purple. B.M. 3064. Var. **albiflòra,** Hort., clear white. Var. **sulphùrea** or **Thórburnii,** Hort., dark yellow. Var. **caryophylloìdes,** Hort., red, striped white. Var. **Bédmannii,** Hort., clear white and purple-striped.—Colors

3150. Portulaca grandiflora. (×½)

of the cult. portulacas range from pure white to yellow, rose, scarlet, deep red, and almost purple, with many striped forms. There are also many full double strains. The rose moss is most easy of cult. if it is given a hot and rather dry soil. It needs full sun. The seeds require a rather high temperature for germination, and therefore they are sown rather late,—near corn-planting time. Sometimes they are started indoors, but usually they are sown directly where the plants are to stand. The soil need not be rich. The plant makes excellent edgings, and is good for growing in dry rockwork. A large patch of it gives a brilliant display of color in sunny weather, but the fls. do not open in dull weather. Seed of the double varieties produces more or less single-fld. plants, unless saved from cuttings of double-fld. plants, but the singles usually bloom earlier than the doubles. Let the plants stand 10–12 in. apart. They are tender to frost. The plant often self-sows, and in some places it persists about old gardens. *Portulaca grandiflora* was first described by Hooker in 1829 in the "Botanical Magazine." The fls. were described as "orange-colored, or of a very bright reddish purple." The plant was "discovered by Dr. Gillies, growing in light sandy soil, in various situations between the Rio del Saladillo, or western boundary of the Pampas, and the foot of the mountains near Mendoza. On the western side of Rio Desaguardero plants were in great profusion, giving to the ground over which they were spread a rich purple hue, here and there marked with spots of an orange color, from the orange-colored variety which grew intermixed with the others."

3151. Pusley.—Portulaca oleracea.

oleràcea, Linn. PURSLANE. PUSLEY. Fig. 3151. A common trailing weed in sandy ground, but also cult. in improved strains as a pot-herb: lvs. small, spatulate or narrow-obovate, very obtuse, thick, dull green or reddish: fls. small, yellow, the 7–12 stamens sensitive to a touch. Widely distributed in many countries; probably native to the southwestern parts of the U. S., but it is considered that it is intro. into the E. and N. In sandy and loamy soils it is one of the commonest and most persistent of weeds, but it is little known on heavy lands. The common wild plant is prized for "greens" in some regions, but the French upright forms are much better, as they are larger and more tender; these improved varieties look very different from the common "pusley;" they are easy of cult. For a discussion of the nativity of purslane in N. Amer., see Gray & Trumbull, Amer. Jour. Sci. 25, p. 253. L. H. B.

PORTULACÀRIA (*similar to Portulaca*). *Portulacàceæ.* Glabrous shrubs or small trees: lvs. opposite, obovate, fleshy: fls. small, rose, fascicled in the upper axils, forming a leafy panicle; sepals 2, short; petals 4–5, longer; stamens 4–7, inserted at the base of the petals; ovary free, 3-cornered, 1-ovuled: caps. 3-winged, indehiscent. Two species, S. Afr. **P. áfra,** Jacq. Small tree, 10–12 ft. high: branches opposite: lvs. obovate-roundish, 4–6 lines long: peduncles compressed and branched; pedicels ternate: fls. small, pink. S. Afr.

POSOQUÈRIA (from a native name in Guiana). *Rubiàceæ.* Glabrous shrubs or small trees with terete branches, for the warmhouse, of which only one has appeared in the American trade, although some other species are rather commonly cultivated abroad.

Leaves opposite, coriaceous, entire; stipules between the petioles, rather large, deciduous: fls. in terminal corymbs, fragrant, white, rose, or scarlet; calyx 5-toothed; corolla long-tubed, limb 5-lobed; stamens 5;

XCI. Harvest scene in the potato country.

ovary 1–2-celled: berry ovoid, rather large, fleshy.—About 15 species in Trop. Amer.

longiflòra, Aubl. (sometimes erroneously written *P. longifolia*). A handsome free-flowering bush 5–8 ft. high: lvs. oblong, acuminate, narrowed at the base, thick and shining: fls. 12 or more in a cluster, 3–5 in. long, waxy white, very fragrant, the slender tube curved, hairy in the throat. French Guiana.—Prop. by cuttings of ripening wood.

densiflòra, Hutchins. Evergreen few-branched shrub: lvs. ovate-elliptic, apex subacute or short-acuminate, base rounded or sometimes slightly cuneate: fls. in a congested corymb, short-peduncled; calyx deeply 5-lobed; corolla white, then yellow, the very long slender tube densely villous at mouth; stamens 5, at first connate then spreading. Brazil. G.C. III. 57:307.

mácropus, Mart. Branches terete: lvs. long-petioled, linear- or ovate-lanceolate, acuminate, base acute or rounded: infl. many-fld., corymbose; fls. sessile or subsessile; calyx pilose outside; corolla-tube elongate, slender, with a papillose mouth; lobes of limb somewhat acute; ovary turbinate. Brazil. G.C. III. 57:313.

multiflòra, Lem. Small tree: lvs. broad oval-oblong, base subcordate-rounded, apex abrupt acute-mucronate: infl. many-fld., in terminal subumbellate cymes; fls. long-tubed, white, erect, very fragrant and large; calyx small; corolla with 5 oblong lobes, the tips cucullate-rounded. Brazil. I.H. 16:597. G.L. 26:266.—This species has been recently referred to *P. macropus*.

F. Tracy Hubbard.

POTAMOGÈTON (from Greek words signifying that these are *river plants*). *Naiadàceæ*. Pondweed. Fig. 640, p. 548. A rather large genus (about 100 species) of aquatic plants in temperate and sometimes in tropical regions, a few of which are sometimes grown in aquaria and ponds. Nearly 40 species are native to N. Amer. They are weedy plants, attaching themselves to the bottom in ponds, lake margins and in shallow streams, and holding their small spikes of inconspicuous fls. above the water in midsummer. In many of the species there are two kinds of lvs., the narrow submerged ones and the broad floating ones. The small perfect fls. have 4 greenish perianth-segms., 4 stamens, and usually 4 sessile 1-ovuled ovaries: fr. a nutlet with a coiled or hooked embryo. The potamogetons are very difficult plants for the systematic botanist, and it is not worth while to describe any of the species here. There is none which is generally known in the trade. They are likely to be weeds in lily-ponds. For the American species, see Morong., Mem. Torr. Club 3, No. 2; also Pflanzenreich, hft. 31. Three species have come into slight notice in American gardens: **P. crispus,** Linn., and **P. natans,** Linn., natives, and **P. densus,** Linn., European. Easily grown.

L. H. B.

POTATO. One of the most widely utilized and valuable of esculent tubers, produced underground as thickened stems. It is commonly known as the "Irish," "white," or "round" potato to distinguish it from the sweet potato; botanically it is *Solanum tuberosum*. See *Solanum*.

The potato is one of the most universally cultivated plants of the United States and Canada, and it is becoming increasingly important as an article of human food. It ranks sixth in agricultural importance in the United States. This country produces, however, only about one-fifth as much as Germany. This is due to the fact that the German consumption of potatoes per capita is about two and a half times as great as ours, and that more than 50 per cent of the German crop is used either for stock-food or for conversion into starch, alcohol, or other industrial by-products. Potatoes, at present, are used very little for these purposes in this country, less than 1 per cent being so used.

The potato is closely allied, botanically, to several powerful narcotics, such as tobacco, henbane, and belladonna, and also to tomato, eggplant, and capsicum. Potatoes contain a small amount of a somewhat poisonous substance. When exposed to the direct rays of the sun and "greened," the deleterious substance is so greatly increased that the water in which they are boiled is not infrequently used to destroy vermin on domestic animals. In any case, the water in which potatoes are cooked should not be used in the preparation of other foods.

The potato is a native of the elevated valleys of Chile, Peru, and Mexico, and a form of it is found in southern Colorado. It probably was carried to Spain from Peru early in the sixteenth century. It seems to have been introduced into Europe as early as 1565. Sir Walter Raleigh, in 1585, is said to have brought back the potato from the "new country." Recent investigations, however, seem to give the credit of introducing the potato into England to Sir Francis Drake, in 1586. As *Batatas virginiana*, it was figured and described by Gerarde in 1597. It is probable that these circumstances led erroneously to giving the credit of introducing the potato to Raleigh instead of to Sir John Hawkins. The wild varieties in their native habitat still bear a close resemblance to cultivated varieties except for the enlarged vine and abnormal development of the tubers in the latter. In the seventeenth century the potato was cultivated in gardens in several European countries. It was recommended by the Royal Society of London in 1663 for introduction into Ireland as a safeguard against famine. The cultivation of the potato as a field crop became somewhat common in Germany soon after 1772, at which time the grain-crops failed and potatoes were a welcome substitute for the bread-corn. It was near the middle of the eighteenth century before it acquired any real importance in Europe, outside of Ireland and a few restricted localities in other countries. As late as 1771 only a white and red variety were mentioned in one of the most important English works on gardening. The

3152. Underground parts of potato plant, showing the fibrous roots and the stems ending in tubers. The old seed-piece is seen near the bottom.

plants were enormously productive, but the tubers were poor in quality, so poor in fact that their chief use was as a food for domestic animals; and only when the bread-corns failed were they used to any extent, and even then only as a substitute. By 1840 the potato had been largely substituted in Ireland for the cereals and other similar food-crops, as the yield of potatoes in weight exceeded by twenty to thirty times the yield of wheat, barley, or oats on an equal area of land. This large dependence on a single food-crop finally resulted in a wide-spread famine. The potato blight which appeared in the United States in 1845 devastated Ireland in 1846. During two years, 1846 and 1847, a conservative estimate places the numbers who perished for want of food or from diseases caused by a meager

diet of unhealthy and unnutritious food at 600,000. By 1848 the plague had virtually disappeared.

The roots of the potato are distinct from the tubers. Usually, two to four roots start from the stalk at the base of each underground stem which, when enlarged at the end, forms the potato. (See Fig. 3152.) Roots may also start where underground stems are wanting. The potato is a perennial plant. The accumulated starch in the tubers furnishes an abundant supply of nourishment for the plants growing from the eyes or buds until they are well above the ground. So much food is stored that not infrequently small young tubers are formed on the outside of the potatoes left in the cellar during the summer. Potatoes grow from 2 to even 3 feet high, have smooth, herbaceous stems, irregularly pinnate leaves, and wheel-shaped flowers, varying in breadth from 1 to 1½ inches and in color from bluish white to

3153. Potato, to show the difference in the progeny or yield of two tubers. One tuber cut into four pieces yielded the product from four hills shown in the left-hand column; another tuber similarly cut and planted, yielded the four hills shown in the right-hand column.

purple. They bear a globular purplish or yellowish fruit or seed-ball of the size of a gooseberry, containing many small seeds. As many as 297 seeds have been found in a single seed-ball.

The cultivated potato of today has undergone a remarkable change since its first introduction into Europe by the Spaniards. Some of this change has been brought about by better cultivation, but most of it is due to breeding. The tubers of the wild *S. tuberosum* were small and attracted little attention. Heriot, in his report on Virginia, describes the plant "with roots as large as a walnut and others much larger; they grow in damp soil, many hanging together as if tied on ropes." The modern potato has been bred so that the hills contain four to six tubers of uniform size, weighing, perhaps, two pounds. (See Fig. 3153.)

The uses of the potato are wide and varied, but taking the world over, its greatest value is as a food-crop. It is probably eaten by a greater proportion of the earth's inhabitants than any other crop except rice. It is extensively used for the manufacture of starch. The great potato-growing sections of the United States, especially Aroostook County, Maine, have many starch factories, where the tubers which are oversize or undersize or otherwise not fitted for ordinary food purposes are converted into starch. The price ordinarily paid for potatoes for starch-making is considerably less than that for eating, and unless the price for eating gets very low, good marketable tubers are not used for starch. The potato has many other uses which have been much less developed in the United States than in Europe, but there is a rapidly increasing tendency for their uses in the arts here. It is used in the textile industries, in the manufacture of woolen, linen, and silk goods; for the manufacture of potato flour, glucose, syrup, candy, desiccated potatoes for food, industrial alcohol, mucilage, dyes, stock-feed, and so forth.

The dry matter of potatoes is composed largely of starch. A high starchy content is desirable because it makes a mealy potato which is demanded in America. Being deficient in nitrogen, the potato is ill adapted for an exclusive diet and should be used in connection with food containing a high percentage of proteids, such as lean meat, peas, beans, and eggs. The lack of vegetable fats may be supplied by butter, gravy, or oatmeal. The composition of the potato varies widely. An average of 136 analyses is as follows:

	Water Per cent	Ash Per cent	Protein Per cent	Starch Per cent	Fat Per cent
Potatoes	78.	1.	2.2	18.	.1
Oatmeal	7.9	2.	14.7	67.4	7.1
Graham flour	13.1	1.8	11.7	69.8	1.7

The nutritive ratio of wheat is 1 to 5.37, almost perfect; that of potatoes 1 to 18.29, much too wide. Many foods in their natural state, as potatoes, are more or less deficient in mineral matter. Notable among these are rice and wheat flour—the former containing but 0.4 per cent and the latter 0.5 per cent of ash.

The main potato industry in the United States is confined to several potato-growing sections in widely separated parts of the United States. The most important of these are Aroostook County, Maine; the Norfolk and Eastern Shore trucking regions of Virginia and Maryland; the Red River Valley of Minnesota and North Dakota; the Kaw Valley of Kansas; the Greely and Carbondale districts of Colorado; the Twin Falls country of Idaho, and the San Joaquin and Sacramento valleys of California. In these regions, the climate and soil are perfect for the best potato-production.

Varieties.

There are many hundred varieties of potatoes. The older varieties run out in the course of time and are supplanted by new ones. The running out is largely due to the fact that growers, as a rule, do not practise seed-selection. The new varieties are ordinarily produced either from hybridized seed or from bud-sports. The latter are somewhat common. Red tubers are now and then found in white hills, and vice versa. Other differences are taken advantage of by breeders.

Of the many varieties listed in seedsmen's catalogues and found on the market, however, only a very few are of commercial importance. Fitch, of the Iowa State College, has made a thorough trial for a number of years of all varieties of commercial importance in the Unites States and Europe. He also made a canvass in person and by letter of the markets of the United States. The result was that only a few varieties were found to be of much market value. He lists the following varieties as being the most valuable in the United States in order of their importance: Rural New Yorker, Green Mountain, Early Ohio, Burbank, Irish Cobbler, Bliss Triumph, Peerless (Pearl). Many other varieties, of course, have local importance and perhaps outyield the standard varieties named above.

New varieties are being produced constantly, a very few of which may prove to be better than the standard sorts, but most of them are worthless.

William Stuart, of the United States Department of Agriculture, has recently made a very comprehensive and admirably arranged classification of potatoes, as follows:

Group 1.—*Cobbler.*
Tubers: Roundish; skin creamy white. Sprouts: Base, leaf-scales, and tips slightly or distinctly tinged with reddish violet or magenta. In many cases the color is absent. Flowers: Light rose-purple; under intense heat may be almost white.

Group 2.—*Triumph.*
Tubers: Roundish; skin creamy white, with more or less numerous splashes of red, or carmine, or solid red; maturing very early. Sprouts: Base, leaf-scales, and tips more or less deeply suffused with reddish violet. Flowers: Very light rose-purple.

Group 3.—*Early Michigan.*
Tubers: Oblong or elongate-flattened; skin white or creamy white, occasionally suffused with pink around bud-eye cluster in Early Albino Sprouts: Base light rose-purple; tips creamy or light rose-purple. Flowers: White.

Group 4.—*Rose.*
Tubers: Roundish oblong to elongate-flattened or spindle-shape flattened; skin flesh-colored or pink, or (in the case of the White Rose) white. Sprouts: Base and internodes creamy white to deep rose-lilac; leaf-scales and tips cream to rose-lilac. Flowers: White in sections 1 and 2; rose-lilac in section 3.

Group 5.—*Early Ohio.*
Tubers: Round, oblong, or ovoid; skin flesh-colored or light pink, with numerous small, raised, russet dots. Sprouts: Base, leaf-scales, and tips more or less deeply suffused with carmine-lilac to violet-lilac or magenta. Flowers: White.

Group 6.—*Hebron.*
Tubers: Elongated, somewhat flattened, sometimes spindle-shaped; skin creamy white, more or less clouded with flesh-color or light pink. Sprouts: Base creamy white to lilac; leaf-scales and tips pure mauve to magenta, but color sometimes absent. Flowers: White.

Group 7.—*Burbank.*
Tubers: Long, cylindrical to somewhat flattened, inclined to be slightly spindle-shaped; skin white to light creamy white, smooth, and glistening, or deep russet in the case of section 2. Sprouts: Base creamy white or faintly tinged with magenta; leaf-scales and tips usually lightly tinged with magenta. Flowers: White.

Group 8.—*Green Mountain.*
Tubers: Moderately to distinctly oblong, usually broad, flattened; skin a dull creamy or light russet color, frequently having russet-brown splashes toward the seed end. Sprouts: Section 1—base, leaf-scales, and tips creamy white; section 2—base usually white, occasionally tinged with magenta: leaf-scales and tips tinged with lilac to magenta. Flowers: White.

Group 9.—*Rural.*
Tubers: Broadly round-flattened to short-oblong, or distinctly oblong-flattened; skin creamy white, or deep russet in the case of section 20. Sprouts: Base dull white; leaf-scales and tips violet-purple to pansy-violet. Flowers: Central portion of corolla deep violet, with the purple growing lighter toward the outer portion; five points of corolla white, or nearly so.

Group 10.—*Pearl.*
Tubers: Round-flattened to heart-shape-flattened, usually heavily shouldered; skin dull white, dull russet, or brownish white in section 1 or a deep bluish purple in section 2. Sprouts: Section 1—base, leaf-scales, and tips usually faintly tinged with lilac; section 2—base, leaf-scales, and tips vinous mauve. Flowers: White.

Group 11.—*Peachblow.*
Tubers: Round to round-flattened or round-oblong; skin creamy white, splashed with crimson or solid pink: eyes usually bright carmine. Includes some early-maturing varieties. Sprouts: Base, leaf-scales, and tips more or less suffused with reddish violet. Flowers: Purple.

Cultivation of potatoes.

The best soil for potatoes is a sandy loam, well drained but provided with an abundant supply of water. If the soil is deficient in moisture, the water from rainfall must be conserved by shallow cultivation. The ground should be plowed deeply and worked thoroughly so as to bring about perfect aëration. Whether the plowing should be done in the fall or the spring will depend largely upon the distribution of time and labor which the grower has at his disposal, except that hilly fields which are likely to wash during winter should not be plowed in the fall.

3154. A good cutting or seed-piece.

In cutting potatoes for planting, each eye should be supplied with an abundance of food to start the young plants vigorously. The pieces should be as large as possible and not bear more than two or three eyes. (See Fig. 3154.)

The potato is sensitive to frost, and therefore must complete its growth in most localities in three to six months. The period of development may be shortened by exposing the seed potatoes to the more or less direct rays of the sun in a temperature of about 60° for one or two weeks before planting. Some of the starch is transformed into sugar, which causes the eyes or buds to develop into miniature short tough plants or "rosettes" which results, when the potatoes are planted, in hastening growth and shortening the period between planting and harvesting. Some varieties, when thus treated in warm rich sandy soil, produce merchantable tubers in six weeks.

The kind and amount of fertilizer which should be applied to potatoes will, of course, vary with conditions, such as method of rotation, natural fertility of the land, methods of growing the crop and so forth. The best method of rotation is one in which a crop of clover immediately precedes the potato-crop, particularly in the North. This furnishes nitrogen and leaves the ground in good mechanical condition. Ordinarily, potatoes require a fertilizer analyzing about 4 per cent of nitrogen, 7 per cent of phosphoric acid and 10 per cent of potash. If lime is applied to the land during the rotation, it should follow the potatoes and not precede them, as it furnishes the best conditions for the development of scab, which is a serious disease. The same is true of wood-ashes which, ordinarily, contain 30 per cent of lime.

Potatoes are planted either by hand or with a machine. Good-sized tubers should be cut into about four pieces and a single piece placed in each hill. The seed-pieces should be planted soon after cutting so as to prevent "bleeding" or loss of water from the cut surfaces. The depth of planting will depend upon circumstances, but ordinarily 4 to 6 inches may be considered an average depth. The planting-machines are usually drawn by two horses and perform several operations at once. They open the furrow, distribute the fertilizer, cover it slightly so that it will not come into direct contact with the seed, drop the seed-pieces and cover them. Sometimes a heavy wheel, to act as a roller, is attached to the rear of the machine to pack the soil over the hills. By means of these machines, large acreages may be planted in a short time.

Potato fields should be given frequent and thorough tillage to keep down the weeds and conserve soil moisture. These cultivations should be shallow to prevent injury to the roots. The soil is cultivated until the plants are large enough nearly to fill the rows and have begun to "set" tubers. Further tillage is likely to injure the plants and reduce the yield.

After the plants are mature, the tubers are dug either by hand or with an elevator digger drawn by two or more horses.

Yields.

The yield of potatoes to the acre in the United States is meager, the average yield for the ten-year period 1900–1909 being 91.4 bushels. Under favorable soil and climatic conditions, with rational methods of procedure, 200 to 400 bushels are not uncommon, and under superior conditions more than 1,000 bushels to the acre have been secured. By dividing the eyes and planting them in the greenhouse in the winter, and after a little time re-dividing them, continuing this until many plants were secured, one grower was enabled to raise 2,558 pounds of potatoes in the open from one pound of seed, being an increase of more than 2,500 fold. Two other growers secured, by similar methods, 2,349 pounds and 2,118 pounds. The low average yield is due, in part, to the ravages of the many enemies of the potato plant, which, uncontrolled, sometimes destroy the crop and usually seriously diminish the yield. In the United States, the potato is not so universally used or so productive as in Europe, though its use as a food is steadily increasing.

In common commercial culture, the yield as well as quality may be greatly enhanced by care in selecting seed. The progeny of two similar potatoes is shown in Fig. 3153, showing the inherited performance of the tubers.

The average annual production in the United States from 1881 to 1890 was 169,809,053 bushels, while the yield in 1913 was 331,525,000 bushels, which sold for an average farm price of 48.9 cents a bushel. New York stands first in potato-production, producing 53,215,000 bushels of the total yield. The crop of Europe aggregates more than the entire wheat-crop of the world. The production of the European countries for 1913 was:

3155. Potato blight. True or late blight on the left; early blight on the right.

France, 477,111,000; Austria, 424,457,000; Germany, 1,988,591,000; Russia, 1,274,439,000; the United Kingdom, 283,912,000 bushels. In 1912 the United States exported 76,382,000 bushels and imported 80,134,000 bushels.

Enemies.

The most common enemy to the potato plant, the Colorado potato-bug, is easily destroyed by applications in a powder or in a liquid of paris green or arsenate of lead to the vines when the bugs first appear. The fungus, *Phytophthora infestans*, causes the true blight (Fig. 3155), which results in potato-rot. The true blight may be kept in check by frequent and thorough sprayings with bordeaux mixture. It is always well to incorporate arsenicals with the mixture, that any remaining bugs may be destroyed. The bordeaux mixture is also useful in protecting in part the plants from the flea-beetle. Two or three applications are usually made during the summer. The early blight is more common than the true or late blight. It causes the shriveling and death of the foliage (Fig. 3155). It is usually the combined result of several causes, chief amongst which are fungi, flea-beetle, drought. Thorough good care and spraying with bordeaux mixture are the best treatments. A good potato field is shown in Fig. 3156 (adapted from "American Agriculturist"); and the picture also shows a good hand-praying rig.

A. W. Gilbert.

Potatoes as a market-garden or truck crop.

The chief difference between potatoes as a field crop and a market-garden or truck-farm crop is that in the former case they are grown in rotation with other long-season plants and consequently may occupy the ground for the entire growing season, while in the latter they occupy the ground only a few weeks and are usually preceded and followed by some early or late garden crop the same year. In the North the crop is usually grown in the spring and early summer, but in the South it may be grown either in the early spring or late fall. The spring crop is grown to supply the demand for new potatoes in the early markets while prices are high, but the fall crop is mostly consumed locally either for table purposes or for seed for the next spring crop. In the trucking region of the upper South, the spring crop is planted in January, February, or March and harvested in May and June, and the fall crop in July or August and harvested in October or November.

The favorite Virginia rotation starts with potatoes planted in February and harvested in June. Cowpeas are sown immediately for a summer cover-crop; these are plowed under in August as a means of improving the soil, and spinach is planted in September. This crop is harvested in January or February and garden peas are planted in rows 5 or 6 feet apart. The peas are interplanted in late March with cucumbers. The peas are harvested in April and May, and the cucumbers in June and July. The ground is planted to kale in August, which is harvested in midwinter and potatoes planted again in February or March. A second two-year rotation starts with potatoes planted in February followed by cowpeas or an annual grass for forage. Winter cabbage is transplanted to the field in November or January. Corn is planted after the cabbage is harvested in May or June. Cowpeas are planted between the rows of corn at the last working. The corn-stalks remain standing in the field until late fall when the grain is harvested and they and the pea-vines are worked into the ground to supply organic matter.

Since earliness, productiveness, and reasonable resistance to disease are the main requisites for truck-farm potatoes, the varieties that meet the requirements are limited. In the South Atlantic and Gulf states, Bliss Triumph is the leading variety, while in the Carolinas and Virginia, Irish Cobbler is the favorite; but in the upper Mississippi Valley, Early Ohio undoubtedly is in the lead.

Seed grown in Maine, Michigan, Wisconsin, or other northern states will produce potatoes of marketable size five to ten days earlier than locally grown seed. Consequently truck-farmers who wish to cater to the early market depend upon the northern tier of states for their seed-supply; but those who wish to sell on the midseason market are now largely using locally grown seed. Plants from northern-grown seed suffer more severely from certain diseases than do those from local seed, hence the extreme earliness of the crop from the

3156. Spraying potatoes.

northern seed is, to a marked degree, compensated for by the healthier vines and larger yield from local seed.

The seed-stock to be used in producing the home or locally grown seed is obtained from the North in the winter or early spring, and held in cold storage until July or August, when it is planted. The tubers are harvested after the vines are killed by frost in October or November, and are placed in farm storage until needed for planting.

The land should be broken with a turn-plow a month or six weeks in advance of planting the potatoes, if the preceding crop in the rotation will admit. It is best to apply the stable-manure to some preceding crop in order that it may be well decayed before the tubers are planted. After the ground is thoroughly harrowed, the rows should be marked out about 3 feet apart. If drainage is not good it is well to open the furrow with a small turning-plow in order to expose a large surface to the action of the sun, air, and frost. A few days before planting, the furrows should be reopened, the fertilizer required distributed in them. It should be thoroughly mixed with the soil to prevent its coming into direct contact with the seed-tubers when they are planted.

In forcing potatoes, especially in the cooler season of the year, it is customary to use from 1,500 pounds to 2,000 pounds of fertilizer analyzing 5 to 6 per cent nitrogen, 6 to 7 per cent phosphoric acid, and 5 per cent potash, to the acre. The potatoes will not use all of this, but that remaining after they are harvested is available for subsequent crops. About one-third of the nitrogen in the fertilizer should be obtained from nitrate of soda and sulfate of ammonia and the other two-thirds from high-grade tankage, blood, and fish-scrap. By using nitrogen from the sources mentioned, the plants are enabled to obtain a constant supply throughout their growing-season. The phosphoric acid is obtained from acidulated South Carolina rock, and the potash, preferably, from sulfate of potash. Some growers apply about 1,000 pounds of the fertilizer in the rows before the tubers are planted and the balance as a side or top dressing when the plants are well started.

Whether the potatoes are to be planted by hand or a power planter, it is better to apply the fertilizer before planting, as much better distribution may thus be obtained. The larger number of truck-farmers follow the practice of hand planting, but the larger growers are now using horse-power machines. From three to five barrels of northern-grown seed and from two to three barrels of home-grown seed are usually required to plant an acre. The seed-pieces are placed 14 to 16 inches apart in the rows and are usually placed from 2 to 4 inches below the surface-level of the ground. The hand-planted tubers are covered by turning two furrows over them with a small turn-plow, thus forming a ridge 8 or 9 inches high above the tubers. If the discs of the power planter do not form such ridges, it is customary to add additional soil with the plow. These high ridges protect the seed-tubers against unfavorable weather conditions and enables them to develop strong roots before the sprouts appear above the ground, thus insuring rapid development when the season opens.

As soon as the tubers have formed sprouts an inch or two long, a light harrow is dragged diagonally across the ridges to kill any weeds that may be starting, and to provide a mulch over the row. A second dragging is given a week or ten days later, or just before the sprouts appear above the surface. The first working with the cultivator is given as soon as the plants have the row well outlined; subsequent cultivations are given at intervals of a week or ten days, a small quantity of soil being worked against the plants, thus forming low ridges at the later cultivations. If proper attention is given to the early cultivation, little or no hoe work need be expected.

The season for harvesting depends more upon market conditions than upon the maturity of the crop. If prices are high, digging may be started when the yield will not be over thirty or forty barrels to the acre, but if prices are moderate with indications for a steady demand, harvesting may be delayed for two or three weeks. In the meantime the yield will have increased from 25 to 50 per cent.

The crop is usually turned out of the ground with a plow while the vines are still green. The vines are then pulled out of the ground with most of the tubers attached. These are carefully pulled from the roots, the others picked out of the loose soil and placed into piles on the ground. They are then graded by hand and packed in barrels for shipment. Great care is used in handling the new potatoes to prevent unnecessary bruising.

Mechanical diggers have not given satisfaction in the trucking region of the South, primarily because they bruise and break the skin, thus causing the tubers to present discolorations when placed on the market.

T. C. JOHNSON.

POTATO, AIR: *Dioscorea bulbifera.* **P. Onion:** *Onion.* **P., Sweet:** *Sweet Potato,* and *Ipomœa Batatas.*

POTENTÍLLA (diminutive of Latin *potens,* powerful; referring to the medicinal properties). *Rosàceæ.* CINQUEFOIL. FIVE-FINGER. A large group of perennial, rarely annual, herbs and shrubs found throughout the North Temperate and frigid zones; somewhat planted.

Leaves compound: appendages of the calyx 5, borne at the base of the 5 sepals, which in turn are borne upon the edge of a cup-shaped, dry receptacle; stamens 10–30, together with the 5 rounded petals inserted upon the margin of the receptacle (perigynous); pistils many, in fr. becoming minute achenes; style deciduous. Those in cultivation are all hardy perennial plants

3157. Potentilla, one of the hybrid garden forms known as P. coccinea; of the P. atrosanguinea group.

suitable for border planting. The most valuable double-fld. forms are hybrids. Monograph by T. Wolf, Bibliot. Bot. Heft 71:1908.

The American potentillas are generally rather unattractive plants with small flowers. They are, as a rule, very tenacious of life and do well with ordinary care. *P. fruticosa,* a handsome and distinct low shrub, prefers moist positions, but will grow in even very dry soil. When thoroughly established in moist soil, it is difficult to eradicate. *P. argentea* should be given a dry soil, preferably about rocks. It is tenacious of life and is rather attractive. *P. Hippiana,* a western species with comparatively large foliage of decided gray color, is hardy East. It is a good perennial, preferring dryish

soil. *P. tridentata* is an attractive evergreen species forming thick mats. It does well in any fairly rich soil in open or partially shaded positions. Potentillas are propagated by division or seed, the hybrids only by division. *P. fruticosa* may be increased by greenwood cuttings. (F. W. Barclay.)

Hybrid potentillas (Fig. 3157) have nearly all the good qualities in a border plant,—handsome foliage and free-blooming habit. They continue in bloom from spring until autumn, although most profusely in June and July. They cannot be said to be reliably hardy in the latitude of Boston, probably not above Washington. They do not grow over 2 feet and seldom need staking. A heavy soil suits them best. Choice varieties are propagated by division of the rootstock in spring; cuttings will not root. They run mostly in shades of maroon, scarlet, and orange, often beautifully banded with yellow. They bear seed freely, and when carefully hybridized one may get a very fine strain with a good proportion of double blooms. Seedlings bloom the second year. Some of the species make neat rock-plants, especially *P. tridentata*, *P. verna*, and *P. argentea*,—the last, though common, is valuable in places in which other plants will not grow. (T. D. Hatfield.)

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ARTIFICIAL KEY TO THE SPECIES.

A. *St. distinctly shrubby, diffusely branched*..... 1. **fruticosa**
AA. *St. herbaceous or merely suffruticose.*
B. *Basal lvs. pinnate, 5–7-foliolate.*
C. *Lvs. white-tomentose, at least beneath.*
D. *Fls. cymose: lfts. whitened both sides*.....13. **Hippiana**
DD. *Fls. lateral, solitary at the nodes: lfts. usually green above.*
E. *Carpels dorsally furrowed: peduncles and sts. pilose; tomentum lustrous*.....31. **Anserina**
EE. *Carpels dorsally rounded: peduncles and sts. glabrate; tomentum dull*.....32. **pacifica**
CC. *Lvs. green both sides.*
D. *Fls. white, rose, or dark purple; infl. more or less lax, diffusely cymose; petals exceeding the sepals.*
E. *Lfts. round-elliptic or rhombic-ovate: carpels glabrous, smooth or rugulose: infl. glandular*.....10. **rupestris**
EE. *Lfts. oblong or cuneate-oblong or oblong-lanceolate: infl. not glandular.*
F. *Carpels densely pilose: petals large, obovate, showy*. 2. **Salesoviana**
FF. *Carpels glabrous: petals minute, ovate-lanceolate* . 3. **palustris**
DD. *Fls. creamy yellow; infl. congested; petals not longer than the sepals*.....11. **arguta**
DDD. *Fls. bright yellow.*
E. *Lfts. minute, ¼–½in. long, dissected: petals shorter than the sepals*.....33. **Gordonii**
EE. *Lfts. large, 1 in. long or more, dentate or incised*.....12. **glandulosa**
BB. *Basal lvs. palmately 5–7-foliolate.*
C. *Fls. white: lvs. white-silky or glaucous beneath*..... 9. **alba**
CC. *Fls. yellow.*
D. *Lvs. white-woolly or white stellate-canescent, at least beneath.*
E. *Caudex with abundant rooting stolons: sts. scarcely exceeding the basal lvs., pilose with long horizontal yellowish hairs: lvs. canescent*....29. **cinerea**
EE. *Caudex without stolons: sts. much exceeding the lvs., without the above hairs.*
F. *St. 16–28 in. high: fls. 7–9 lines broad*.....14. **gracilis**
FF. *St. 6–16 in. high: fls. 4–7 lines broad*.....21. **argentea**
DD. *Lvs. green beneath, or somewhat silky.*
E. *Fls. lateral, solitary at each node*.....30. **canadensis**
EE. *Fls. terminal and solitary or cymose.*
F. *Lfts. large, 2–5 in. long: plants large.*
G. *Infl. glandular: lvs. rugose, coarsely serrate-dentate*.....22. **recta**
GG. *Infl. glandless: lvs. not rugose, laciniate-pinnatifid*.....23. **laciniosa**
FF. *Lfts. small, ½–1½ in. long: plants low.*
G. *Style conical: fls. 1 in. broad*.....25. **pyrenaica**
GG. *Style clavate: fls. 5–12 lines broad.*
H. *Stipules of basal lvs. broadly ovate or ovate-lanceolate: stolons scarcely elongated, clothed with dead stipules*.....27. **alpestris**
HH. *Stipules of basal lvs. linear, elongated: stolons much elongated, rooting, not clothed with dead stipules*.....28. **verna**
CCC. *Fls. purple or rose.*
D. *Lvs. and sts. velvety with yellowish hairs: lvs. almost tomentose beneath*.....17. **hæmatochrus**
DD. *Lvs. and sts. not yellowish hairy: lvs. green both sides.*
E. *Lfts. 5: petals clear purple with dark veins and dark spot at base: infl. not glandular*.....15. **nepalensis**
EE. *Lfts. mostly 7: petals dark purple: infl. glandular*.....16. **Thurberi**
BBB. *Basal lvs. palmately, or rarely pinnately, 3-foliolate.*
C. *Fls. rose, white, or creamy white.*
D. *Lfts. glabrous, or slightly strigose beneath, 3-toothed: fls. white*..... 4. **tridentata**
DD. *Lfts. white-silky on both sides, 3-toothed or entire: fls. rose, rarely white*..... 8. **nitida**
DDD. *Lvs. tomentose at least beneath; teeth several.*
E. *Petals white or cream, narrow, cochleate, and dorsally villous*..... 7. **speciosa**
EE. *Petals purple or red, broadly obovate, glabrous*.....19. **atrosanguinea**
CC. *Fls. yellow.*
D. *Lvs. white-tomentose beneath, white-silky above (see also P. grandiflora).*
E. *Margin of lfts. incised-serrate: fls. 1–1¼ in. broad*..18. **argyrophylla**
EE. *Margin of lfts. crenate-serrate: fls. ¾–1 in. broad*....20. **villosa**

DD. *Lvs. not tomentose beneath.*
E. *Lfts. 3-toothed at apex*..... 5. **ambigua**
EE. *Lfts. several-toothed.*
F. *The lfts. small, ½in. long or less: fls. 3–6 lines broad*.....26. **dubia**
FF. *The lfts. larger: fls. ¾in. broad or more.*
G. *Achenes pilose*..... 6. **eriocarpa**
GG. *Achenes glabrous, either smooth or rugose*.....24. **grandiflora**

Section I. TRICHOCARPÆ. *Carpels completely or in part pilose (except P. palustris): receptacle long- and dense-pilose.*

Subsection A. RHOPALOSTYLÆ. *Style clavate.*

1. **fruticòsa,** Linn. St. shrubby, much branched, mostly 1–4 ft. high, with peculiar shreddy bark: lvs. all cauline, pinnate; lfts. 3–7, small, 6–12 lines long, oblong-linear, acute, silky, with revolute margins: fls. numerous, bright yellow, showy, 8–16 lines broad; receptacle, carpels, and disk all long-hairy; style subbasal, clavate. June–Aug. Boggy or dry, more or less calcareous soil, Eu., Asia, N. N. Amer. J.H. III. 31:602. —A useful shrub, flowering throughout the summer. Var. **Vilmoriniàna,** Bean, has lvs. silvery white beneath and fls. creamy white. Var. **álbicans,** Rehd. & Wilson, is similar but has yellow fls. China, and cult. Var. **dahùrica,** Lehm., is white-fld. L.B.C. 10:914 (as *P. glabra*). Var. **Veïtchii,** Bean, white-fld., is *P. fruticosa*×*P. dahurica* (*P. Friedricksenii,* Spaeth). B.M. 8637. In nature, *P. fruticosa* runs into many forms.

Subsection B. NEMATOSTYLÆ. *Style filiform.*

Series A. SUFFRUTICULOSÆ. *Suffruticose: fl.-bearing sts. terminal on the determinate plant axis.*

2. **Salesoviàna,** Steph. Sts. 12–24 in. high, woody at base, laxly cymose above, and silky villous: stipules broadly scarious, fuscous: basal lvs. pinnate; lfts. 7–9, rarely 5, lower much smaller, all short-petiolulate, oblong or cuneate-oblong, coarsely and sharply serrate, thick or subcoriaceous, green and glabrous above, pale appressed pilose below, often furfuraceous and canescent: fls. 1¼ in. broad; sepals purple outside, yellowish within, twice as long as the appendages; petals broadly obovate, entire, about equaling the sepals, lilac or white suffused with rose; carpels villous; style lateral, filiform. June–Aug. Asia. B.M. 7258.—A beautiful and striking plant of dry stony places.

3. **palústris,** Scop. (*Comàrum palústre,* Linn.). Suffruticose: stolons long, creeping and branched: aërial sts. ascending, 8 in. to 2 ft. long, glabrous, laxly cymose above and more or less pilose or glandular: basal lvs. pinnate, long-petioled; lfts. 2–3 pairs, contiguous, thick, not veiny, sessile, oblong-lanceolate, 1–3 in. long, evenly and sharply serrate, green above, glaucous beneath, often puberulent, rarely silky: fls. few; sepals dark purplish, large; petals small, ovate-lanceolate, acuminate, pale purple, often villous or ciliate, shorter than the sepals; receptacle spongy; carpels glabrous; style lateral, filiform. June–Aug. Very wet marshes, Arctic and Temp. Eu., Asia, and N. Amer.—A striking species for aquatic gardens. See *Comarum.*

4. **tridentàta,** Soland. Caudex somewhat woody: sts. 1–12 in. high, slender: branches erect-spreading, appressed-pubescent: lvs. mostly basal, long-petioled, ternate; lfts. ½–2 in. long, oblanceolate, truncate and 2–3-toothed at apex, cuneate and entire below, coriaceous, dark green, glabrous or strigose and paler beneath: fls. several, small, 3–5 lines broad, in a terminal, nearly naked cyme; petals oval, entire, exceeding the calyx, white; carpels villous; style sub-basal, long-filiform. June–Aug. Rocky places, N. E. N. Amer.—Good for dry banks and rockeries.

5. **ambígua,** Camb. Sts. slender, subrepent or ascending, tufted and branched, woody below: lvs. ternate; lfts. subcoriaceous, lateral sessile, terminal long-stalked, obovate or orbicular-cuneate, nearly as broad as long, coarsely and obtusely 3-toothed, green above, glaucous beneath, appressed pilose on both sides or subglabrous: fls. solitary on the branches, long-peduncled, ¾–1 in. broad; peduncles strigose; appendages and sepals subequal; petals suborbicular, slightly retuse, much exceeding the sepals, yellow: carpels pilose. July, Aug. Himalayas.

6. **eriocárpa,** Wall. Caudex branched, woody: fl.-sts. flaccid, simple, ascending, 4–8 in. long, almost leafless, sparsely pilose or subglabrate, 1–2-fld.: basal lvs. ternate or pinnately 3-foliate; lfts. more or less long-stalked, obovate-rhomboid, coarsely and sharply 5–7-toothed above, green both sides, subglabrous: fls. conspicuous, 1½ in. broad, long-peduncled; appendages broad, usually longer than the sepals; petals round-ovate, much exceeding the sepals, soft yellow with large orange blotch; carpels long-pilose; style subterminal, filiform or slightly swollen at the middle or above. July, Aug. Himalayas.—Showy for borders and rockeries.

Series B. HERBACEÆ. *Herbaceous: fl-bearing sts. lateral on the indeterminate plant axis.*

7. **speciòsa,** Willd. Caudex thick, branched, woody: fl.-sts. ascending, 2–10 in. long, few-lvd.: basal lvs. ternate, long-petioled; lfts. thick, obovate, terminal slightly stalked, all crenate-dentate above base, with short teeth, white-tomentose on both sides or only below: fls. 3–8, short-pedicelled, 7–9 lines broad; appendages narrow; sepals rather obtuse; petals scarcely exceeding the sepals, long-canaliculate-unguiculate, terminating in a very small ovate-cochleate limb, tardily deciduous, white or yellowish white, dorsally ciliate or more or less villous; carpels pilose; style subterminal, slender, not dilated. June–Aug. S. Eu.

8. **nítida,** Linn. Cespitose; caudex subligneous: fl.-sts. ascending, short, 1–2 in. long, usually not exceeding the lvs., apex 1–2-fld.: peduncles often glandular: basal lvs. ternate (rarely 4–5-nate), short-petioled, crowded; lfts. thick, sessile, oblong-obovate or subcuneate, apex with 3 incurved teeth, rarely entire, densely white-silky on both faces: fls. conspicuous, 9–12 lines broad or more; appendages narrow, shorter than the purple sepals; petals very short-clawed, broadly obovate, emarginate, twice as long as the sepals, rose or lilac, rarely white; filaments and anthers purple; carpels pilose; style subterminal, long, slender, purple. July, Aug. Mountains of S. Eu.—"One of the most beautiful of alpine fls."

9. **álba,** Linn. Caudex thick, branched: fls.-sts. short, not exceeding the basal lvs., weak, decumbent, laxly 2–5-fld., sericeo-villous: basal lvs. long-petioled, 5-foliolate, some often ternate or 7-foliolate; lfts. sessile or short-stalked, all symmetrical but the outer shorter, oblong-lanceolate, apex acute and serrate, teeth few, appressed, terminal smaller, green and glabrous above, more or less densely white-silky, becoming glabrous and glaucous beneath: fls. long-peduncled, showy, 9–12 lines broad; appendages very narrow, shorter than the sepals; petals broadly obcordate, somewhat longer than the sepals, white; carpels pilose; style subterminal, slender. April–June, and often Aug.–Oct. Cent. Eu. G. 37:98.

Section II. GYMNOCARPÆ. *Carpels glabrous: receptacle short-pilose to almost glabrous.*

Subsection A. CLOSTEROSTYLÆ. *Style subbasal, fusiform.*

10. **rupéstris,** Linn. Caudex thick, subligneous: sts. erect, 20 in. high or more, few-lvd., dichotomously branched and laxly corymbose above, glandular-hairy and hirsute: basal lvs. long-petioled, pinnate; lfts. 2–4 pairs, decreasing downward, distant, round-elliptic or rhombic-ovate, lateral sessile, terminal sessile or

stalked, margin irregularly biserrate, pilose and green on both faces, often glandular: fls. ½–1 in. broad, long-pedicelled; appendages much shorter and narrower than the sepals, often bi- or trifid; petals obovate, entire, equaling or much exceeding the sepals, white; carpels smooth or rugulose; style subbasal, glandular-thickened in the middle. May–July. Eu., Asia, and mountains of W. N. Amer.—Grows well in dry soil.

11. **argûta,** Pursh. Similar to *P. rupestris,* but with a more strict habit, more glandular-hirsute pubescence, more congested infl., and smaller cream-colored petals which scarcely exceed or are shorter than the sepals; calyx enlarging more in fr., and receptacle becoming elongated, much swollen and almost fleshy. June–Aug. N. Amer.—Good for dry rocky soil.

12. **glandulòsa,** Lindl. Similar to *P. rupestris* and *P. arguta:* differs from the former in its golden yellow or pale yellow fls., and from the latter both in the color of the fls., and in the dichotomous and laxly cymose infl. June–Aug. W. N. Amer.—Grows well in dry sterile ground.

Subsection B. Conostylæ. *Style subterminal, conical.*

Series A. Eriotrichæ. *Plant with some true tomentum.*

13. **Hippiàna,** Lehm. St. erect, 1–2 ft. high, silky, laxly cymose above: basal lvs. rather large, pinnate; lfts. 3–5 pairs, whitish-silky above, white-tomentose beneath, uppermost somewhat confluent, the others decreasing regularly toward base of lf., obovate-cuneate, 1–2½ in. long, obtusely incised-toothed: fls. ½–1 in. broad; appendages nearly equaling the calyx, acute; petals obovate, retuse, slightly exceeding the sepals, bright yellow; carpels glabrous, rugose; style papillose-thickened at base, tapering above to the enlarged stigma. June, July. W. N. Amer.

14. **grâcilis,** Douglas. Erect and rather tall, about 2 ft. high, more or less white-hairy, erect-branched and cymose-paniculate above: basal lvs. long-petioled, digitate; lfts. 5–7, obovate or oblanceolate, 1–2 in. long, deeply and regularly incised-dentate, sparsely pilose or glabrous and green above, white-tomentose beneath: fls. 6–9 lines broad, showy; petals obcordate, exceeding the acuminate sepals, yellow; carpels glabrous and smooth; style subterminal, slender, thickened at the base. June–Aug. W. N. Amer.

15. **nepalénsis,** Hook. (*P. formòsa,* Don. *P. Tónguei,* Hort.). St. stout, erect or ascending, 1–2 ft. high, purple: the branches laxly paniculate or raceme-like, hirsute, not glandular: radical lvs. long-petioled, palmately 5-foliolate, often 12 in. long; lfts. oblong-obovate, 2–3 in. long, veiny and rugose, crenate-serrate except toward the base, with broad and short subacute teeth, green both sides, sparsely appressed-pilose: fls. long-pedicelled, showy, 9–12 lines broad; calyx purple within; petals broadly obcordate, deeply emarginate, nearly twice the length of the sepals, clear purple with darker veins and dark-purple base; carpels glabrous, rugulose; style subterminal, thickened at the base, tapering above. July, Aug. Himalayas.—The branches elongate zigzag-like during the summer. A fine species.

16. **Thúrberi,** Gray. Similar to *P. nepalensis,* but finely glandular-hairy all over: lvs. mostly 7-foliolate: petals dark purple and scarcely exceeding the sepals: infl. more cymose. June–Aug. New Mex. and S. Calif.—Good for border planting.

17. **hæmatóchrus,** Lehm. St. stout, ascending, 8–16 in. high, densely cymose above, pubescent or canescent with yellowish hairs: basal lvs. with long and stout petioles, palmately 7-, rarely 5-foliolate; lfts. oblong-obovate, obtuse, thick, elevated-veiny beneath, crenate-serrate with small teeth, velvety above with yellowish subappressed hairs, more or less densely white-tomentose below: fls. on thick pedicels, 9–10 lines broad; sepals purple within; petals broadly obcordate, longer than the sepals, dark purple; carpels glabrous, smooth; style subterminal, red, much thickened at the base. June–Aug. Mountains of Mex. —The yellowish pubescence is characteristic.

18. **argyrophýlla,** Wall. (*P. insígnis,* Royle). Sts. erect, 8–16 in. high, nearly simple, leafy, cymosely few-fld., above puberulent and whitish tomentose: basal lvs. large, long-petioled, mostly ternate; lfts. subsessile, broadly obovate or elliptic-ovate or obovate-oblong, more or less rugose beneath, coarsely incised-serrate with acute teeth, more or less densely silky above, rarely subglabrate, densely white-tomentose beneath: fls. long-pedicelled, showy, 1–1¼ in. broad; petals broadly obcordate, twice the length of the sepals, yellow; carpels glabrous, smooth; style subterminal, greatly thickened at the base. June–Aug. Himalayas. —This species and the next are two of the most common species in cult., and are extensively hybridized with each other and with *P. nepalensis,* giving rise to most of the hybrid potentillas of the trade. (Fig. 3157.)

19. **atrosanguínea,** Wall. Similar to *P. argyrophylla,* but larger, more branched, lvs. less heavily silky-glossy and less white-tomentose beneath, usually more bluntly toothed: petals, stamens, and styles dark purple. June–Aug. Himalayas.—Parent of many garden forms.

20. **villòsa,** Pall. Sts. stout, ascending, 4–12 in. high, few-lvd., cymosely few-fld., densely silky-villous: basal lvs. long-petioled, ternate; lfts. sessile or nearly so, thick and veiny, suborbicular-cuneate, 9–15 lines long, lateral oblique at the base, all coarsely crenate-serrate with short teeth, margin somewhat revolute, densely silky-pilose above, densely white-tomentose beneath: fls. 9–12 lines broad, showy; sepals and bracteoles equal; petals broadly obcordate, 2–3 times the length of the sepals, golden yellow; carpels glabrous, smooth or rugulose; style subterminal, conical, moderately thickened at the base. June, July. Arctic Asia and N. W. Amer.—Showy, with beautiful lf.-rosettes.

21. **argéntea,** Linn. Sts. several, ascending, rarely prostrate, slender, 4–20 in. long, laxly paniculate or corymbose above, white-tomentose: basal lvs. long-petioled, palmately 5- rarely 7-foliolate; lfts. broadly cuneate-obovate, 4–14 lines long, coarsely and regularly incised-dentate with 2–5 pairs of teeth, margins revolute, from green and glabrous to densely silky or tomentose above, densely white-tomentose beneath, very rarely tomentose and green beneath: fls. long-pedicelled, 5–7 lines broad; petals obovate, emarginate, scarcely exceeding the sepals, sulfur-yellow; carpels glabrous, rugulose; style subterminal, conical, papillose-thickened at the base. June–Aug. or Oct. Eu. and Asia, intro. in N. Amer.—Good for dry, sterile soil. Var. **calàbra,** Sir. (*P. calàbra,* Ten.). Lfts. dilated-fan-shaped, incised on outer edge, whitened on both sides: plant low: sts. stout, declined, condensed-cymose: fls. relatively large. Italy.

Series B. Orthotrichæ. *Plant with no true tomentum; pilose and often glandular.*

22. **récta,** Linn. Sts. stout, erect, strict, 12–28 in. high, leafy, dichotomously much branched and widely corymbose above, hirsute or pilose and pubescent, and more or less glandular: basal lvs. large, long-petioled, palmately 5–7-foliolate; lfts. 2–4 in. or more long, the outer smaller, all usually sessile, oblong, linear-oblong or oblong-obovate, regularly and coarsely serrate-dentate, green both sides, villous and rugose, thin: fls. 8–12 lines broad; petals obcordate, deeply emarginate, equaling or somewhat exceeding the sepals, yellow to golden yellow; carpels glabrous, very rugose; style swollen at the base. June, July. Eu.—Very handsome and showy. Var. **sulphùrea,** Lam. Petals sulfur-yellow, much exceeding the sepals: sts. and lvs. lighter

green. Widespread in Eu. Intro. as a weed in E. N. Amer.

23. **laciniòsa,** Waldst. & Kit. (*P. laciniàta,* Amer. Hort.). St. stout, erect, forming clumps. 12–20 in. high, mostly reddish, laxly corymbose above, long-pilose with soft spreading hairs: basal lvs. palmately 7-foliolate, rarely 5-foliolate; lfts. green and pilose on both surfaces, not rugose, the terminal folded, all oblanceolate-oblong, 2–3 in. long, laciniate-pinnatifid, with 6–12 pairs of lanceolate or linear and incised teeth: fls. and general habit as in *P. recta,* to which it is closely related. S. Eu.

24. **grandiflòra,** Linn. Sts. ascending or erect, from a thick caudex, 4–15 in. high, the erect branches of the cyme few-fld., densely villous above, eglandular: basal lvs. long-petioled, mostly ternate; lfts. 7–15 lines long, lateral obliquely obovate, terminal cuneate-obovate, all incised-serrate toward the apex with 6–10 ovate or oblong acutish teeth, pubescent above, densely short-villous beneath, veiny, rarely whitened: fls. conspicuous, 9–15 lines broad; petals broadly obcordate, emarginate, much exceeding the sepals, golden yellow; carpels glabrous, smooth or obsoletely rugose; style papillose-thickened at the base. July, Aug. Alps.—A good border plant.

25. **pyrenàica,** Ram. St. stout, arcuate-ascending from a thick subcespitose caudex, 4–10 in. long, racemosely few-fld. above, pilose or somewhat canescent: basal lvs. both short- and long-petioled, palmately 5-foliolate; lfts. small, sessile, cuneate-obovate or cuneate-oblong-obovate, 4–9 lines long, the outer smaller, all entire below, dentate toward apex with 5–7 pairs of short acutish or obtuse teeth, green and subglabrous above, densely pilose and subsericeous beneath: fls. 1 in. broad; petals large, broadly obovate, emarginate, much longer than the sepals, golden yellow; carpels glabrous, striate-rugulose; style thickened below. July, Aug. Pyrenees.—Closely related to *P grandiflora.*

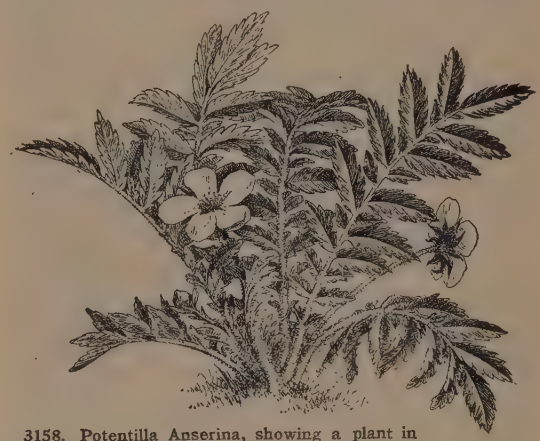
Subsection C. Gomphostylæ. *Style subterminal, rarely lateral, clavate: plant with no true tomentum.*

26. **dûbia,** Zimm. Cespitose, forming mats, runners wanting: sts. slender, prostrate or ascending, ¾–2 in. long, scarcely as long as the lvs., 1-fld., rarely 2–3-fld., pilose, eglandular: basal lvs. short-petioled, ternate; lfts. small, 4–5 lines long, broadly obovate, the outer strongly oblique, the terminal slightly petioled, all with 2–3 pairs of ovate, acute, or obtuse teeth, light green and glabrous above, strigose on the veins beneath: fls. small, 3–6 lines broad; appendages broad, obtuse or rounded; petals broadly obovate, slightly emarginate, exceeding the sepals, yellow; carpels glabrous, smooth or rugulose; style somewhat thickened below. July, Aug. Mountains of Eu. G. 36:483.—The smallest of European potentillas.

27. **alpéstris,** Hall. f. Caudex densely clothed with stipules; runners almost wanting: sts. slender, arcuate-ascending, rarely strict, few-lvd., 2–8 in. long, somewhat exceeding the basal lvs., laxly dichotomous-ramose at top, pilose above, rarely glandular: basal lvs. short-petioled, appendages 5-foliolate, rarely 3- or 7-foliolate; lfts. mostly sessile, obovate, crenate-dentate or deeply incised-serrate with 2–5 pairs of obtuse teeth, strigose or glabrous above, pilose or villous on the veins beneath, green both sides: fls. long-pedicelled, ½–1 in. broad; petals broadly obovate, emarginate, more or less exceeding the sepals, golden yellow, rarely paler, often with an orange spot at the base; carpels glabrous, rugulose or smoothish; style subterminal, clavate. June–Sept. Arctic and Alpine Amer., Eu., and Asia.—A close relative of *P. verna* but not forming such extended mats. Extremely variable.

28. **vérna,** Linn. Caudex emitting runners, forming a thick turf: sts. numerous, decumbent or ascending, 2–6 (rarely 12) in. long, dichotomously branched and laxly corymbose, pilose, rarely glandular, usually reddish: basal lvs. long-petioled, palmately 5-foliolate, rarely 7-foliolate; lfts. sessile or nearly so, cuneate-obovate, ½–1½ in. long, toward the apex crenate-dentate to deeply incised-serrate, sparsely pilose and green above, green and pilose beneath: fls. long-slender-pedicelled; appendages oblong, obtuse; petals obovate to broadly obcordate, emarginate, longer than the sepals, golden yellow, rarely paler; carpels glabrous, rugose; style subterminal, clavate. March–May, often also Aug., Sept. Eu.—Very variable. Dry or stony soil. For banks and rockeries.

29. **cinèrea,** Chaix. Forming mats: sts. slender, ascending, 2–4 in. high, scarcely exceeding the basal lvs., few-fld.; basal lvs. palmately 5-foliolate, rarely 3–4-foliolate; lfts. narrowly cuneate-oblong-obovate or nearly oblong, rounded at apex, short-crenate-dentate, thick, rugose, sparingly stellate-tomentose above, densely so beneath, long-hirsute on both faces; appendages dilated and often bifid, scarcely shorter than the ovate, obtuse sepals; petals oblong-obovate, pale yellow, much exceeding the sepals; carpels glabrous, rugose; style subterminal, clavate. April–June. Alps.



3158. Potentilla Anserina, showing a plant in early summer before the runners start. Later the flowers are borne on the runners.

30. **canadénsis,** Linn. Sts. slender, at first ascending, later prostrate and creeping, simple, flagelliform, 12–24 in. or more long, leafy, bearing solitary long-peduncled fls. at the nodes, villous, eglandular: basal and cauline lvs. slender-petioled, palmately 5-foliolate; lfts. cuneate-obovate or oblong, coarsely dentate-serrate except at the base, green both sides, pubescent or glabrate above, more or less strigose-pilose beneath: fls. 5–6 lines broad; appendages narrowly lanceolate; petals broadly obovate, slightly emarginate, yellow, longer than the sepals; carpels glabrous; style subterminal, from clavate to fusiform. May–Aug. E. N. Amer. Mn. 3:38.—Good for dry, sterile, open soil.

Subsection D. Leptostylæ. *Style lateral, short-filiform, of equal diam. throughout: plant with or without tomentum.*

31. **Anserìna,** Linn. Silver-Weed. Fig. 3158. Caudex thick; sts. simple, slender, prostrate and creeping, rooting at the nodes, often 2½ or 3 ft. long, bearing solitary, long-peduncled fls. at the nodes, pilose-sericeous with ascending or somewhat spreading hairs: basal lvs. numerous, large, pinnate, mostly short-pedicelled; lfts. many pairs, decreasing in size downward, with minute ones interspersed, linear-oblong to oblong-ovate, ½–1½ in. long, sharply serrate, green or whitened above, densely white to lustrous silky-tomentose beneath, very rarely green both sides: fls. large, 8–10 lines broad;

appendages usually lobed; petals obovate, entire, exceeding the sepals, golden yellow; carpels at maturity glabrous, thick, ovoid, corky, dorsally furrowed; style lateral, filiform. May–Aug. Gravelly, more or less calcareous shores. Most widespread of all potentillas, through the cold and temperate portions of all countries except possibly Afr.—Very decorative.

32. **pacífica,** Howell. Similar to *P. Anserina;* but sts., peduncles, petioles, and rachis glabrous or early glabrate: lfts. dull-tomentose beneath: achenes laterally compressed, firmer, rounded on the back, not furrowed. Along the coast of temperate and arctic E. and W. Amer., and E. Asia.—This species may be in the trade as *P. Anserina.*

33. **Gôrdonii,** Baill. (*Ivèsia Górdonii,* Torr. & Gray. *Horkèlia Górdonii,* Hook.). Caudex stout, woody, and cespitose: sts. erect, 4–12 in. high, and, like the lvs., glandular-pubescent or glabrous: lvs. pinnate, mostly basal, numerous; lfts. 10–20, divided into 3–5 oblong or linear segms.; cauline lvs. few, very small: fls. small and inconspicuous, in a crowded cyme; petals yellow, spatulate, shorter than the sepals; stamens 5–20, inserted on the edge of the cup-shaped receptacle at a distance from the carpels; style filiform, basal. Subalpine W. U. S.—Forms dense mats in dry soil. This species belongs properly to Horkelia (a genus apparently not known to the gardeners) and is generically distinct from Potentilla because of the more deeply cup-shaped receptacle. It is, however, known in the trade as a potentilla.

Following are some of the hybrid potentillas, the exact botanical status of which has not been worked out and which have not been standardized as to nomenclature: *P. bícolor* (P. argyrophylla × P. atrosanguinea, according to Wolf), orange and vermilion.—*P. cardinàle* (P. atrosanguinea × P. nepalensis, according to Wolf), brilliant cardinal.—*Dr. André,* golden yellow suffused with vermilion.—*Eldorado,* purple suffused with yellow.—*Emile,* bright bronzy red.—*Gloire de Nancy,* golden yellow.—*Hamlet,* dark carmine.—*P. Hopwoodiàna* (P. nepalensis × P. recta, according to Wolf). Lfts. 5–6: petals at base deep rose, at center pale rose, margins whitish.—*P. hýbrida,* name applied to various hybrids. R.H. 1890, p. 305. Gn. 16:462; 25:514.—*Jeane Salter,* orange, shaded scarlet.—*Le Vesuve,* floriferous, light red margined with yellow or scarlet.—*P. Mac Nabiàna* (P. argyrophylla × P. atrosanguinea, according to Wolf).—*Mars,* dark velvety red.—*M. Daudin,* beautiful amber.—*O'Briana,* pink and salmon.—*P. perfécta,* maroon, shaded lemon.—*P. purpùrea,* deep purple.—*P. versícolor,* carmine- and yellow-flaked.—*Victor Lemoine,* light red striped with yellow.—*Wm. Rollinson,* mahogany-brown, suffused with orange.

The status of the fcllowing trade names cannot be determined: *P. amœna, P. caucásicum, P. cóncolor, P. lanuginòsa, P. mínima, P. nessénsis, P. spléndens.*

K. M. Wiegand.

3159. Pothos aureus of the horticulturists. (×⅙)

POTÈRIUM (Greek for *drinking cup;* because the foliage of one species was used in the preparation of a medicinal drink). *Rosàceæ.* Linnæus placed certain rosaceous plants in the genera Poterium and Sanguisorba, the latter having precedence of publication. Many subsequent authors have united these genera. Focke, however (Engler & Prantl, Die Natürlichen Pflanzenfamilien), re-defines the genus Poterium to include one species, the *P. spinosum* of S. Eu., allowing the other species to remain in Sanguisorba. As thus understood, Poterium is monœcious, the lower fls. in the spike staminate, the upper pistillate, the stamens many and hanging, the styles 2, the fr. somewhat fleshy, colored, and inclosed in the calyx, the lvs. pinnate. These plants are known as burnet, although the name applies more correctly to Sanguisorba alone. **P. spinôsum,** Linn., is a small spiny shrub with nearly glabrous serrate lfts., somewhat downy branches, small greenish fls. in oblong spikes and reddish berry-like fr. It is offered in S. Calif. Grows 3 ft., the branchlets ending in spines. Said to be a very interesting ornamental undershrub. Recently **P. obtûsum,** Franch. & Sav. (*P. obtusàtum,* Hort. *Sanguisórba obtùsa,* Maxim.), has been offered abroad: it is from Japan, said to be the finest of the burnets yet introduced: 3 ft.: lvs. long, pinnate, lfts. about 6 pairs, oblong, rounded at end, serrate, petioluled: fl.-sts. much branched, the crimson spikes about 3 in. long and 1 in. diam. Summer. G.C. III. 59:2. For *P. canadense* and *P. Sanguisorba,* see *Sanguisorba.*

L. H. B.

PÒTHOS (*Potha* is said to be a Ceylonese name). *Aràceæ.* Tall-climbing branching shrubs (more or less herbaceous as known in cultivation) of the oriental tropics.

Leaves thick and often shining, entire or lobed, sometimes blotched or variegated: fls. small and perfect, crowded on a spadix, with 6 perianth-segms. and 6 stamens, the ovary 3-loculed and with a rounded or mushroom-like sessile stigma: fr. a 1–3-seeded berry: spathe usually persistent and wide-spreading or deflexed at maturity. Rhaphidophora has an oblong or linear stigma.—About 50 species. Several names are in the hort. trade, but not all of them belong to Pothos. In fact, the genus Pothos is very ill-defined in cult. because species are named before fls. and frs. are known and determinations are often wrongly made. Some of them are to be referred to Scindapsus and others perhaps to Rhaphidophora. The species of Pothos send out cord-like roots that cling to damp walls. For *P. argyræa,* see *Scindapsus pictus* var. For monograph, see Engler, Das Pflanzenreich, IV. 23 B (1905). They are warmhouse foliage plants and require the same general treatment as Philodendron.

A. *Lvs. green, not banded or mottled.*

nìtens, Bull. Lvs. obliquely ovate-acute, cordate at base, shining purplish green; needs further botanical definition. Malaya.

AA. *Lvs. mottled or banded.*

aùreus, Lind. Fig. 3159. Strong evergreen climber with cordate-ovate-acute lvs., which are variously blotched and mottled with yellowish white, the body color being bright green. Solomon Isl. I.H. 27:381. S.H. 1:334.—The generic position of this plant—which is one of the commonest ones in cult.—is in doubt. It probably belongs to Scindapsus so treated by Engler. In a dark place the handsome markings of the lvs. tend to disappear. Branches will grow in water for a time. Prop. by cuttings or layers.

argénteus, Bull. Lvs. obliquely ovate-acuminate, silvery gray, with a deep green margin and a deep green band along the midrib; needs further definition. Borneo.

P. celatocaùlis, N. E. Br.=Monstera latevaginata.—*P. Loùreiri,* Hook. & Arn. Climbing, branched, with aërial roots: petioles 4–5

in. long, linear, flat; blades decurved, much shorter than petiole, linear-lanceolate, acuminate: spathe 1½–2 in. long, linear to linear-lanceolate; spadix stipulate, 2–4 in. long, cylindric, green: berries smooth, scarlet, about ⅜in. long. S. China. B.M. 7744.

L. H. B.

POTHUÀVA: *Æchmea.*

POT MARIGOLD: *Calendula.*

POTS. Of the three firms of interest to horticulturists that are eligible to the Century Club because of one hundred years or more in the same business, are A. H. Hews & Co., potters, and J. M. Thorburn & Co., of New York, and D. Landreth & Co., of Philadelphia. This indicates the age of the flower-pot business in this country.

The first entry in the oldest Hews account book reads as follows: Weston, April 19, 1775, Lemuel Jones, to Ware, debtor: 0£ 2s. 8d. From 1788 to 1810, a period of twenty-one years, there is a continuous account. The charges within that entire term cover about as many pages as are now often entered in a day; and the amount in dollars and cents does not compare with single sales of the present time. Through all the years up to 1807 the term "flower-pots" does not once appear, and it is much to be regretted that the first sale of flower-pots and the name of the purchaser cannot be found.

In 1861, after war was actually declared, business conditions were much depressed. The members of the Hews firm felt sure that there would be no demand for flower-pots, they being more of a luxury than a necessity, and that the factory must close. At that time the writer succeeded in securing permission to make his first venture as salesman "on the road." Going first to C. M. Hovey, he secured what was a good order for those times, some 10,000 or more pots for the spring trade of 1862. Not once after that, during the Civil War, was the firm able, in the spring and fall rush, to fill all their orders for flower-pots. It is not that these orders were remarkably large or numerous, but they were beyond the capacity of the firm. In 1866, prices were a third or a half higher than they are today. The firm first got fairly under way with machinery for making small flower-pots in 1869.

Until about 1864 or 1865, common flower-pots throughout the world had always been made by hand on the potter's wheel. There have been, indeed, many different forms of this wheel, but it had always been propelled by hand- or foot-power. When, in the early fifties, a wheel was made to be propelled by the foot, with two sizes of pulleys and a balance-wheel whereby the speed of the wheel was increased in the proportion of three to one, it was thought that perfection had been reached. Much time, though very little money, had been spent previous to the fifties in attempts to make a pot machine. It was left to William Linton, of Baltimore, an experienced practical potter, to perfect and patent the first machine. From him two machines were purchased and the exclusive right to use them in Massachusetts. In a short time great improvements were made on his patent. America was far ahead of Europe in this kind of machinery, as also in improved machinery in general. The machine made only small pots, up to about 5 inches in diameter; and while it had previously taken an experienced man to make his thousand 3-inch pots in ten hours, a smart boy without any previous experience whatever could make 3,000 on the machine in the same time.

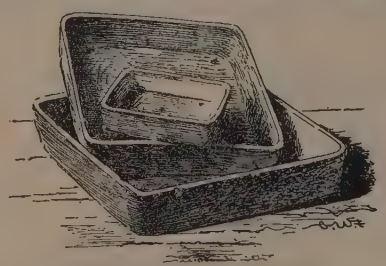
When the standard pot was adopted, about twenty-five years ago, the hand-process was practically abandoned in the principal potteries in favor of what is technically called the jigger. This is a revolving disc propelled by machinery. These discs, or jigger-heads, are made of different sizes and fitted with various rings. Plaster molds are made in very large numbers for each size of pot, and the larger standard pots (6- to 12-inch) are all made at the present time in these molds. The old methods have now passed.

The making of the pot is not its only cost: previous to that comes the preparation of the clay. The hundred years from 1765 to 1865 saw no improvement in the process of preparing it for use. It was ground in a wooden tank or tub, propelled by an ox. The various other processes remained as crude in 1865 as they had been the century previous: the drying, firing, and all connected with the manufacture. The capacity of our flower-pot drying-rooms of today far exceeds the

3160. Pots of various sizes. All are "standard" pots except the rimless one at the right, which is a "rose pot."

entire product of any one year prior to 1865. At that time the custom of using wood for drying and firing pots still continued. It required three cords of white pine and from thirty to forty hours' labor thoroughly to fire a small furnace. Today three tons of bituminous coal will fire five times as much pottery in fifteen hours.

Grades of clay used in the manufacture of flower-pots are almost as numerous as the banks in which they are found, and require many different methods of treatment. To separate the stones from the clay has always been a very perplexing as well as expensive problem. The clay is first plowed by means of a horse and capstan, whereby one horse will do the work of twenty men with picks. This clay is then loaded in dump-carts and carried to the mill, where it is shoveled through a disintegrator, which expels the larger stones and crushes the smaller ones. It then falls on an endless belt and is carried to a revolving drier. This is a western device, with which, by the use of crude petroleum for heat, from 20 to 25 per cent of moisture is evaporated from the clay, and while it passes through a direct blaze of white heat there is sufficient moisture all the time to prevent it from burning. (Burning of the



3161. Fern-pans. A form of pottery useful for small bulbs and many shallow-rooted subjects of which spreading masses are desired.

clay at this stage would make it worthless.) To demonstrate this point beyond question, paper and dry shavings have been passed through with the clay, and they came out without even scorching.

From the drier, the clay goes into large bins, where it must remain twenty-four hours, so that portions of it which have become too dry and hard may absorb the moisture from that not dry enough. From these bins it is carried to whippers, which beat the clay without further crushing the stone. From the whipper it goes to the revolving screens, and thence to the elevators.

The next process is mixing, or, as it is termed, "pug-

ging." This is all done by machinery. From one machine the clay comes out very soft and plastic, to be worked in plaster molds. From the other the clay comes out into hard cubes for the iron molds of the machine. The pot machine and the jigger of today each does the work of six to eight men at the wheel.

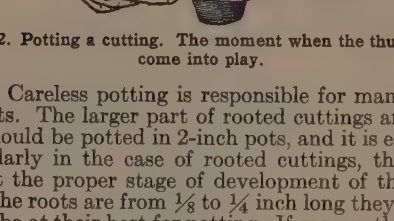
The difference in cost between a good and a poor pot is very slight, and if the florist will demand and accept nothing but a first-class pot, a standard in quality as well as size will soon be reached. To be standard in quality a pot must be of clay properly prepared, be of uniform firing, and of a smooth surface inside as well as out. It must also be of right porosity, a condition which can be attained by the proper mixture of clay. Moreover, a machine-made pot should have a smooth rim on the inside, so that the man standing at his bench potting thousands of plants a day, as is being done constantly in large establishments, may have flesh remaining on his thumbs at night. Such a pot must also be able to stand transportation and years of usage if necessary. "Standard" flower-pots, such as are now used by American florists, are shown in Figs. 3160, 3161.

A. H. Hews.

POTSHERDS. Gardener's name for broken pots and crocks, a material used in the bottom of pots, pans, boxes, and the like, to provide drainage. Coal-clinkers, gravel, and other inert materials, are often used for the same purpose.

POTTING. The first stage in the life of the plant is when the seedling is transplanted from the seed-bed or the cutting is put in the cutting-bench. It is only when either is potted that it can truly be said to take on the dignity of a plant. It is then out of swaddling clothes and enters the ranks of its big brothers and sisters, on the way to making its bow in society; to live perchance in the window of the tenement or on the fire-escape; mayhap to refresh the eye of the patient in the sick-room; or to lose its identity in rows of its fellows in great glass houses where the blossoms are garnered and sent to market; perhaps to take its place in row upon row of its kind and make an arabesque pattern or gay border, and so delight the eye or regale the senses with sweet odors.

The mechanical operation of potting includes also "shifting," i.e., transferring the plant from a small to a larger pot. Repotting signifies the same, generally speaking, as shifting; but speaking technically it means shaking out an established plant and putting it in a pot of the same size or one smaller, according to its needs. The actual operation of potting is very simple, and yet it must be well done to give the young plant a fair start



3162. Potting a cutting. The moment when the thumbs come into play.

in life. Careless potting is responsible for many losses in plants. The larger part of rooted cuttings and seedlings should be potted in 2-inch pots, and it is essential, particularly in the case of rooted cuttings, that it be done at the proper stage of development of the roots. When the roots are from ⅛ to ¼ inch long they may be said to be at their best for potting. If sooner, the plants are not likely to develop so rapidly in the pot as if left in the cutting-bench; if later, they are harder to handle, injury is liable to result, and they do not so readily recover from the shock incident to the change.

The operation of potting as practised in commercial florists' establishments is as follows: The soil having been prepared, the workman places the empty pots at his left hand, the cuttings in front of him, and an empty "flat" to receive the potted plants at his right. With a simultaneous movement he takes an empty pot in his left hand and a handful of soil in his right. He "sets" the pot in front of him, fills it with soil, and while doing so reaches for the cutting, retaining a small portion of soil in his hand. With the index finger of the right hand he makes a hole in the center of the pot of soil, inserts the cutting, drops the portion of soil which he retained in his right hand into the hole, takes the pot between the index and middle fingers of both hands to steady it and obtain leverage, places his thumbs on each side of the cutting and parallel with his body (Fig. 3162), the right on the side away from his body, the left on the other side, and presses evenly and firmly; then shifts his thumbs so that they are at right angles with his body and presses again; transfers the potted plant with his right hand to the "flat," placing it with a little force to level the loose soil on top, reaching for another empty pot with his left hand as he does this, and repeats the movements. It is marvelous how rapidly these motions are made by expert workmen, and the work can be done as well rapidly as slowly when the cuttings are in the proper condition as to root-development already described. There was a time when 5,000 a day of ten hours was considered the maximum, and it is still good work for the average workman. James Markey, an employe of the late Peter Henderson, repeatedly potted 10,000 verbena cuttings with two boys to assist in taking away the plants as potted, supplying him with empty pots and cuttings, the requisite quantity of soil having been previously placed on the bench. The writer was his only assistant when he made his first great effort at "breaking the record," when he succeeded in potting 7,500 in ten hours. Upon one occasion he potted 11,500 verbena cuttings in a day of ten hours, which is the highest number ever reached. At a potting contest held in Madison Square Garden in New York city in 1892, George Martin potted 1,373 cuttings in one hour, the material used being arborvitæ cuttings without roots. The "standard" pots (Fig. 3160) cannot be handled so rapidly as those without rims, for the reason that the lower edges of the rim are sharp and rough and make the fingers of the workman sore. Consequently the pots without rims are to be preferred.

The essentials in good potting are to put the cutting in the center of the pot and at the proper depth, to firm the soil thoroughly and evenly, and to leave ¼ inch, or a little less, between the top of the soil and the upper edge of the pot to receive water.

Included in potting is the care of the plants immediately after being potted and until they have taken root in the pots. First in importance is the "setting" of the plants on the bench; care should be taken that they are "set" perfectly level so that they will hold water. They should be watered thoroughly and shaded as soon as they are set. The best method of shading when large quantities are potted is by the use of lath shutters. These are made by nailing common laths on three parallel pieces of furring strip, allowing 1 inch space between the laths. They may be made any length, 3 feet being a very convenient size. Inverted pots of a sufficient height to clear the young plants make very handy supports for these shutters. During late spring and summer it will be necessary to supplement this method of shading by covering the shutters with paper or muslin, the muslin being preferred. Sew the muslin in 10-yard lengths, giving pieces 2 yards wide. Sprinkle the muslin copiously at intervals as it becomes dry. This care must be kept up for three to six days according to conditions; the shutters should be put over the plants early in the morning, first watering the plants; an hour or so later

the muslin should be put on, provided the sun is shining brightly. After the second day the period for covering the plants should be shortened by putting shutters and muslin on later and taking them off earlier until the plants are sufficiently established to get along without them. An important detail is to have about ½ inch of sand on the bench to retain moisture and allow for the proper "setting" of the plants. Another very important detail, in case new pots are used, is thoroughly to saturate them with water before filling, allowing sufficient time for the water to evaporate from the surface before using. It is bad practice to work with wet pots, and worse still with wet soil. A good test of the proper amount of moisture in soil for potting is when it molds in the hand only under strong pressure. Another essential, in case old pots are used, is to see that they are clean inside at all events; they should be clean outside as well, but if any old soil is found adhering to the inside of the pot it should be cleaned out and thrown away.

3163. Implement for firming the soil in large pots.

Potting large plants from the open ground, such as carnations, roses, geraniums, and shrubs, is an entirely different operation from the foregoing. These all require pots 5 inches in diameter and over, and sufficient pressure cannot be given with the thumbs properly to firm the soil. It is necessary, therefore, to use a stick about an inch wide, and sharpened down to ¼ inch at the end. (Fig. 3163.) The handle should be round, and in a large place where much heavy potting and shifting are done it pays to have some of these sticks in regular tool stock. After the plant is placed in the pot and the latter filled with soil, take the stem of the plant at the surface between the index fingers and thumbs, the other fingers extended down the sides of the pot, lift the pot about an inch and set it back with a smart shock, at the same time pressing the plant down and steadying it; this settles the soil considerably in the pot. Next take the stick described above and run it around the inside edge of the pot twice or so to pack the soil, add more soil to fill up, finish by pressing evenly and firmly the entire surface with the thumbs, allowing ½ inch of space between the surface of the soil and the upper edge of the pots to hold water. What has been said about new and clean pots applies with even greater force to large pots.

The potting of orchids is a radically different operation from the potting of purely terrestrial plants, about which the preceding has been written. Consider cattleyas as an example: being epiphytes, they do not require soil in which to grow; put them in as small pots as possible. The material for potting best suited to these and most orchids is fibrous peat and live sphagnum moss in equal proportions, adding a small portion of broken charcoal. If freshly imported pieces are to be potted, cut away all the old dead roots, pseudobulbs and leaves. If the formation of the piece is uneven, it should be cut in two, so as to combine the parts thus separated into a more symmetrical whole, with the growths pointing to the center. Have the pot thoroughly clean, fill it about half with clean "crocks" and small pieces of charcoal, adjust the piece in the center of the pot, distributing evenly any roots which remain; but first spread a layer of moss over the "crocks," then press the preparation of peat and moss evenly and moderately firm around the piece and in the interstices between the roots, finishing up high around the center; insert some small-sized stakes at the proper places to support the piece, tie the growth to them, and the job is finished. Fig. 3164 will show better than words can describe how the plant should look after it is potted.

3164. Potting an orchid. The pot is cut in two to show the proper conditions inside.

Repotting, when necessary, is almost identical in its details with potting itself. The spring is the best time to do it, even with species which flower in autumn. Carefully remove all the old crocks and other material, so as not to injure the roots, a pointed stick being the best implement for the purpose. Then replace as carefully with new material in a clean pot. The undersigned dwells upon cleanliness repeatedly, for herein lies the great essential in successful plant-growing. Potting orchids in baskets, which sounds paradoxical, is identical with potting them in pots as far as the essential details of manipulation are concerned. The potting of bulbs is discussed under *Bulb*.

3165. "Shifting" an established plant into a larger pot.

"Shifting" is the technical term used in the florist's trade when plants are transferred to larger pots. (See Fig. 3165.) When the plant exhausts the soil in the small pot it must be put in a larger one to maintain growth. The trained eye detects at a glance by the appearance of the plant when it requires a "shift." Those lacking such training can discover it by turning the plant out of the pot and examining the roots. (See Fig. 3166.) If the outside of the ball of soil on the lower portion is well netted with roots as in Fig. 3167, and particularly if most of them have lost the fresh creamy white color of healthy "working" roots, then the plant must be at once shifted, or it will soon reach that stage which is the bane of the careless plant-grower, viz., "pot-bound."

3166. A plant may be turned out of its pot to ascertain whether it needs a "shift."

"Knocking out" is the technical term used by florists to describe the turning of a plant out of a pot. The best way to do this is to take the pot in the right hand, invert it in passing it to the left, as the plant should be placed between the index and middle fingers of the left hand, give the pot a smart tap on its rim on the edge of the bench and the ball of soil is separated from the pot; place the plant in a flat ready for the purpose, and repeat. One tap is all that is necessary in ninety-nine cases out of a hundred. It is bad practice to get into the habit of giving a series of taps, as it makes slow work. We are considering now the first shift, i. e., from a 2-inch to a 3-inch pot.

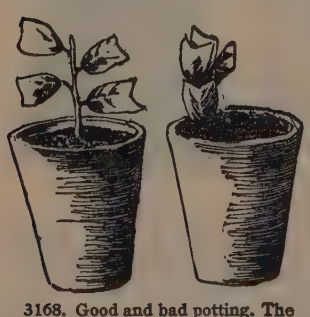
The plants having been knocked out, the next operation is to "shoulder" them. This consists of removing

the shoulder or edge of the ball of soil with the thumb and forefinger down to where the roots begin. (Fig. 3167.) The object of this is obvious, to remove leached-out soil and supply a fresh, nutritious portion in its place, so as to get the greatest possible advantage from shifting. Everything being made ready, the operator proceeds by putting a portion of soil in the bottom of the pot sufficient to raise the ball of soil flush with the edge of the pot. As this is being done, reach for the plant with the left hand and put it in the center of the pot; simultaneously take a handful of soil in the right hand and fill the pot, then grasp the pot between the index and middle fingers of each hand, place the thumbs on each side of the plant at right angles with the body, lift the pot about ½ inch and set it back on the bench with a smart rap, pressing with the thumbs at the same time; change the thumbs to right angles with their former position and press again, then change so as to press where they have not touched already; three pressures of the thumbs and the rap on the bench, and the operation is done. A smart operator with two boys will shift 5,000 plants in ten hours. This amount of work is made possible only by eliminating all unnecessary motions and making them synchronous with each hand in reaching for soil, pot, and plant as described. One hand should not be idle while the other is employed. See Figs. 3168–3172 for good and bad examples of potting.

3167. Repotting a sickly plant. The "shoulder" is rubbed off as at *b*, replaced by fresh soil and the whole ball of earth reduced in size. (Only a fraction of the plant's height is shown.)

Be careful in shifting not to set the plants too deep. The tendency of roots is downward, and only enough of the stem to steady the plant in the pot should be in the soil Plants set too deeply in the pots are easily overwatered, because so much soil is not within the influence of root-action. A few plants which root from the crown, like lilies, should be set deeper than such plants as roses, geraniums, fuchsias, palms, and all plants whose root-action is mainly downward.

Do not give too great a shift at one time; that is, do not attempt to shift from a 2-inch pot to a 5- or 6-inch. As a rule, an inch at a time is best, especially for commercial purposes, where plants are grown to be shipped some distance. In private places soft-wooded plants may be shifted in spring from 2- to 4-inch pots and from 4- to 6-inch, as the question of shipping does not enter. But it would not be safe even with these to do the same in late fall when growth is slower and the days are growing shorter. Hard-wooded plants, such as palms, azaleas, and the like, and even roses should never be shifted more than an inch at a time; in fact, it is better not to shift them later than September in any case. The spring is the best time to do it.



3168. Good and bad potting. The cutting should be placed in the center.

Drainage is necessary in all pots over 4 inches and for hard-wooded plants even that size is better drained. This is technically called "crocking," i. e., placing potsherds in the bottom of the pot to allow the quick passage of water and admit air to the roots. Place a large piece over the hole in the bottom of the pot and the remainder in smaller pieces. There are usually enough broken pots around a place to supply the needs. Charcoal is an excellent material for supplying pot-drainage, none better. An inch or so of drainage is sufficient in a 5- or 6-inch pot, 2 inches or so for all sizes above these. A bottom of broken stone, cinders or gravel is essential upon which to stand the pots, as such a stratum accelerates drainage, while at the same time providing a moist surface so beneficial to plants in a greenhouse.

3169. Too deep.

3170. Too high.

A few words of caution may not be out of place before closing this branch of the subject. Never shift plants while the ball of soil is wet; it should be dry enough to crumble readily to the touch. Never shift into dirty pots; it will pay to clean them, especially the inside. Never shift a pot-bound plant without loosening the soil on the surface of the ball. A few smart raps with the closed fist will do it; or better still repot as now described.

Repotting is necessary frequently when plants have become pot-bound, or when from any cause they appear to require it; such, for instance, as debility from overshifting, over-watering or neglect of any kind. In such cases the soil should be washed from the roots almost entirely and the plant put into a pot a size or two smaller than it has been growing in, taking care to firm the soil well, and if a shrubby plant prune it back according to its needs and conditions. Shade such plants until danger of wilting is past and water sparingly until new and vigorous growths appear, showing that the subjects have regained their normal health.

There are a few cultural details intimately associated with potting which may with profit be added as a closing paragraph. The high narrow pot shown on the extreme right of the line of pots in Fig. 3160 is frequently used for roses and palms by some, especially for *Cocos Weddelliana*, which makes a long tap-root and which it is almost invariably fatal to break. It is feasible, however, to avoid this if the seeds are sown in 6-inch pots, using 4 inches of clinkers as a bottom. These check the downward growth and induce development of fibrous roots in the soil, so that the tap-root may be cut off below them and the ordinary 2-inch pot used with safety. It is not necessary to use the deep pot for roses in any case. Plants which exceed the diameter of the pot should be given room to allow for development. The best market growers plunge the pots in soil to half their depth, as it is necessary in the spring months because of the rapid evaporation of water. This refers especially to geraniums, fuchsias, heliotropes, petunias, and the like. Care must be taken, however, to lift them occasionally so as to prevent the roots from getting hold in the soil through the hole in the bottom of the pot. Ten inches apart from center to

center for such plants will not be too much if stocky plants well set with good flowers are wanted; and in these days such plants will bring enough in the best markets to pay for the space and trouble. For 2- and 3-inch pots use sifted soil, but for 4-inch and over, soil well broken, but having plenty of fiber from sod in it, should be used. Always water plants thoroughly after

3171. Pot too full.

3172. Good.

shifting so as to soak the soil to the bottom, and do not water again until they show dryness half way down the pot on the outside.

PATRICK O'MARA.

POURRÉTIA: *Puya.*

POURTHIÆA: *Photinia.*

POUTÈRIA (native name). *Sapotàceæ.* Trees or shrubs with small often short-peduncled fls. in clusters: corolla with 4 rounded lobes and a tube about twice as long; staminodes free, petal-like, borne at the edge of the tube; stamens borne at the base or middle of the tube, becoming free; ovary swollen at base, hairy, 2–4-celled, gradually produced into the long style: fr. a 1–4-seeded berry, hairy or glabrous, occasionally pointed.—About 30 species in Trop. Amer. *P. suàvis,* Hemsl. Tree with rather slender flowering branches: lvs. crowded at the ends of the branches, narrow-oblong to lanceolate, about 4 in. long, coriaceous: fls. very small in fascicles borne in the axils of the fallen lvs.: fr. pear-shaped with a thin edible pericarp possessing a delicate perfume. Uruguay. Intro. into gardens abroad.

PRÀTIA (named after Prat-Bernon, with Freycinet's voyage). *Campanulàceæ.* Slender prostrate or creeping herbs, rarely ascending or erect, sometimes grown for ornament.

Leaves alternate, toothed: infl. axillary, in 1-fld. peduncles; fls. rather small, often unisexual; calyx-tube adnate to the ovary, 5-parted; corolla oblique, split to the base at the back, 2-lipped, upper lip 2-parted, lower lip 3-lobed; stamens 5, 2 lower tipped with short bristles, 3 upper naked; ovary 2-celled: fr. a globose or obovoid berry.—About 30 species, mostly from Austral. and New Zeal., but also in S. E. Asia and S. Amer. Several species seem to be more or less extensively cult. abroad. The genus is very closely related to Lobelia and similarly cult., differing from it in the indehiscent more or less succulent fr. They are used both as greenhouse and hardy herbaceous rockwork plants, depending on the species.

angulàta, Hook. (*Lobèlia littoràlis,* Cunn.). Fig. 3173. Perennial herb, very variable, slender, creeping or prostrate, glabrous or sometimes slightly pubescent: sts. 2–12 in. long: lvs. short-petiolate, orbicular or ovate-oblong to obovate: fls. white with purple streaks: berry globose or broadly ovoid, purplish red. New Zeal. G. 34:757. G.M. 53:897. G.C. III. 47:98. J.H. III. 71:57.—Hardy in England and used as a creeper for rockwork. Var. **arenària,** Hook.f. (*P. arenària,* Hook.f.). Lvs. larger, obscurely toothed: peduncles very short. Auckland Isls.—Well adapted for shady localities; a quick-growing creeper with many white, star-like fls.

begonifòlia, Lindl. Small, creeping, rooting, and pubescent: lvs. cordate-ovate, denticulate: fls. green, marked pink: berry short-ellipsoid, finally smooth, black. India, Malaya. B.R. 1373.—Sometimes grown in the greenhouse.

rèpens, Gaud. Creeping: lvs. petiolate, rather reniform, undulately subcrenate: peduncles rather long, axillary, 1-fld.; fls. white with a violet tint. June–Oct. Falkland Isls.—Hardy in England; well adapted for a sunny position on rockwork.

P. ilicifòlia, Hort., listed abroad as a charming little creeping plant with evergreen foliage studded through all the summer months with large pure white fls. followed by large lilac-colored berries, and loving a damp spot, is unknown botanically.

F. TRACY HUBBARD.

PRÉMNA (Greek, *stump* of a tree in allusion to the low sts. of most species). *Verbenàceæ.* Shrubs, subshrubs or trees, sometimes climbing: lvs. opposite, entire or dentate: cymes panicled or corymbose; fls. often polygamous; calyx small, cup-shaped, subequal or 2-lipped; corolla tubular, throat hairy, limb 2-lipped, 5-lobed or subequally 4-lobed; stamens 4, didynamous; ovary 2- or 4-celled, 4-ovuled: drupe small, surrounded below by the calyx, globose or oblong-obovoid.—About 80 species, inhabitants of the warmer regions of the Old World. **P. Gaudichaùdii,** Schau. Branches puberulent: lvs. long-petiolate, broad-ovate, short-acuminate, entire: infl. terminal, corymbose panicles, many-fld.; fls. small; calyx short cup-shaped, subbilabiate; corolla subequally 4-lobed. Marianne Isls. This is known as "ahgao" and is said to be extensively used in Guam for the construction of buildings. The following E. Indian species have occasionally been cult. in hothouses abroad: *P. esculénta,* Roxbg., has yellowish white fls. in May and purple fr.: st. grows about 6–8 ft. high; *P. integrifòlia,* Linn., with greenish white fls. in July, about 10–12 ft. high, and *P. latifòlia,* Roxbg., with dirty white fls. in June, growing about 15 ft. high.

PRENÁNTHES (Greek words, meaning *drooping blossom*). *Compósitæ.* RATTLESNAKE ROOT. Tall perennial herbs, a few species of which are offered by collectors for use in wild-gardens.

Leafy-stemmed, with dull-colored heads borne in spike-like terminal panicles: lvs. alternate, lower ones

3173. Pratia angulata. (×½)

petiolate, sagittate, cordate, often much divided; upper ones auriculate and much narrower and smaller: heads 5–30-fld.: achenes terete, 4–5-angled, usually striate.—About 16 species, of which 10 are native of N. Amer. (The N. American forms are by some botanists separated as Nabalus.) The species are extremely variable. They are of easy cult. in any good soil, but are very weedy and of little importance horticulturally.

A. *Involucre glabrous.*

B. *Heads 5–7-fld.; involucre very narrow, only 1 line thick.*

altíssima, Linn. A variable species, mostly perfectly smooth: st. 3–7 ft., slender: lvs. membranous, all stalked, ovate, heart-shaped: fls. greenish yellow; pappus straw-colored or whitish. July–Oct. In open or shade, Canada to Ga. and Tenn.

BB. *Heads 8–16-fld.; involucre broader, 1½–3 lines thick.*

C. *Pappus deep cinnamon-brown.*

álba, Linn. St. 2–5 ft. high, usually smooth and glaucous or purplish: lvs. angulate or somewhat triangular halberd-form, the uppermost usually undivided: infl. thyrsoid-paniculate; fls. dull white. Aug., Sept. Open woods and sandy soil, Canada to Ga. and Ill. B.B. 3:289. Mn. 3:161.

CC. *Pappus straw-colored.*

serpentària, Pursh (*Nábalus Fràseri,* DC.). St. usually about 2–4 ft. high, sometimes purple-spotted: fls. purplish, greenish white or yellowish. July–Oct. Ont. to Fla. and Ky. B.B. 3:289.—Little known in cult. and usually only a weed as a wild plant.

AA. *Involucre hirsute-pubescent.*

racemòsa, Michx. St. 6 in. to 2 ft. high: st.-lvs. mainly sessile, while they are mostly petiolate in the other species here described: fls. purplish. Aug., Sept. Moist open places, Canada to N. J. and Colo. B.B. 3:291.

F. W. Barclay.
N. Taylor.†

PRESTÒEA (named after H. Prestoe, of the Botanic Gardens at Trinidad). *Palmàceæ.* Slender dwarf palms with a reed-like, annulate caudex, occasionally grown in the warmhouse: lvs. long and slender-petioled, pinnatisect at the base, upper segms. connate in an oblong blade, 2-cleft at the apex, lower segms. narrow: spathes 2, membranaceous, finally lacerate; spadices short-peduncled, fuscous-pubescent, with strict erect-spreading branches: fls. small, moncœcious; male fls. asymmetrical, calyx 3-lobed, minute, petals obliquely ovate, stamens 6, ovary rudimentary; female fls. larger than the male, globose, sepals reniform-rotundate, petals broadly ovate, ovary obovoid-oblong, 1-celled. Three species, W. Indies and Colombia. *P. pubígera,* Hook. f. (*Hyospàthe pubígera,* Griseb. & Wendl.). Trunk 10–12 ft. high: lvs. 3–4 ft. long, green with pale nerves, glabrous; lower segms. somewhat distant, linear-acuminate, 1½–2 ft. long, upper more or less cohering and forming oblong or oblong-linear blades: exterior spathe 2-keeled, 5 in. long, interior 12–15 in. long; lower branches of spadix about 6 in. long, thickened at base, glomerules somewhat distant: fls. minute and sessile. Trinidad.

PRESTÒNIA (named for Dr. Charles Preston). *Apocynàceæ.* Tall climbing pubescent or glabrous shrubs, among which is *P. venosa,* a tender foliage plant once offered in America as *Echites nutans.*

Leaves opposite, with a few well-separated pinnate veins: cymes often densely corymbose or almost umbelliform, pseudo-axillary; calyx nearly 5-parted with 5 entire or lacerated scales inside at the base; corolla salver-shaped with 5 linear erect scales below the throat, which is constricted, 5-lobed; ovary 2-carpelled, ovules numerous in each carpel: follicles hard, erect or divergent at base.—About 30 species, natives of Trop. Amer.

Prestonia venosa is cultivated for the network of crimson veins on its foliage. The plant blooms rarely, and its flowers are inferior to Echites or Dipladenia. When properly cultivated it makes a charming subject, but if neglected it is as worthless as a weed. It can hardly be propagated by cuttings; the fleshy roots are cut into pieces 1 to 2 inches long. The plant demands a temperature of 85° F., with an atmosphere as moist as possible. Foliage should never be syringed. Young plants should be raised every season, as older plants become unsightly. The plant was formerly considerably grown, being trained to a balloon-shaped wire trellis. Needs warmth to bring out the markings.—From Lowe's "Beautiful Leaved Plants."

venòsa, Mottet (*Echìtes nùtans,* Anders. *Hæmadictyon venòsum,* Lindl.). Lvs. opposite, ovate-lanceolate, villous beneath: fls. yellow, in pedunculate panicles; corolla-lobes roundish, wavy. St. Vincent in the W. Indies. B.M. 2473. Lowe 58.

F. Tracy Hubbard.†

PRICKLY ASH: *Xanthoxylum.* **P. Comfrey:** *Symphytum asperrimum.* **P. Pear:** *Opuntia.* **P. Poppy:** *Argemone.*

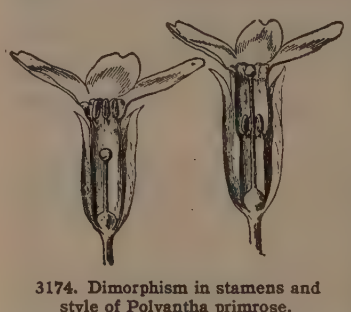
PRIDE OF INDIA: *Melia Azedarach.*

PRIM: *Ligustrum.*

PRIMROSE: *Primula.* **Arabian P.:** *Arnebia cornuta.* **Cape P.:** *Streptocarpus.* **Common P.:** *Primula vulgaris.* **English P.:** *Primula vulgaris.* **Evening P.:** *Œnothera.*

PRÍMULA (*Primula veris,* the "first in spring," was an old appellation of one or more of the species). *Primulàceæ.* Primrose. Low plants, for the most part herbaceous, mostly spring-blooming but a few kinds used for winter flowering, producing usually clusters of attractive flowers mostly in white, pink, and rose, but sometimes in red, blue, and yellow.

Perennial (plant sometimes monocarpic or blooming but once), with monopetalous salverform fls. in clusters on scapes that arise from a radical cluster of simple entire or lobed lvs.: corolla-tube usually surpassing the 5-toothed or 5-cleft calyx; corolla with 5 spreading lobes, which are commonly notched or retuse at the end and more or less narrowed at the base; stamens 5, affixed to the corolla-tube: ovary 1-loculed, with many ovules on an axile placenta, and 1 undivided filiform style and a capitate stigma, dehiscent by 5–10 valves: bracts of the floral involucre sometimes lf.-like.: the fls. of some species are strongly dimorphic or trimorphic,—the stamens and pistils of different lengths in different fls. of the same species (Fig. 3174). See Darwin's work, "The Different Forms of Flowers on Plants of the Same Species;" this polymorphism is associated with cross-pollination. Often the herbage is covered with a loose meal or farina or powder.— Primulas are natives to the N. Temp. zone, only one being known in the cold parts of S. Amer., one in Java, and sparingly in Afr. They are mostly boreal or alpine plants. About a score are native to the colder parts of N. Amer. Twenty-five years ago, Pax (Monographische Ubersicht über die Arten der Gattung Primula, Leipzig, 1888, and in Engler's Bot. Jahrbücher, vol. 10), admitted 145 species. Pax & Knuth, in Engler's Das Pflanzenreich, hft. 22 (iv. 237), 1905, describe 208 species and many marked hybrids, and others have been recognized since that time. The number of species now known is upward of 300, with the greatest extension in China (about one-half the species), about 70–75 in the Himalayan region, and the remainder in Japan, N. Amer., Eu., and Eurasia. *P. magellanica* occurs in Patagonia, but is apparently not in cult. The latest horticultural treatment is by S. Mottet, Monographie du genre primevère, Paris, 1915; this work follows the systematic analysis of Pax & Knuth, which also is adopted herewith. The fancier of primules must



3174. Dimorphism in stamens and style of Polyantha primrose.

also have the proceedings of the Primula Conference held in London in 1913, comprising botanical and horticultural discussions (Journ. Roy. Hort. Soc. 39). The discussion contains a full synonymy of the Chinese and other Asiatic species by Balfour and of European species by MacWatt. For cult. and horticultural descriptions (for England), the reader should consult H. M. Paul, "Handbook of the Hardy Primula," 1911. For evening primrose and Mexican primrose, see *Œnothera*.

Notwithstanding the volume of the recent literature, a comprehensive monograph is still lacking, due to the great extension of the genus by contemporary explorers. Further collecting in the Himalaya-Thibet-China region will undoubtedly discover many more forms. The numbers of new species have made it necessary to extend and to recast the sections as defined by Pax & Knuth; but these have not yet been redefined and keyed at once in a connected treatment for the entire genus, and in a compilation like the present it is necessary to spread the Paxian groups as a tentative expedient, even if species of not very close relationship are brought together; in this compilation, the purpose is not so much to show botanical affinities as to make an effort to enable the consultant to identify given species. Even so, it can not be expected, in a genus so large, so variable, and in which so many of the species are recently discovered and little known, that the groups and keys will be always satisfactory to the student. Much change is likely to take place in the definition or recognition of species in the genus, as the many forms are more closely studied. In the present account, the characterizations of the species have been drawn so far as possible from the recent working authorities. The portraits are cited in the text under the names they bear in the different publications, and the author cannot vouch for the authenticity of all of them. The reference R. H. S., in the citation of portraits, is to the Journal of the Royal Horticultural Society.

The date of introduction, given for some of the recent species, is the year in which they were brought into cultivation in Great Britain. The informal notes on culture, under the different species, apply mostly to Great Britain.

Primulas are cool-climate or cool-season plants, mostly spring-bloomers. Many of them grow at very high altitudes, and depend on very special conditions for their perfect development. Several cultural groups of primulas may be recognized: (1) The alpine and subalpine section affords some of the most useful plants for rock and alpine gardens. The relatively little attention given to alpine gardens in this country is the reason for the neglect of these charming spring-flowering plants. In recent years, many species have been added to these outdoor primulas and great interest has arisen in them abroad. (2) The polyanthus class, comprising fully hardy spring-flowering plants, suitable for culture under ordinary garden conditions, and always popular in this country. To the same class belong the true cowslip (*P. veris*) and the oxlip (*P. elatior*), but these are rarely seen in our gardens in their pure form. All are easily propagated by division. (3) Yellow-flowered or purple-flowered verticillate-clustered outdoor species, of the *P. imperialis* and *P. japonica* type, some of which are hardy even in the northern states with some winter protection. (4) The true greenhouse species, represented by the old *P. sinensis* (Chinese primrose), the more recent *P. obconica* and the still more recent *P. malacoides*. These are Chinese species. The colors are of the cyanic series. (5) The auriculas of gardens, developed from *P. Auricula*.

In Great Britain, much interest is now taken in new primulas, and very many species are more or less in cultivation, the larger part of them as fancier's subjects. Not many of them have been tried to any extent in this country, and it is commonly assumed that the American hot summers are against them. Many of them are easily grown from seed and can be carried over in pots in a frame, if they are not hardy or will not withstand the changeable conditions of the open winter. Some of the species do well in open light, but the larger number of the new kinds probably require protection from sun; the species demand an equable supply of moisture. Some of the species mentioned in this country for outdoor growing are *P. Auricula, P. Beesiana, P. Bulleyana, P. capitata, P. cortusoides, P. denticulata, P. farinosa, P. frondosa, P. japonica, P. marginata, P. minima, P. pulverulenta, P. rosea, P. Sieboldii, P. sikkimensis, P. Veitchii*, aside from the English primroses, oxlips, and cowslips (*P. acaulis, P. elatior*, and *P. veris*), and the auriculas. For the cultivation of the auricula, see Vol. I, page 430.

Cultivation of hardy primulas. (E. J. Canning)

The hardy primulas are not so well known in American gardens as they deserve to be, although their culture is gradually on the increase, and new species are occasionally introduced. Perhaps the best known and most commonly cultivated are those which are native to the meadow lands of Great Britain, central and northern Europe. These are the English primrose (*P. acaulis*), the cowslip (*P. veris*), the oxlip (*P. elatior*), and the polyanthus (*P. Polyantha*). They are all simple in their requirements, growing and flowering freely in any good garden soil, and are quite hardy as far north as Massachusetts at least, provided they are not planted in a too exposed or wind-swept position. They are all very attractive when in flower, and they can also be grown in pots and easily forced for flowering in the greenhouse in February and March.

These primulas may be propagated by seeds or division. Seeds may be sown in February in pans or small shallow flats in a mixture of loam, leaf-mold, and sand of about equal proportions, making the surface very fine, pressing the seeds evenly into the soil and covering with about ¼ inch of the finely sifted mixture. Place the flats or pans in a warm greenhouse or a temperature of 55° to 60° at night with a rise of 15° by day. In two or three weeks the seedlings should begin to appear. As soon as large enough to handle, they may be pricked out into other flats in a similar soil, and about 2 inches apart each way. By the middle of May they will be good plants, and since they do not flower the first season, they may be planted out in lines in some sheltered part of the garden till September, when they may be lifted and planted where they are wanted to flower in spring. Also those intended for flowering in the greenhouse should be potted at this time. Seeds may also be sown in a coldframe in April or May, scattering them very thinly in shallow drills, watering and keeping free from weeds in the summer, and transferring them in September to the position in the garden where they are to flower in the spring.

Propagating by division is practised when the plants become rather large or to perpetuate some very fine variety. It consists simply in dividing the plant or clump into two or more parts and replanting again. September is the best month to do this.

The cowslip, oxlip, and English primrose are excellent subjects for massing or naturalizing in open woodland, on sheltered banks, or any position where they are not too shaded, and where they can be left undisturbed for several years. They are almost indispensable in gardens where a spring display of flowers is wanted. A light mulching with stable-manure, or in very cold gardens, a few branches of hemlock or pine, is all the winter protection they need.

Other hardy primulas not so well known as the above, but even more beautiful and showy and some of them of larger growth, are species from China and Japan, some of them from high altitudes in the Himalaya

mountains, and others from boreal and mountainous regions of Europe and North America. From Japan, *P. japonica* and *P. Sieboldii* are the best. From China, *P. pulverulenta* and the recently introduced species, *P. Bulleyana* and *P. Beesiana*, are large and showy, producing their bright flowers in whorls, *P. Beesiana* having from five to eight whorls with an average of sixteen flowers in a whorl. From experience and observation, the writer finds that they must have a deep rich moist soil in a sheltered place, with an eastern aspect, or where they are shaded during the warmest part of the day. A low moist nook in a properly constructed rock-garden is an ideal place for them.

The high mountain and northern species, *P. cortusoides*, *P. denticulata* and the variety *cachemiriana*, *P. rosea*, *P. farinosa*, *P. mistassinica*, and *P. Auricula*, require a rich moist soil with an eastern aspect in a rock-garden for their successful culture. It is not so much the cold of the winters as it is the heat and drought of our summers that makes their cultivation difficult.

Most of them flower through the months of May and June. They are all propagated by seeds which may be sown in flats in a cool shaded frame as soon as ripe or about the end of July, wintering the seedlings in a cool greenhouse or frame the first winter, and planting out in the rock-garden in spring; or seeds may be sown in February in a warm greenhouse as recommended for the English primrose, but keeping the seedlings in flats in a shaded frame till September before planting in the rock-garden. A light dressing of decayed stable-manure carefully placed between the plants as winter comes on and a few hemlock or pine branches to protect them from the sun in winter are beneficial.

While this last group of primulas may never become so popular in this country as they are in the cool and moist climate of England, yet, for anyone who can provide the conditions, they are well worth growing.

Commercial culture of florist's primulas. (E. A. White)

Primulas have long been regarded as important by commercial plant-growers. Their compact dwarf habit of growth and their freedom of flower production make them especially desirable. They have never been used extensively as cut-flowers, yet the flower-clusters of some species, such as *P. obconica* and *P. malacoides*, lend themselves well to artistic arrangement and are sold in limited numbers in the larger cities, usually in bunches of twenty-five sprays. *P. Polyantha* also produces sprays of blooms which are particularly attractive in spring when cut and arranged in a somewhat formal manner similar to bunches of trailing arbutus. The species most generally grown under glass for potted plants are *P. obconica*, *P. sinensis*, *P. kewensis*, and *P. malacoides* (fairy primrose); *P. Forbesii* (the baby primrose) is still sometimes grown.

While *P. sinensis* in its varying varieties is still grown as a potted plant to a considerable extent, it is of less importance commercially than are *P. obconica*, *P. kewensis*, *P. malacoides*, and *P. floribunda*. *P. sinensis* var. *stellata* seems more in demand than the type. When taken from the greenhouses to a dwelling-house or a flower-store, the individual flowers of *P. sinensis* soon fade and the plants become unsightly. Retail dealers speak of them as "poor keepers." The most desirable varieties of *P. sinensis* are Crimson King, Pink Beauty, Reading Blue, Orange King, The Czar, The Duchess, Coral-Pink, Princess May, and Royal White. In the stellata group, White Star, Pink Star, Light and Dark Blue Star, and Giant Red Star are most frequently grown. *P. malacoides* and *P. obconica*, the latter in its several varieties, Kermesiana, Fire King, and Giant Red are probably the most important present-day primulas.

Primulas are usually propagated yearly from seed. When very large plants for exhibition purposes are desired, the plants may be carried over a second year. Young plants are usually more productive of blooms, hence are more desirable. Seeds must be fresh. Primulas may also be propagated from cuttings.

When large plants are desired for Christmas, the seed is sown in January. Later sowings may be made in February and March. Seed-pans should have a layer of broken crock in the bottom for drainage, and a little coarse material is placed above this. The seed-pan is then filled evenly full with a mixture of equal parts of leaf-mold and sand. This is compacted slightly, being careful to have the surface even. The top of the soil should not be over ⅛ inch below the top of the rim of the pan. If lower than this, the confined atmosphere about the seedlings may cause an attack of the "damping-off" fungus. The seeds are then sown evenly and thinly over the surface and a thin covering of one-half finely sifted leaf-mold and sand, thoroughly mixed, is sprinkled evenly over the top. The seed-pans are then sprinkled with a fine spray, covered with glass, and placed in a partially shaded spot. As soon as the seedlings germinate, the glass should be removed. The germination period in the life of primulas is a critical one, and temperature, light, and moisture require particular attention.

When the seedlings have developed about three leaves, they should be transplanted. Small flats are preferable to pots. The seedlings are spaced about 1½ inches each way. A soil compost of equal parts of leaf-mold and sand is excellent for the first transplanting. When the seedlings have developed about five leaves they should be potted into 2- or 2¼-inch pots. Care should be taken in this first potting and in subsequent repottings not to set the plants too deeply in the soil, as it causes the lower leaves to decay. The crown should be even with the soil. If it is above the soil, the plants will be inclined to topple over as they reach maturity and it may be necessary to stake them. At no time should the young plants be allowed to become pot-bound. Any check in their development during the rapid-growing period prevents the perfection of the plants. They should be repotted several times and the soil made a little richer each time by the addition of well-rotted cow-manure and bone-meal.

About the tenth of June primulas may be put into a frame out-of-doors. A shaded glass sash should be put over them and raised about 2 feet above the frame. This gives excellent air circulation about the plants and makes them strong and stocky. In August the plants are repotted for the last time. Six-inch pots are mostly used. The soil at this time should be considerably heavier and richer than previously. A mixture of three parts leaf-mold, two parts finely chopped sod, one part sand and one part well-rotted cow-manure with a liberal sprinkling of bone-meal makes an excellent soil for primroses. Watering should be carefully attended to in the summer months.

About the middle of September the plants should be brought into the greenhouse and placed in a coolhouse where a night temperature of about 45° can be maintained. This low temperature induces a stocky healthy growth and subsequently large strong flower-spikes. After bringing the plants into the greenhouse, they should become accustomed gradually to full sunlight. After a few weeks in a coolhouse, the temperature may be gradually raised to 50° or even 60°; but the plants are better if grown in a low temperature.

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KEY TO THE SECTIONS OR GROUPS.

I. *Plants of hybrid origin, of many kinds, more or less in cult.* I. HYBRIDS, p. 2786.

II. *Plants of specific difference, representing wild or native species of Primula.*

A. *Young lvs. involute (edges turned inward).*

B. *Lvs. mostly thick or coriaceous: fls. umbellate: bracts of involucre usually not lf.-like* II. AURICULA, p. 2787.

BB. *Lvs. thin or membranaceous: fls. in superimposed whorls or verticels: bracts of involucre leafy.* III. FLORIBUNDÆ, p. 2791.

AA. *Young lvs. revolute (edges turned backward).*

B. *Lvs. lobed and distinctly petioled, the lobes dentate or crenate.* IV. SINENSES, p. 2791.

BB. *Lvs. not lobed or only indistinctly so.*

C. *Calyx leafy, strongly accrescent (increasing in size) after flowering.* V. MONOCARPICÆ, p. 2795.

CC. *Calyx little or not leafy or accrescent: plant stoloniferous.* VI. MINUTISSIMÆ, p. 2796

CCC. *Calyx as in* CC.: *plant not stoloniferous.*

D. *Fl. solitary on a bractless scape.* VII. OMPHALOGRAMMA, p. 2796.

DD. *Fls. usually many (sometimes solitary) on a bracted scape.*

E. *Foliage usually pilose or pubescent.*

F. *Blossoms distinctly pedicellate (each one on a stalk).*

G. *Lf.-texture coriaceous or nearly so, strongly rugose.*

H. *Length of lvs. 4 in. or less.* VIII. BULLATÆ, p. 2796.

HH. *Length of lvs. 4 in. or more.* IX. CAROLINELLA, p. 2797.

GG. *Lf.-texture thin or membranaceous, rugose.*

H. *Base of lf.-blade cordate; petiole distinct.* X. FALLACES, p. 2797.

HH. *Base of lf.-blade usually attenuate into a petiole.* XI. VERNALES, p. 2797.

FF. *Blossoms sessile or very short-pedicellate.*

G. *Bracts of involucre short and broad.* XII. SOLDANELLOIDEÆ, p. 2799.

GG. *Bracts lanceolate or subulate.* XIII. CAPITATÆ, p. 2800.

EE. *Foliage usually glabrous or only minutely pubescent.*

F. *Bracts of involucre gibbous or saccate at base.* XIV. FARINOSÆ, p. 2801.

FF. *Bracts not gibbous or saccate.*

G. *Base of lf.-blade cordate; petiole distinct: caps. cylindrical.*

H. *Corolla funnelform.* XV. CORDIFOLIÆ, p. 2804.

HH. *Corolla cylindrical.* XVI. SREDINSKYA, p. 2804.

GG. *Base of lf.-blade gradually narrowed into petiole: caps. globose.*

H. *Umbel 1–2-fld.: lvs. somewhat coriaceous: plants low, sometimes very small.* XVII. TENELLÆ, p. 2804.

HH. *Umbel several- to many-fld.: lvs. either petioled or narrowed into a winged base, the midrib very wide: plant mostly low, but scape sometimes long.* XVIII. PETIOLARES, p. 2805.

HHH. *Umbel several- to many-fld.: plant tall.*

I. *Blossoms pedicellate, in superposed umbels: lvs. membranaceous or papery, serrulate or denticulate.* XIX. CANKRIENIA. p. 2805.

II. *Blossoms very short-pedicelled or nearly sessile, mostly in simple umbels: lvs. usually coriaceous, obtusely denticulate.* XX. CALLIANTHÆ, p. 2807.

gggg. *Base of lf.-blade cuneate or rounded, contracted to petiole, the margins usually coarsely toothed toward apex: caps. cylindrical or ovoid.* XXII. Macrocarpæ, p. 2808.

I. Hybrids and Reputed Hybrids.

Several hybrid primulas have attained more or less prominence in cult. aside from those in the Vernales group (*P. elatior-veris-acaulis* set), and they are briefly described here; *P. kewensis* is apparently the best known of them in cult. In a genus so vast and abounding in beautiful forms, many good cultural hybrids are to be expected, although the number of artificial ones is surprisingly small considering the number of species and the length of time some of them have been in cult. For an account of Primula hybrids in nature, see Farrer, Journ. Roy. Hort. Soc. 39:112–28; also the monograph by Pax & Knuth.

aa. *Fls. yellow.*

1. **kewénsis,** W. Wats. (*P. floribúnda* × *P. verticillàta*). Fig. 3175. A hybrid that appeared in one of the houses at Royal Botanic Gardens, Kew, in 1897, blooming in 1899: it has some of the mealiness of *P. verticillata* and the general appearance of a robust form of *P. floribunda:* lvs. in rosette, 6–8 in. long and 1½–2 in. wide, obovate-spatulate, tapering to a petiole-like base, margins wavy and dentate: scapes many, 1 ft. high, slender but erect, glabrous, bearing 2–4 whorls of 6–10 bright yellow fragrant fls. on slender pedicels: bracts large, dentate: calyx campanulate, the lobes regular and acute; corolla-tube 1 in. long, the limb ¾in. across, the lobes nearly circular and notched. G.C. III. 27:195. R.H. 1908:400. Gn. 59, p. 198; 64:10. G.M. 43:232; 51:320. G. 26:99. Gn.M. 15:18. Gn.W. 20:249; 21:214.—A var. **farinòsa,** Hort., is listed, the sts. and foliage covered with silvery white powder. *P. kewensis* is a good winter bloomer of long season, and a desirable companion for *P. sinensis* and *P. obconica;* requires the general treatment of *P. obconica.*

aa. *Fls. not yellow, in shades of red or purple, sometimes white.*

b. *Plants of the Auricula section or type.*

2. **admontènsis,** Gusm. Said to be a hybrid between *P. Auricula* and *P. Clusiana,* but probably a *P. Clusiana* form or *P. Clusiana* × *P. minima:* described by Paul as a very dwarf-growing plant, hardly 3 in. high: fls. large, purplish lilac, in June: lvs. fleshy, round-oval, evergreen. Admont, in Steiermark, Austria.—Said to thrive in full sun in limestone soil.

3. **Arctòtis,** Kerner. One of the numerous hybrid progeny of *P. Auricula* and *P. hirsuta* (see *P. pubescens,* No. 20): as a garden plant, said to have acquired some of the characteristics of both parents: fls. lilac-purple or white, in May and June, on scapes 4–5 in. high.—Succeeds in partly shady places in sandy loam; natural hybrid.

4. **Bernìnæ,** Kerner (*P. hirsùta* × *P. viscòsa*). Three to 4 in.: fls. large, rosy purple, on short sts.; April, May.—A natural hybrid.

5. **biflòra,** Huter. Natural hybrid of *P. glutinosa* and *P. minima:* fls. in 2's, deep rose-colored, rising scarcely more than 1 in. above the foliage, early.—Requires partial shade and a well-drained position.

6. **Bilèkii,** Hort. A natural form from the Tyrol, probably hybrid of *P. minima* and *P. hirsuta:* very small, resembling *P. minima* but slightly taller, bearing profusely of large pale rose-colored fls.; late spring and early summer.

7. **Bówlesii,** Farr. (*P. pedemontàna* × *P. viscòsa*). A natural hybrid, usually larger than *P. pedemontana,* the upper face of lvs. densely glandulose, scale longer, pedicels longer and densely glandular, the umbel few-fld. and 1-sided; smaller than *P. viscosa,* the fls. wider, the lvs. and pedicels with more or less rufous glands: intermediate between the parents, with which it was found. Intro. 1911.

8. **díscolor,** Leyb. (*P. Pórtæ,* Huter). Natural hybrid of *P. Auricula* × *P. œnensis:* said by Paul to be "a charming plant for sunny places on the rockery:" 3–4 in.: fls. lilac-purple with silvery white eye; April–June.

9. **Fácchinii,** Schott. Natural hybrid of *P. minima* × *P. spectabilis:* said to inherit the strength and vigor of *P. spectabilis* and the free-flowering qualities of *P. minima:* 3 in.: fls. rosy purple, usually 2 or 3 to each

3175. Primula kewensis. (×⅓)

st.; May, June.—Paul says that it is essentially a rock-plant, succeeding in shady positions as well as in full sun in light sandy soil. G.W. 15, p. 273.

10. **Floerkeàna,** Schrad. Natural hybrid, *P. glutinosa* × *P. minima:* an excellent plant, intermediate between the parents: 3 in. or less: fls. bright rose, in heads.—Succeeds best in partly shaded places in rockery, in peaty loam.

11. **Fórsteri,** Stein. Natural hybrid of *P. hirsuta* × *P. minima:* resemblance closer to *P minima,* but with 2 or 3 larger fls., which are rosy purple with white throat, carried 3–4 in. above the foliage. Brenner Alps. G.C. III. 52:490.—Prefers loamy soil in partial shade; blooms in early spring and also in autumn.

12. **Goèblii,** Kerner (*P. Goèbelii,* Hort.). Natural offspring of *P. Auricula* × *P. hirsuta*: 4–5 in.: lvs. stiff and fleshy, in close rosettes: fls. brownish violet;

May–July.—Sunny position in rockery. See *P. pubescens*, No. 20.

13. **Heèri,** Bruegg. Natural hybrid of *P. hirsuta* and *P. integrifolia:* a showy dwarf tufted plant, with loose heads in June of bright purple fls.—Shady place in the rock-garden, in light loam.

14. **Hûteri,** Kerner. Natural offspring of *P. glutinosa* × *P. minima:* very small, scarcely more than 1 in. high: fls. rather large for size of plant, deep violet, borne singly; May, June. Tyrol.—Of good constitution; prefers slightly shaded place.

15. **intermèdia,** Hort. Several applications are covered by the name *P. intermedia:* described and illustrated in G. 8:259 as "one of the most beautiful of the members of a very large family, and closely resembles the alpine auriculas, its fls. being purplish crimson, with a conspicuous yellow eye, and produced on stout sts, in crowded clusters that overtop the foliage:" fragrant. April.—The garden plant under the name *P. intermedia* is probably one of the natural hybrids of *P. Clusiana* and *P. minima.*

16. **Kéllereri,** Widm. Natural hybrid of *P. hirsuta* and *P. minima:* very dwarf, but sturdy: fls. pale rose-colored, in trusses; May, June. Tyrol.—Slightly shaded positions in a light sandy soil.

17. **Kérneri,** Goebl & Stein. *P. Auricula* × *P. hirsuta,* a natural hybrid (see *P. pubescens,* No. 20): 4–5 in., hairy: fls. rose-lilac, with yellowish white eye; April, May.—Sunny and dry positions in rockery.

18. **Muretiàna,** Moritz. (*P. Mùreti,* Charp.). Natural hybrid of *P. integrifolia* and *P. viscosa;* a similar cross is *P. Dinyàna,* Lagger, which may be the preferable name for the group: lvs. pale green, in rosettes, stiff and fleshy: scapes 4–5 in.: fls. bright purple, in clusters; April, May.—Lightly shaded places in rockery.

19. **Péyritschii,** Stein. Natural hybrid of *P. Auricula* and *P. hirsuta* (see No. 20): 4–5 in., producing many crimson-purple fls. in large clusters; March–May.—Strongly recommended for partly shaded places in well-drained soil in the rock-garden.

20. **pubéscens,** Jacq. Several natural forms of *P. Auricula* × *P. hirsuta* are included under the name *P. pubescens;* here may be referred the variants represented by the names *P. helvetica,* Don, *P. rhætica,* Gaud., *P. Arctotis,* Kerner, *P. Goeblii,* Kerner, *P. Kerneri,* Goebl. & Stein, *P. Peyritschii,* Stein, all probably differing in minor characters and garden value. *P. pubescens* is a hardy plant, according to Paul, and easy to grow in both sun and shade, if it has a well-drained place: 3–4 in.: fls. rosy crimson with white eye; May, June. *P. pubescens alba=P. hirsuta* var. *nivea* (No. 41), a very free-flowering plant, with large snow-white fls. which make an excellent display against the rosettes of stiffish lvs. Gn. 75, p. 88. G.L. 16:95.

21. **rhætica,** Gaud. One of the *P. pubescens* forms (No. 20), hybrid of *P. Auricula* and *P. hirsuta:* lvs. white-mealy: scape 3 in. above foliage, mealy: fls. large, clustered, brilliant violet-purple; May–July, flowering continuously in a sunny place in the rockery.

22. **salisburgénsis,** Floerke. Natural form of *P. glutinosa* × *P. minima,* perhaps not in cult.: lvs. cuneate, strongly 7–9-toothed toward the top, serrate at summit: scape not glutinous: fls. rose-colored.

23. **Stùrii,** Schott. Natural hybrid of *P. minima* and *P. villosa:* dwarf and tufted but vigorous and free-flowering: fls. large, bright rose-purple, borne singly; April–June.—For shaded places in the rock-garden.

24. **venùsta,** Host (*P. Jelénkæ,* Gusm.). Natural hybrid of *P. Auricula* and *P. carniolica:* habit of *P. carniolica,* but the lvs. and calices sometimes more or less white-mealy: vigorous and hardy; 3–4 in., forming large spreading rosettes: fls. fragrant, red to brownish rose or purple; April–June.—For half-shady places in the rock-garden.

25. **Venzòi,** Huter (*P. adulterìna, P. cridalénsis, P. micrántha,* and *P. valmenòna,* Gusm.). Natural hybrid of *P. tyrolensis* and *P. Wulfeniana:* large or small, mostly a strong and free grower with lvs. in rosettes: scapes 3–4 in. above foliage: fls. in loose heads or clusters, large, lilac-purple.—For half-shady places in the rock-garden.

26. **vochinénsis,** Gusm. One of the natural forms of *P. minima* × *P. Wulfeniana:* robust, 4–6 in., or much less in the wild: lvs. oblong, usually few-toothed but rarely entire: fls. in trusses, bright red, spring to late summer.—Said by Paul to be serviceable for chalky soils in dry sunny places.

BB. *Plants of various sections, probably not of the Auricula group or kind.*

27. **Arèndsii,** Hort. Arends. Said to be a hybrid between *P. obconica* and *P. megaseæfolia,* "in general appearance similar to a glorified *P. obconica:*" fls. rich lilac-pink in color, in many-fld. umbels: lvs. more nearly resembling those of *P. megaseæfolia,* the petioles exceedingly hairy.

28. **Bríscoei,** Hort. Veitch. (*P. Bulleyàna* × *P. japónica,* of garden origin). Habit of *P. japonica,* but with paler lvs. and more crimsoned midrib, the infl. inheriting to some extent the powdery character of *P. Bulleyana;* the scapes and fls. are said also to resemble *P. pulverulenta;* purple-fld.(?).

29. **Fórtunei,** Vatke, is undetermined. The plant in cult. is described and figured in G.C. III. 53:238 as a perennial with coarsely dentate lvs., with very little farina: scapes about 3 in. high, terminating in a loose head of fls. which suggest those of *P. farinosa:* fls. about ½in. diam., bluish lilac, with primrose-yellow eye. "Flowering early in the year, it is a useful subject for the alpine house, and the blooms last fresh for a considerable period." Fl. Mag., X. 7 (1860). J.H. III. 63:343. Gn. 69, p. 210; 77, p. 182. G. 37:279.—Rare in cult.; at Kew grown recently from stock contributed in 1905 by Col. Beddome. Perhaps hybrid of *P. denticulata* and *P. farinosa.* Said to be suggestive, as it grows, of *P. frondosa.*

30. **Líndsayi,** Hort. Hybrid, parentage not recorded, with deep crimson fls. with purplish yellow eye: "a pretty plant with neat foliage and fls. of a kind of deep crimson and a purplish yellow eye." Named for R. Lindsay, Edinburgh.

31. **Sílva-Taroucàna,** Fedde (*P. pulverulénta* × *P. Cockburniàna,* a garden hybrid). Known also as Unique: foliage much like that of the common primrose, the blade decurrent on the petiole: fls. turkey red, in tiers, the calyx and pedicel white-farinose. A fine garden plant. G.C. III. 41:391.

32. **Sueptítzii,** Gusm. (*P. ròsea* var. *grandiflòra* × *P. cashmeriàna,* a garden hybrid). Fls. light blue, in April, on strong sts., and strong plants: sometimes bloom in autumn: hardy and free-flowering.—Intro. by P. Süptitz, Bad Lauterberg, Germany.

33. **Tewfikiàna,** Hort. Vilm. Garden hybrid of which one of the parents is supposed to be *P. Bulleyana:* a vigorous grower, producing infl. 2 ft. high: fls. in several tiers, salmon-rose with yellow eye: fertile.

II. Auricula.

Fleshy-lvd. or coriaceous-lvd. species from the Alps, Pyrenees, and other high mountains of Eu.: fls. in umbels (rarely varying to nearly or quite single): bracts not foliaceous or leafy.

A. *Fls. yellow (much modified in color in cult. forms, particularly in No. 34).*

34. **Aurícula,** Linn. (*Aurícula lùtea,* Opiz). Auricula. See p. 430 and Fig. 440, Vol. I, and also for

cult. Low, with a radical rosette of thick obovate-cuneate glabrous or pubescent mealy lvs. 2 or 3 in. long, which are often crenate on the upper part: scape 1–8 in. high (sometimes nearly or quite wanting), usually exceeding the lvs.: fls. in an umbel, sometimes as many as 20, bright yellow and fragrant or inodorous, short-stalked, subtended by minute oval mealy bracts, the segms. obovate-cuneate and emarginate; stamens dimorphous.—This description represents the wild form as understood by J. G. Baker in B.M. 6837. "It is one of the most widely spread of all the species," Baker writes, "as it extends in a wild state from Dauphine and the Jura on the west through Switzerland to Lombardy, the Tyrol, Hungary, and Transylvania." In cult., the plant has run into fls. of many colors. It is possible that some of these forms are hybrid progeny with related species. Baker writes: "What the relation is of this widely spread wild type to the multiform races of the garden Auricula is a subject that still remains to be fully worked out." The cult. forms are of two groups,—those having farina on the lvs. and those without it. Var. **albocíncta,** Hort. Lvs. densely farinaceous, white-margined. The wild form of the species is little known in cult. MacWatt writes that "by nature it flourishes best where it is most at home, amongst the limestone rocks of the Alps, the Apennines, and the Carpathians. In the wild state the flowers are comparatively small, but under cultivation the scape often carries a big head of large-sized flowers." Var. **ciliàta,** Koch (*P. ciliàta,* Moretti. *P. Bálbisii,* Lehm. *P. bellunénsis,* Venzo), has lvs. not farinose, cartilaginous-margined, more or less glandular-pilose, the edges densely long-ciliate: fls. scentless. Var. **Obrístii,** Beck (*P. Obrístii,* Stein. *P. símilis,* Stein. *P. Bálbisii,* Beck). Lvs. silvery green, not mealy, more or less glandular-hairy, the margin cartilaginous and ciliate: fls. fragrant, yellow, the calices and pedicels mealy; May–July.—For dry sunny edges or rocks.

35. **Palinûri,** Petag. Rhizome woody and widely spreading: lvs. large, often 8 in. long and 3 in. wide, obovate or oblong, fleshy and pliable, light green, not farinaceous, dentate, narrowed into a petiole which is sometimes elongated: scape surpassing the lvs., farinose above, bearing a many-fld., even to 40-fld., umbel: fls. pedicellate, drooping to one side, the floral bracts leafy and farinose; calyx densely white-farinose, campanulate at top, deeply cut into sharp-pointed lobes; corolla deep yellow, standing well out of the calyx, the lobes emarginate: caps. equaling or exceeding the calyx. S. Italy in the Appennine region. B.M. 3414. G.C. III. 41:18. Gn. 76, p. 227. G.M. 55:381. —A striking species with a cowslip odor, blooming in England in May; it is advised in England to grow it in good loam to which peat and sand have been added; in cold districts it is to be kept under glass, with plenty of light and air, in winter; does not bloom until it has attained good size.

AA. *Fls. rose, violet, purple, or bluish.*

B. *Lvs. entire, coriaceous, cartilaginous-margined: bracts narrow and long: fls. rose-colored.*

C. *Foliage pellucid-punctate and viscid.*

36. **spectábilis,** Tratt. (*Arètia spectábilis,* Link). A low plant (3–4 in.) with stiff, glossy green oblong or rhomb-oblong viscid entire lvs. that have a pronounced cartilaginous margin or edge, acute or subacute, deeply pitted on the upper surface: scape equaling or exceeding the foliage, bearing a 1–7-fld. umbel: bracts linear and acute, usually reddish: fls. mauve-colored; calyx tubular-campanulate, with lanceolate obtuse lobes, minutely glandular; corolla exceeding the calyx, about 1 in. across, widened above, the lobes obcordate. Alps. R.H.S. 39:105.—A showy species, requiring a shady place in light soil in the rock-garden; worthy of attention.

CC. *Foliage not pellucid-punctate or viscid, green or glaucous.*

37. **glaucéscens,** Moretti. A vigorous glabrous species, not farinose: lvs. 1–4 in. long, lightly glaucous and blue, stiff, shining, narrowly oblong or lanceolate, acute, broadly cartilaginous-margined: scape 2–5 in. high, somewhat exceeding the foliage, bearing a 2–6-fld. umbel: bracts leafy, usually reddish, linear: fls. rose, lilac, or purple; calyx tubular, cut to middle or below, the lobes lanceolate or oblong and acute or somewhat obtuse; corolla funnelform, about 1 in. across, with obcordate lobes: caps. oblong, included in calyx. Alps. Gn. 61, p. 360. R.H.S. 39:105. Var. **calycìna,** MacWatt (subsp. *calycìna,* Pax & Knuth. *P. calycìna,* Duby). Stouter: lvs. and calyx large, the latter cut beyond middle with acute lobes: corolla-limb about ⅜in. across. G.W. 15, p. 271. G. 36:273. Var. **longobárda,** MacWatt (subsp. *longobárda,* Pax & Knuth. *P. longobárda,* Porta). Smaller: lvs. and calyx small, the latter cut to middle with acute or obtuse lobes: corolla-limb scarcely ⅜in. across.

38. **Wulfeniàna,** Schott. Spreading tufts: lvs. 1–2 in. long, stiff, lanceolate to oblong and elliptic, not viscous, shining, dark green, margined and minutely glandular: scape about 2 in. high, equaling or surpassing the foliage, bearing 1–3 fls.: bracts linear, usually reddish: fls. rose-colored; calyx tubular, glandular, more or less purplish, with ovate-obtuse lobes; corolla with white throat, the limb funnelform and about 1 in. across, the obcordate lobes deeply emarginate: caps. included in calyx. Alps, chiefly Austrian. Gn. 61, p. 429. —Very early blooming in cult. and not difficult to grow.

39. **Clusiàna,** Tausch. Foliage lighter in color than in No. 38, the lvs. stiffish and somewhat shining, scarcely viscid, ovate or oblong, acute or obtuse, entire and the margin narrowly cartilaginous: scape sometimes 4 in. or more high (usually 6–7 in. under cult.), glandular, 1–6-fld.: bracts lanceolate or linear, more or less purplish: fls. rose-colored or lilac; corolla-lobes bifid rather than emarginate. Austrian Alps. G.W. 15, p. 271. R.H.S. 39:105.—Of easy cult. in a slightly shaded place.

BB. *Lvs. serrate or dentate (sometimes only subserrate or, as in No. 40, perhaps entire), coriaceous or fleshy: bracts various: fls. rose-colored, bluish, or violet.*

C. *Foliage not farinose but reddish glandular-hairy, at least on margin (with a reddish exudate).*

D. *Glandular-hairy on margins of lvs. only.*

40. **pedemontàna,** Thomas. Lvs. ovate or oblong-lanceolate, acute or obtuse, dentate or sometimes practically entire, shining, the margin densely glandular red-ciliate, otherwise glabrous or nearly so: scape surpassing the lvs., about 6 in. high, glandular, bearing 1 to many rose-colored or rarely white handsome fls.: bracts ovate and obtuse, scariose: calyx tubular-campanulate, glandulose; corolla minutely reddish glandular, the throat white, limb about 1 in. across, the lobes obcordate. Graian and Cottian Alps. B.M. 5794. Gn. 61, p. 397; 72, p. 166.

DD. *Glandular-hairy on both surfaces of lvs.*

E. *Fls. long-pedicelled (pedicels usually ⅛–½in. or so in length): scape mostly shorter than the lvs.*

41. **hirsûta,** All. Lvs. broadly obovate or rhomboid, varying rarely to somewhat cuneate, obtuse, very viscid, with yellow, orange, or reddish glands, toothed toward the apex or throughout: scape glandular, often shorter than lvs., to about 3 in. high, bearing 1 to many fls. on filiform pedicels: bracts broadly ovate and obtuse, scarious: fls. lilac, rose, or white; calyx broad-campanulate, glandular; corolla-limb 1 in. or less across, with obcordate emarginate lobes: caps. included in calyx. Pyrenees, Alps, Apennines. B.M. 14 (as *P. villosa*); 1922 (as *P. decora*). Gn. 61, p. 359. R.H.S. 39:105.

The species is said to be grown sometimes as *P. viscosa*. Runs into var. **angustàta,** Widm., with oblong lvs. gradually narrowed into a petiole, and rose-colored fls.; var. **exscàpa,** Pax, scape very short or none, and lvs. nearly sessile; var. **nívea,** Sims, fls. white. B.M. 1161. Gn. 78, p. 314. G.M. 57:191. The white-fld. plant cult. as *P. nivalis* and as *P. pubescens alba* is this form (see No. 20). In gardens are forms known as vars. *ciliata, coccinea,* and *Balfouriana.*

EE. *Fls. short-pedicelled (pedicels usually ¼in. or shorter): scape equaling or exceeding the lvs.*

F. *Shape of lvs. narrow and cuneate.*

42. **œnénsis,** Thomas (*P daonénsis,* Leyb. *P. cadinénsis,* Porta). Lvs. very viscid and bearing large red glands, oblong-cuneate to lanceolate-cuneate, gradually narrowed to a petiole, obtuse or truncate at apex, upper margin serrate or dentate: scape mostly exceeding the lvs., about 3 in. high, with 1–7 fls.: bracts broadly ovate, scariose: fls. rose-colored; calyx densely glandulose, tubular-campanulate, with ovate obtuse lobes; corolla white in throat, the limb ½–¾in. across, with emarginate obcordate lobes: caps. about equaling the calyx. Rhætian Alps. R.H.S. 39:105.—Said to be easily raised in partial shade in a variety of soils.

FF. *Shape of lvs. oblong to broad-ovate.*

43. **apennìna,** Widm. Lvs. bearing large, short, yellow at length brown glands, ovate, oblong or lanceolate-cuneate, gradually or suddenly narrowed to the petiole, obtuse, entire or toward the apex slightly denticulate or dentate: scape slightly exceeding to double the length of the lvs., bearing 1–8 fls.: bracts scarious, ovate or rounded: fls. reddish purple; calyx glandular: caps. included in the calyx. Apennines.—Dwarf, blooming freely in April and May, in a shady part of rock-garden; said to prefer limestone soil.

44. **villòsa,** Jacq. Lvs. strongly viscid and densely covered with red glands, broad-obovate or oblong or oblong-lanceolate, gradually rarely suddenly narrowed to the petiole, obtuse, often dentate from the middle or only at the apex or even more or less subentire, scape red-glandular, about 6 in. high, exceeding the lvs., 1–12-fld.: bracts green or scarious, broadly ovate, obtuse: fls. rose or lilac; calyx glandular, not split to the middle with short triangular acute or obtuse lobes; corolla-tube slightly broadened toward the white throat, the limb ½–1 in. across with emarginate obcordate lobes. E. Alps. Gn. 61, p. 429. G.W. 6, p. 112. R.H.S. 39:105. Var. **commutàta,** Chitt. (*P. commutàta,* Schott. *P. villòsa,* subsp. *commutàta,* Widm.), from Steiermark, has larger and thinner often oblong and coarsely toothed lvs. Gn. 61, p. 328.

3176. Primula sinensis. A young plant, as the flowers are beginning to appear. (×½) No. 60.

45. **Cŏttia,** Widm. Lvs. viscid and very densely covered with red glands, obovate or oblong-lanceolate, gradually or rarely suddenly narrowed to the short petiole, obtuse or subacute, denticulate or dentate from the middle, rarely from the base or rarely entire: scape frequently exceeding the lvs., glandular, bearing 2–12 fls.: bracts subscarious, obtuse: fls. rose; calyx glandular, campanulate with triangular obtuse or subobtuse lobes; corolla-tube scarcely broadened toward the glandular white throat, the limb ¾–1¼ in. across with emarginate obcordate lobes: caps. about equaling or slightly shorter than the calyx. Cottian Alps, 3,200–8,000 ft. altitude. R.H. S. 39:105.

CC. *Foliage farinose or not, sometimes glutinous but not red-glandular.*

D. *Bracts elongated: lvs. coriaceous, truncate at apex.*

46. **mínima,** Linn. Lvs. little more than ½in. long, shiny, firm, almost glabrous, the margin not cartilaginous, cuneate or obtriangular, exceedingly truncate and serrate at the apex, narrowed toward the base:

scape short or very short, shorter or rarely longer than the lvs., 1–2-fld.: bracts 1–2, small: fls. rose or white, when rose-colored usually bearing a white eye; calyx covered with sessile glands, not split to the middle, with obtuse or mucronate lobes; corolla-tube whitish, the throat glandular, limb funnel-shape from the base, finally flat, ½–1¼ in. across, with bifid, obcordate lobes: caps. included in the calyx. Mountains of S. E. Eu. (Austria and Balkan region), in limestone and granitic regions. Gn. 61, p. 397. G.W. 15, p. 273. R.H.S. 39:113.—A choice little plant of several forms, one of which has fringed corolla-lobes. Plant about 1 in. high.

DD. *Bracts elongated: lvs. fleshy.*

E. *Scape equaling or exceeding the lvs.*

47. **Kitaibeliàna,** Schott. Lvs. more or less glandular-pilose, viscid, the glands discolored, subglaucous, intense-smelling, elliptic or oblong-lanceolate, gradually narrowed to the long petiole, acute or obtuse, margin entire or toward the apex wavy-denticulate: scape glandular, shorter than the lvs., bearing 1–2 fls.: bracts herbaceous, linear: fls. rose or lilac, with white throat; calyx glandular, reddish, split almost to the middle, with ovate or oblong, acute or obtuse lobes; corolla-tube white, the limb almost flat, ¾–1 in. across, the throat glandular with emarginate, obcordate lobes: caps. included in the calyx. Mountains of S. E. Eu.—Needs a moist shady place.

48. **integrifòlia,** Linn. Lvs. scarcely vicidulous ciliate, upper surface covered with few, small, pellucid glands, green, rather shining, margin not cartilaginous, very entire, elliptic or oblong, almost sessile, obtuse or subacute: scape glandular, reddish, bearing 1–3 fls.: bracts herbaceous, often reddish, linear or lanceolate, obtuse or acute: fls. rose-lilac, rarely white; calyx more or less reddish, glandular, not split to the middle, tubular or tubular-campanulate, with ovate or oblong obtuse lobes; corolla-tube broadened toward the densely glandular, rose-colored throat, the limb broad-funnelform, ¾–1 in. across, with emarginate lobes: caps. included in the calyx. Pyrenees and Alps. G.C. III. 52:258. R.H. S. 39:112.

EE. *Scape very short, less than the lvs.*

49. **tyrolênsis,** Schott. Lvs. viscid, densely covered with hyaline glands, intense green, somewhat shiny, slightly scented, rounded or broad-obovate, suddenly narrowed to the very short petiole, apex rounded, minutely denticulate or almost subentire: scape glandular, more or less exceeding the lvs., bearing 1–2 fls.: bracts herbaceous, linear or lanceolate: fls. rose or rose-lilac; calyx glandular, split to the middle, campanulate, with ovate obtuse lobes; corolla-tube broadened at the glandular white throat, the limb broad-funnelform, ½–1 in. across, with emarginate, obcordate lobes: caps. included in the calyx. Mountains of S. Cent. Eu. (Dolomites). R.H.S. 39:112.

50. **Allìonii,** Loisel. Lvs. strongly viscid, densely clothed with discolored glands, rather thick, gray-green, slightly scented, not cartilaginous margined, rounded or oblong or oblong-cuneate, gradually narrowed to the shorter or longer petiole, obtuse, entire, or denticulate: scape almost none, bearing 1–7 fls.: bracts scarious, ovate obtuse: fls. rose; calyx glandular, split to the middle with ovate obtuse or acute lobes; corolla-tube paler pink than the limb, the throat glandular, white or yellowish white, the limb ½–¾in. across, with the lobes emarginate: caps. included in or equal to the calyx. Maritime Alps, both in sun "and in shallow sunless caves where neither sun nor rain reaches it." G.C. III. 53:85. R.H.S. 39:112.—Said to be difficult to grow in the open, but thrives in perpendicular position in rock-garden where well protected from sun and rain; may also be grown in a pot plunged in a frame.

DDD. *Bracts broad but short: fls. violet or rose.*

51. **marginàta,** Curt. Plant 3–4 in. high: lvs. farinose, not cartilaginous margined, the surface not farinose, punctate with short glands, oblong or obovate, obtuse, narrowed gradually to a short petiole, regularly dentate-serrate: scape usually exceeding the lvs., bearing 2–20 fls.: bracts with the pedicels farinose, broad-ovate, lf.-like, short: fls. blue-lilac; calyx more or less farinose, campanulate, purplish, split almost to the middle, with the lobes triangular; corolla-tube many. times exceeding the calyx, gradually broadened upward, the limb broad-funnelform, rarely flat, ¾–1 in. across, with emarginate lobes: caps. equaling or exceeding the calyx. Maritime and Cottian Alps. B.M. 191. Gn. 61, p. 398; 63, p. 261; 71, p. 179. G.W. 15, p. 271. R.H.S. 39:104.—Should not be grown vertically. Natively it hangs from crevices in the rocks; it is recommended to grow it in an elevated place in the rock-garden where it may droop.

52. **carniólica,** Jacq. Entirely devoid of farina: lvs. glabrous or only the margin sparsely glandular-pilose, shiny, bright green, margin cartilaginous, obovate or oblong, narrowed to a short or long petiole, obtuse or subacute, entire or slightly wavy, very rarely remotely somewhat denticulate: scape much exceeding the lvs., sometimes 8 in. long, bearing a many-fld. umbel: bracts broad-ovate, obtuse or acute: fls. rose, at length lilac, white-eyed; calyx split to the middle, campanulate with acute or subobtuse lobes; corolla-tube gradually broadened to a farinose throat, the limb ½–1 in. across, broad-funnelform with emarginate, obcordate lobes: caps. equaling or frequently exceeding the calyx. Alps, Idrian district, Austria, near Trieste. Gn. 61, p. 327. R.H.S. 39:104.—The plant is recommended to "be grown in turf to which has been added a little leaf-mold, in positions where it does not get full sun."

53. **viscòsa,** All. (*P. latifòlia,* Lapeyr.). Not farinose: lvs. fairly densely clothed with short discolored glands, intensely rank-smelling, yellowish green, rather soft, often more or less curved, the margin not at all cartilaginous, oval or oblong-cuneate or lanceolate-cuneate, obtuse or acute, gradually narrowed or contracted to a petiole more or less equaling the blade, dentate, wavy-dentate or entire: scape glandular, exceeding the lvs., bearing a several- to many-fld. umbel: bracts broad-ovate: fls. 1-sided, nodding, fragrant, violet or red-violet; calyx glandular, or even sparingly farinose, narrowly campanulate, split to the middle with the lobes acute or subacute; corolla-tube gradually broadened from the cylindrical base, the throat sparingly farinose, the limb funnelform almost ½in. across with emarginate lobes: caps. more or less exceeding the calyx. Mountains of S. Eu., in several forms. Gn. 61, p. 430; 69, p. 186; 73: 572. G.W. 15, p. 272. H.F. 1:242. R.H.S. 39:104. Forma *cynoglossifòlia,* Widm., has lvs. smaller and oval or oblong, entire or only lightly toothed: umbel many-fld. R.H.S. 39:104.—The *P. viscosa* of commerce, according to MacWatt, is chiefly varieties of *P. hirsuta.*

DDDD. *Bracts broad and leafy: fls. bluish violet*

54. **glutinòsa,** Wulf. Deciduous: 3–4 in.: lvs. glandular-viscid, rather stiff, somewhat shining, punctate above, the margin toward the apex subcartilaginous, lanceolate-cuneate or oblong-lanceolate, gradually narrowed to the short-petiole, obtuse, denticulate from the middle, rarely subentire: scape exceeding the lvs., bearing a little head of 1–6 fls.: bracts broad, imbricate, frequently brownish purple, broadly ovate, obtuse: fls. fragrant, intense blue finally violet, rarely white; calyx glandular, not split to the middle, with ovate obtuse lobes; corolla-limb ½–¾ in. across, funnelform, with divaricate bifid lobes: caps. slightly shorter than the calyx. Tyrolese and Cent. Alps. Gn. 61, p. 359.—

Said to be difficult to flower under cult., but blooms freely in marshy places where it grows wild; it has the color of a blue gentian.

55. **deòrum,** Velen. Plant 8–10 in. high: lvs. provided with sessile glands, subcoriaceous, stiff, margin cartilaginous, punctate above, oblong or lanceolate, very entire, acute, gradually or scarcely narrowed toward the base: scape viscid, obscurely colored

3177. Single and semi-double flowers of Primula sinensis. (×1)

upward, exceeding the lvs., bearing a somewhat nodding, 1-sided umbel of 5–10 fls.: bracts oblong-linear: fls. intense purple-violet; calyx viscid, dark green, split to the middle, with narrowly triangular acute lobes; corolla gradually broadened toward the glandular throat, the limb funnelform, about ½in. across, with slightly emarginate lobes: caps. included. Bulgaria. B.M. 8124. G.C. III. 37:98. R.H.S. 39:113. F.S.R. 2, p. 239.—Said to be difficult to grow, but thrives in a rock-garden if well drained.

III. Floribundæ.

Thin-lvd. verticillate species, with leafy involucral bracts, from S. W. Asia and Afr.

A. Plant not farinose: calyx very deeply cut.

56. **floribúnda,** Wall. Buttercup Primrose. Plant glandular-pubescent, 5–8 in.: lvs. elliptic or ovate, acute or obtuse, membranaceous, narrowed to a broad petiole which is shorter than the blade, irregularly dentate: scape bearing 3–5 many-fld., superimposed umbels which are distant from each other: bracts sessile, lf.-like, ovate or lanceolate, acute, denticulate: fls. golden yellow, fragrant; calyx split below the middle, broadly campanulate with acute lobes which are reflexed after flowering; corolla-tube slender with obcordate, rounded or slightly emarginate lobes: caps. ovate, smooth. Himalayas. B.M. 6712. G.C. II. 19:113; III. 27:195. Gn. 41:580; 61, p. 270. R.H. 1895, pp. 400, 401. Gt. 45:1424; 47, p. 221. Gn.W. 5:453. Var. **grandiflòra,** Hort., is offered. Var. **Isabellina,** Hort., free-flowering, with sulfur-yellow bloom.—*P. floribunda* makes a good pot-plant for winter bloom, smaller and more compact than *P. kewensis.* It is grown the same as *P. kewensis* and *P. obconica.*

AA. Plant often farinose: calyx not cut to base.

57. **verticillàta,** Forsk. Not glandular, very glabrous, scarcely farinose, 8–10 in. high: lvs. membranaceous, lanceolate or ovate-lanceolate, not farinose, acute or acuminate, irregularly and acutely serrulate, narrowed to a short broad-winged petiole: scape bearing several many-fld. superimposed umbels, farinose below the umbels: bracts 1-nerved; the lower lanceolate or lanceolate-linear, acuminate, sharp-serrulate, longer than the pedicels; the upper smaller, narrow, entire, shorter than the pedicels: fls. yellow, fragrant; calyx deeply parted, campanulate, with linear entire lobes; corolla glabrous, the tube slender, cylindrical, the limb ¾in. across, with obcordate, slightly emarginate lobes: caps. globose, glabrous. S. Arabia. Gn.W. 24:398.—Tender in England except in sheltered places in the milder parts; requires partial shade and a light soil.

58. **siménsis,** Hochst. (*P. verticillàta* var. *siménsis,* Hook. f. *P. Coùrtii,* Hort. Veitch). Not glandular, bald, or farinose: lvs. membranaceous, ovate-elliptic, acute, irregularly and sharply serrate, narrowed to a short broad-winged petiole: scape bearing several many-fld. superimposed umbels: bracts 1–3-nerved; the inferior lanceolate or ovate, acuminate, sharp-serrate, longer than the pedicels; the upper smaller, subentire, shorter than the pedicels: fls. yellow; calyx deeply parted, campanulate, with triangular-lanceolate, entire lobes; corolla-tube slender, cylindrical; the limb about 1 in. across with broad-ovate, slightly emarginate lobes: caps. globose, included. Abyssinia. B.M. 6042.

59. **Boveàna,** Decne. (*P. verticillàta* var. *Boveàna,* Mast.). Not glandular, more or less farinose or glabrous: lvs. membranaceous, rhomboid or spatulate, acute or acuminate, irregularly serrate or even somewhat incise-lobed, narrowed to a winged petiole which is shorter than the blade: scape bearing several many-fld. superimposed umbels: bracts (at least the lower) sessile, lf.-like, 3-nerved, rhombic-ovate, acuminate, sharp-serrate, exceeding the pedicels; the upper smaller: fls. yellow; calyx campanulate with triangular-lanceolate, acuminate, denticulate lobes; corolla glabrous, tube slender, cylindrical, the limb more or less than ½in. across with broad-ovate scarcely emarginate lobes: caps. globose. Sinai. B.M. 2842 (as *P. verticillata*).

IV. Sinenses.

Plants of various habit, with lobed distinctly petiolate lvs., the lobes dentate or crenate. Himalaya-Chinese region.

A. Calyx prominently inflated, truncate, or squared at the base.

60. **sinénsis,** Lindl. (*P. chinénsis,* Hort. *P. Mandarìna,* Hoffmg. *P. prænìtens,* Ker. *P. semperflòrens,* Lois.). Chinese Primrose. Figs. 3176, 3177. Trunk short and woody, but as known in gardens the plant is practically stemless, the ample foliage and the strong short scapes arising directly from the surface of the ground or very near it: whole plant soft-hairy: lvs. rotundate, soft, and usually limp, several-lobed and

3178. Wild form of Primula sinensis, after one year's cultivation from seed collected in China.

the lobes unequally incise-dentate, long-petioled: scapes erect, exceeding the lvs., bearing 2–3 superimposed umbels: fls. now of many colors, several to many in an umbel, large and showy, salverform, the segms. obcordate; calyx inflated; corolla-limb about 1¼ in. across, spread out, the lobes broad-cordate, emarginate: caps. glabrous. China. Winter bloomer, as grown in

3179. Wild form of Primula sinensis, as it grows at Ichang, China.

greenhouses. B.M. 2564. L.B.C. 10:916, 20:1926. B.R. 539. F.S. 22:2334–7. I.H. 32:551; 35:42. Gn. 51:468 and p. 469. G.C. III. 25:181, 203, 205. Gng. 2:91. A.F. 8:623, 625, 671. F.R. 4:29.—The Chinese primrose is variable under cult. There are double-fld. forms of various shapes and colors and of various degrees of doubling. For pictures of various double and half-double forms, see R.H. 1867:250, 330. F.S. 20:2145. I.H. 31:512; 35:42; 38:126. J.H. III. 44:515. The normal form of this primrose has a somewhat flat-topped fl.-cluster, but there are forms with pyramidal and elongated clusters. *Primula sinensis* was intro. into England from Chinese gardens in 1820, but it was not until 1879 that the original wild form was known to botanists. For accounts and pictures of this wild primrose as grown in English gardens, see essay by Sutton in Journ. Royal Hort. Soc. 13:99 (1891). G.C. III. 5:117; 8:564; 9:209; 31:270 (reproduced, less than half in Fig. 3179); 11:13 and 31:271 showing the plant after one year of cult. and reduced in Fig. 3178 (figure reproduced in A.G. 13:245). Gn. 49:214. B.M. 7559. G.C. III. 45:148; 55:131. Gn. 62, p. 307. R.H.S. 39:128. Dr. Augustine Henry, who has collected the wild plant at Ichang, in China, writes in Gardeners' Chronicle that "The habitat and mode of growth is remarkedly different from what we find in the cultivated forms. The wild plant grows on the ledges of rocky cliffs of limestone, in spots where there is no soil, and practically no moisture, exposed to the sun, and living amidst the decaying remains of former generations of the plants. These ledges of Primula are often continuous for hundreds of feet, and in December and January, when the flowers appear, present a scene of great beauty. The scent of the leaves is very strong, and can be perceived at once on entering any of the ravines where the ledges occur. The flowers are pinkish, with a yellow ring around the neck of the corolla."

The general improvement of *P. sinensis* has taken place without hybridity with other species. There are now crested or fringed forms (var. **fimbriàta,** Hort.), and those with a frill or extra corolla projecting from the throat (Fig. 3177). Gt. 43:1402; 45:1432; 46, p. 192. G.Z. 31:217. H.F. II. 2:228. G.C. III. 27:141. J.H. III. 62:31. The lvs. are variable in shape and depth of lobing. Some forms have crisped lvs. (var. **filicifòlia,** Hort.). G.Z. 12:2. Var. **stellàta,** Hort. (*P. stellàta,* Hort.), Fig. 3180, is a form with handsome star-like long-stemmed fls. in successive whorls or tiers in a long open cluster, in pink, blue, red, and white; now a popular conservatory and florist's form, prized for its taller and freer habit and smaller more numerous fls. Gn. 53, p. 229; 57, p. 52; 59, p. 252 (bench). G. 20:632; 26:88. G.C. III. 45:149. R.B. 36, p. 268. Gt. 64, p. 91. A.F. 17:7; 18:42. F.E. 19:339. A.G. 18:201; 20:384, 385. A.F. 12:605. Gng. 5:167.

AA. *Calyx produced into a horn.*

61. **pycnóloba,** Bur. & Franch. Plant woolly: lvs. petioled, broadly ovate-cordate, the apex subobtuse, lobulate, the lobes unequally denticulate: scape shorter or longer than the lvs., bearing 5–12 fls.: bracts large, lanceolate, reticulate-nerved: corolla-tube cylindrical, the lobes small, erect, obovate emarginate and apparently subincised. Cent. China. Intro. 1906. B.M. 8612. R.H.S. 39:148.—Of this plant Balfour writes: "From a group of petiolate hairy leaves with broad heart-shaped lamina, so common in plants of its alliance, there arises a short scape bearing a close cluster of flowers in which the calyx has enlarged as a long creamy white membranous horn with wide mouth, from the edge of which extend the spike-like sepaline segments. Closing, as it were, the mouth of the horn is seen the small dark red limb of the corolla. There is nothing like it elsewhere in Primula. The species is easily grown if protected from overhead moisture when resting, and it spreads rapidly in the soil by root buds which provide a ready means of propagation." He makes for it the Section Pycnoloba.

AAA. *Calyx little or not at all inflated, narrowed at the base.*

B. *Shape of calyx goblet-like, after flowering becoming larger.*

C. *Lobes of calyx entire, acute.*

62. **Sièboldii,** Morr. (*P. cortusoìdes* var. *amàena,* Lindl., var. *grandiflòra,* Lem., and var. *Sièboldii,* Hort. *P. pàtens,* Turcz. *P. amàena,* Hort.). Fig. 3181. Pubescent all over except the corolla: lvs. petioled, ovate-oblong, base cordate, lobed, the lobes numerous, unequally dentate; the petiole longer than the blade: scape exceeding the lvs., bearing a simple many-fld. umbel: fls. white, rose, or purple; calyx funnelform, with narrowly triangular-lanceolate acute lobes which are lf.-like and glabrous; corolla-lobes broad and emarginate. Japan. B.M. 5528. I.H. 16:599. Gn. 29, p. 382; 35, p. 335; 36:318; 72, p. 327. G.M. 51:911. G. 9:454; 19:175. G.L. 17:365. C.L.A. 23, No. 5, 53. R.H.S. 39:176. Gng. 8:241, 242. R.H. 1892:300.—Looks like a large and robust form of *P. cortusoides,* with fls. 1½ to nearly 2 in. across, the throat usually striped and the limb in various colors. The fls. are two to three times larger than those of *P. cortusoides.* In some forms the fls. are fringed. Blooms in late spring. Hardy N. Several named forms are mentioned in gardening literature, as var. *clarkiæflòra* (G. 37:109), var. *grandiflòra,* and others.

63. **obcónica,** Hance (*P. poculifórmis,* Hook.). Fig. 3182, and Plate XCII. Slender, with loose-hairy lvs. (the sharp hairs often irritating-poisonous): lvs. all radical, ovate-oblong or round-oblong, base more or less cordate, long-petioled, scallop-toothed and very finely serrate: scapes many, 4–10 in. tall, exceeding the lvs.: bracts small, linear, and unequal: fls. small, lilac or light purple, several to many in umbels, on long-spread-

ing or somewhat drooping pedicels, the segms. obcordate; calyx wide open and shallow-toothed. China. B.M. 6582. Gn. 26:206 and p. 206; 29, p. 241; 51, p. 317; 60, p. 416; 61, p. 271; 72, pp. 190, 255; 77, p. 630. G.C. III. 9:401 (house); 35:245; 40:208; 47:28. G.M. 44:51. Gn.M. 2:228. G. 7:389; 20:33; 28:128, 129; 32:321. C.L.A. 2:233. R.H.S. 39:144. Gt. 43, p. 138. F.R. 1:941.—Of late years this species has become a popular winter-blooming pot-plant. The fls. are nearly or quite an inch across in well-grown specimens. There is a var. **grandiflòra,** Hort., with fls. nearly or quite 1½ in. across. Gn. 51:316; 74, p. 200. J.H. III. 60:196. G.W. 3, p. 109. R.H. 1892, p. 114. Gt. 46, p. 193. S.H. 2, p. 52. A.F. 13:1063; 18:43. Gng. 6:245. Some of the large-fld. forms have somewhat lacerated or fringed petals (var. **fimbriàta,** Hort.); var. **ròsea,** Hort., has rose-colored fls.; var. **semi-plèna,** Hort., has partially doubled fls. (G.M. 46:206); var. **supérba,** Hort., is a large-fld. race in different colors. (R.H. 1906:448); var. **undulàta,** Hort., has crisped or undulate fls. (R.H. 1914:300).—Intro. 1880. For history, see Hill, Journ. Genetics, Vol. 2 (1912). *P. obconica* is very easily grown. Prop. by seed. Persons liable to poisoning by the hairs of *P. obconica* should rinse the hands or exposed parts in alcohol, then wash with soap and water.

A number of very recent species closely allied to *P. obconica* are likely to find their way into cult. and perhaps to extend the usefulness and range of this type of primula. Some of these species are: *P. ambìta,* Balf. f., a glabrous type from a dry site, with a remarkable involucre; *P. barbicalyx,* C. H. Wright, hairy all over and with a bearded calyx, the lvs. somewhat elongated and with rounded lobes; *P. oreodóxa,* Franch., in which the characters of *P. barbicalyx* are more emphasized (the plant cult. under this name is said to be *P. saxatilis); P. begoniæfórmis,* Petitm., smaller than *P. obconica* and less hairy; *P. párva,* Balf. f., very dwarf, xeromorphous; *P. Vilmoriniàna,* Petitm., very hairy, lvs. 2–3 times usual size, scapes short, fls. minute; *P. Petitmenginii,* Bonati, a grotto plant, lvs. large, membranous, and delicate, scapes very short.

64. **sinolísteri,** Balf. f. A recent species of the *P. obconica* type that promises to be of much horticultural value, since it does not have the irritant hairs, is a free grower, forms compact masses of foliage, and produces many trusses of white sometimes lilac fls.: lvs. acutely lobed. Yunnan, China. R.H.S. 39:145.—Said to have been distributed as *P. Listeri.*

cc. *Lobes of calyx entire, obtuse.*

65. **Lísteri,** King (*P. obcónica* vars. *rotundifòlia* and *glabréscens,* Franch.). Lvs. petioled, glabrescent or glabrous, membranaceous, opaque, reniform-orbicular from a cordate base, sinuate-dentate, the lobes irregularly few-toothed or subentire, acute; the petioles slender, manifestly longer than the blade, very short-pubescent, glabrescent: scape much shorter than the lvs., glabrescent, 3–5-fld.: bracts small, linear: fls. rose; calyx almost glabrous, broad-campanulate, with broad-semiorbicular, obtuse or scarcely mucronulate lobes; corolla-tube almost ½in. long, the lobes obovate, bilobed, at other times entire or denticulate. Himalayas; usually credited to China, but the oriental forms are probably distinct. G.C. III. 53:271.

ccc. *Lobes of calyx denticulate.*

66. **malvàcea,** Franch. (*P. langkongénsis,* Forr.). Whole plant fairly densely short-pubescent: lvs. glabrescent, bright green, open-cordate at the base, rotundate or very broadly ovate, coarsely crenate, the crenatures denticulate; the petioles longer than the blades: scape thick, exceeding the lvs., bearing 2–3 superposed umbels which are slightly separated from each other: bracts, those below the lowest umbel, lf.-like, large, ovate-lanceolate: fls. reddish; calyx pubescent, at the same time clothed with melliferous glands intermixed, cup-shaped, with the lobes frequently denticulate; corolla-limb about ¾in. across, distinctly annulate at the throat, with obovate, 2-lobed lobes: caps. small, globose, not exceeding the calyx-tube. China. Intro. 1908. R.H.S. 39:149.

67. **blattarifórmis,** Franch. Whole plant covered with short papilliform hairs: lvs. ovate or obovate, from a rotund or shortly attenuate base, coarsely crenate, the crenatures denticulate; the petioles shorter than the blades: scape erect, much exceeding the lvs., bearing a raceme 8–12 in. long; the pedicels short: bracts equaling the calyx: fls. lilac; calyx broad-campanulate, with acute dentate lobes; corolla-tube puberulent outside, the limb ½–⅞in. across, broadly obcordate, acute: caps. subglobose, small, included in the calyx. China. —"A first glance at the plant suggests Verbascum."—Balfour.

bb. *Shape of calyx more or less tubular, little if any enlarging after flowering (perhaps exception in No. 80).*

c. *Stamens affixed in base of corolla-tube.*

68. **heucherifòlia,** Franch. (*P. Gagnepàinii,* Petitm.). Lvs. petiolate, deeply and narrowly cordate, rotundate, 7–9-lobed to a depth of scarcely one-fourth the diam., sparsely pilose, the lobes ovate-deltoid, unequally dentate; the petiole villous with red hairs: scape much exceeding the lvs., when mature short-pulverulent as well as short-pilose, bearing 3–4 fls.: bracts short, linear-lanceolate, pulverulent: fls. purplish; calyx narrowly campanulate-tubular, with lanceolate acute lobes; corolla-tube cylindrical, the limb concave, about ½in. across, with shortly bilobed lobes. Thibet and China. G.C. III. 50:102.

3180. Primula stellata of florists, a form of P. sinensis, prized for its small well-formed slender-stalked flowers that stand well above the foliage. (×⅓)

cc. *Stamens affixed in the tube or at the throat of corolla.*

d. *Lvs. paper-like, suborbicular, glaucous beneath.*

69. **chartàcea,** Franch. Lvs. long-petiolate, chartaceous, glabrous, ovate-suborbicular, base slightly cordate, obscurely crenate-dentate, glaucous above, pin-

nately somewhat 7-nerved, both surfaces densely finely rusty-punctate: scapes frequently several, 2–3-fld.; the pedicels very slender-puberulent: fls. rose-lilac; calyx urn-shaped, 5-cleft to the middle, the lobes oblong, obtuse, strewn especially at the margin with resinous red dots; corolla salver-shaped, the lobes ovate, 2-cleft: caps. spherical, not exceeding the calyx-tube. Cent. China.

DD. *Lvs. membranaceous or thin, oblong in general outline, doubly crenate and often somewhat lobed.*

70. **cortusoïdes,** Linn. Lvs. in a rosette on the ground, rather large and soft, loose-hairy (at least on the midrib and petioles), ovate-oblong or cordate-oblong, irregularly many-notched: scapes few to several, 6–12 in. tall, much exceeding the lvs., very straight, hairy: bracts linear: fls. rose-colored, about 1 in. across, short-pedicelled, in a loose many-fld. umbel, the segms. obovate and deeply notched or even lobed. W. Siberia. B.M. 399. Gn. 29, p. 382; 62, p. 217. G.M. 43:247.—A handsome hardy species, blooming in May in the northern states, and represented by garden forms; known sometimes as "bear's-ear primrose," from the large radical lvs. G. 2:207 (var. *amœna*); J.H. III. 44:277 (var. *grandiflora lilacina*). It is a question, however, whether *P. cortusoïdes* is now much known in cult., the plants grown under this name being perhaps *P. Sieboldii* and *P. saxatilis*. It is recognized, according to Balfour, by the short pedicels of the fls.

71. **saxátilis,** Komar. Fig. 3183. Plant pubescent: lvs. oblong or broadly oblong-ovate from a cordate or subcordate base, incise- frequently slightly curled-incise-lobed, the lobes sometimes subentire, sometimes crisped or dentate; the petioles frequently exceeding the blades: scape exceeding the lvs., pubescent below, subglabrous above, bearing 1–10 fls.: bracts linear: fls. rose-violet; calyx ovate-cylindrical or narrowly campanulate,

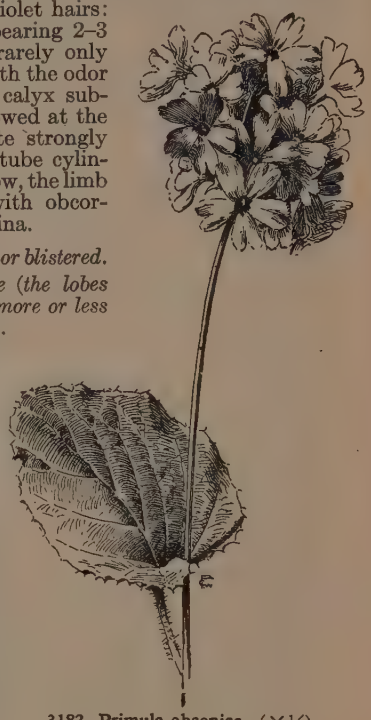
3181. Primula Sieboldii. (×⅓)

prominently nerved, with deltoid acute very shortly puberulent lobes; corolla tubular, the limb up to ¾in. across, with emarginate lobes: caps. oblong, included, very glabrous. E. Siberia. R.H.S. 39:173.—Said to be cult. under the name of *P. oreodoxa*. Pedicels much exceeding the bracts

DDD. *Lvs. membranaceous, rounded or deltoid in general outline, lobed.*

E. *Foliage bullate or blistered.*

72. **violodòra,** Dunn. Plant pubescent: lvs. reniform or orbicular, frequently bullate, base cordate, lobed, the lobes bicrenate; the petiole longer than the blade, covered with violet hairs: scape 8–12 in. high, bearing 2–3 superposed umbels, rarely only 1: bracts small: fls. with the odor of violets, rose-lilac; calyx subglabrous, green, narrowed at the base, with very acute strongly nerved lobes; corolla-tube cylindrical, the mouth yellow, the limb up to ¾in. across, with obcordate lobes. Cent. China.



3182. Primula obconica. (×½)

EE. *Foliage not bullate or blistered.*

F. *Lobes of lvs. obtuse (the lobes sometimes with more or less acute large teeth).*

73. **móllis,** Nutt. Plant softly hirsute-pubescent, 1 ft.: lvs. deeply cordate at the base, the sinus closed, cordate in general outline, sinuate-lobed, crenulate-denticulate, softly pubescent; the petiole densely pubescent, equaling or exceeding the blade: scape pubescent, 8–10 in., after flowering growing to as much as 16 in. high, much exceeding the lvs., bearing 3–5 many-fld. superposed umbels: bracts lanceolate, the upper narrower: fls. bright rose; calyx intense red, soft-hirsute, tube turbinate, with spreading acute lobes; corolla-limb more or less oblique, ½–¾in. across, with obovate emarginate lobes. E. Himalayas. B.M. 4798. F.S. 12:1230. Gn. 76, p. 424. G.W. 13, p. 123. R.H.S. 39:184.—May and June to July, requiring a moist or boggy place.

74. **sinomóllis,** Balf. f. Lvs. gray-hairy, rounded, petiolate, very shallowly rounded-lobed or scalloped: scapes long, bearing superposed whorls of red fls.: calyx cup-shaped to campanulate, ribbed, with straight erect lobes. Yunnan, China. Intro. 1913. R.H.S. 39:148.

75. **septémloba,** Franch. Whole plant scattered with soft white hairs: lvs. up to 3½ in. diam., in outline orbicular, deeply cordate, sparsely pilose, 7-lobed, the lobes one-third the depth of the lf.-diam., broadly ovate or triangular, obtuse but sometimes with more or less acute large teeth, denticulate; the petioles somewhat hairy, much exceeding the blade: scape up to 12 in. high, slender, clothed with spreading hairs, bearing a small cluster of fls.: bracts linear-lanceolate, obtuse: fls. reddish purple, semi-pendulous and somewhat fragrant; calyx glabrous, tubular-campanulate with lanceolate acute lobes; corolla-limb about ½in. across, concave, with obovate emarginate lobes. Cent. China. Intro. 1908. G.C. III. 58:297. R.H.S. 39:145.

76. **oculàta,** Duthie. Allied to *P. septemloba*, with geranium-like lvs. and red-purple drooping fls. which are darker in color than those of the related Chinese species. W. China. Intro. 1904.

FF. *Lobes of lvs. acute.*

77. **Kaufmanniàna,** Regel. Lvs. pubescent, becoming glabrescent, petiolate, about 2 in. long and broad,

orbicular in outline, cordate or subtruncate at base, the many lobes oval and few-toothed, the petiole exceeding the blade: scape 6–8 in. tall, over-topping the lvs., soft-pubescent below and glabrescent above, carrying a many-fld. umbel: bracts lanceolate, acute, exceeding the pedicels: fls. rose-purple; calyx glabrous or nearly so, the lobes erect and acute; corolla exceeding calyx, the limb more than ½in. across, the obcordate lobes emarginate. Cent. Asia.

78. **polyneûra,** Franch. Lvs. petiolate, 1–2½ in. long, broadly deltoid or suborbicular, about 11-lobed, the lobes broadly ovate and dentate or crenate, the petiole very long: scape 4–16 in. tall, much overtopping the lvs., pubescent, the umbel solitary or 2 or 3 superposed: bracts lanceolate, shorter than the villose pedicels: fls. purplish or violet(?); calyx ribbed, long-tubular, pilose, the lobes lanceolate-acute; corolla-tube cylindrical, twice exceeding the calyx, the limb about ½in. across, lobes bifid. Cent. China.—*P. Veitchii* and *P. lichiangensis* may be minor forms of this.

79. **Veìtchii,** Duthie. Lvs. petioled, when young subrugose, about as broad as long, lobed, the lobes dentate, green and pubescent above, dense-white floccose-tomentose beneath; the petiole equaling the blade: scape exceeding the lvs., 10–12 in. high, bearing a rather densely many-fld. umbel or several umbels superposed: bracts shorter than the pedicels, ciliate, pubescent: fls. rose-purple or violet, the anthers yellow; calyx subtruncate at the base, pubescent, with lanceolate acute often unequal lobes; corolla pubescent, the limb yellow-tinted at the mouth with broad-obcordate emarginate lobes: caps. twice as long as the calyx. Cent. China. Intro. 1906. B.M. 8051. G.C. III. 37:344. G.M. 48:314. R.B. 36, p. 270. R.H.S. 39:144. —A very desirable hardy free-flowering species. *P. Veitchiàna,* Petitm., is a different species, apparently not in cult.

80. **lichiangénsis,** Forr. (*P. cortusoìdes* var. *lichiangénsis,* Forr.). Much like *P. Veitchii,* but foliage less hairy and not white underneath, and fls. fewer, larger, and more drooping, with larger eye and purple anthers, the calyx somewhat inflated at base: plant 6–14 in. tall: lvs. petiolate, ovate-oblong, deeply cordate, lobed, and toothed: bracts lanceolate: fls. fragrant, rich rose-red or almost crimson in shade, the eye greenish yellow. Lichiang Range, N. W. Yunnan, China, altitude 10,000 ft. Intro. 1908. G.C. III. 50:472. R.H. 1912, p. 488. G. 35:9. R.H.S. 39:129.

81. **geraniifòlia,** Hook. f. Very short-pubescent: lvs. about 2 in. long and broad, orbicular in outline, cordate at base, 11–15-lobed, the lobes triangular and many-toothed and acute, the slender petiole much exceeding the blade: scape 8–10 in. high, bearing 1 or 2 umbels: bracts small (about ¼in. long), linear: fls. rose-colored, on slender pedicels about ½in. long; calyx campanulate, glabrous, the lobes acute; corolla exceeding calyx, the limb about ½in. across, the lobes lightly emarginate. Thibet. R.H.S. 39:184.

82. **Paxiàna,** Gilg. Plant tall and very showy: lvs. very thin-membranaceous, reniform from an open cordate base, acute, many-lobed, at first sparse-pilose on the nerves, somewhat ciliate, primary nerves 3, prominent, dividing ternately, the lobes shortly and broadly triangular, denticulate; the petiole much exceeding the blade: scape tall, 16–20 in. high, sparsely puberulent, bearing 3–4 superposed umbels which are 4–6-fld. and 1–2 in. apart: bracts small, almost subulate: fls. bluish lilac; calyx campanulate, somewhat strigose-puberulent with acute lobes; corolla cylindrical, the limb up to 1 in. across, with obovate, deeply bifid lobes. China.—The foregoing species may be difficult to separate from printed descriptions. In *P. Kaufmanniana* and *P. polyneura,* the lf.-lobes are oval and few-toothed; the former has a glabrous and the latter a pilose calyx. In *P. geraniifolia* and *P. Paxiana* the lobes are triangular and many-serrate; in the former the corolla-tube is twice and in the latter thrice or more longer than the calyx.

V. Monocarpicæ.

Lvs. little if at all lobed: calyx leafy, often much enlarging after flowering: Chinese.

83. **malacoìdes,** Franch. Fairy Primrose. Fig. 3184. A slender and open grower, 8–20 in. high, larger and more branched than *P. Forbesii,* somewhat hairy below with white hairs, glabrous above: lvs. thin-papery, glabrescent, broad-ovate, under surface sometimes sparsely white-farinose, upper pale green, the base open-cordate, broadly 6–8-lobed, the lobes acutely incise-dentate; the petiole exceeding the blade: scape more or less exceeding the lvs., bearing 2–6 many-fld. superposed umbels which are distant from each other: bracts short, linear-lanceolate, acute, white-farinose below: fls. rose and lilac; calyx densely white-farinose, campanulate from a spherical base, with the lobes

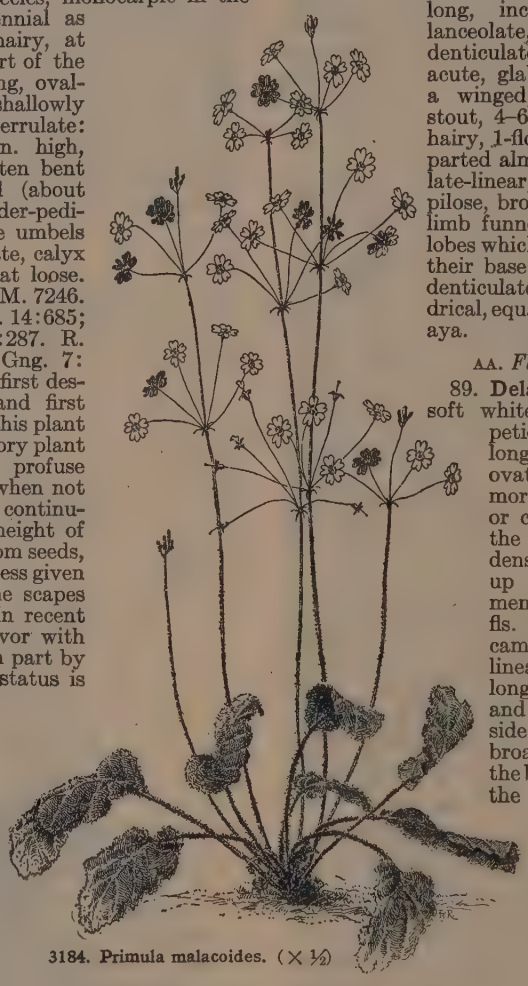
3183. Primula saxatilis. Often cultivated under the name of P. cortusoides. (Separate fls. ×½)

short, acute, and spreading; corolla-tube cylindrical, slender, the limb a little concave, ⅜–½in. across, with obcordate lobes: caps. globose, included. China. Intro. 1908. G.C. III. 44:396, 397; 52:308. R.H. 1912:156. Gn. 76, p. 157; 77, p. 291, 624. J.H. III. 60:399. G. 31:53. G.M. 51:914; 56:917. G.W. 13, p. 42. Var. **álba,** Hort., has white fls. Var. **plèna,** Hort., has double fls. G.C. III. 54:428.—An excellent greenhouse species, blooming well in winter. Although perennial, it is usually treated as an annual; seed sown in spring should produce flowering plants in autumn. It blooms several months, bearing fls. in successive whorls on very slender sts., which sometimes reach a height of 18 in. It is now common in cult., and self-sows about the greenhouse. Several shades of color are represented, and also large-fld. forms which are possibly hybrids (see G.C. III. 55:180). The plant grows well out-of-doors in the

rock-garden in mild climates, with some protection. Often confounded with baby primrose (*P. Forbesii*), but the oblong long-petioled lvs. at once distinguish it, as well as the tall and open infl.

84. **pseudomalacoìdes,** Stewart. Much like *P. malacoides,* but more delicate in every way and said not to seed readily unless cross-pollinated: lvs. more prostrate, oblong. Yunnan, China. Intro. 1908.

85. **Fórbesii,** Franch. Baby Primrose. Figs. 3185, 3186. Handsome slender species, monocarpic in the form first intro. but a perennial as now grown: loosely white-hairy, at least on the lvs. and lower part of the scape: lvs. small, 1–2 in. long, oval-oblong to cordate-oblong, shallowly sinuate-toothed, minutely serrulate: scapes very slender, 6–14 in. high, much exceeding the lvs., often bent above the whorls: fls. small (about ½in. across), light lilac, slender-pedicelled, appearing in successive umbels or whorls, the segms. obcordate, calyx sharp-toothed, small, somewhat loose. China; Burma, 3,000 ft. B.M. 7246. R.H. 1892, p. 259. G.C. III. 14:685; 35:20; 40:192. J.H. III. 49:287. R. H.S. 39:149. A.F. 14:757. Gng. 7: 149. F.E. 11:72.—Although first described so recently as 1886, and first exhibited in London in 1891, this plant was once a common conservatory plant in America. It is a most profuse bloomer, beginning to flower when not more than 2 or 3 in. high and continuing until the scapes reach a height of 10–12 in. It is easily grown from seeds, and blooms well all winter. Unless given plenty of light and room, the scapes become weak and crooked. In recent years it has dropped from favor with florists, its place being taken in part by *P. malacoides.* Its botanical status is not well understood.



3184. Primula malacoides. (× ½)

VI. Minutissimæ.

Plant very small or minute, producing stolons: lvs. toothed or crenate: Himalaya, Thibet.

86. **minutíssima,** Jacq. Plant very small, stoloniferous, the stolons short and leafy: lvs. small, less than ½in. long, sessile, spatulate-obovate or lanceolate, acuminate, dentate or crenate, more or less farinose below: scape very short, almost hidden among the lvs., 1–3-fld.: bracts 1–2, small: fls. strictly sessile, large in relation to the plant's size, purple; calyx glabrous, tubular-campanulate, split to the middle with acute lobes; corolla-tube slender, the limb ½in. or less across, with obcordate, deeply emarginate lobes. Himalayas.

VII. Omphalogramma.

Lvs. little if any lobed: fls. solitary on a bractless scape, the calyx little or not at all enlarging after flowering: China, Himalaya.

A. *Fls. appearing with or after the lvs.*

87. **vinciflòra,** Franch. Plant with a short perennial rhizome: lvs. thin, papery, oblong or oval, densely overlapping and forming a narrow erect crown, all erect or nearly so, the upper ones larger, all entire but ciliate, covered with reddish glands: scape short (6–9 in.): fl. solitary, purple-violet or blue, 1½ in. across, the tube cylindrical or long-obconic, yellowish at the base and covered with black glandular hairs outside; the segms. well separated and broadly obcordate, the 3 upper reflexed on the tube; calyx small, not inflated. China. B.M. 8564. G.C. III. 1:574; 40:230; 54:198. Gn. 77, p. 497; 79, p. 242.—A most odd species, with vinca-like fls., of simple cultural requirements.

88. **Elwesiàna,** King. Rhizome scaly: lvs. about 4 in. long, including the petiole, ovate-lanceolate, very remotely and scarcely denticulate, almost subentire, leathery, acute, glabrous, gradually narrowed to a winged, puberulent petiole: scape stout, 4–6 in. high, without bracts, red-hairy, 1-fld.: fls. violet; calyx pubescent, parted almost to the base, with lanceolate-linear, subobtuse lobes; corolla-tube pilose, broadened toward the throat, the limb funnelform, with almost quadrate lobes which are slightly narrowed toward their base and are almost truncate and denticulate at their apex: caps. cylindrical, equaling the calyx. Sikkim, Himalaya.

AA. *Fls. appearing before the lvs.*

89. **Delavàyi,** Franch. Plant slightly soft white-hairy pubescent: lvs. long-petiolate, thin-papery, about 3 in. long and almost as broad, broadly ovate or suborbicular, the base more or less cordate, wavy-dentate or crenate: scape produced before the lvs., without bracts, 1-fld., densely pubescent, laxly enveloped up to the middle with fuscous, membranaceous, very broad scales: fls. bright purple; calyx broadly campanulate, deeply parted, with linear-lanceolate lobes about ½in. long which are entire or denticulate and acute or obtuse; corolla outside pilose, the funnel form tube broad, slightly constricted above the base, then gradually broadened, the throat sprinkled with hairs, with oblong-ovate incised lobes: caps. ovate-oblong, ¾–1 in. long, ⅜in. thick. S.W. China.

VIII. Bullatæ.

Lvs. strongly rugose or bullate, hairy or glandular, more or less coriaceous, little if any lobed, small (2–4 in. long): fls. pedicelled: China, Thibet.

90. **ovalifòlia,** Franch. Lvs. membranaceous, finally subcoriaceous, ovate, obtuse, crenulate or subentire, ciliate, contracted abruptly to the petiole which equals or is shorter than the blade and is more or less covered with red hairs: scape 1–6 in. high, equaling or shorter than the lvs., somewhat red-hairy: bracts lanceolate, acuminate: fls. purple; calyx open-campanulate, with lanceolate acuminate, hairy lobes; corolla-tube broadened to the concave limb, which is up to 1 in. across, with obovate slightly emarginate lobes. Cent. China. Intro. 1906. G.C. III. 38:70.

91. **Fórrestii,** Balf. f. Beautiful undershrub of very recent intro., not farinose, with glandular fragrant foliage, and in its native places producing rootstocks 2–3 ft. long and probably in some cases 50–100 years old.: lvs. petiolate, ovate-elliptic, attenuate or sub-

cordate at base, irregularly bi-crenate, rugose above and densely farinose beneath: scape stout and erect, 3–9 in. high and equaling or exceeding the lvs., bearing a 10–25-fld. umbel: bracts leafy, lanceolate: fls. on slender erect pedicels, large, fragrant, deep orange (or deep yellow?) with an orange-yellow tube; corolla-limb nearly 1 in. across, the lobes ovate or rounded and deeply emarginate; calyx pouch-like or scarcely campanulate: caps. ovoid. Pendulous from dry shady crevices of limestone cliffs of the Lichiang Range, S. W. China; in cult. said to thrive in limestone well-drained soil in the alpine rockery. Intro. 1908. B.M. 8313. G.C. III. 45:274, 299; 51:240. R.H.1912, p. 490. Gn. 73, p. 242. G.M. 52:325. G. 31:289; 36:209. R.H.S. 39:152.—Placed in a new section Suffruticosa by Balfour, together with several others. A very recent and interesting species of this group is **P. rùfa,** Balf., with golden meal and hairy: fls. yellow. Yunnan, China.

92. **rédolens,** Balf. f. Allied to *P. Forrestii* and in foliage much resembling it but softer and more hairy: scapes 6–9 in. tall, bearing umbels of 12–20 fls. that vary in color from white to pale pink and splashed purple, with a small yellow eye. W. China; a very recent intro., and probably not yet tested in this country.

93. **cærùlea,** Forr. Rhizome not woody: lvs. petiolate, 2–4 in. long, ovate or ovate-elliptic, densely pubescent beneath and mostly bullate (puckered) above, at the base more or less attenuate, at the apex rounded, sinuate-crenate: scape 1–3 in. high, more or less woolly, 1- or 2-fld.: calyx broadly bell-shaped, lightly pubescent, the lobes triangular and acute; corolla purplish blue, the tube funnelform and throat greenish yellow, the limb 1 in. or more across, lobes broadly obovate and entire or nearly so. China, on rocks in exposed situations. Intro. 1911.

IX. Carolinella.

Much like Bullatæ, but lvs. larger: Asia Minor, China.

94. **megaseæfòlia,** Boiss. More or less somewhat ferrugineously-pilose, at length almost glabrous everywhere: lvs. chartaceous, rotund or ovate-rotund, obtuse, the base slightly cordate or subrotund, remotely somewhat spinulose-dentate, glabrous above, ferrugineous-pubescent along the nerves below; the petioles stout, more or less equaling the blade, narrowly winged: scape shorter than or equaling the lvs., glabrescent, bearing 1 or 2 closely approximate superposed many-fld. umbels: bracts lanceolate, with a subulate-acuminate apex; pedicels slender, nodding white infl.: fls. rose; calyx glabrous, narrowly tubular, 5-ribbed, with lanceolate, acute, slightly reflexed lobes; corolla-limb 1 in. across, with obcordate, deeply emarginate lobes: caps. glabrous, oblong, exceeding the calyx. Mountains of Asia Minor, B.M. 7901. G.C. III. 29:223. Gn. 59, p. 298; 65, p. 323. G.M. 44:287. G. 32:347. Gn.W. 20:211. F.S.R. 2:24. R.H.S. 39:117.—An interesting and distinct species, suitable for outdoor planting.

X. Fallaces.

Lvs. membranaceous, rugose, hairy, cordate at base, distinctly petiolate: infl. bracteate, about 2–3-fld. Japan.

3185. Primula Forbesii, the baby primrose, at the beginning of its blooming season.

95. **Reìnii,** Franch. Densely covered with long, many-celled hairs, especially the petioles and the upper surfaces of the lower lvs.: lvs. petiolate, 4–6 in. diam., rotundate or reniform, base deeply cordate, incise-crenate to scarcely one-third the depth of the blade the lobes with the edges overlapping: scape scarcely longer than the lvs., bearing 2–6 fls.: bracts lanceolate: fls. pale violet; calyx glabrous, lobed to the middle, the lobes ovate, obtuse, and callous-mucronate; corolla with deeply bifid lobes. Japan. G.M. 58:207. R.H.S. 39:177.

96. **tosaénsis,** Yatabe. Lvs. petiolate, membranaceous, pubescent below, ciliate, about 2 in. diam., base cordate, orbicular or very broadly ovate, slightly lobed, the lobes acute, dentate; the petioles pubescent, subequaling the blades: scape exceeding the lvs., pubescent, glabrescent toward the top, bearing a simple 2–4-fld. umbel or 2 superposed umbels: bracts short, subulate: fls. pale purple; calyx tubular, split scarcely to the middle with narrowly triangular lobes; corolla-tube slightly dilated toward the top, the limb about 1¼ in. across, the mouth annular; the lobes ovate, emarginate: caps. long-cylindrical, very much longer than the calyx. Japan. Gn. 79, p. 266.

XI. Vernales.

Lvs. membranaceous, rugose, gradually attenuate at base (rarely cordate): fls. pedicelled: handsome species: Eu., Asia. This is a group of spring-flowering plants to which the polyanthus and the true cowslip belong. They are much varied and hybridized, and the botany of them is therefore much confused.

A. *Limb of corolla concave; calyx open-campanulate.*

97. **vèris,** Linn. (*P. vèris* var. *officinàlis,* Linn. *P. officinàlis,* Hill. *P. odoràta,* Gilib. *P. doméstica,* Hoffmg. *P. coronària,* Salisb.). Cowslip. Fig. 3187. Stemless, minutely soft-pubescent: lvs. rugose, membranaceous or chartaceous, ovate or ovate-oblong, obtuse, more or less contracted or narrowed to the petiole, crenate, more or less pilose or canescent- or white-tomentose below; the petiole winged, shorter than or equaling the blade: scape pubescent, bearing a many-fld. umbel, 4–8 in. high: bracts linear, acute, small: fls. fragrant, bright golden or light yellow, rarely purplish; calyx pubescent, campanulate, more or less broadened, 5-ribbed, whitish, with triangular, acute frequently mucronulate lobes; corolla-limb concave, rarely somewhat flat, expanding little beyond the bulge of the calyx, ½–1 in. across, with obcordate obtuse emarginate lobes: caps. oval, included in the calyx. S. Cent., and N. Eu., Britain, Asia. G.W. 4, p. 245 (var. *grandiflora*); 13, p.74; 15 p. 270.

The cowslip is a variable species, with a strong tendency to abnormal development of the calyx. Var. **macrócalyx** (*P. macrócalyx,* Bunge. *P. officinàlis* var. *macrócalyx,* Koch), Asian, has calyx about ¾in. long and broadly obconic at base, the lobes short-triangular and acute-mucronate: corolla exceeding calyx, orange-yellow, ¾–1 in. or more across: lvs. usually more or less tomentose or subcanescent beneath (sometimes greenish), attenuate or contracted into a winged petiole.

Var. **inflàta,** Reichb. (*P. inflàta,* Duby. *P. canéscens,* Opiz. *P. officinàlis* var. *canéscens,* Beck. *P. pannónica,* Kerner). Calyx equaling or surpassing corolla-tube, more or less open-campanulate, about ¾in. long; corolla ½–¾in. across: lvs. contracted or narrowed into petiole, cano-tomentose or glabrescent beneath.

Var. **suavèolens,** Reichb. (*P. Colúmnæ,* Ten. *P. officinàlis* var. *Colúmnæ,* Pax). Calyx campanulate; corolla-limb little concave or almost plane, about ¾in. across: lvs. ovate to oblong-ovate, cordate, densely white-tomentose beneath.

3186. Primula Forbesii. (×½)

AA. *Limb of corolla plane.*

B. *Scape evident.*

C. *Fls. yellow.*

98. **elàtior,** Hill. Oxlip. Lvs. rugose, membranaceous, ovate or oblong, the apex, obtuse, more or less contracted or narrowed to the petiole, crenulate or denticulate, more or less pilose or canescent-tomentose below; the petiole more or less winged, shorter than or equaling the blade: scape more or less pubescent, 4–8 in. high, bearing a many-fld. umbel: bracts linear, acute, small: fls. pale yellow, turning green in drying, scentless; calyx more or less pubescent, 5-ribbed, tubular, with narrowly lanceolate acute lobes that are shorter than the tube; corolla-tube cylindrical, the limb flat, more or less than ¾in. across, with obcordate, emarginate lobes: caps. cylindrical or oblong, equaling or exceeding the calyx. Eu., especially in the mountains and the northern part, southeast to Caucasus and Persia. Gn. 62, p. 217. G.W. 15, p. 269.—Var. *gigantèa,* Hort., is offered, with fls. more than 1 in. across, yellow predominating. For cowslip × oxlip, see New Phytologist, vi:162 (1907).

From the cowslip the oxlip differs in having the fls. more or less upright, the corolla-limb is plane and the throat is open without folds. The species is widely variable. Var. **carpáthica,** Griseb. Lvs. ovate or oblong, the petiole more or less winged and the blade strongly rugose and crenulate: calyx usually ventricose-tubular before flowering: caps. cylindrical. Carpathians. Var. **intricàta,** Pax. Lvs. ovate-elliptic, gradually attenuate into a winged petiole, little rugose, green beneath: scape only equaling the lvs.: calyx tubular, the lobes triangular and acute: caps. short-cylindrical, equaling or perhaps exceeding the calyx. S. Eu. Var. **Pállasii,** Pax (*P. Pállasii,* Lehm. *P. altàica,* Pall.). Lvs. oblong or elliptic, gradually attenuate into petiole, nearly glabrous, little or not at all rugose: calyx very narrowly tubular, the lobes very narrow and recurved at apex. Urals, Caucasus, N. Persia, Altai. Var. **cordifòlia,** Pax (*P. cordifòlia,* Rupr.). Lvs. round-ovate, cordate at base, the petiole wingless or narrowly winged, nearly glabrous, scarcely rugose: calyx very narrowly tubular, the lobes very narrow and at apex recurved. Caucasus and Armenia.

99. **pseudoelàtior,** Kusn. Differs from *P. elatior* in calyx-lobes being broad-lanceolate and about equaling the length of the tube: lvs. ovate, hairy, rugose, green beneath, abruptly contracted into petiole, the base cordate to truncate: scape exceeding the lvs., bearing a simple umbel: corolla yellow, with plane limb: caps. rounded, much shorter than calyx. Caucasus.

100. **leucophýlla,** Pax. Differs from *P. elatior* in the lvs. being densely white-tomentose beneath: lvs. somewhat coriaceous, oblong or elliptic, obtuse, rugose, petiolate: scape exceeding the lvs., pubescent but becoming more or less glabrescent, bearing a many-fld. umbel: corolla yellow, scarcely exceeding the calyx, the limb plane, lobes obcordate: caps. cylindrical, equaling or less than the calyx. Carpathians.

CC. *Fls. violet, rarely white.*

101. **amœ̀na,** Bieb. Lvs. submembranaceous, somewhat roughened or thin, narrowed to the petiole or abruptly and longer petioled, in which case the base is cordate or subcordate, sometimes minutely denticulate or subentire, sometimes decidedly coarse-crenate, ashy tomentose or glabrous below; the petiole equaling the blade: scape 1–5 in. high, exceeding the lvs., bearing a many-fld. umbel: bracts short-lanceolate, acuminate; fls. purple or lilac, rarely white; calyx narrowly tubulate, with lanceolate acuminate lobes; corolla-tube cylindrical, the limb flat, ¾–1¼ in. across, with obcordate emarginate lobes: caps. cylindrical, equaling or exceeding the calyx. Caucasus region to Asia Minor, in several varieties. B.M. 3252.

BB. *Scape none or nearly none, the umbels therefore borne in the foliage and the fls. standing singly on the long rays.*

C. *Lvs. not white-tomentose beneath.*

102. **acaùlis,** Hill (*P. vulgàris,* Huds. *P. vèris* var. *acaùlis,* Linn.). Primrose. Lvs. many, tufted, somewhat wrinkled, membranaceous, oblong or obovate-oblong, apex obtuse, gradually rarely evenly narrowed to the petiole which is shorter than the blade, sometimes sessile, more or less pilose or glabrescent, crenulate; the petiole more or less winged: scape none; pedicels 2½–4 in. long, more or less equaling the lvs., soft-pubescent, as is the calyx: fls. pale yellow, or rarely purple or blue, becoming greenish in drying; calyx ovate-tubular, 5-ribbed with narrow-lanceolate, acuminate lobes; corolla-tube cylindrical, the limb flat, 1–1½ in. across, with obcordate emarginate lobes, the throat slightly contracted and bearing a circle of scale-like folds: caps. ovate, included in the calyx. Eu., widely distributed and well known. B.M. 229. Var. **rùbra** Sibth. & Smith. *P. Sibthórpii,* Hoffmg.), has rose-colored or purple fls. E. Medit. region. *A. anisìaca,* Stapf, is a hybrid of *P. acaulis* and *P. elatior. P. Croùssei,* Hort., is probably a garden form of *P. acaulis* or one of the hybrid derivatives. For pictures of various forms of *P. acaulis* or *vulgaris,* see Gn. 7, pp. 319, 345; 11, p. 127; 12:496; 29, p. 385; 54:142, and pp. 142, 143. A.F. 13:1102. Gng. 6:245. R.H. 1880: 90; 1898:12. In cult., the primrose runs into many forms and colors, some of them double-fld. More or less caulescent forms (var. *caulèscens,* Hort.) are probably hybrids.

3187. The cowslip.—Primula veris. (×¼)

103. **Polyántha,** Hort. Fig. 3188. A garden group supposed to be hybrids of *P. veris* or *P. elatior* and *P. acaulis,* although some botanists refer it to *P.*

elatior direct, and some consider it to be a direct development of *P. acaulis*, with elongated scapes. Whatever its origin, the group is distinct for garden purposes, and it is the commonest form of hardy primula known in American gardens. The fls. are several to many in an erect umbel that usually stands well above the long lvs.; the colors are mostly yellow and red-and-yellow, running into orange, bronze, and maroon, and sometimes pure white. Gn.M. 2:59.—There is a form with one corolla inside the other, known as duplex or hose-in-hose. The polyanthus is perfectly hardy, blooming in earliest spring. Prop. easily by seeds sown as soon as fully ripe; also by division. *P. variabilis*, as used in horticultural literature, usually refers to this Polyanthus group or to plants of similar origin.

CC. *Lvs. white-tomentose beneath.*

104. **Jùliæ,** Kusn. Lvs. thin, glabrous, reniform-orbiculate or ovate-orbiculate, base cordate, coarsely crenate, abruptly passing into the somewhat winged petiole which is 2–3 times as long as the blade: scape none: pedicels numerous, 2–3 times longer than the lvs.: fls. rose or red; calyx glabrous, narrowly tubular, angled, with narrow-lanceolate very acuminate lobes; corolla-limb flat, ¾–1 in. across, with narrow deeply obcordate lobes. Transcaucasus. Intro. 1910. B.M. 8468. G.C. III. 51:293. R.H. 1914, p. 251. Gn. 78, p. 194. G. 35:327.—Said to be a free grower, liking moisture, and producing its red fls. in profusion.

XII. SOLDANELLOIDEÆ.

Lvs. more or less hairy or pubescent: fls. sessile or very nearly so: involucral bracts short and broad: Himalaya, China.

A. *Infl. spicate.*

105. **spicàta,** Franch. Lvs. membranaceous, short-pubescent on both surfaces, petiolate, with the petiole 1½–3 in. long, ovate or oblong-ovate, obtuse, short-attenuate at base, double-serrate; the petiole narrowly winged and shorter or longer than the blade: scape slender, 2–3 times longer than the lvs., glabrous, short-puberulent toward the top: infl. elongated, 1-sided, spicate: bracts lanceolate: fls. sessile, horizontal or somewhat pendulous, violet; calyx campanulate, sparsely white-farinaceous, triangular, acute; corolla-tube short, abruptly dilated into a broad flattened cup-shaped limb, ovate, emarginate, the apex erose-dentate: caps. globose, about equaling the calyx. China. Intro. 1908. R.H.S. 39:157.

AA. *Infl. capitate or umbellate (fls. sometimes solitary).*

B. *Fls. several or many.*

106. **Wâttii,** King (*P. Gillii*, Hort.). Lvs. covered with flexuous white hairs especially on the nerves and margin, glabrescent, membranaceous, oblong-lanceolate, gradually narrowed to the petiole which equals the blade, coarsely crenate-dentate, the teeth entire or crenulate: scape 4½–6 in. high, many-fld., glabrous: bracts membranaceous: fls. sessile, nodding, violet; calyx open cup-shaped, membranaceous, with lobes which are quadrate or semi-orbicular in outline and dentate; corolla glabrous, the limb broad-funnelform, broad-obcordate, emarginate as well as crenulate. Sikkim-Himalaya. B.M. 8456. G.C. III. 51:286. Gn. 76, p. 191. R.H.S. 39:192.

107. **flórida,** Balf. f. & Smith. Lvs. long-stalked, the blade ovate, covered beneath with white meal (farina): scape very much overtopping the lvs., which spread on the ground: fls. in umbel, short-stalked, with mealy calices, the corolla purple-blue, and rapidly fading to paler tint. Yunnan, China. G.C. III. 57:207.—A humus-loving species.

108. **dryadifòlia,** Franch. Glabrous: lvs. small, ovate crenulate, contracted to a petiole about ½in. long or subcordate, white-farinose below or devoid of farina: scape 2–3 times longer than the lvs., puberulent, bearing 3–5 fls. which are clustered: bracts broad-ovate, sometimes tridentate, green or becoming purple, sparsely farinose: fls. subsessile, violet; calyx broadly campanulate, split scarcely to the middle with ovate, obtuse, entire or minutely crenulate lobes; corolla-limb flat, ½–¾in. across, with noticeable 4-lobulate lobes: caps. ovate-oblong, about equaling the calyx. China. Intro. 1911.

109. **pinnatífida,** Franch. Lvs. clothed with soft, white hairs especially so on the nerves and margin, petiolate, 1½ in. or less long, ovate or oblong, base cuneate, entire, or else incise-lobed, the lobes quadrate or ovate, the lower and upper smaller, entire, the intermediate variously lobed; the petioles narrowly winged,

3188. Polyanthus.—Primula Polyantha. (×⅓) No. 103.

equaling the blades: scape 2–3 times longer than the lvs., glabrous, somewhat farinate toward the top: bracts lanceolate, acuminate, frequently colored: fls. capitate, reflexed, violet; calyx becoming violet, sparsely golden-farinose, campanulate, with ovate, obtuse lobes frequently denticulate or erose at the apex; corolla-tube cylindrical, the limb cup-shaped, less than ½in. across, with ovate, entire or scarcely emarginate lobes. China. Intro. 1908. R.H.S. 39:156.

110. **cérnua,** Franch. Closely allied to *P. pinnatifida*, whose fls. have similar capitate infl., differs however in having the lvs. broadly ovate, short, indistinctly petiolate, margins scarcely conspicuously crenulate: bracts of the involucre ovate not lanceolate: calyx-lobes ovate, mucronate not rounded or crenulate at the apex: fls. blue. China.

BB. *Fls. few or only 1.*

C. *Blossoms large for the plant.*

111. **Reìdii,** Duthie. Lvs. membranaceous, upper surface convex, puckered, laxly silky-villous, oblanceolate, obtuse, coarsely lobulate-dentate or -crenate, narrowed to a winged petiole which is shorter than the blade: scape stiff, up to 4 in. high, several-fld.: bracts broad: fls. subsessile, nodding, ivory-white; calyx campanulate, white-farinose inside, with broad, rotundate, obtuse, glandular-ciliate lobes; corolla-lobes broad-oblong, closed in a globe almost ¾in. diam., the apex 2-cleft with a tooth between. Himalaya. B.M. 6961. G.C.II. 26:693; III. 49:195. Gn. 77, p. 231. G.M. 58:288. R.H.S. 39:185.

112. **uniflòra,** Klatt. Devoid of farina, small: lvs. small, membranaceous, sparsely white-villous, broad-ovate or orbicular-ovate, acute, base truncate or acute, incise-dentate or crenate; the petiole slender, equaling or exceeding the blade: scape slender, long, exceeding the lvs., 1–2-fld.: bracts minute, oblong: fls. large in relation to the plant, sessile, nodding, pale violet; calyx campanulate, membranaceous, deeply 5-lobed, the lobes quadrate, truncate, apiculate, frequently undulate-crenulate; corolla funnelform, the limb almost 1¼ in. across with broad, coarsely dentate lobes: caps. globose. Sikkim-Himalaya. R.H.S. 39:186.

113. **pusílla,** Wall. Plant minute, cespitose, small-lvd., small-fld., and the habit of an androsace: lvs. less than ½in. long, spreading-recurved, spatulate or oblanceolate, obtuse, pinnatifid, somewhat strigose-pilose above, more or less puberulous below, the midrib stout, toward the base narrowed to a petiole which can scarcely be distinguished from the blade: scape slender, about 2 in. high, bearing 1–4 fls. in a head: bracts ovate-lanceolate: fls. purple or violet; calyx farinose, campanulate, with triangular acute lobes; corolla-tube densely villous at the throat, the limb almost ⅜in. across, with spreading, obcordate, emarginate lobes; ovary depressed-globose. Himalaya. B.M. 7079. R.H.S. 39:208.

cc. *Blossoms small for the genus: plant minute.*

114. **sapphirina,** Hook. f. Very small and densely cespitose, small-lvd. and small-fld., glabrous or nearly so: lvs. ¼–½in. long, cuneo-spatulate or obovate, narrowed into petiole, pinnatifid: scape slender, 1–2 in. high, 1–4-fld.: bracts minute, lanceolate: fls. very short-pedicelled, nodding, capitate or essentially so, violet; calyx cup-like with triangular lobes; corolla funnelform, with short tube, scarcely surpassing the calyx, the limb about ⅛in. diam., lobes ovate and emarginate. Sikkim, 12,000 to 15,000 ft. altitude. B.M. 6961.

XIII. Capitatæ.

Much like the Soldanelloideæ, but bracts subulate or lanceolate: fls. sessile or pedicelled: W. Himalaya to China.

A. *Fls. erect; calyx tubular-campanulate.*

115. **eròsa,** Wall. (*P. capitàta* var. *crìspa,* Hort. *P. denticulàta* var. *eròsa,* Duby). Glabrous or puberulous, 5–7 in. high: lvs. appearing with the fls., not farinose, somewhat pellucid, slender reticulate-veined, obovate-spatulate or oblanceolate, obtuse, gradually narrowed to the petiole which can scarcely be distinguished from the blade, sharply erose-denticulate: scape slender, 8–10 in. high, much exceeding the lvs., bearing a many-fld. umbel: bracts small, triangular, farinose: fls. purple or violet; calyx open tubular-campanulate, the tube short, with lanceolate acute lobes; corolla-limb about ½in. across, with obcordate emarginate lobes: caps. included in the calyx. Temp. Himalaya. B.M. 6916 A. Gt. 2, p. 130. Gn. 62, p. 131. G.L. 16:95. R.H.S. 39:187.—Said to require a moist place or a bog in the rock-garden. Hooker says that the lvs. are sometimes 18 in. long.

116. **denticulàta,** Smith. Scapes 4–18 in. tall, bearing a dense umbel or head of pale purple fls.: lvs. in a rosette on the crown, usually not full grown until the fls. are past, and surrounded beneath by short, broad, thick, lf.-like bracts; lf.-blades oblong-obovate or spatulate, usually narrowed into a winged stalk, sharply denticulate, more or less mealy: corolla-tube about twice as long as the calyx-teeth, the corolla-lobes obcordate. Himalaya region, 7,000–13,000 ft., and said by Hooker to be "the commonest Himalayan primula, and very variable." The fls. are said to be eaten in salad and the powder of the roots to be used in killing leeches. Intro. 1842. B.M. 3959. B.R. 28:47. Gn. 11, p. 127; 29. p. 382; 35, p. 529; 41, p. 588; 62, p. 218; 79, p. 161. G.M. 54:344. G.C. III. 47:152. J.H.III. 62:261; 67: 529. R.H.S. 39:160.—A hardy plant, usually treated as a rockwork subject. Blooms in earliest spring. Var. **purpûrea,** Hort., has dark purple fls. Var. **álba,** Hort., has white fls. Gn. 50, p. 372; 78, p. 165. G.L. 23:422. Gn.W. 22, suppl. May 13 (as var. *alba grandiflora*). Var. **pulchérrima,** Hort., is very robust, with deep purple fls. in dense heads. Var. **variegàta,** Hort., has lvs. bordered white. Var. **Fire Ball** has bright purple fls. in large heads.

Var. **cachemiriàna,** Hook. f. (*P. cachemiriàna,* Munro. *P. cashmeriàna,* Hort.). Lvs. nearly or quite full grown when the fls. are in bloom, usually more mealy (yellow-mealy beneath and sometimes on top): fls. rich purple with yellow center: perhaps a hybrid. W. Himalayan region. R.H. 1880:330. J.H. III. 60:199. Gn. 79, p. 97. *P. sibirica* var. *kashmiriana.* (B.M. 6493) is a different plant. See No. 132.

117. **pseudodenticulàta,** Pax. Glabrous: lvs. chartaceous, appearing with the fls., linear-oblong, obtuse or acute, scarcely noticeably denticulate, almost entire, not farinose, gradually narrowed to the winged petiole: scape stiff, exceeding the lvs., 1½–4 in. high, sparsely farinose below the top, bearing a head of many fls.: bracts lanceolate, acuminate from a broad base: fls. lilac, the outer ones of the head opening long before the inner ones; calyx tubular-campanulate, white-farinose, with narrowly triangular, obtuse pilose lobes which do not turn black; corolla-limb annulate at the throat, about ½in. across, with broad-obcordate, deeply emarginate lobes. S. W. China. Intro. 1908. G.C. III. 53:264.—Another recent species of this group is **P. nessénsis,** Forr., with bright pink fls., "of considerable merit" for both indoors and outdoors; scape slender and much overtopping the oblong-rugose or bullate lvs. R.H.S. 39:160. It is said that this is the name for the plant that has been distributed as *P. farinosa* var. *Beesii,* and also for some of the *P. pseudodenticulata.*

118. **glàbra,** Klatt. Lvs. not farinose, membranaceous, small for the size of the plant (about ½in. long), ovate-spatulate, obtuse, erose-dentate, attenuate into a narrow petiole-like base: scape slender, 2–3 in. high, bearing a close head-like umbel: bracts small, acute: fls. purple-violet, very short-pedicelled; calyx tubular-campanulate, incised or cut scarcely one-third the length, the lobes obovate and very obtuse; corolla-tube scarcely exceeding the calyx, the lobes narrowly obcordate and bifid. Sikkim-Himalaya, 12,000–15,000 ft. and more altitude. R.H.S. 39:192.—Apparently cult. only very recently.

AA. *Fls., or the outer ones, reflexed, nodding or pointing downward; calyx mostly globose-campanulate.* (Some of the plants of this group have been associated by Balfour as a section Muscarioides, with a muscari-like flower habit. "The characteristic feature of the group is the aggregation of small fls., which have tubular corollas with a short erect limb, in a close spike or capitulum, in which they are all inserted with the mouths of the corollas downwards.")

B. *Calyx-teeth acute.*

119. **capitàta,** Hook. Lvs. appearing with the fls., oblong-lanceolate, obtuse or acute, finely denticulate, more or less intensely white-farinose below, narrowed to the petiole, which is shorter than the blade and frequently scarcely distinct from it: scape 8–16 in. high, stout, slightly thickened toward the top, bearing a dense, rarely a little lax, many-fld. head: bracts lanceolate, acute: fls., the outer ones, opening long before the inner, reflexed or nodding, the inner forming a dense crown, bright purplish blue; calyx open-campanulate, scurfy, split to the middle, with the lobes triangular acute, rather concave, about ½in. across with obcor-

XCII. A plant of Primula obconica.

date emarginate lobes. Himalaya. B.M. 4550. F.S. 6:618. Gn. 16:534; 29, p. 382; 45, p. 503; 50, p. 373; 54, p. 467; 76, p. 183; 79, p. 124. J.H. III. 32:209; 50:407. J.F. 1:80. In China this species is represented by forms regarded as distinct species, as in Nos. 120 and 121. Var. **grandiflòra,** Pax, is a culture-form with large fls. in a more open head, the fls. being very short-pedicelled. B.M. 6916 B.

120. **pseudocapitàta,** Ward. A Chinese (Yunnan) representative of *P. capitata,* with smaller trusses of purple fls.; bracts cut. Intro. 1911.

121. **sphærocéphala,** Balf. f. & Forr. Much like *P. capitata,* with small globular heads, the fls. purplish inside, not annulate, bracts fimbriate: delicately perfumed. S. W. China.—This and No. 120 are distinguished from No. 119 by the much smaller corolla-limb and more globular heads.

122. **Giraldiàna,** Pax (*P. muscarioìdes,* Hemsl.). Not farinose, 8–12 in.: lvs. flaccid, very thin-membranaceous, glabrescent, the younger ones cobwebby-pilose below, especially on the nerves, narrowly oblong, acute or obtuse, lobulate-crenate-dentate, long-narrowed to a winged petiole which is shorter than the blade: scape 8–12 in. high, glabrous, bearing a many-fld., globose-cylindrical head: fls. strictly sessile, reflexed, blue; calyx open-campanulate, split below the middle, with ovate, acute, denticulate, ciliolate lobes; corolla-tube slender, the limb rather concave, about ¼in. across, with broad-ovate, entire, very obtuse not emarginate lobes: caps. globose, little exceeding the calyx. Shensi, in Cent. China. Intro. 1908. B.M. 8168. R.H.S. 39:153.—Said to require a moist and somewhat shaded place.

BB. *Calyx-teeth obtuse.*

C. *Corolla-lobes less than half the exserted part of the tube.*

123. **defléxa,** Duthie. Rootstock short and rather stout: lvs. rosulate, rather thin, 5–11 in. long, narrowly oblanceolate, obtuse or subacute at apex, tapering to long winged petiole, minutely white-hairy, irregularly crenate-dentate, the teeth with reddish gland-like tips: scape often 2 ft. high, much exceeding the lvs., bearing nearly globose heads about 1 in. diam. of crowded sessile deflexed dark blue or rose-purple fls. with a delicate blue center and which often turn whitish after expansion: calyx about ¼in. long, yellow-farinose, unequally lobed; corolla about ½in. long, glabrous, funnel-shaped, the lobes cuneate-oblong and broadly emarginate: caps. depressed-globose in form. W. China, 10,000–13,000 ft. altitude. Intro. 1906. R.H.S. 39:153.

124. **bellidifòlia,** King. Puberulous: lvs. thin-flaccid, not farinose, oblanceolate or spatulate, irregularly sublobately dentate, obtuse, narrowed to a petiole more or less equaling the blade: scape 4–8 in. high, glabrous, exceeding the lvs., bearing a dense many-fld. head: bracts small: fls. reflexed, purplish blue; calyx open-campanulate, puberulent, split below the middle, with ovate obtuse farinose lobes; corolla-tube slender, the throat constricted, annulate, the limb about ¼in. across, concave, with obcordate lobes: caps. globose. Sikkim.

125. **Wâtsonii,** Dunn. Lvs. sessile and rosulate, 3–6 in. long, oblanceolate, obtuse, long-attenuate at base, more or less lobulate-crenate, hirsute on veins and not farinose: scape strict, very much exceeding the lvs. (to 1 ft. high), glabrous, farinose at apex, bearing a small globose or ovate spike or head of many sessile deep purple fls. which are ⅓–½in. long: calyx broad-campanulate, the 5 broad-ovate ciliate teeth equaling the tube; corolla glabrous, dark purple, the tube cylindrical, the limb cup-shaped, the lobes truncate or obtuse: caps. ovoid. W. Szechuan, China.—Scapes powdery yellow. Intro. 1911. R.H.S. 39:157.

CC. *Corolla-lobes more than half as long as the exserted part of the tube.*

126. **Littoniàna,** Forr. Plant 2 ft. or more, with spikes resembling those of kniphofia: lvs. broadly lanceolate, attenuate into petiole, rounded at apex, irregularly dentate, hairy, about 8 in. long: scape thick, erect, much exceeding the lvs., farinose toward the top, bearing a dense many-fld. elongated spike (which is 3–5 in. long) of violet-blue, sessile or short-pedicelled fragrant fls.: bracts linear, farinose: calyx broadly campanulate, deeply cut or split, the scarlet lobes ovate or ovate-lanceolate and acute; corolla-tube exceeding calyx, the limb concave and about ½in. diam., the lobes narrow-ovate and entire with rounded apex: caps. small, globose, not exceeding the calyx. S. W. China, 10,000–11,000 ft. altitude. Intro. 1908. B.M. 8341. G.C. III. 46:14, 15. Gn. 73, p. 361. G.M. 52:528. R.H.S. 39:156.—"Named to commemorate the late Consul Litton of Tengyveh." *P. Vìali,* Franch., is very like this species but smaller and lacking the hairs; the plant described under this name in Pax's monograph is said to be a chimera or confusion of *P. deflexa, P. gracilenta,* and *P. Watsonii. P. cernua* (No. 110) is by recent authors associated with this group.

127. **gracilénta,** Dunn. Perennial, not farinose: lvs. petioled, in rosettes, oblong and obtuse, narrowed at base, irregularly dentate and wavy, hairy: scape slender, 6–8 in., bearing a head of sessile deflexed deep lilac fls., subtended by lanceolate bracts; calyx broad-campanulate, the teeth ovate and more or less ciliate; corolla with cylindrical tube, the lobes oblong and terminated by short tail, giving a fringed effect to the corolla. Yunnan. Intro. 1915. G.C. III. 57:207.—A humus-loving species.

XIV. FARINOSÆ.

Lvs. glabrous or minutely pubescent: involucral bracts gibbose or saccate at base: widespread in arctic and subarctic regions of both hemispheres and in mountains of Eu., Asia, to Japan.

A. *Fls. sessile or very nearly so.*

128. **álgida,** Adam. Farinose or not so: lvs. glabrous, oblong-spatulate or oblong, obtuse, gradually narrowed to a short, frequently obscure, winged petiole, minutely and sharply denticulate or subserrate, rarely with the lower margin subentire: scape exceeding the lvs., 1–8 in. high, bearing a frequently many-fld. umbelliform head or rarely a congested umbel: bracts lanceolate, acuminate, their base subsaccate: fls. violet; calyx split to the middle, the teeth lanceolate, rather obtuse or rather acute, black, rarely green; corolla-limb about ⅜in. across, with obcordate trifid lobes: caps. oblong, more or less equaling the calyx. Caucasus, Asia, and Asia Minor, in several marked forms. Gn. 78, p. 180. R.H.S. 39:96.—For shady cool parts of rock-garden; May, June.

129. **auriculàta,** Lam. (*P. longifòlia,* Curt.). Lvs. glabrous, not farinose, membranaceous, elliptic, lanceolate or oblong-spatulate, obtuse, remotely and minutely denticulate or subentire, narrowed to a short, often obscure petiole: scape exceeding the lvs. 4–14 in. high, bearing a many-fld. umbelliform head, sparsely farinose or not so below the infl.: bracts linear-lanceolate, acuminate, more or less auriculate: fls. rose, violet, or lilac with a whitish eye; calyx split two-thirds to three-fourths its length, the teeth lanceolate, rather obtuse or rarely rather acute, often colored at their apex; corolla-limb ½–¾in. across, with obcordate lobes: caps. ovate or rotundate, slightly exceeding the calyx or not. Mountains of Greece to Persia. B.M. 392. Gt. 1874, p. 225.

130. **capitellàta,** Boiss. Lvs. farinose or becoming bald, ligulate-lanceolate or subspatulate, narrowed to

an often obscure petiole, obtuse or rather acute, obsoletely and sparingly denticulate or subentire, rarely sharply denticulate: scape exceeding the lvs. or (in alpine forms) more or less equaling them, 1½–10 in. high, bearing a densely fld. subsessile head: bracts oblong-lanceolate, obtuse base produced below the place of insertion: fls. rose; calyx split one-third to one-half its length, with ovate, obtuse lobes which become black; corolla-limb less than ¼in. across, with short obcordate lobes: caps. globose, about as long as the calyx. Persia and Afghanistan. G. 31:49.

AA. *Fls. distinctly pedicellate (pedicels short in No. 139).*

B. *Lvs. distinctly petiolate, the blade usually gradually contracted at base, the petiole not winged.*

C. *Lf.-margin entire.*

131. **involucràta,** Wall. (*P. Munròi,* Lindl. *P. Tràillii,* Wilson). Fig. 3189. Not farinose: lvs. leathery, becoming somewhat glaucous, ovate, oblong, or deltoid-orbicular, obtuse, very entire or obsoletely and minutely denticulate, suddenly contracted to a petiole which exceeds the blade: scape much exceeding the lvs., 4–12 in. high, slender, bearing a 3–6- to many-fld. umbel: bracts linear, their base spurred with appendages: fls. white; calyx glabrous, tubular, 5-ribbed, with narrowly triangular subacute lobes; corolla-throat annulate, yellowish, the limb about ¾in. across, lobes obcordate. Himalaya. F.S. 10:1023. Gt. 1863: 394. G.C. III. 22:263 (reduced in Fig. 3189). Gn. 79, p. 197. R.H.S. 39:209.—Needs a moist position.

3189. Primula involucrata. (×¼)

132. **sibírica,** Jacq. Plant wholly green: lvs. pale green, membranaceous, glabrous, elliptic-orbiculate or ovate, very entire or rarely with a tendency to be denticulate, suddenly contracted to a petiole which almost equals the blade: scape exceeding the lvs., 2–7 in. high, slender, bearing a lax, few-fld. umbel: bracts oblong, obtuse, their base appendaged-saccate: fls. lilac or pink; calyx glabrous, tubular, 5-ribbed, with short, rather obtuse lobes; corolla-throat naked, the limb about ½in. across or less, with obcordate deeply emarginate lobes: caps. cylindrical, exserted from the calyx.

Var. **integrifòlia,** Pax (*P. integrifòlia,* Œder. *P. sibírica* var. *kashmiriàna,* Hook. f.), has fls. mostly smaller, the corolla-tube scarcely exceeding the calyx, and the corolla-lobes narrower. B.M. 6493. Var. **brevícalyx,** Trautv., has corolla-tube twice or more longer than calyx. Arctic and alpine regions of the northern hemisphere. B.M. 3167 (as *P. sibirica*); 3445 (as var. *integerrima*). G.C. III. 41:350 ("the small variety"). Gn. 78, p. 412. G. 37:247. G.M. 56:963.

133. **conspérsa,** Hort. Veitch. Allied to *P. sibirica:* lvs. finely but variably serrate, about 1½ in. long and ½in. broad, erect, firm in texture, not farinose, fls. rather more rosy: scape about 9 in. high, farinose, bearing an umbel about 12-fld.: fls. about ¾in. across, pale lilac: later than *P. farinosa* and with taller scapes and larger fls. W. Kansu, China.

134. **tibética,** Watt (*P. pumílio,* Pax). Not farinose, dwarf: lvs. leathery, glabrous, elliptical, acute or obtuse, very entire, contracted to a petiole which almost equals the blade: scape very short, ¾in. (frequently less) high, bearing 1–5 fls.: bracts linear-oblong, their base hardly gibbous: fls. rose or blue; calyx tubular, 5-angled, with short-triangular obtuse lobes; corolla-throat annulate, the limb hardly ⅜in. across, with deeply obcordate lobes: caps. long-exserted, cylindrical. High mountains of Thibet.

CC. *Lf.-margin more or less denticulate.*

D. *Involucral bracts scarcely gibbous at base.*

135. **Knuthiàna,** Pax. Farinose, not hairy: lvs. membranaceous, oblong-ovate or lanceolate, acute or obtuse, narrowed to a winged petiole which is distinguishable from the blade or scarcely so and is equal to or shorter than the blade, densely farinose below, denticulate: scape equaling or exceeding the lvs., 4–5½ in. high bearing a many-fld. lax umbel: bracts broad subulate-acuminate from the base which is scarcely gibbous: fls. violet; calyx open-campanulate, split to the middle with triangular acute lobes; corolla-throat constricted, the limb about ½in. across, with obcordate deeply emarginate lobes: caps. globose, included in the calyx. China, in two or more forms. G.C. III. 51: suppl. May 25. G.M. 55:254. F.E. 33:975. R.H.S. 39:160.

136. **frondòsa,** Janka. Farinose or entirely devoid of farina, not hairy: lvs. very thin-submembranaceous, the inner ones finally becoming elongated, cuneate-oblong or when obovate, obtuse, gradually narrowed to a petiole which equals or exceeds the blade, sharply denticulate or when mature wavy-crenulate, a little undulate: scape exceeding the lvs., 1½–4 in. high, bearing a many-fld. lax umbel: bracts small, linear-lanceolate, their base not saccate: fls. bright blue; calyx tubular-campanulate, with triangular acute lobes; corolla-limb almost ½in. across, with obcordate, bifid-emarginate lobes: caps. cylindrical, equaling or half longer than the calyx. Balkans. Gn. 71, p. 323; 72, p. 167; 76, p. 194. Gn.W. 25:529. G. 36:534. R.H.S. 39:97.—It has been stated that the plant in cult. under this name is not the plant of Janka, but this is probably an error (see Roy. Hort. Soc. 39, pp. 103, 178).

DD. *Involucral bracts somewhat saccate at base.*

137. **efarinòsa,** Pax. Not farinose, very glabrous: lvs. membranaceous, 1½ in. (more or less) long, oblong-ovate, obtuse, sharply erose-denticulate, narrowed into a winged petiole which equals or is shorter than the blade: scape exceeding the lvs., 5–7 in. high, bearing a lax, many-fld. umbel: bracts acuminate from a saccate base: fls. violet; calyx tubular-campanulate, not split to middle with shortly triangular, subobtuse lobes; corolla-tube not constricted at the throat, the limb about ½in. across, with narrowly obovate, deeply emarginate-bifid lobes: caps. globose, included in the calyx. Cent. China.

138. **dariálica,** Rupr. Plant farinose or not so, glabrous: lvs. ¾–2¼ in. long, soft, obovate-lanceolate, oblong or spatulate, obtuse, sharp-denticulate or serrate, suddenly cuneate-attenuate to a petiole which is longer or shorter than the blade: scape equaling or exceeding the lvs., bearing a few- or many-fld. umbel: bracts linear, their base somewhat saccate: fls. rose; calyx subglobose, split to the middle, with oblong, subacute, greenish lobes; corolla-limb less than ½in. across, with obcordate, bifid lobes: caps. exceeding the calyx. Caucasus region. R.H.S. 39:176.

139. **ellíptica,** Royle. Not farinose: lvs. small (½–¾in. diam.), membranaceous, glabrous, glaucous beneath, orbicular to elliptic, obtuse, strongly dentate, petioled, with base dilate and vaginate: scape exceeding lvs., 4–5 in tall, somewhat flexuose, bearing a 3–10-

fld. nodding umbel: bracts linear and obtuse, dilated and saccate at base, exceeding the short pedicels: fls. rose-colored; calyx campanulate-tubular, cut to the middle, the lobes triangular and somewhat obtuse; corolla exceeding calyx, the limb more than ½in. across, the lobes obcordate: caps. included in calyx. W. Himalaya, Thibet.

BB. *Lvs. scarcely distinctly petiolate, the base of blade short-attenuate, the petiole winged.*

C. *Fls. yellow.*

140. **lutèola,** Rupr. Not farinose, glabrous: lvs. membranaceous, long lanceolate-elliptic, obtuse, denticulate, gradually narrowed to a petiole which is very frequently scarcely distinguishable from the blade: scape exceeding the lvs., 4–6 in. high bearing a densely many-fld. umbel: bracts lanceolate acute, their base saccate-produced: fls. pale sulfur-yellow; calyx campanulate, split two-thirds its length, with lanceolate acute lobes; corolla-limb about ½in. across, with obcordate lobes. E. Caucasus regions. G.M. 58:264.

CC. *Fls. rose, lilac, or purplish.*

D. *Corolla-tube little if at all exceeding the calyx, or only twice or less as long.*

141. **rósea,** Royle. Fig. 3190. Tufted, with rhizome bearing somewhat lf.-like scales, plant 4–8 in. tall, glabrous, not mealy: lvs. many, oblong-obovate or oblanceolate, crenulate or small-toothed: fls. few to many in a rather loose head (each fl. distinctly stalked), rose-red, more or less drooping, the tube somewhat exceeding the long sharp calyx-teeth, the lobes obcordate. W. Himalaya. B.M. 6437. Gt. 1879:994. Gn. 16:12; 29, p. 382; 31, p. 597; 39, p. 417; 62, p. 82; 77, p. 193; 79, p. 161. G. 14:110. R.H.S. 39:208. G.C. II. 19:540. F.M. 1879:360. R.H. 1880:330.—One of the best of the alpine primulas. Var. **grandiflòra,** Hort., has large fls. Gn. 50:372. *P. magnífica,* Hort., is a German seedling from *P. rosea* var. *grandiflora:* lvs. coarsely toothed, gray-white when full-grown. Intro. 1904.

142. **Ólgæ,** Regel. Glabrous, not farinose: lvs. about ½–1 in. long, obovate-oblong, obtuse, narrowed into broadly winged petiole, crenulate-denticulate: scape about 3 in. tall, exceeding the lvs., bearing a dense umbel of rose-lilac fls.: bracts lanceolate, acute, somewhat saccate at base: calyx green and purple-striped, the lobes lanceolate and acute; corolla-tube twice as long as calyx, the lobes obcordate and bifid. Turkestan.—Alpine garden; late spring and early summer.

143. **farinòsa,** Linn. (*P. Wàrei,* Stein). Fig. 3191. Farinose at least when young: 4–8 in.: lvs. variable in size, glabrous, veiny, elliptic-lanceolate, obovate or ovate-rotundate, obtuse, frequently gradually narrowed to a petiole which is scarcely distinguishable from the blade, denticulate or subentire: scape exceeding the lvs. ½–12 in. high, sometimes slender, sometimes stout, bearing a rather dense or lax many-fld. umbel: bracts lanceolate, acute, their base slightly saccate: fls. lilac, blue, or becoming purple, the throat yellow; calyx urn-shaped, green, with oval or subtriangular obtuse or rarely subacute lobes; corolla-limb ½in. or less across, with obcordate deeply emarginate lobes: caps. subequaling or almost twice exceeding the calyx. Generally distributed in boreal and alpine regions of the northern hemisphere, in N. Amer., occurring in Maine, on Lake Superior, and in the mountains as far south as Colo. Gn. 29, p. 385; 62, p. 29; 63, p. 406 (var. *alba*); 70, p. 271; 78, p. 282. G.C. III. 40:193; 58:333 (reduced in Fig. 3191). G. 8:456. F.E. 15:674.—A widely variable species, with which Pax & Knuth unite *P. mistassinica* and others. The Rocky Mt. form has been separated by Rydberg as *P. americàna.* It is difficult to find good dividing lines between the many geographical forms of this type, and one must combine them all into *P. farinosa* or keep many of them separate as species. The above description of *P. farinosa* is the inclusive one. More narrowly defined, it may be characterized as follows: lvs. obovate-lanceolate, farinose beneath: fls. variable in color and breadth of lobes, but usually pale lilac with yellow center, umbellate; calyx oblong-ovate, with linear teeth; corolla-limb flat; corolla-lobes obcordate and rounded below, distant, as long as the tube: caps. twice as long as calyx.

144. **scótica,** Hook. The form in the extreme north of Scotland, on sandy heaths: half as large as *P. farinosa:* lvs. obovate-lanceolate: fls. bluish purple with yellow center; calyx swollen, the teeth short-ovate and blunt; corolla-limb flat, the lobes broadly obcordate and about half the length of the tube: caps. scarcely exceeding the calyx.

145. **modésta,** Biss. & Moore (*P. farinòsa* subsp. *modésta,* Pax). Treated as a subspecies of *P. farinosa* by Pax & Knuth: lvs. farinose, about 2½ in. long and one-sixth as broad, spatulate, dentate-serrate: scape about 5 in. tall, 10-fld.: bracts setaceous: pedicels about 1 in. long: calyx campanulate. Japan. R.H.S. 39:180.

146. **davùrica,** Spreng. (*P. farinòsa* subsp. *davùrica,* Pax). Small or tall, 2–12 in. or more: lvs. 1–3 in. or more long, less than ½in. wide, lanceolate or narrow-elliptic or narrow oblong-lanceolate, obtuse, nearly or quite devoid of farina, wing-petioled, very nearly or quite entire: fls. rose or lilac-rose, on filiform pedicels. Siberia, Mongolia, subarctic N. Amer.

147. **mistassínica,** Michx. (*P. farinòsa* subsp. *mistassínica,* Pax. *P. pusílla,* Hook.). Plant small and slender, with only mere traces of mealiness if any: lvs. only ½in. long, stalked or not, spatulate or obovate, toothed or repand: scape about 6 in. tall, with few fls., the latter flesh-colored (rarely white) and shorter than

3190. Primula rosea. (×½)

in *P. farinosa.* Arctic Amer., and south to N. New England, Cent. N. Y., Lake Superior, etc. B.M. 2973 (?), 3020.

148. **magellánica,** Lehm. (*P. farinòsa* var. *magellánica,* Hook. f.). The south hemisphere representative, growing in S. Chile, Terra del Fuego, Patagonia: robust, 4–8 in. tall: lvs. farinose beneath, rhomb-elliptic, crenulate-denticulate: scape strong, exceeding the lvs.: fls. nearly capitate, flesh-colored or white; calyx-teeth subacute: seeds large and granulate.

149. **concínna,** Watt. Very small but very handsome species, the whole plant in the wild not more than 1 in. high and growing in cushion-like clumps: lvs. about ½in. long, oblanceolate, acute or obtuse, entire or crenulate, yellowish farinose beneath: scape very short, not exceeding the lvs., with a 2–5-fld. umbel: bracts short, linear-oblong: fls. rose-purple varying to white, with notched yellow corona, the corolla-tube equaling the calyx, the lobes obcordate. High Himalayas; a charming alpine. R.H.S. 39:208.

150. **cognàta,** Duthie. Lvs. rosulate, 1½–3 in. long, obovate or spatulate, obtuse, narrowed into a winged petiole, crenate-dentate and ciliolate, farinose beneath and minutely puberulent above: scape about 9 in. high, farinose, bearing 6–12 pale violet-purple white-throated sweet-scented long-pedicelled erect or spreading fls.: bracts linear-lanceolate, ciliolate: calyx ⅛in. long, the tube prismatically angular, the lobes linear, obtuse, yellow-farinose; corolla-tube about twice exceeding calyx, the limb divided nearly to base, the lobes

3191. Primula farinosa. (×½)

obovate or cuneate and deeply 2-lobed. Szechuan, W. China, 10,000–12,000 ft. altitude. Intro. 1906. G.C. III. 39:358. Gn. 69, p. 303.

DD. *Corolla-tube very long.*

151. **longiflòra,** All. Farinose: lvs. oblong-obovate, rarely ovate, acute or obtuse, denticulate or subentire, gradually narrowed to a short, broad petiole which is scarcely distinguishable from the blade: scape stout, 4–12 in. high, rarely lower, bearing a many-fld. umbel: bracts acuminate from a broad base, frequently denticulate, base subsaccate: fls. violet, throat yellow; calyx often colored, angular, subtubular, the lobes lanceolate, acute or obtuse, very much shorter than the corolla-tube; corolla-limb about ¾in. across; stamens always inserted on the corolla-throat: caps. cylindrical, more or less exceeding the calyx. Alps to S. E. Eu. Gt. 1878:937*a*. Gn. 62, p. 29. R.H.S. 39:96.

XV. Cordifoliæ.

Nearly or quite glabrous, the lvs. cordate at base and distinctly petioled: corolla funnelform and caps. cylindrical: Himalaya.

152. **Gambeliàna,** Watt. The buds farinose: lvs. long-petioled, almost orbicular, about ¾in. diam., membranaceous, base cordate, dentate; the petiole longer than the blade: scape 4½ in. high, exceeding the lvs., glabrous, bearing 2–7 fls.: bracts lanceolate, acute: fls. purple; calyx minutely puberulous, campanulate, split below the middle, with lanceolate acute lobes; corolla-tube broadened toward the ringless throat, the limb ¾–1 in. across, with obcordate emarginate lobes. Sikkim-Himalaya. R.H.S. 39:192.

XVI. Sredinskya.

Like the Cordifoliæ, but the corolla cylindrical: Caucasus region.

153. **grándis,** Trautv. Plant stout, tall, large-lvd., not farinose: lvs. about 6 in. long, 5 in. broad, chartaceous, wrinkled, ovate or triangular-ovate, base cordate or subcordate, irregularly twice-crenate, very lightly powdery-puberulent below; the petiole narrowly winged, exceeding the blade: scape stout, exceeding the lvs., bearing a many-fld. umbel: bracts short, lanceolate-linear, acuminate: fls. borne on filiform pendulous pedicels, pale yellow; calyx campanulate, 5-ribbed, cut one-third of length with triangular acute lobes; corolla-tube cylindrical, with erect oblong-linear, obtuse retuse lobes which have a broad sinus between them; style long-exserted: caps. cylindrical, exceeding the calyx. Caucasus. Gt. 1879:968.

XVII. Tenellæ.

Small plants: lvs. somewhat coriaceous, narrowed to petiole: fls. 1–2 on the scape: caps. globose: Himalaya, China.

A. *Scape practically none.*

154. **muscoìdes,** Hook. f. Plant minute, densely cespitose, very glabrous, not farinose: lvs. spatulate or ovate-oblong, convex, sessile, apex subtruncate, narrowed toward the base, coarsely toothed toward the top, the broad midrib produced beyond the blade: scape none: bracts small, ovate: fls. sessile, subsolitary, 2-bracted; calyx split below the middle, cup-shaped, with triangular acute lobes; corolla-tube slender, cylindrical, the limb about ¼in. across, with narrowly obcordate, emarginate lobes. Sikkim-Himalaya.

AA. *Scape about equaling or exceeding the lvs.*

155. **bélla,** Franch. Plant slender, cespitose, glabrous: lvs. from ½ to about 1 in. long, including the petiole, which equals or exceeds the blade, white-farinose below, ovate or suborbicular, incise-lobed, the lobes narrow, linear, acute or mucronate, narrowed to a very narrowly winged petiole: scape exceeding the lvs., 1–2–3-fld.: bracts lanceolate, acute, entire or tridentate at the apex: fls. violet-purple; calyx open-campanulate, split to the middle, with deltoid-ovate, acute lobes sometimes tridentate at the apex; corolla-tube cylindrical, the limb densely white-hairy at the throat, ¾–1 in. across, with obovate-cuneate lobes which are bilobulate below the middle: caps. oblong, small, included in the calyx. S. W. China. Intro. 1908. R.H.S. 39:165.

156. **yunnanénsis,** Franch. Plant rather small, glabrous: lvs. ½in. or less long, including the petiole, which is shorter than the blade, obovate-oblong, narrowed to the winged petiole, frequently farinose below, crenulate: scape 3–4 times longer than the lvs., bearing 1–2 fls. on pedicels about ¼in. long ("in pairs on long slender stalks"): bracts lanceolate, acute: fls. violet-purple; calyx open-campanulate, split to the middle, with deltoid-lanceolate lobes, spreading after flowering and displaying a mealy upper surface; corolla-tube slender, the limb ¾–1 in. across, not very concave, with deeply bilobulate lobes: caps. ovoid, small, included in the calyx. Yunnan, China. Two recent species allied to this are *P. kichanénsis*, and *P. umbrélla*. Intro. 1908. R.H.S. 39:168.

157. **kichanénsis,** Franch. (*P. Clementinæ*, Forr.). Plant more or less covered with farina: lvs. spatulate, sharp-serrate, obtuse or nearly so: scape slender, exceeding the lvs., bearing a spreading-drooping umbel of several almost sessile lilac-purple fls.: calyx-lobes short. W. China. Intro. 1908. R.H.S. 39:165.

158. **umbrélla,** Forr. Farinose, with short scape: lvs. oblong-pointed and irregularly dentate: fls. 5 or 6, lilac-purple, deflexed; calyx-lobes long and pointed. Yunnan, China. Intro. 1908. R.H.S. 39:168.—"The bracts radiate from the top of the scape, each one forming a channel in which a pedicel, twice the length of the bract, lies."

XVIII. Petiolares.

Lvs. in rosettes, glabrous, or nearly so and mostly narrowed to their insertion, dentate, the midrib wide: fls. large, pedicelled, umbelled, the scape mostly short, sometimes long: caps. globose: Himalaya, China.

159. **petiolàris,** Wall. Glabrous, with or without farina or meal: lvs. membranaceous, rugose, polymorphous, the petiole long or short, the blade oblong or roundish in outline and more or less irregularly erose-denticulate: scape short or even none, sometimes equaling or exceeding the lvs., bearing long-pedicelled white, rose or pale purple fls.: calyx tubular or narrowly tubular-campanulate, somewhat enlarging after flowering, the lobes narrow and acute; corolla exceeding calyx, funnelform, the limb about 1 in. across, the lobes obcordate and emarginate, crenate or dentate: caps. globose, included in the dilated calyx-tube. Himalaya.—Perhaps not in cult., although *P. Winteri*, by some regarded as a form of it, is in gardens.

160. **Wínteri,** W. Wats. (*P. petiolàris* var. *pulverulénta*, Hook. f.). Whole plant yellowish or whitish farinose: lvs. obovate-spatulate and irregularly dentate, 4 in. long and 2 in. broad: fls. 20 or more in a crowded umbel on a short scape, pale purple with a yellow eye and a broad white ring surrounding it; corolla-tube 1 in. long; limb flat, 1¼ in. across, the lobes rounded and toothed. Himalaya. G.C. III. 49:130; 55:238. Gn. 75, p. 130; 76:206. G.M. 54:163; 58:200. G. 33:303; 34:607; 35:207; 36:206; 37:217. R.H.S. 39:185.

XIX. Cankrienia.

Lvs. nearly or quite glabrous, membranaceous or paper-like, serrulate or denticulate, narrowed to the petiole: fls. in superposed umbels: caps. globose: China; also Japan, Himalaya, Java, N. Amer.

A. *Fls. yellow.*

161. **imperiàlis,** Jungh. Tall, stout, not farinose, the infl. excepted, glabrous: lvs. 4–16 x 2½–4½ in., elongate-obovate or spatulate, obtuse, long-narrowed to a winged petiole which is shorter than or rarely equal to the blade, wrinkled, finely denticulate, the very broad midnerve produced beyond the blade: scape stout, much exceeding the lvs., 16–32 in. or more high, bearing several many-fld. superposed umbels which are 2–3 in. apart, more remote in fr.: bracts lanceolate from a broad base, acuminate: fls. golden yellow; calyx open-campanulate, farinose or not so, with short, broadly triangular acute lobes; corolla-tube slightly dilated toward the ringed throat, the limb about ¾in. across, rarely less, with obcordate emarginate lobes: caps. globose, included in the calyx. Mountains of Java. B.M. 7217. Gn. 40:266; 61, p. 272. G.M. 34:758, 759.—Not hardy N. The noblest of cult. primulas, the scape rising 3½ ft., and bearing 5 or 6 whorls of deep yellow fls. of firm substance. Once confounded with *P. prolifera*, from which it differs, according to Hooker, in "the more robust habit, the thicker texture, broader midrib, close reticulate nervation, and bullate surface of the foliage and its deeper colored flowers."

162. **serratifòlia,** Franch. Lvs. long-elliptic or oblong, sharply irregularly serrate, rugose above, broad at the end or only short-acute: scape slender, much exceeding the lvs., bearing a few fls. on short but slender drooping pedicels; corolla pale yellow with lemon-tinted blotch in center. S. W. China.—Apparently confused in the descriptions, the *P. serratifolia* of Pax's monograph being, according to Balfour, "a chimera including *P. Beesiana*, *P. pulverulenta*, and *P. serratifolia*." Intro. 1908. R.H.S. 39:173.

163. **Bulleyàna,** Forr. Plant 1½–2½ ft. tall: lvs. paper-like, ovate-lanceolate, rounded or acute at apex, narrowed into a short winged petiole, sharply irregularly toothed, glabrous and lightly hispid above: scape tall and strong, farinose at apex, bearing 5–7 superposed umbels each 15–17-fld.: bracts linear, farinose when young: fls. faintly fragrant, deep reddish orange, in bud deep brownish crimson, on spreading or drooping pedicels that are erect after anthesis; calyx campanulate or in fr. cup-like, the lobes triangular to subulate; corolla-tube cylindrical to funnelform, the limb nearly 1 in. across, the lobes obovate to roundish: caps. ovoid, scarcely exceeding calyx. Yunnan, China, 10,000–11,000 ft.—Named for A. K. Bulley, England, for whom Forrest collected in China. Intro. 1908. G.C. III. 46:16, 17. J.H. III. 68:103. R.H. 1911, p. 467. G.M. 52:403. G. 35:325. R.H.S. 39:172.—Produces heavy rosettes and fl.-sts. 2–2½ ft. tall; a moisture-loving species, and apparently adapted to cultivation in this country.

164. **helodóxa,** Balf. f. A very recent addition to this group, collected in 1912 in China and intro. into Great Britain in 1913. It is described as a magnificent plant of strong growth, producing many whorls of dark yellow fls. Intro. 1913.

165. **Cockburniàna,** Hemsl. Glabrous: lvs. membranaceous, 2–4 in. long, obovate-oblong, obtuse, the young ones more or less puberulent, soon becoming bare, obscurely lobed and at the same time minutely or obsoletely denticulate, narrowed toward the base but scarcely petiolate: scape slender, 4–18 in. high, bearing 2 superposed 3–6-fld. umbels: bracts minute: fls. yellow; calyx farinose, narrowly campanulate with deltoid acute lobes; corolla-tube cylindrical, the limb scarcely 1 in. across with obcordate spreading retuse lobes. W. China. Intro. 1906. B.M. 8073. G.C. III. 37:331; 40, 231, 249. R.H.S. 39:172. Useful for pots and also planted out. P. "Unique," offered by Bees, in England, is a hybrid between *P. Cockburniana* and *P. pulverulenta*. fls. cinnabar-red, in tall graceful spikes (see No. 31).

AA. *Fls. white, rose, or purple.*

B. *Scape pilose.*

166. **sonchifòlia,** Franch. (*P. gratissima*, Forr.). Lvs. papery, 6–8 in. long, glabrous, sprinkled with raised dots, oblong or obovate-oblong, obtuse, double-sinuate, the mature ones subruncinate, the teeth or lobes broadly triangular and acute and spreading or somewhat reflexed, sharply denticulate: scape about equaling the lvs., thick, the top as well as the pedicels and the calyx very shortly scabrous, bearing a simple umbel: bracts very short, ovate-triangular: fls. violet; calyx mealy or not, short-campanulate, cut scarcely one-third its length, with ovate, obtuse lobes; corolla-tube broadened toward the throat, the limb ½–1 in. or more across, slightly concave with obovate shortly emarginate lobes: caps. globose, included in the calyx. S. W. China. G.C. III. 47:58.

BB. *Scape pulverulent or farinose.*

167. **pulverulénta,** Duthie. Resembles *P. japonica* in general habit, but distinguished by its silvery-farinose scape and infl. and by the deep rose-purple or violet-colored fls., also by the long and gradually

acuminate calyx-lobes: rootstock short and stout: lvs. membranaceous, 6–16 in. long including petiole, obovate or oblanceolate, rounded at apex, tapering into long winged petiole, irregularly dentate and sometimes obscurely lobed: scape to 3 ft. high, silvery farinose as are also the calyx and the spreading pedicels: bracts linear: calyx not equaling corolla-tube, white-farinose inside, the lobes lanceolate and acuminate and valvate around the elliptic-oblong or subglobose caps. after flowering; corolla about 1 in. diam., with orange-brown eye, the limb deeply divided, the lobes obcordate. W. China, 8,000–10,000 ft. altitude. Intro. 1905. G.C. III. 41:391. R.H. 1911, p. 466. R.B. 36, p. 270. Gn.W. 25:516. G. 33:609; 35:415; 37:55. G.W. 13, p. 124. R.H.S. 39:169.—Thrives in usual garden conditions but best along streams and about ponds.

BBB. *Scape glabrous, or at most only puberulent.*

c. *Corolla-throat annulate.*

168. **japónica,** Gray. Plant glabrous, tall, not mealy except the calyx: lvs. 4–6 by about 2 in.; obovate-oblong or spatulate, obtuse, membranaceous, sharply and irregularly denticulate, gradually narrowed to a winged petiole shorter than the blade and with a sheathing base: scape tall, much exceeding the lvs., 8–24 in. high, bearing several many-fld. superposed umbels: bracts linear-subulate: fls. purple, rarely rose or white; calyx open-campanulate, mealy inside, with broad-triangular acuminate lobes; corolla-tube gradually broadened toward the ringed throat, the limb about ⅜in. across, with obcordate emarginate lobes: caps. globose, shorter than the calyx. Japan. B.M. 5916. G.C. III. 33:307; 40:207. J.H. III. 68:465. G.M. 48:283. G.Z. 15:129. G.W. 3, p. 183. H.F. II. 13:265. Gt. 1872, p. 195. R.H. S. 39:193. F.S. 19:1950, 1951. I.H. 18:69. Gn. 29, p. 382. R.H. 1871:570; 1895, p. 424. F.M. 1871:537, 538; 1872:9. —Blooms early in summer to midsummer. Makes a noble plant in deep moist soil and a shaded place. Hardy at the N. There are many color-forms, as var. **álba,** Hort., has white fls. (Gn. 78, p. 280. G.W. 7, p. 559); var. **rósea,** Hort., has rose-colored fls. (F.W. 1872:257); var. **lilácina,** Hort., lilac; var. **spléndens,** Hort., rich blood-red; var. **striàta,** Hort., striped white; var. **salmónea,** Hort., salmon-colored; var. **bícolor,** Hort., white with crimson center; var. **carminàta,** Hort., carmine.

169. **Beesiàna,** Forr. Very like *P. serratifolia* (No. 162), and at first confused with it: 1–2 ft. high: fls. rose-carmine with bright yellow eye, fragrant: lvs. oblong to obovate-oblong or ovate-lanceolate, obtuse or very short-acute at apex, narrowed to petiole which is winged above, serrate: scapes surpassing the lvs., bearing about 3 or more whorls of few to several more or less deflexed fls.: calyx campanulate, to 5 lines long; corolla-limb about ¾in. across; spring and early summer. Yunnan, China, 9,000 ft. altitude. Named for Bees, nurseryman, Liverpool. Intro. 1908. G.C. III. 50:240, 243. J.H. III. 68:121. G. 36:175. R.H.S. 39:168.—A moisture-loving species. An attractive and promising species for cultivation.

170. **Poissonii,** Franch. Plant tall, stout, glabrous, not farinose or aromatic: lvs. about 8–9 in. long and 2 in. broad, stiff-leathery, glaucous, obovate-oblong, obtuse, sharp-dentate, margin folded upward on each side and crisped and twisted, midrib prominent; the petiole very short, sheathing and scarcely distinct from the blade: scape stout, many times longer than the lvs. (3–5 ft.), bearing superposed umbels of 3–12 fls.: bracts lanceolate, herbaceous: fls. rose; calyx split to the middle or below, tubular-campanulate, with ovate-lanceolate, subacute lobes; corolla-tube funnelform, red inside and out, puberulous inside, the limb with a golden ring at the mouth, about 1 in. across, flat on expansion, with obcordate, emarginate and cleft lobes: caps. cylindric, little exposed above the closely investing tubular calyx, the fr.-stalks closely appressed to the scape. Yunnan, China. B.M. 7216. Gn. 62, p. 81. R.H.S. 39:169.—Fl.-stalks and calyx usually glistening and red-striate; season of bloom long. Intro. 1880. A very promising species.

171. **Wilsonii,** Dunn (*P. angústidens,* Pax, in part). Plant aromatic: lvs. green (not glaucous), tending to recurve rather than to incurve, rarely 8 in. long or more than 1½ in. broad: fl.-stalk and calyx green, not shining: fl. much smaller than in *P. Poissonii,* the corolla-limb concave and never flat, the lobes short, rounded, crenulate, not cleft: caps. ovoid, much projecting from the cup-like calyx, the fr.-stalks not so closely appressed to the scape. China. Intro. 1907.

172. **oblanceolàta,** Balf. f. (*P. angústidens,* Pax, in part). Plant like *P. Poissonii:* not aromatic: lvs. glaucous, oblanceolate or strap-shaped, always narrow (about 1 in. wide) and often more than 1 ft. long, flat, curving outward from the st., the margins with sharp and rigid small teeth: calyx not shining; corolla-limb larger than that of *P. Poissonii,* flat on expansion, tube whitish inside and outside, the lobes acute: fr. ovoid with conical summit, partially inclosed in calyx, the fr.-stalks not rigidly appressed. China.

173. **Miyabeàna,** Ito & Kawak. (*P. japónica* var. *Miyabeàna,* Ito). Lvs. oblong-ovate to wide-oblanceolate, acute when young but later obtuse or rounded, to 8 in. long, somewhat narrowed at base, glabrous on both surfaces, farinose beneath at first but becoming nearly or quite destitute of meal, the margin irregularly denticulate: scape 1–2 ft. high and much exceeding the lvs., bearing several superimposed, 6–10-fld. whorls, with pedicels to 1½ in. long: bracts ½–¾in. long, narrow and acute: calyx mealy within, the lobes deltoid and shorter than the tube; corolla purple, the tube more than ½in. long, the obcordate lobes nearly ¼in. long: caps. oblong or globose-oblong, inclosed in the purplish fruiting calyx. Formosa. B.M. 8606. —Closely allied to *P. Poissonii.*

cc. *Corolla-throat not annulate.*

174. **Párryi,** Gray. Plant glabrous or minutely puberulent, tall, robust, not farinose: lvs. more or less than 8 in. long, 1–2 in. broad, fleshy, narrowly obovate-oblong, obtuse or subacute and then mucronulate, entire or minutely denticulate, almost sessile, narrowed to a winged petiole which is scarcely distinguishable from the blade: scape tall, stout, 8–16 or 20 in. tall, bearing a simple 1-sided, many-fld. umbel: bracts oblong-lanceolate, acute: fls. fragrant, purplish; calyx glandular, split to the middle, the tube ovoid, with triangular acute often purplish lobes; corolla-tube broadened toward the ringless throat, the limb with a golden mouth, 1 in. across, with obcordate, emarginate lobes: caps. oblong, included in the calyx. Rocky Mts., Idaho and Colo. to Ariz. B.M. 6185. Gt. 1877, p. 65.—According to Nelson, "a handsome plant but very rank smelling; along subalpine brooks." Often 1 ft. and more high.

175. **Rúsbyi,** Greene. Not farinose (except the infl.), slender and small for the section: lvs. 2–3 in. long, oblanceolate, subobtuse, membranaceous, denticulate, narrowed to the narrow winged petiole which more or less equals the blade: scape slender, 4½–6 in. high, slightly exceeding the lvs., bearing a simple 6–10-fld. umbel: bracts ovate-lanceolate: fls. bright rose borne on pedicels which are soon nodding; calyx tubular-campanulate, split almost to the middle, farinose, with narrowly lanceolate, acute lobes; corolla-tube slender-cylindrical, the limb somewhat concave, almost ¾in. across, with obcordate emarginate lobes. Mountains in New Mex. and Ariz. B.M. 7032. G.C. III. 54:190. J.H. III. 51:89. Gn. 78, p. 388.

XX. Callianthæ.

Lvs. glabrous or nearly so, nearly coriaceous, bluntly toothed: fls. in umbels, very nearly sessile or short-pedicelled: caps. globose: Turkestan to China.

A. *Calyx cut scarcely to the middle.*

176. **vittàta,** Bur. & Franch. Glabrous: lvs. membranaceous, not farinose, narrowly oblong, obtuse or subobtuse, finely denticulate, narrowed to a short winged petiole which is scarcely distinguishable from the blade or even subsessile: scape 6–10 in. high, much exceeding the lvs., white-farinose at the top, bearing a simple umbel or 2 superposed and a short distance apart: bracts lanceolate, acute, white-farinose margined: fls. somewhat nodding, purple; calyx campanulate, not split to the middle, purplish green, the lobes triangular, subacute and glabrous; corolla-tube obconical-dilated above the calyx, the limb concave about ½in. across, with broadly obovate, subtruncate, slightly emarginate and at the same time frequently undulate-subcrenulate lobes. Cent. China. Intro. 1905. B.M. 8586. G.C. III. 37:390; 40:209. R.H.S. 39:161.—The calyx is banded or costate with white farina.

177. **brevifòlia,** Forr. Glabrous and not farinose: lvs. paper-like, very broadly ovate-elliptic, serrate, attenuate into short winged petiole: scape slender, 4–8 in. high and much exceeding the lvs., bearing a 4–12-fld. unilateral somewhat drooping umbel: bracts small, broad-lanceolate, acute: fls. faintly fragrant, pedicellate, deep blue; calyx purplish green, with broad-lanceolate acute lobes; corolla broad-funnelform, the tube equaling or exceeding the calyx, the limb ⅛ to nearly ½in. across, lobes short and broad and emarginate. S. E. Thibet, altitude 14,500–16,000 ft. G.C. III. 57:207.

AA. *Calyx cut to the middle or beyond.*

B. *Lobes of calyx acute.*

178. **hazárica,** Duthie. Lvs. obovate or spatulate, denticulate, membranaceous, densely white-farinose below, acute or obtuse, gradually narrowed to a short winged petiole which is scarcely distinguishable from the blade: scape only slightly exceeding the lvs., about 4 in. high bearing 1 to many fls., which are umbellate: bracts linear, somewhat recurved: fls. purple; calyx narrowly campanulate, split to the middle, with lanceolate, acute, ciliate lobes; corolla-tube cylindrical, pale yellow, the limb about ½in. across, with broadly or narrowly obcordate emarginate lobes: caps. included in the calyx. W. Himalaya.

179. **membranifòlia,** Franch. (*P. longitùba,* Forr.). Lvs. very thin-membranaceous almost diaphanous, cuneate-ovate from an entire base, unequally dentate-crenate, very glabrous, yellow-farinose below: scape scarcely equaling the lvs., bearing 4–9 fls.: bracts short, linear, these as well as the pedicels yellow-farinose: fls. violet; calyx yellow-farinose, split to the middle, tubular-campanulate, with lanceolate, acute lobes; corolla cylindrical, slender, gradually broadened to a concave limb which is ¾–1 in. across, with obcordate, emarginate lobes: caps. ovate, slightly exceeding the calyx. S. W. China. Intro. 1908. R.H.S. 39:165.

BB. *Lobes of calyx obtuse.*

180. **calliántha,** Franch. Lvs. with petiole 2–3 in. long, oblong or obovate-oblong, attenuate into short winged petiole, yellowish farinose beneath, dentate-crenulate: scape about twice longer than lvs., the apex and the narrow-lanceolate bracts farinose, the umbel with 5–10 pedicelled fls.: calyx brown-purple outside and farinose within, narrow-campanulate, very deeply cut and with linear-oblong obtuse lobes; corolla deep purple-violet, the tube cylindrical and little if any exceeding the calyx, the limb about 1 in. across and cup-shaped, the lobes obovate and dentate. Yunnan, China. Intro. 1908.

XXI. Nivales.

Lvs. glabrous or nearly so, entire or nearly so, narrowed into a winged petiole: caps. cylindrical: Asia Minor to China and far north; N. Amer.

A. *Fls. yellow.*

181. **sikkiménsis,** Hook. Glabrous and devoid of farina, the calyx excepted, the scape reaching 2 ft.: lvs. 4–5 x 1–1½ in., narrowly obovate-spatulate, obtuse, wrinkled, sharply double-serrate, subequally narrowed to the petiole: scape elongated, 8–14 in. high, bearing a many-fld. umbel: bracts narrow, subulate-acuminate from a broad base: fls. slightly drooping, yellow; calyx farinose, 5-ribbed, tubular-campanulate, not split to the middle, with triangular acute frequently recurved lobes; corolla-tube funnelform-broadened, the limb concave, flattened up to 1 in. across, with roundish emarginate lobes: caps. subcylindrical, exceeding the calyx. Himalayas; reported also from China, but the oriental forms may be distinct. Two of them, also in cult., are Nos. 182 and 183. B.M. 4597. Gt. 1876, p. 321. Gn. 62, pp. 82, 113; 65, p. 93; 79, p. 161. J.H. III. 49:571. G. 4:589. G.M. 52:869. J.F. 2:169. R.H.S. 39:161. —*P. sikkimensis* is a fine alpine species from altitudes of 11,000 to 15,000 ft. and more, covering large areas with fragrant light yellow bloom; considered to be easy to grow along water-courses or in other moist places, but requiring shade.

182. **pseudosikkiménsis,** Forr. Differs from *P. sikkimensis* in having shorter lvs. and larger fls.: plant 12–18 in. high, with bright canary-yellow fragrant fls. Crevices and ledges of limestone cliffs, Lichiang Range, Yunnan, 11,000–12,000 ft. altitude. Intro. 1908. R.H.S. 39:161.

183. **microdônta,** Petitm. Very like *P. sikkimensis,* but distinguished by the suborbicular-ovate glabrescent lvs. with a petiole as long as the blade, irregularly toothed: corolla at least twice as large as calyx, deep yellow and attractively veined. W. China. Intro. 1912.

184. **orbiculàris,** Hemsl. Similar in foliage to *P. Cockburniana* and *P. tangutica,* but very different in fls.; most nearly allied to *P. sikkimensis* and *P. Stuartii,* from which it differs in having nearly entire lvs., tube of corolla, which scarcely exceeds calyx, constricted near the top and below the middle at the insertion of the very short stamens, and in the limb of the corolla which is flat and with entire lobes. Lvs. somewhat coriaceous, oblong-lanceolate, 2–6 in. long, obtuse, longitudinally recurved, minutely dentate: scape about 1 ft. high, yellowish or whitish farinose, bearing an umbel of 5–7 yellow fragrant pedicellate fls.: calyx thick, campanulate, scarcely ½in. long, the lobes ovate and obtuse and equaling the tube; corolla scarcely exceeding calyx-tube, the limb orbicular and about 1 in. diam., the lobes orbicular. W. China. Intro. 1906. B.M. 8135. G.C. III. 39:403.

185. **Stùartii,** Wall. An exceedingly variable Himalayan species with drooping yellow fls. in a terminal umbel: radical lvs. 5–10, narrowly oblanceolate, acute, sharp-serrate or sometimes entire, yellow, mealy beneath: scape 12–18 in. tall, bearing a mealy-covered infl.: fls. light yellow, with tube twice the length of the usually acute-lobed calyx, the lobes orbicular and emarginate or sometimes orbicular and entire. B.M. 4356. G.C. II. 19:824; 25:528. Gn. 29, p. 382.—Fls. 1 in. or more long.

186. **elongàta,** Watt. Glabrous: lvs. about 4 in. long, membranaceous, obovate, obtuse, crenulate, farinose or not so below, gradually narrowed to a short, winged petiole: scape almost twice as long as the lvs., 8–10 in. high, farinose above, bearing a somewhat congested umbel of 5–8 fls.: bracts triangular, acute: fls. golden yellow; calyx farinose, tubular, split to the middle, with lanceolate acute lobes; corolla-tube funnelform-broad-

ened, the limb concave, 1 in. across, with ovate, truncate, emarginate and crenulate lobes. Sikkim-Himalaya.

187. **szechuánica,** Pax. Glabrous and not farinose: lvs. 2–3 in. long, thin-membranaceous, oblong or ovate-oblong, suberose-denticulate, acute, narrowed to winged petiole: scape 8 in. or more high, stout, bearing an umbel of 6–10 yellow fls.: bracts triangular, acuminate: fls. nodding; calyx green, 5-ribbed, about ½in. long, tubular, incised about one-third of the way, the lobes ovate and subacute; corolla cylindrical, the limb nearly ½in. across, the ovate lobes reflexed. Szechuan, China.

AA. *Fls. purple or violet, rarely white.*

B. *Corolla-lobes reflexed.*

188. **Maximòwiczii,** Regel. Glabrous, not farinose: lvs. distinctly petiolate or almost subsessile, narrowly elliptical or elliptic-oblong, acute, densely denticulate or subentire, base entire, petiole winged, equaling the blade, sheathing, spreading at the base, whitish, rarely almost none: scape many times longer than the lvs., 8–16 in. high, glabrous, not farinose, stout, bearing a simple numerous-fld. umbel or superposed umbels: bracts long-acuminate from a broad base: fls. dark purple; calyx campanulate, green, 5-ribbed, cut one-third the length, with triangular, very acute, somewhat recurved lobes; corolla-tube slender, cylindrical, the limb flattened, ½in. across, with reflexed oblong lobes, neither retuse nor emarginate: caps. frequently much exceeding the calyx. N. Cent. China. Intro. 1911. B.M. 8363. G.C. III. 47:221; 53:267. Gn. 77, p. 208. R.H.S. 39:152.

189. **tangùtica,** Pax. Glabrous, not farinose: lvs. almost sessile, 2–3 in. long, oblong or ovate-oblong, acute, narrowed toward the base, very entire or slightly denticulate, the very broad, white midnerve produced beyond the blade: scape stout, 14–16 in. high, glabrous, bearing superposed umbels: bracts long-acuminate from a broad base: fls. 4–6 to an umbel, soon drooping, purple; calyx glaucescent, tubular-campanulate, cut one-third its length with triangular acute ciliolate lobes; corolla-limb ¾in. across, with narrow, linear lobes N. China. Intro. 1906. B.M. 8043. G.C. III. 38:42.

BB. *Corolla-lobes not reflexed.*

190. **nivàlis,** Pall. Glabrous, farinose or not so: lvs. 3–5 in. long, ovate-oblong or lanceolate, obtuse or subacute, margin often recurved, crenate-dentate or subentire, gradually narrowed to a winged petiole which is shorter than and very often scarcely distinguishable from the blade: scape robust, 3–10 in. high, exceeding the lvs., bearing a many-fld. umbel, rarely 2 superposed: bracts subulate-acuminate from a broad base: fls. erect, purple or white; calyx frequently farinose, cup-shaped, split below the middle, with lanceolate, acute or rather obtuse lobes; corolla-limb ½–¾in. across, with ovate, retuse lobes: caps. frequently twice the length of the calyx. Caucasus to the Himalayas and China, northward to the Baikal and Dahuria.—A variable species, with well-marked geographical forms. The white-fld. plant in cult. as *P. nivalis* is a form of *P. hirsuta* (No. 16).

191. **purpùrea,** Royle (*P. nivàlis* var. *purpùrea,* Regel. *P. Stùartii* var. *purpùrea,* Watt). Lvs. obovate-spatulate, nearly entire: fls. purple, in compact umbels: caps. often twice length of calyx. Thibet, etc., 10,000–14,000 ft., on exposed hillsides, but seeking the shade of overhanging banks. Gn. 31:444; 62, p. 131.—Correvon describes it as a stout, strong-looking plant, with stiff upright slightly toothed lvs. (often untoothed), dark green above and bright white generally yellowish beneath, long and narrow: fls. very dark purple, numerous, drooping because of the length of the pedicel, which, with the st., is covered with white powder; corolla deeply cut: scape 8–12 in. high.

192. **turkestánica,** Regel (*P. nivàlis* var. *farinòsa,* Schrenk). Smaller: lvs. 2–3 in. long, and about 1 in. wide, elliptic-oblong, crenate-dentate or dentate or rarely nearly entire, densely farinose beneath and on the margins: fls. sometimes in superposed umbels; pedicels short; calyx and corolla purplish. Turkestan.

193. **sinopurpùrea,** Balf. (*P. nivàlis* var. *sinénsis,* Pax). Said to be "a splendid species, enveloped in golden meal:" robust: lvs. entire: fls. purple, on short pedicels, often in superposed umbels; calyx densely farinose inside and on margins of lobes. W. China.

194. **Púrdomii,** Veitch. White-farinose: lvs. lanceolate or oblanceolate, 3–5 in. long and ¾in. or less broad, tapering to the winged or wingless petiole: scape about 6–7 in. high, bearing a 3–12-fld. pendulous umbel of nearly sessile lilac-mauve (or bright violet) fragrant fls. with a small greenish yellow eye; corolla-tube almost closed, the limb about 1 in. across: caps. oblong, exserted. W. Kansu, China, altitude 10,000–11,000 ft. B.M. 8535. G.C. III. 53:200. Gn. 77, p. 170. G. 35:209. G.M. 56:201. R.H.S. 39:164.—Certificated by Roy. Hort. Soc., 1913. "Like most members of the Nivalis group of primulas, *P. Purdomii* died after flowering. It is a plant of vigorous growth and robust habit which prefers a loamy soil" (B.M.).

195. **pulchélla,** Franch. Glabrous: lvs. 2–4 in. long, yellow-farinose below, narrowly lanceolate, acute or obtuse, revolute, minutely denticulate, long-narrowed toward the base: scape 8–12 in. high, stiff, bearing a many-fld. umbel: bracts lanceolate or linear: fls. erect, violet; calyx golden farinose finally bare, split below the middle, with lanceolate acute not at all rarely unequal lobes; corolla-limb ¾in. across, with shortly lobulate, sometimes entire lobes: caps. ovate, obtuse, more or less equaling the calyx. S. W. China. Intro. 1908. G.M. 56:962. R.H.S. 39:161.

196. **pulchelloìdes,** Ward. A smaller plant than *P. pulchella,* with fewer and smaller fls., less depth of color and also narrower smaller lvs. China. Intro. 1911. R.H.S. 39:164.

197. **Cusickiàna,** Gray. Scapes 6 in. or less tall, each bearing 2–4 violet or white fls.: lvs. oblong-spatulate or narrow-oblong, about 2 in. long, entire or very nearly so: involucre-bracts 2 or 3, conspicuous, unequal: corolla-lobes retuse, the tube little if any exceeding the green calyx-lobes which are white striate between. Early spring. E. Ore.—Offered by dealers in native plants.

198. **secundiflòra,** Franch. Glabrous: lvs. 2–4 in. long, papery, golden farinose below when young, finally becoming bare, oblong or ovate-oblong, finely and evenly serrulate, acute, narrowed to a winged petiole which is scarcely distinguishable from and equaling or shorter than the blade: scape exceeding the lvs., 8 in. or more high, stout, bearing a 1-sided, 6–10-fld. umbel: bracts triangular, acuminate: pedicels soon nodding, secund: fls. bright violet; calyx dark purple, marked with 5 white lines, ovate-campanulate, split to the middle, with deltoid, lanceolate, acute lobes; corolla-tube cylindrical, the limb funnelform, ¾in. across, with broadly obovate scarcely emarginate lobes. S. W. China. Intro. 1908. G.C. III. 55:357. Gn. 78, p. 284. R.H.S. 39:160.

XXII. MACROCARPÆ.

Lvs. glabrous or nearly so, contracted into a petiole and cuneate or rounded at base, toward the apex usually toothed: caps. cylindrical or ovoid: China, Japan, N. Amer.

199. **Faùriei,** Franch. Lvs. distinctly petioled, sulfur-farinose below, ¾–2 in. long, membranaceous, ovate or oblong-ovate, obtuse, crenulate-dentate or almost subentire, gradually narrowed to a wingless or narrowly winged petiole: scape more or less exceeding the lvs., 2–4 in. high, bearing a several- to many-fld.

umbel: bracts linear-subulate: fls. rose; calyx narrowly campanulate, split nearly to the middle, with lanceolate acute lobes; corolla-tube cylindrical, the limb flat, and about ½in. across, with triangular-obcordate, deeply emarginate lobes, the lobules divaricate: caps. cylindrical, much exceeding the calyx. Japan.

200. **suffrutéscens,** Gray. Rhizomatous, part above ground branched and woody: plant not farinose, glabrous: lvs. about 1 in. long including the petiole, cuneate-spatulate, obtuse, leathery, top 5–7-toothed, long-narrowed toward the base to a winged petiole which is scarcely distinguishable from the blade: scape 4–5 in. high, bearing a many-fld. umbel: bracts lanceolate, acuminate: fls. reddish purple; calyx campanulate, split almost to the middle, glandular-puberulent, with lanceolate, acute lobes; corolla-tube pale, gradually broadened toward the throat, the limb ⅛–¾in. across, with obcordate, emarginate lobes. Calif.; alpine. R.H.S. 39:181. L. H. B.

PRÍNGLEA (personal name). *Cruciferæ.* Perennial herb with a long stout rhizome and forming a head of lvs., in which it resembles *Brassica oleracea:* scape thick, simple, with a strict fr.-bearing raceme: fr. a 1-celled silique. One species from Kerguelen Land. *P. antiscorbùtica,* Hook. f. Kerguelen's Land Cabbage. Lvs. broadly obovate-spatulate, 3–6 in. long: peduncle arising from the rhizome, beneath the foliage, 2–3 ft. long, leafy, bearing a dense raceme 6–12 in. long: sepals oblong; petals none: fr. shortly oblong or oblong-lanceolate. R.H. 1913, p. 14. Intro. into botanic gardens abroad. Valuable as a remedy for scurvy.

PRÌNOS: *Ilex.*

PRINSÈPIA (after Macaire-Prinsep, botanist at Geneva, Switzerland). Including *Plagiospérmum. Rosàceæ,* subfamily *Prùneæ.* Woody plants, chiefly grown for their early-appearing flowers and bright green dense foliage.

Deciduous shrubs: branches with axillary spines: pith lamellate: lvs. alternate, petioled, entire or serrulate; stipules small, lanceolate: fls. 1–4 in the axils of last year's branches or in axillary racemes; calyx with cup-shaped tube and broad and short lobes imbricate in bud; petals 5, spreading, suborbicular, clawed; stamens 10 or many, with short filaments; ovary superior, 1-celled, the style inserted near the base, with capitate stigma; ovules 2: fr. a drupe with a smooth or slightly fissured stone.—Three species on the Himalayas and in N. E. Asia to N. W. China. The edible frs. are gathered in their native countries.

The two prinsepias in cultivation are low spiny slender-branched shrubs with narrow bright green foliage and white or yellow flowers appearing with the leaves in early spring along the branches of the previous year and followed by purple or black cherry-like drupes which, however, so far have been produced only sparingly in cultivation; possibly the flowers, though apparently perfect, are functionally dicœcious or they need insects for fertilization, which are wanting at the very early flowering time of this shrub. The shrubs have proved perfectly hardy at the Arnold Arboretum, only the flowers suffer sometimes during cold weather; they are among the earliest shrubs to burst into leaf and are conspicuous by their bright green foliage when most other shrubs are still bare. They seem to grow best in a sunny and open position and in well-drained soil. Propagation is by seeds sown after maturity or stratified and sown in spring or by greenwood cuttings under glass; also by layers.

sinénsis, Oliver (*Plagiospérmum sinénse,* Oliver). Fig. 3192. Shrub, to 6 ft. or taller, nearly glabrous: younger branches light gray, older brown, with short axillary spines about ¼in. long: lvs. slender-petioled, ovate-lanceolate to lanceolate, long-acuminate, cuneate at the base, sometimes broadly so, entire or sometimes sparingly serrulate, finely ciliate, otherwise glabrous, bright green above, paler beneath, 2–3 in. long: fls. 1–4, on pedicels about ½in. long, bright yellow, ½–¾in. across; sepals triangular ovate; stamens 10: fr. subglobose or ovoid, ½–¾in. across, purple, juicy; stone ovoid, compressed, rugose. April, May. N. E. Asia. M. D. 1903:1. I.T. 5:182. H.I. 16:1526. R.H. 1907, pp. 418, 419.—Besides being an ornamental shrub this species may be worth while growing for its cherry-like edible frs. which have a pleasant acid taste.

3192. Prinsepia sinensis. (×⅙)

uniflòra, Batalin. Shrub, to 4 ft., with slender spreading light gray branches: spines about ¼in. long: lvs. short-petioled, linear-oblong to narrow-oblong, acutish or obtuse at the apex, cuneate at the base, entire or remotely serrulate, dark green above, paler beneath, glabrous, 1–2 in. long: fls. 1–3, on pedicels about ¼in. long, white, ½–¾in. across; stamens 10: fr. about ½in. across, black, with bloom; stone ovoid, compressed, rugose, about ⅛in. long. April, May. N. W. China.—This and the preceding species are closely related and form a distinct subgenus chiefly characterized by fascicled fls. with only 10 stamens, while *P. utilis* has the fls. in axillary racemes and many stamens.

P. ùtilis, Royle. Shrub, to 5 ft.: spines 1–1½ in. long, usually leafy: lvs. elliptic to oblong-lanceolate, acuminate, entire or serrulate, 1½–4 in. long: fls. pedicelled, in axillary racemes, white, about ½in. across: fr. purple, ½–¾in. across, edible. Himalayas. —Apparently not in cult. in this country and probably not hardy north of Washington, D. C. Alfred Rehder.

PRIÒNIUM (Greek *saw,* referring to the leaves, which have serrate edges). *Juncàceæ.* Tender aquatics growing in great masses in running water.

Stem erect, woody, from a repent rhizome: perianth rigid, cleft to the base, segms. ovate, subequal; stamens 6; ovary sessile, globose, 3-celled; ovules usually few, often 2 in a cell: caps. rigid, 3-valved; seeds usually only 1 to a cell.—One species in S. Afr. This is one of the few plants of the rush family having the lvs. crowded at the top of an erect woody st. 5–6 ft. high. This plant may be grown in a pot placed in a pan of water, and, if desired, may be planted out for the summer in a wet position. Prop. by division.

Palmìta, E. Mey. St. stout, often forked, 2–4 in. in thickness, reaching a length of 5–6 ft.: lvs. linear, rigid, glabrous, 3–4 ft. long, in a dense rosette at summit of st.: infl. a large, dense, terminal panicle on long peduncle; perianth and bracts ⅛in. long. B.M. 5722. G.W. 11, p. 390. F. Tracy Hubbard.†

PRITCHÁRDIA (W. T. Pritchard, British consul at Fiji in 1860). *Palmàceæ,* tribe *Corỳpheæ.* Spineless fan palms from islands of the South Pacific; also in Cuba if Colpothrinax is included.

Trunk usually ringed, crowned at the summit by a large cluster of spreading plicate-flabelliform lvs.: spadix at first erect, ultimately drooping at the fruiting stage: fls. hermaphrodite, small, green; ovary 3-cornered or 3-lobed, narrowed into a strong style; corolla with persistent tube and deciduous segms.; embryo subbasilar.—About 14 or 15 species; by some, Washing-

tonia is included in this genus. The genus was monographed by Beccari in Malesia, vol. 3 (1890). A good horticultural account is that of Wm. Watson in G.C. III. 13:332 (1893). True pritchardias, according to Watson, differ from all other fan-lvd. palms in the form of the blade, which is cuneate in outline; the lvs. are also exceptionally soft and pliant. The best of the genus, probably, is *P. pacifica*, which is remarkable for its fibrous fluffy lf.-stalks.

3193. Pritchardia pacifica.

A. *Ovary 1, 3-angled or 3-lobed, attenuate into style.*

B. *Fr. black-purple, globose, 6 lines thick.*

pacífica, Seem &. Wendl. Fig. 3193 (adapted from Martius). Trunk attaining 30 ft. high, 10–12 in. thick, straight, smooth: lvs. 4½ ft. long, 3¼ ft. wide, densely covered when young with whitish brown tomentum, finally glabrous and of a fine rich green; segms. about 90; petiole 3½ ft. long. Samoa, Fiji Isls. I. H. 21:161. F.S. 22:2262.

BB. *Fr. yellow or red, 9 lines thick.*

Gaudichaûdii, Wendl. (*P. macrocárpa*, Lind.). Trunk 20 ft. high, 1 ft. thick, usually much lower in cult.: lvs. roundish, 3–4 ft. long, covered beneath with pale brown matted wool, slit for about 1 ft. into about 60 segms.; petioles 2–3 ft. long, without spines: calyx glabrous and not prominently striate: fr. ovoid, ¾in. long, yellowish red. Hawaiian Isls. I.H. 26:352.

BBB. *Fr. greenish, globose, 15–20 lines thick.*

Mârtii, Wendl. Trunk generally not exceeding 5–6 ft., but recorded to 12 ft., as thick as in *P. Gaudichaudii:* lvs. glabrous and glaucous below, not woolly; segms. about 40, not as deep; petioles longer: calyx densely striate: fr. globose, 1¼–1¾ in. diam., greenish. Hawaiian Isls.—Cult. in S. Calif.

AA. *Ovary of distinct carpels.* (*Colpothrinax.*)

Wrìghtii, Becc. (*Colpothrìnax Wrìghtii*, Wendl.). Barrel or Bottle Palm. Palma Barrigona. Fig. 3194; also Fig. 2725, p. 2437. Formerly retained in Colpothrinax, as the only species, but recently (1907) transferred to Pritchardia by Beccari: st. single, rising for 3–6 ft. or more, at first cylindrical but gradually increasing in thickness in a bottle-like or flask-like form, the trunk slender and ascending beyond this part till the whole reaches 30–40 ft.: lvs. circular in outline, more than 5 ft. across, suborbicular, flabellate-radiate, regularly divided into about 80 segms. about 4¼ ft. long; segms. rigid, slightly leathery, pale green, very glabrous and shining: spadix simply duplicate-branched; spathes 2, slightly leathery, red-brown: fls. sessile: fr. globose, 1-celled. Sandy savannas in Pinar del Rio, Cuba.—A very striking palm is indicated in Fig. 3194, which is drawn from photo-illustration in Pomona College Journ. Ec. Bot., vol. 3.

P. borneénsis, Hort., was intro. in 1891 by Linden, but unknown to botanists.—*P. filamentòsa*, Hort., is presumably a catalogue error for P. filifera.—*P. filífera*, Lind., is Washingtonia filifera.—*P. grándis*, Bull, is Licuala grandis.—*P. periculòrum*, Wendl., is characterized by its dark brownish golden petioles and obliquely spherical fr. Pomotu Isl.—*P. robústa*, Hort., listed abroad, is without botanical description.—*P. Thirstonii*, Drude, is distinguished by its long slender fl.-stalks like fishing-rods bearing a thyrse-like infl. Neither of the last two is in cult. in Amer.

L. H. B.†

PRIVET: *Ligustrum.* **P., Mock:** *Philly rea.*

PROBOSCÍDEA: *Martynia.*

PROCHNYÁNTHES (Greek, *kneeling* and *flower;* referring to the sudden bend in the flower which is likened to a knee). *Amaryllidàceæ.* Interesting tuber-bearing plants, probably suitable for cult. in pots and also planted out: closely related to Polianthes and Bravoa, differing chiefly in the shape of the flowers.

Sts. slender, from oblong tubers which crown short thick rootstock: lvs. mostly basal: infl. a lax spike or raceme: fls. always in pairs, tubular below, abruptly bent at the middle, bell-shaped above; stamens 6, included: fr. 3-celled, many-seeded.—A genus, discovered by E. Palmer in 1886, of which two species have been described. Native of W. Mex.

viridéscens, Wats. Sts. 4–6 ft. high: lvs. mostly basal, numerous, 1–2 ft. long, 2–3 in. broad, erect: fls. 5–30 pairs, brownish; pedicels nearly wanting to 1½ in. long. At first supposed to be a very rare species, known only from near Guadalajara, Mex., but found by the writer to be very common in the mountains of the states of Jalisco, Durango, and Zacatecas. Not yet in the trade, but it is a plant that deserves to be intro.

P. Bullidna, Baker. Hardly differs from the above but described as having larger fls., which are sessile instead of having a long pedicel: fls. brownish green. The fls. are not jointed at the pedicel as Baker says. B.M. 7427.—*P. viridiflòra*, mentioned under B.M. 7427, is a mere slip of the pen for P. viridescens.

J. N. Rose.

3194. Pritchardia (or Colpothrinax) Wrightii, from Cuba. Swelling is usually higher on trunk.

PROMENÆA (named presumably after the prophetess of Dodona). *Orchidàceæ.* A group of small herbs with the habit of odontoglossum but having leaves of paler green.

Leaves conduplicate in the bud: pseudobulbs evident: infl. originating above the annual leafy axis, 1–2-fld.; sepals and petals subequal, spreading, the lateral sepals forming a mentum with base of the column; labellum movably joined to the base of the column.—About 10 species in Brazil. It is one of the many genera formerly united with Zygopetalum. For cult., see *Zygopetalum.*

xánthina, Lindl. (*Zygopétalum xánthinum*, Reichb. *P. citrìna*, Donn). A little orchid with small ovate pseudobulbs and lanceolate lvs. 2–3 in. long: fls. pale lemon-yellow; labellum

3-lobed, with crimson spots in the throat; column streaked with red. June. Brazil. G.W. 14, p. 521.

gramínea, Lindl. Lvs. about 6 in. long, lanceolate, faintly striate, jointed to the equitant bases: scapes 3–5, clustered; fls. dirty yellow, spotted with brown; sepals and petals oblong-lanceolate; labellum oval, crisp and toothed on the margin, shaded with rose and blotched with crimson-brown. Spring. Brazil. B.M. 5046. G.C. II. 23:636.—On account of the absence of pseudobulbs this species is now generally placed in the genus Keffersteinia.

stapelioìdes, Lindl. Pseudobulbs 4-angled, 1–2-lvd.: lvs. lanceolate, pale glaucous, reticulate: peduncle 2-fld.; fls. green outside, yellowish inside, speckled and banded purple. Brazil. B.R. 25:17 (as Maxillaria).

P. micróptera, Reichb. f. Fls. 1½ in. broad; sepals and petals lanceolate, acute, light green; lip 3-lobed, basal half white with narrow purple bars, front lobe green; column pale green. Brazil. —*P. Róllissonii,* Lindl. Fls. pale yellow, the lip with purple spots; sepals and petals very acute; lip with lateral lobes ovate, acute, the front lobe oblong, apiculate. Brazil. G. 12:237; 17:103.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

PROPAGATION: *Cuttings, Grafting, Layers, Nursery, Seeds, and Seedage.*

PROSÁRTES: *Disporum.*

PROSÒPIS (Greek, but the meaning is obscure). *Leguminòsæ.* Tender trees and shrubs, including the mesquit and the screw bean, two forage plants of considerable value in the arid regions of southern California and the Southwest.

Stems with or without spines, the spines axillary, solitary or in pairs or only the stipules spinescent: lvs. bipinnate, 1 or 2 pairs of pinnæ; lfts. usually numerous, small, entire: fls. small, greenish, in cylindrical or globose axillary spikes: pods linear, coriaceous and indehiscent.—About 25 species, tropical and subtropical regions of the world.

The mesquits are thorny shrubs which ordinarily grow only a few feet high in the desert, but under favorable circumstances make trees 60 feet high. They are also called algaroba and cashaw. The sweetish pods are eaten chiefly by cattle. Seeds and plants are offered in southern California.

A. *Plant spiny: pod straight or sickle-shaped.*

juliflòra, DC., and allies. MESQUIT, or MESQUITE. Several forms have been confused under this name. *P. juliflòra,* DC., is a strictly W. Indian species, with many pairs of lfts. very close together, ¼–¾ x $\frac{1}{12}$–⅛in. rather thin in texture and elliptic to oblong, apex and base blunt and rounded. *P. dúlcis,* Kunth, is a Mexican species somewhat similar to the preceding but with the lfts. slightly more distant although still crowded, ¼–½ x $\frac{1}{16}$in., linear to linear-oblong, apex tending to be acutish and mucronulate, the texture more coriaceous. *P. glandulòsa,* Torr., is the common species throughout Texas, New Mex., and S. Calif., also occurring in Mex.; it has more remote pairs of lfts. often distantly so, ¾–2 x ⅛–$\frac{3}{16}$in., which, when mature, are longer than in *P. juliflora,* rigid and linear, those of the young shoots frequently elliptical to spatulate and up to ¼in. or even more broad, base slightly narrowed, apex mucronulate and usually acutish although also bluntish. *P. velùtina,* Wooton, is a southwestern species which looks much like *P. dulcis,* but the younger shoots, lvs., and lf.-rachis velutinous-pubescent; lfts. $\frac{3}{16}$—½ × $\frac{1}{32}$—⅛ in. oblong, apex rounded, base rounded. Ariz. and S. Calif.

AA. *Plant less spiny: pod spirally twisted.*

pubéscens, Benth. (*Strombocárpa pubéscens,* Gray). SCREW BEAN. TORNILLO. Shrub or small tree, merely spinescent on petioles: lfts. 5–8 pairs, oblong, ¼–⅓in. long: spikes globose to cylindrical, 1½–2 in. long: pod twisted, nearly sessile, 1–2 in. long. Texas, Calif., Mex. —The pods are used as food by Mexicans and Indians.

P. strombulífera, Benth. (Acacia strombulifera, Willd.), is a shrub 5–8 ft. high, with ash-gray bark, very short spines, lfts. of the pinnæ 4–6-paired, linear, and the pod yellowish, about 2 in. long, and spirally twisted. Peru.

F. TRACY HUBBARD.†

PROSTANTHÈRA (Greek, *to add to,* and *anther;* referring to the connectives of the anthers being spurred or crested beneath). *Labiàtæ.* Shrubs or subshrubs with resinous glands, and commonly strong-scented.

False whorls 2-fld., axillary or borne in a terminal raceme; fls. often white or red; calyx campanulate, limb 2-lipped; corolla-tube short, dilated into a broad campanulate throat; limb 2-lipped; stamens 4, in pairs; anthers 2-celled, connective dorsally slightly prominent, often spurred or appendaged: nutlets obovoid and netted wrinkly.—About 40 species from Austral. Prop. by cuttings of young shoots.

nívea, A. Cunn. A beautiful shrub, 3–6 ft. high, glabrous except the corolla or with a few appressed hairs: st. and branches slender, twiggy, upper ones 4-angled: lvs. ½–1½ in. long, oblong-lanceolate or linear, entire, pale green; margins involute, especially on older lvs..

3195. Protea cynaroides. (×⅙)

fls. snow-white or tinged with blue; pedicels short; calyx about ¼in. long, green; corolla ½–¾in. across. Rocky hills, New S. Wales and Victoria. B.M. 5658.—Can be safely grown only where the lemon is hardy. It is a showy species when well grown.

Other species which have been intro. and sometimes cult. abroad are: *P. denticulàta,* R. Br. Robust shrub: lvs. sessile or nearly so, broadly lanceolate to narrow-linear, with rigid bristles on the margins: fls. in distant pairs forming interrupted terminal racemes, lilac to purple. B.M. 7934.—*P. pulchélla,* Skan. Subshrub about 1½ ft. high, slender: lvs. subsessile, linear to linear-lanceolate: fls. with a lilac subrotate corolla, the tube white at base, dotted with dark purple at the throat. B.M. 8379.—*P. rotundifòlia,* R. Br. Shrub, 3–7 ft. high: lvs. broadly ovate, orbicular or spatulate, entire or coarse crenulate: fls. in short close terminal racemes, purple. G.M. 58:147.

F. TRACY HUBBARD.†

PRÒTEA (from Proteus, the sea-god, who changed into many forms; alluding to the baffling diversity of the species). *Proteàceæ.* Tender shrubs, small trees or acaulescent perennial plants, which are among the most attractive and characteristic plants of the Cape of Good Hope, a region whose plant life is singular.

Leaves alternate, coriaceous, entire: fls. in many-fld. sessile or subsessile, terminal or lateral, usually solitary heads, inclosed in an involucre of numerous imbricate coriaceous to scabrous and various colored bracts; ovary covered with long hairs; ovule 1: nut

densely bearded.—About 100 species, mainly from S. Afr. but extending into Trop. Afr. Their fl.-heads are said to look like a "glorified artichoke." Indeed *P. cynaroides* (Fig. 3195) is named from this very resemblance. (*Cynaroides* means cynara-like; and *Cynara* is the artichoke.) It has bright pink fl.-heads which last several months. The structure of the fl.-heads is the distinctive feature of the whole family of the Proteaceæ. The showy parts of the fl.-head are the bracts, which are often rigid, colored, and overlap one another like the scales of a hard cone or an artichoke. "When the heads of *P. cynaroides* first open," says Watson, "they are full of honey and are known to the Boers as honey-pots." This honey is collected and made into a kind of sugar. The blooming of the "honey-pots" is a great occasion for picnics. Watson saw large bushes of *P. speciosa* at the Cape, which he declared were quite as effective as big specimen rhododendrons. "Fifty years ago," writes Watson, in 1891, "there were about 30 species of Protea included among popular greenhouse plants in England; now one may safely say there is not one, the few really under cultivation being only in botanical collections." In 1881, Hooker wrote: "That these and many other plants requiring like treatment will be reintroduced, and will be the wonders of the shows for many successive seasons, is as certain as that they were once the glories of the old flue-heated houses that our forefathers called stoves, in which orchids quickly perished, and Banksias and Proteas throve magnificently." Over 40 colored plates of proteas have been published, of which 23 appeared in Andrews' Bot. Rep. between 1797 and 1811.

The interest in proteaceous plants is growing in southern California. Proteads have a reputation for being difficult to cultivate away from the Cape, but Hooker's statement seems to indicate that their culture is not so much difficult as special. Under glass they are said to require a coolhouse which is airy and sunny. "The one great danger to cultivated Proteads," says Watson, "is excessive watering, and to guard against this it is found to be a good plan, in the case of delicate species, to place the pot in which the plant is growing inside a larger one, filling up the space between with silver sand. The latter is always kept moist." It is suggested by one grower that it is possibly not excessive watering that injures them, but insufficient drainage. Many of the species need staking, as the shoots are quick to break off at the base if unsupported. Proteas ripen seeds freely, and seeds can be easily procured from the Cape.

cynaroìdes, Linn. Fig. 3195. Bush, up to 6 ft. high or sometimes acaulescent: lvs. petioled, varying from subrotundate and obtuse to elliptic and acute: head sessile; outer involucral bracts ovate to ovate-lanceolate, inner lanceolate, oblong, acuminate, tomentose, exceeding the fls.; ovary oblong, covered with long whitish hairs. S. Afr. G.F. 8:35. G.C. III. 17:773. G.M. 38:407.

mellìfera, Thunb. A large bush, 6–8 ft. high: lvs. linear-oblanceolate: involucral bracts very viscid, those of the stipes silky pubescent, the others glabrous, dark red to whitish green with pinkish tips and margins but usually rosy pink: fls. whitish, exceeded by the involucre; ovary covered with long golden hairs. S. Afr. B.M. 346. R.H. 1903:308.—The oldest specific name for this plant is *P. rèpens*, Linn. Mant., not Thunb., but following Phillips & Stapf in Fl. Cap. 5 sect. 1:577, the name *mellìfera* is maintained. They state that "The specific name *repens* is so inapplicable to this plant, while Thunberg's name is so suitable and has been in such general use that we have retained it." Var. **rùbra,** Hort., is a form of *P. mellìfera* which has been offered in the trade abroad.

nàna, Thunb. (*P. rosàcea*, Linn.). Smooth shrub, 2 ft. high, branched: lvs. acicular, erect-spreading, acute or acuminate: involucral scales oblong, obtuse, the outer greenish, the inner scarlet, exceeding the yellowish fls. S. Afr. B.M. 7095. G.F. 4:413. G.M. 35:268, 269. Good horticultural accounts of proteas are those of Wm. Watson in G.F. 8:34 and 4:412, which have been liberally quoted above.

WILHELM MILLER.
F. TRACY HUBBARD.†

PROTECTION, as used by the gardener, is an indefinite term. A plant may need protection from living agencies, as animals, birds, insects, or plants (including fungi and weeds), or it may need protection from the weather,—heat, cold, rain, drought. Generally, however, the gardener means winter-protection, which again covers two very distinct ideas,—freezing injury and mere mechanical injury. Most Cape bulbs, for example, are ruined if they are frozen; tulips are not. Yet Cape bulbs may sometimes be wintered outdoors if they are protected by a covering heavy enough to keep out frost. Strawberries, on the contrary, are covered after frost with a light mulch, which is designed merely to keep the plants from being heaved by alternate freezing and thawing. These are the main objects of winter protection in the East, at least with herbs. In the prairie states the fruit-trees also need protection from the hot drying winds of summer and from sunscald, which are not the important considerations with eastern fruit-growers. See *Winter Protection.* Allied topics are discussed under *Greenhouse, Coldframes,* and *Hotbeds; Diseases* and *Insects; Weeds; Transplanting.*

PRÒTIUM (probably the Javan name). *Burseràceæ.* Trees, with balsam sap: lvs. toward the ends of the branches, alternate, 3-foliate or uneven pinnate; lfts. few-paired, rather large, petiolulate, entire or dentate: panicles long-peduncled, fasciculate, branched: fls. small, slender-pedicelled; calyx small, cup-shaped, 4–6-cleft or -dentate; petals 4–6, linear-oblong; disk urn-shaped; stamens 8–12; ovary sessile, 2–4-celled: drupe fleshy, globose.—About 50 species, mostly natives of Trop. S. Amer., some species also in India, Malaya, Mauritius, Madagascar, W. Indies, and Mex. **P. serràtum,** Engl. (*Bursèra serràta*, Wall.). Sometimes planted in tropics and subtropics for ornament, and wood said to be used for furniture: evergreen: lfts. about 7 or more, opposite, narrow-ovate, base acuminate, pubescent or nearly glabrous, serrulate or entire: panicles axillary, lax, much branched, shorter than the lvs.: fls. very small, hermaphrodite, pubescent externally; calyx 5-toothed; petals 5; stamens 10: drupe globose, 1–3-celled. India.

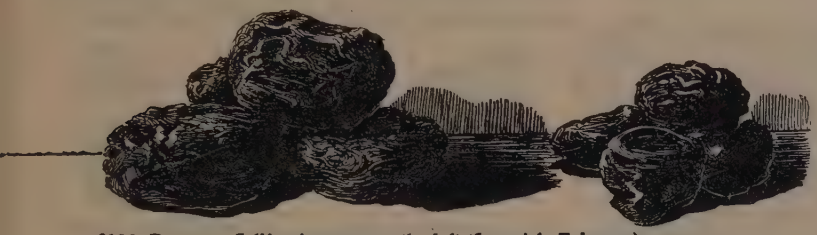
PROTOPLASM. The living or organized cell-content. The difference between living and non-living things, so far as it has been possible to study it, consists in the fact that the former are characterized by the possession of protoplasm, "the physical basis of life." This protoplasm is a most complex material, the seat of diverse chemical reactions and physical changes, and at the same time a material having a wonderful capacity for correlation and growth. When the cell or living organism is killed, there is no loss of substance, and the material originally constituting this protoplasm remains, but there is left relatively little to suggest living protoplasm. So far as is known, this non-living residue can never be reëndowed or activated with those characteristic properties of correlation and growth, and many other properties less complex, which are the potential or kinetic possessions of the living. It is in some ways unfortunate to call the dead material by the same name as the living.

In the living plant or animal, the protoplasmic unit is the cell, usually microscopic in size, and an association of cells of the same form, or with similar functions, constitutes a tissue. The spores of many fungi and of mosses and ferns are single cells. In plants the protoplasmic unit is usually surrounded by a resistant mem-

brane, or cell-wall, resulting in a high degree of rigidity and strength. In some cases, as in "woody" tissues, the cells become highly modified, the walls may be much thickened, and the protoplasm may disappear, leaving only the non-living cell-walls.

Since the protoplasm is the seat of the greater part of the chemical reactions and physical changes even in the more complex living plants, with it must be associated the absorption, digestion, and assimilation of foods, respiration, and excretion, as well as growth, reproduction, and heredity capacities. In the simplest plants, such as many of the lower algæ (pond-scums), consisting of but a single cell, this cell must perform all the functions of the organism; but in complex plants there is a certain amount of differentiation of labor or function of the various protoplasts, or cell units. Thus the various tissues are more or less seats of different physiological processes; for example, the nectar-glands are "organs" of excretion, the green tissues are the seats of organic food-making (see *Photosynthesis*).

The protoplasm of the cell is itself differentiated into various structures, important among which are (1) the cytoplasm, or general protoplasm, within which are (2) the nucleus, and (3) the plastids (in green plants).



3196. Prunes.—California prune on the left (Imperiale Epineuse); common commercial on the right. (× nearly ½)

Protoplasm is generally regarded as a viscid semi-fluid material, and commonly it behaves as a liquid (an emulsion colloid). When killed, protoplasm is "set," that is, it becomes a jelly-like matrix, and it is a study of such fixed material upon which have been based the earlier views regarding structure. There is strong evidence that much of what is called the finer structure of protoplasm is a result of fixation, and that there is actually little real "structure" in the living material, although certainly the gross appearance may change more or less with the diverse activities of the cell. Protoplasm cannot be expressed chemically; indeed, the view which is today most widely accepted is that it consists of numerous substances physically related, rather than of complex molecules of a definite "substance."

B. M. Duggar.

PRUMNÓPITYS: *Podocarpus.*

PRUNE (from *Prunus*), is used in this country to designate a cured dried plum, and also the varieties that are employed for the making of this product. In literature, however, it may be used rather indefinitely for many kinds of plums, particularly those that are firm-fleshed; "dried prunes" is then used for the cured product which in this country is known only as "prunes." The product is now an important article of horticulture and commerce in California and the Pacific Northwest. It is also produced in southern and to some extent in central Europe.

Prunes in California.

There are at least three important characters which distinguish the prune interest of California from that of any other state, viz.: the extent of the industry, the method of curing, and the plum variety chiefly used.

According to figures gathered by George P. Weldon, there were in California 91,470 acres of bearing prune trees in 1915, and 24,774 acres of young trees. This places the prune next to the peach, which is the leading deciduous tree-fruit of California with a total acreage of 144,888. The annual cured prune product of California, during the decade 1905 to 1914, has ranged from 57,000,000 pounds in 1908 to 205,000,000 pounds in 1912, the average annual product being 122,050,000 pounds. The Pacific Coast States produce all the prunes grown in the United States, and, according to the United States Census of 1910, "California reported, in 1909, 85.7 per cent of the total value of dried prunes produced in the United States." The development of this American product has not only reduced importation of European prunes so that they no longer receive distinctive enumeration in the customs reports, but about half the product is annually exported.

There are several reasons why the prune product of California is so overwhelmingly large and is still increasing. Beyond the general suitability of natural conditions for fruit-growing, there is, in the case of plum varieties, the total absence of the curculio, and "black-knot;" the practical freedom from rot-fungi which attack ripening fruits, and a dry condition of soil-surface and air during August and September which favor gathering fruits from the ground and curing in the open air. Curing in evaporators by artificial heat is practically unknown. The process of handling prunes, from the tree to the package, is outlined by an experienced handler, E. N. Richmond, of San José, as follows:

"Prunes should never be picked from the tree. They should be allowed thoroughly to ripen and fall to the ground. An orchard should be covered by pickers every seven to ten days—seven days preferably, so as to prevent sunburn of the fruit lying on the ground. The usual form of contract with pickers calls for four pickings, no shaking of the trees until the third picking, and then at grower's discretion.

"The green fruit is hauled to the dipper-shed in picking-boxes and there passed through a light solution of lye. A kettle or tank, holding 200 gallons of water and containing a basket container, is used for this purpose. In many instances the fruit is rinsed by passing from this dip into a vat of clear water and then dumped onto a combination pricking-board and grader, operated by power, which grades the fruit into three grades so that the drying in the field can be uniform. The fruit is then placed on trays 8 by 3 feet and taken to the drying-yard and dried in the sun. The purpose of passing the fruit through the lye-solution and over the pricking-board is that the skin may be slightly cut, thereby hastening evaporation, preventing fermentation and producing a fruit with a clear bright meat. From the dipper-shed to the dry-yard, the fruit is hauled on a one-horse truck especially constructed for this purpose.

"The operation of drying requires judgment. Fruit should be allowed to lie in the sun on the trays until about three-quarters dried, and then the trays are stacked in piles, one above the other, leaving air-vents on either end. About twenty trays can be stacked in one pile and the finishing process takes place in this stack. Under normal weather conditions it takes from ten days to two weeks to cure prunes. While the fruit is on the trays in the dry-yard, it should receive at least one turning by hand, shaking the trays or using brooms, so that the fruit secures an equal drying on all sides. It also materially lessens the time of drying and makes a finer grade of fruit. The fruit must not be taken from the trays until it is thoroughly cured.

"At the packing-house the fruit is carefully separated

into the different grades, varying from thirty to forty prunes to the pound, up to prunes running smaller than 120 to the pound. The grades as to weight and size are obtained by passing the fruit over a large grader which consists of a series of screens of different sizes, commencing with the smaller size and increasing to just a trifle larger size every 3 or 4 feet. There are from eight to nine different screens, the largest fruit passing over the end. As the fruit comes from the grader, it is carefully tested by weighing and counting, and taken to the proper bin. From there it is taken as required for packing to the processor or cleanser. The fruit in the field has been subjected to considerable dust and dirt as well as insect life. The processor or cleanser conveys the fruit through a long vat of boiling-hot water, thoroughly washing and cleansing it. From the processor the fruit is dumped on a long shaker which further assists in the cleansing process, so that by the time the fruit is put into the boxes it is in a most sanitary condition. Prunes are packed in packages varying from one pound to fifty-five pounds according to the requirements of the trade for which they are intended."

The third distinctive feature of California prune-growing is the predominance of the Prune d'Agen—the variety which has been chiefly used in the commercial prune industry of France from early times. This variety (which is discussed in the article on *Plum*) has the "prune character" developed to a degree which no other plum variety has thus far attained. It has a sweetness often reaching above 50 per cent of fruit-sugars in the cured fruit, but this is not its distinctive character. The really distinctive characters are: (1) the high aromatic flavor in the cured fruit; (2) the dense fine texture of the flesh, which gives this variety unequaled tenderness and mouthing quality, both as a confection and as a slightly cooked fruit; and (3) the smallness, thinness and smoothness of the pit, which the tongue gratefully accepts. The chief objection to the variety is that, when grown without thinning and the tree is allowed to carry too much bearing wood, the fruit will be small. For this reason there has been a demand for the last fifty years for a prune retaining all the characters of the Prune d'Agen and adding greater size. Although continued effort has been made to find such a prune elsewhere in the world and to originate such a one in this state, this end has not yet been reached. All rivals of the predominant variety are, when dried, either flat or acid in flavor, coarse and stringy in flesh and large and rough in pit. It is quite probable that California growers are repeating the experience of the early French growers who have given us the Prune d'Agen as the result of their prolonged selection. Leonard Coates, of Morgan Hill, has emphasized the fact that there are variations toward better size among established trees of the true characters of the Prune d'Agen and propagation from such variations is being pursued. In view of long experience of disappointment in importation and origination, this seems at present the most promising avenue toward gaining size without losing other characters. The varieties which have been brought to notice as substitutes for the French prune have been planted only on a small acreage, have sold well for size and style and may continue to be profitable, although they can never satisfy habitual prune-eaters, for the reasons stated.

The culture of the prune tree as pursued in California has already been outlined in the article on the plum.

E. J. Wickson.

Prunes in the Pacific Northwest.

Prune-culture in the Pacific Northwest has had a very checkered career. The early pomologist took much interest in plums and prunes, because of the magnificence of the products secured, and the ease with which they were grown. This interest increased up to the early nineties, when the prune reached a boom period. Thousands of acres were planted in a few years. They were planted on all soils and exposures and a great many varieties were tried. Toward the latter part of the nineties, there was a tremendous production of the fruit, mostly of a questionable value. Few men knew how to evaporate prunes properly. Much of the product decayed in transit, while other portions were evaporated so hard as to be practically inedible. There was little or no market for the dried tart prune; consequently, there was but one inevitable result: namely, a collapse, and in a few years thousands of acres of trees were taken out. The United States Census shows that there were nearly a million less prune trees in the state of Oregon in 1910 than were growing in 1900. About 1905 the industry began to pick up. Those growers who had good locations and proper varieties, and who had mastered the process of evaporation, began to find a market. This market has steadily improved, until in the last seven or eight years the prune has proved to be a very profitable crop, either shipped green, or evaporated. The increase in acreage in the past four years has been very large, and the industry now seems to be thoroughly established. The United States Census for 1910, giving the number of plum and prune trees, shows the following figures:

Oregon	1,764,896
Washington	823,082
Idaho	302,855

The number of bushels produced is as follows:

Oregon	1,747,587
Washington	1,032,077
Idaho	179,027

There are two distinct areas in which the prunes of the Northwest are produced. In western Oregon and Washington, prunes are grown entirely for evaporation, the conditions there being strong loamy soils and abundant rainfall. East of the mountains the prunes are grown very largely in the irrigated valleys, although some of the dry-farming areas are producing a splendid fruit. The product at present, however, is largely centralized in such valleys as the Boise and Payette valleys of Idaho, the Grande Ronde and Freewater districts of Oregon, and the Walla Walla and Yakima valleys of Washington. In these districts the prunes are rarely evaporated, but are shipped out in the fresh condition to eastern markets, where they are generally known as plums.

There is considerable controversy, especially in the western section, as to the better locations for prunes. Some growers prefer the bottom lands—either the sandy loams along the rivers, or the stronger clay soils. The contention is that these lower elevations produce larger prunes and a greater yield. Another set of growers, however, stoutly maintain that the rolling hills are the only places for prunes, and while their plums are smaller, nevertheless they are heavier and sweeter, and their orchards are more reliable. East of the mountains, the prunes are generally planted in the silt loams.

Since all plum trees blossom in early spring, they are very subject to loss from frosts and cold rains. To offset the loss from frosts, the southern and eastern exposures should be avoided, as these are undesirable since the thawing out on such exposures is very rapid, supposed to lead to a breakdown of the tissues.

When planted on the lighter loams, the peach root is preferred, but when on the stronger loams, plum roots are better. As yet, not enough investigation has been conducted to determine what species of plum roots are the most desirable for the various locations.

On the lighter soils, or higher elevations, the trees are planted from 18 to 20 feet apart, but when grown on the stronger loams, from 20 to 22 feet should be allowed.

Some growers think that on extremely rich soils, 25 feet is a more desirable distance.

The tillage given prunes is very similar to that for other deciduous fruits grown in the Northwest. In all young orchards, the tillage should be very thorough in the early spring. With trees not in bearing, tillage should cease by the middle of July. In many of the bearing orchards, where the tillage has been very thorough in the early spring months, sufficient vigor of tree and size of fruit is often obtained so that tillage may be discontinued by the middle of July or the first of August, but in many of the orchards it will be necessary to continue the tillage up to about the time of harvest, which comes later, varying from the first of August to the middle of September.

Formerly, the trees were all headed from 30 to 40 inches in height. In more recent years, however, many growers are heading from 20 to 24 inches and producing very satisfactory trees. The same general principles that apply to the pruning of apple trees, also apply to the prune. Care should be taken to have the main scaffold limbs spaced as far apart as possible. Strong heading back is necessary the first few years. With many orchards, summer pruning can be conducted advantageously, the pruning being done largely in June and consisting of a cutting back of the terminals to the point where it is desirable to force out new laterals. Occasionally a little thinning out of the laterals is practised. When the trees reach their heavy bearing, which is about the seventh year, it is desirable to give them moderate pruning annually, the aim being to keep the trees well supplied with strong one- and two-year-old wood, as the large plums are found almost invariably on the vigorous wood. When orchards have been allowed to run down somewhat, it is often found desirable to thin out the spurs with hand shears, and in this way reinvigorate the remaining spurs. When trees are very much run down, the most satisfactory treatment will probably be to dehorn them, forcing out a new vigorous top which, in three to four years, will produce commercial crops of fruit. Very little hand-thinning is done with plums and prunes in the Pacific Northwest. The Italian prunes generally thin themselves. Some varieties of plums, however, must have hand-thinning.

3197. A prune orchard in Oregon, with the fruit on the ground ready for harvest.

Very little work has been done as yet with manures or fertilizers. Commercial fertilizers, where tried, have never given striking results in the older orchards. The growers are finding that, in mature orchards, a stable compost is very desirable. When it is impossible to secure such material, vetch or rye planted the latter part of August or early September, and plowed under in the early spring, is very beneficial. Care has to be taken, however, not to use excessive amounts of nitrogen, as this element tends to make the trees unproductive, and generally makes the skin of the prune so heavy that it is difficult to evaporate.

The prune industry in the Pacific Northwest is not old enough as yet to demonstrate how long an orchard will remain profitable. However, there are several orchards in Oregon forty years old, that are still very productive. On the other hand, there are orchards twenty years of age that have passed their usefulness. The trees in this latter class, however, have been neglected. Where good soil is obtained, and proper care given, it is safe to say that the orchards will be productive at least fifty years.

There are a number of insects which are troublesome to the prune. The San José scale attacks the tree, but is very easily controlled with the lime-sulfur spray. The borers—both the peach-root (*Sanninoidea opalescens*) and the shot-hole (*Xyleborus dispar*)—are very bad. Young trees are often severely attacked with aphis. Other insects which are more or less troublesome at times are the leaf syneta (*Syneta albida*), the Indian meal moth (*Plodia interpunctella*), the rose-leaf hopper (*Empoa rosæ*), and the tipulid (*Ctenophora angustipennis*). Of the other diseases, the mushroom root-rot (*Armillaria mellea*) is very serious, especially when the trees have been planted on newly cleared land. Brown-rot (*Sclerotina fructigena*) is the worst pest of the fruit and is becoming more serious. Other diseases that have to be contended with are crown-gall, rust, and bacterial canker. The latter three diseases, however, are not nearly so serious as the first two mentioned.

Of the varieties of prunes that are grown in Oregon, the Italian (Fellenberg) comprises about seven-eighths of the planting, and the percentage in favor of the Italian is constantly increasing. For evaporation, it is the only one worth consideration in the Northwest. For shipping purposes, however, numerous plantings have been made of the Tragedy, and also of the Hungarian. Other varieties that are grown to a limited extent are the French, locally called the Petite, or Prune d'Agen, the Pacific, Willamette, Clairac Mammoth, Columbia, Tennant, Silver, and Sugar. There is, of course, to be found scattered over the Northwest a miscellaneous list of soft plums that are grown largely as local fruit. Since the Italian prune is benefited by growing with other varieties, there will probably always be a scattering of other kinds planted in our orchards. Many growers report that, wherever the Italians are near other varieties, a more satisfactory set of fruit is obtained on the Italian. In the evaporated fruit districts, the Petite will be the pollinator. The greatest drawback of this prune is its small size. It, however, dries heavier than the Italian and, size for size, sells somewhat higher.

When prunes are to be shipped in their green state for eating fresh in the eastern markets, it is customary to pick the fruit while it is still very hard and green. The plums, however, will have developed to a very large extent their true color before the packing is undertaken. The fruits are graded carefully and packed in five-pound baskets, four baskets being placed in a crate. While this crate virtually holds about twenty pounds, the weight of the fruit will range from eighteen to thirty pounds, according to varieties, size, and the general condition of the fruit. These four-basket carriers are the typical ones used for plums, apricots, and vinifera grapes constantly seen in the eastern markets. The fruit, when properly refrigerated, has not only been shipped all over the United States, but successful shipments have also been made to Europe, Mexico,

and Alaska. When the fruit is to be evaporated, it is first allowed to ripen on the trees and should not be gathered until it drops naturally to the ground (Fig. 3197), or will drop with very little shaking. The fruit is picked from the ground in bushel boxes, the pickers going through the orchard every few days to gather it up. The yield varies tremendously, from 1,000 to 8,000 pounds to the acre. As soon as the fruit is gathered, it should be hauled to the evaporators and evaporated quickly in order to avoid brown-rot, which often spreads rapidly in the containers.

There are two main types of evaporators used for drying fruit,—steam and hot air. The steam driers are used only where a very large output is obtained. It is customary for most of the orchardists to dry their own fruit. Since the orchards on the whole are rather small, an inexpensive building is used for the process, and the hot-air type of building is erected. These hot-air driers are of two distinct types, the tunnel, and the stack. There are many forms of tunnel driers. These tunnels consist of groups of long nearly horizontal pipeways, built over a fire pit. They vary in length from 25 to 50 feet. Each tunnel in itself may

Bulk Basis	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5
30 to 35	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾	5⅞	6	6⅛	6¼	6⅜	6½	6⅝	6¾	6⅞	7	7⅛	7¼
35 to 40	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾	5⅞	6	6⅛	6¼	6⅜	6½	6⅝	6¾	6⅞	7
40 to 45	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾	5⅞	6	6⅛	6¼	6⅜	6½	6⅝	6¾
45 to 50	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾	5⅞	6	6⅛	6¼	6⅜	6½
50 to 55	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾	5⅞	6	6⅛	6¼
55 to 60	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾	5⅞	6
60 to 65	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½	5⅝	5¾
65 to 70	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼	5⅜	5½
70 to 75	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5	5⅛	5¼
75 to 80	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾	4⅞	5
80 to 85	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½	4⅝	4¾
85 to 90	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼	4⅜	4½
90 to 95	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4	4⅛	4¼
95 to 100	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾	3⅞	4
100 and over	¾	⅞	1	1⅛	1¼	1⅜	1½	1⅝	1¾	1⅞	2	2⅛	2¼	2⅜	2½	2⅝	2¾	2⅞	3	3⅛	3¼	3⅜	3½	3⅝	3¾

be complete, or they may all be connected. The tendency in the past has been to have the tunnels too long. In the newer buildings, however, are tunnels from 16 to 25 feet in length. The capacity of the drier can be increased more satisfactorily by increasing the number of tunnels rather than by increasing the length of the tunnels. The heat pit is found directly below the tunnels and, as a rule, brick arch furnaces, or iron stoves, such as are commonly known as the hop stoves, are employed. In order to distribute the heat more uniformly, it is generally conducted from the furnaces by long pipes ranging from 9 to 15 inches in diameter, decreasing the farther they get away from the source of heat.

The stack drier is arranged to contain trays which are placed one over the other, the bottom of the stack being open. A single stack consists of three or four small vertical compartments generally open to each other. The fruit is first placed in the top compartment and after slightly drying is removed and placed in a lower compartment. The stack driers turn out a very good product, but require a maximum amount of labor. The buildings should be very well ventilated; these ventilators should be of an adjustable nature so that they can be opened and closed quickly. Cold air intakes are also provided. These should be in below the vent pipes so as to furnish fresh air rather than to assist in rapidly sucking out the warm air. There is a very close relation between ventilation, air-circulation, and the humidity of the atmosphere. Such relationship, unfortunately, has not been well studied by the larger number of those operating the evaporators.

The temperature is gradually increased during the drying process, starting in the neighborhood of 125° to 135° and finishing at 160° to 180°. It requires about thirty-six hours on the average to dry prunes well, the time depending on the building, ripeness of the fruit, and atmospheric conditions. The fruit will generally produce about twenty pounds of dried fruit to a bushel of fresh. Before the prunes are placed over the heat, it is customary to wash and grade the fruit. The more modern buildings now have automatic machinery which does all of this labor in one process. The prunes, after being sorted, are dipped into boiling lye. This is generally at the strength of one pound of lye to thirty to fifty gallons of water. This use of lye is adopted solely for the purpose of checking the skin of the fruit so that the gases can escape more readily and the prune be more easily dried. In most cases, as good results could be secured by boiling water. There are probably cases, however, when the skin of the fruit is so thick that it is difficult to secure as quick and satisfactory results without the use of lye. As soon as the prunes have been dipped into the lye, they are quickly dipped into clean water. A chemical analysis of the rinsing waters has shown that they are generally acid rather than alkali and it is very doubtful whether lye remains on the fruit any length of time or, if it does, it is not sufficient ever in any way to be injurious to the health. As soon as the prunes have been thoroughly dried, they are taken from the driers and stored in large bins and allowed to sweat. They are then ready for the processing. The processing is largely a steaming operation. This is generally done in central buildings owned or controlled chiefly by the buyer or packers. The prunes are submitted to the steam for a very short time. This steaming cleans and sterilizes the fruits and adds luster to the products. They can be so handled as to add considerable weight. When this is done, however, it is unscrupulous on the part of the packer and will sooner or later lead him into trouble. The processing of the prunes also softens them so that they can be packed more easily. Formerly some bleaching was

done, but very little is now practised in the Pacific Northwest.

The finished product is subject to considerable loss from fermentation, mold, and the attack of mites. It will be necessary for considerable scientific investigation to be made before the problems connected with these losses will be entirely understood. As soon as the prunes have been processed, they are taken in the hot, warm condition and packed in boxes. These boxes range in capacity from ten to fifty pounds. The bottom of the box is faced. Uniform, well-proportioned prunes are flattened with the fingers. This makes a very attractive top for the box when it is reversed. Lace paper and lithographs are used on the better packs.

In selling prunes, they are bought entirely according to weight, but based on the number of prunes to the pound: such as 30–40's, 40–50's, and so on, indicating the number of prunes to the pound. The table on page 2816 illustrates the method used in basing the prices for any given size of prune in the Pacific States.

The figures below the words "bulk basis," such as 30 to 35, 70 to 75, mean the number of prunes in a pound of fruit. The figures to the right of the words, "bulk basis," such as 2, 2⅛, refer to the so-called base price paid for prunes. The base price is, in this case, figured on the sizes running from 75 to 80 prunes to the pound. Note that the figures to the right of 75 to 80 are the same as the figures to the right of the words "bulk basis."

As an illustration of the way the table works, take the first figure to the right of the words "bulk basis," which is 2. That means then, that for prunes running from 75 to 80 to the pound, the buyer will pay 2 cents a pound. Should the prunes be so large, however, as to run 30 to 35 to the pound, note that the figure to the right of this number is 4¼. Should they run, for example, 55 to 60 to the pound, note that the figure opposite is 3.

Should the base price at any time be more than 5 cents, one could easily enlarge this table by adding 2¼ cents to the base price for prunes running from 30 to 35 to the pound, and decrease the price ¼ cent for each smaller size in proportion to the size of the prunes.

C. I. Lewis.

PRUNÉLLA: *Brunella.*

PRUNING is the methodical removal of parts of a plant with the object to improve it in some respect for the purposes of the cultivator. Much of the current "pruning" is really repairing, and is now commonly called "tree surgery." See page 354, Vol. I.

Under this denomination are comprised a multitude of practices and ideals. It is impossible to give any advice for pruning until one has analyzed the subject and knows the objects for which one is to work and the underlying principles on which the practices must rest. The larger part of the writing on pruning gives mere advice or directions, or details some person's experience, without analyzing or clarifying the subject. The practice must differ with every person and every condition, but the principles are general. The ideas that are associated with pruning may be grouped around three centers: (1) pruning proper, or the removal of a part of a plant for the purpose of bettering the product and improving the character of the remaining part; (2) training, or the disposition or placing of the individual branches, a practice that ordinarily is coincident with pruning proper; (3) trimming, or the shaping of a plant into some definite or arbitrary form.

The principles that underlie pruning proper may be associated with two purposes,—the lessening of the struggle for existence amongst the parts of a plant, and the cutting away of certain parts for the purpose of producing some definite effect in the formation of fruit-buds or leaf-buds or in modifying the habit of the plant.

There are more branches in the top of any plant than can persist; therefore there is struggle for existence. Those which have the advantage of position persist. Nature prunes. Dying and dead branches in any neglected tree-top are illustrations of this fact. Whenever the struggle for existence is greatly lessened, the remaining branches receive a greater proportion of the plant's energy, and they therefore make stronger growth, yield better produce, or are more productive in flowers and fruit. Pruning is essentially a thinning process.

There exist the widest variations of opinion as to the merits of pruning, particularly as it applies to fruit-trees. Some persons oppose any pruning whatever. Undoubtedly a certain type of novice places too high estimate on pruning, as if it were the one essential operation; others carry the practice to needless extremes; but the reasons for pruning lie in the nature of the plant, and the useful results are attested by long experience. It is one of the cardinal practices in the growing of many kinds of plants, along with tilling, fertilizing, combating pests and diseases; and it is not to be considered as a thing apart or as a remedy or corrective for all deficiencies.

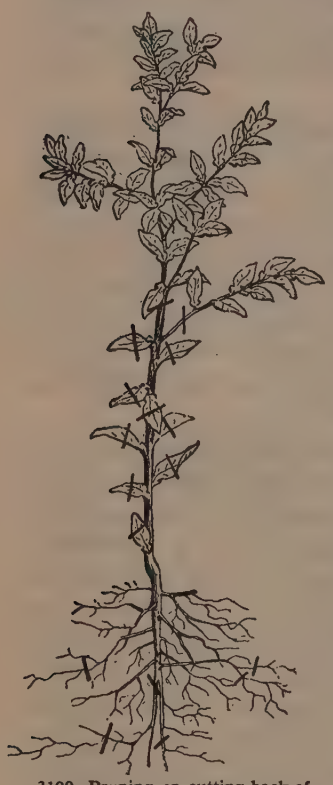
3198. More limbs have perished than have survived.—Nature's pruning.

In itself pruning is not a devitalizing process; it is devitalizing only when it is carried to excess or when the wounds do not heal and disease sets in. It is rather an invigorating process, since it allows more nourishment to be distributed to the remaining parts of the plant. The notion that pruning is devitalizing arises from false analogy with animals, which suffer shock or injury when parts are removed. The fact that pruning is not a devitalizing process is proved by every tree. The tree is a record of successive prunings. Note the number of branches on the seedling tree in the nursery-row or in the forest, and then consider that all these branches, with the exception of the leader itself, will probably perish in the course of time. The forest tree develops a bole and the side limbs are pruned away by natural causes. (Fig. 3198.)

Knots are records of this natural pruning. In the greater number of cases the limbs die and are removed when still very young, and they leave small record in the grain of the wood; but all visible knots are histories of the removal of large branches. As a rule, it is only when the knots become knot-holes that injury results. A knot-hole means decay, and this decay may extend into the heart of the tree, finally causing it to become hollow. A discolored or decayed heart is an indication of disease. The disease originates on the outside of the plant; it is the result of inoculation. This inoculation takes place through some bruised or broken part; it is usually an infection of filamentous fungi. These fungi gain a foothold in the dead and dying cells of the wound, and as they grow they are able to destroy the living cells. The larger the wound, the greater is the liability to infection. It is very important, therefore, in the pruning of trees, that the wounds shall be as small as possible and shall heal quickly. This means that the best pruning is that which is practised annually, so that the branches to be removed do not attain to large size. This annual pruning is also most desirable for other reasons, as will be seen

Pruning when transplanting.

Woody plants should always be pruned when they are transplanted. This is because the roots are pruned in the very process of removal, and the tops should be reduced in proportion. For some time after the plant is transplanted, it has very little vital connection with the soil, and if all the top is allowed to remain there is much evaporation from it and a dissipation of the energies. How much of the top shall be removed depends on how much of the roots was removed in digging, on climate, and also on personal desires of the operator. It is a general practice to cut back the top of a plant at least one-half on transplanting; in some cases still more of the top is removed. In broad-leaved evergreens, some of the leaves may be cut in two at transplanting, to reduce transpiration. (Fig. 3199, after Wester.)



3199. Pruning or cutting back of orange at time of transplanting.

Quite another question is the particular form in which the top shall be left. Some growers prefer to remove all side branches, if it is a fruit-tree, and leave a straight whip. (Fig. 3200.) They are then free to start the new branches where they like. This is allowable with very young trees, and it is much employed with peach trees, inasmuch as these trees are planted when the top is only of one season's growth. (Fig. 2792, page 2496.) If trees are two or three years old and well branched, as is the case with apples and pears, most persons prefer to leave three or four of the main branches to form the starting point of the future top. (Fig. 3201.) These branches may be headed back half or more of their length. Some years ago a method of very severe pruning came into notice under the name of the Stringfellow or stub-root system, taking its name from the late H. M. Stringfellow, of Texas (page 1598, Vol. III), who wrote much concerning it. The fullest presentation of Stringfellow's ideas will be found in his book, "The New Horticulture." It advises that practically all the roots be cut away and that the top be shortened to a straight stick 1 or 2 feet long, without side branches. It is the supposition that when trees are reduced to their lowest terms in this way, the new root-branches that arise will take a more natural form and the tree will assume more of the root character of a seedling. This method of transplanting has not gained acceptance.

In most cases, it will be better, particularly in trees that are three years or more old, to prune them only moderately, shortening them in all around, allowing a part of the original root-system and a part of the top to remain.

Whatever the way of pruning at transplanting, good live buds should be left on the tree; the practice of pruning two-year-old wood to a whip is therefore to be discouraged, for only dormant buds (if any) then remain on it.

Pruning fruit-trees.

Fruit-trees are pruned for the purpose of enabling them to produce a superior quality of fruit. In America, they usually are not pruned primarily to make them assume any definite or preconceived shape. It is best, as a rule, to allow each variety of tree to take its own natural or normal form, pruning it only sufficiently, so far as shape is concerned, to remove any unusual or unsymmetrical growths.

1. The fundamental conception in the pruning of fruit-trees is to reduce the struggle for existence, so that the remaining parts may yield larger and finer products.

2. The result of pruning fruit-trees should be to keep the tree in bearing condition, not to force it into such condition. If the tree has received proper care from the time it is planted, it should come into bearing when it reaches the age of natural fruitfulness. Pruning aids to keep the tree in proper bearing condition. When trees have been much neglected, pruning may be the means of reinvigorating them and setting them into a thriftier condition. In such cases it is one of the means of renovating the tree, as are tilling, fertilizing, and spraying.

3. Heavy pruning of the top in any year tends to produce very vigorous growth on remaining parts. This is because the same amount of root energy is concentrated into a smaller extent of top, thereby causing a heavier growth. This is particularly true if the pruning is performed when the plant is dormant.

4. Heavy pruning of the root tends to lessen the production of wood, because the same amount of top receives a less supply of soil-water.

5. Trees that grow much to wood are likely to be relatively unproductive. It is an old maxim that checking growth induces fruitfulness, so long as the plant remains healthy. This, of course, does not mean that trees of decreased vigor are more fruitful, nor that the maintenance of full growth from the first is to be avoided. Orchards that are kept in a vigorous thrifty condition are most productive, other things being equal; but when very thrifty trees do not bear, the checking of the growth may induce the desired results. If the tree is thrown into redundant growth every two or three years by very heavy pruning, it tends to continue to produce shoots at the expense of fruit. When a tree is to be brought into bearing condition by general good treatment, the aim should be to keep it in that condition by a relatively light annual pruning. Violent pruning is allowable only when trees have been

3200. Pruning peach tree at time of transplanting.

3201. Pruning of a young tree on transplanting.

neglected and it is necessary to bring them back into bearing condition by renewal or to re-shape them.

6. The operator should know where the fruit-buds are borne before undertaking the pruning of any fruit-tree; otherwise he may destroy too many of them. If he knows the position of the fruit-buds, he may prune in such way as to thin the fruit even without the removal of much wood, and thereby to reduce the struggle for existence to a minimum. Every species of tree has its own method of fruit-bearing. The pear bears its fruit largely on old spurs. The peach bears mostly on the long wood of the last season's growth, particularly when trees are young. If one is to thin the fruit of the pear by pruning, therefore, it is necessary to remove part of the spurs. In the peach it is necessary to cut out or to cut back a part of the previous year's growth. Each species of plant is a law unto itself in these regards.

3202. Young apple tree, the marks showing which limbs may be removed to advantage.

7. Heading-in under certain conditions (which the operator must judge by observation) tends to promote fruitfulness. If the heading-in is very severe it may amount to a heavy pruning, and in that case it may set the plant into shoot-bearing rather than into fruit-bearing. It is not to be supposed that heading-in is necessarily to be advised in order to make trees bear. They may bear just as well if they are never headed-in, provided they are otherwise well pruned and well cared for. Whether one shall head-in the fruit-trees or not, is in part a personal question. If the trees are growing too rapidly, it is well to head them back. This may be necessary when trees are growing on very fertile soil in order to keep them within bounds; but the heading-in under these conditions may not conduce to greater fruitfulness. When trees are planted too close together, it may also be necessary in order to prevent the plantation from becoming too thick. Some growers like a low-headed and rounded top; this is a question of personal preference and of the general management of the plantation. If the orchardist desires such form, it is necessary to head-in the tree. It should be remembered that the more a tree is headed-in the thicker it tends to become in the crown and the more inside pruning is necessary. Whenever there is danger of fruit-rot, as in plums and early peaches, it is a question whether the thick form of top is the most advisable.

8. Pinching-in the annual growths in early summer tends to augment the development of fruit-buds, although these buds may not be developed the very year in which the pinching-in is performed. This is a special practice, however, which can be employed only on small areas and with particular trees. It is essentially a garden practice and not an orchard practice. In the orchard, one must depend for fruitfulness on the general good care of the plantation, and in this care pruning is one of the essential factors.

9. Pruning fruit-trees usually resolves itself into a thorough and systematic thinning out of the weak, imperfect and interfering branches. Thereby, the energy of the plant is saved and is deflected to those parts that are capable of bearing a useful product. The sun and air are admitted. The tree becomes manageable for spraying and for picking. All the fruits have an opportunity to develop. How much or how little to thin, is a special question. In humid climates, much thinning may be necessary. In dry hot climates, as on the Plains, but little thinning is allowable, else the branches may sunscald. Figs. 3202 and 3203 illustrate two pruning ideals.

3203. A New York cherry-grower's ideal of a Montmorency cherry tree. Perhaps the large branch on the front side should have been removed when the tree was young.

10. Scraping the rough bark from old trunks may be a desirable practice, since it destroys the breeding places of insects and fungi. Trees that have been continuously thrifty, however—that have received uniformly good tillage, fertilizing, pruning, spraying—rarely need to be scraped, as the bark remains relatively smooth and firm. Only the loose outer bark should be removed. On ornamental trees, the bark is a part of the characteristic beauty, and it should not be scraped. Although not a pruning question, this is closely associated with pruning practices.

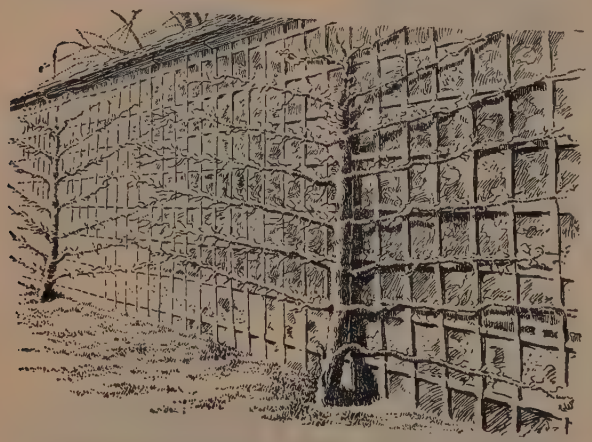
Pruning ornamental plants.

Ornamental trees and shrubs are pruned for three purposes: (1) to enable them to produce greater quantity of bloom; (2) to make them take some desired form; (3) to remove unusual or injured growths.

The pruning of woody plants for the production of flowers is controlled largely by the flower-bearing habit of the plant. Most early-blooming plants develop their flower-buds the year before. Heavy pruning, therefore, particularly heading-in, when the plants are dormant, cuts off the flower-buds and the amount of bloom is lessened. If these plants are pruned just after the flowers are passed in spring, the best results will be secured, since the new growths will then develop flower-buds for the year following. Among spring-flowering

3204. Cordon training. An apple tree (grafted on dwarf stock) trained in two branches on a horizontal wire running only 2 feet above the ground. Each year the growths are cut back to spurs.

shrubs that may be pruned after flowering (while in leaf), are deutzias, diervillas or weigelas, forsythias, lilacs, flowering almond, wistaria, exochorda, and many spireas and viburnums. It may be advisable, however, to prune such plants in winter for the purpose of thinning them, thereby allowing the flower-buds that



3205. Pear trees trained on a wall. When once the wall is covered, the tree is never allowed to increase in surface area. It is cut back to spurs each year, much as grape-vines may be treated.

remain to produce larger bloom. In most ornamental plants, however, it is the number of flowers rather than the size of each which is desired.

Plants that bloom late in the season, as hydrangea and most species of clematis, make their flower-buds on shoots which arise that very season. With such plants, it is well to prune rather heavily while they are dormant in order to cause them to throw up a profusion of strong shoots in the spring. These shoots will bear that summer. Among the summer-flowering shrubs that may best be pruned when dormant, are hydrangeas, althea or hibiscus, ligustrums, trumpet creeper, ceanothus, potentillas, vitex, symphoricarpos, and many kinds of clematis, lonicera, jasminum, and some spireas.

Pruning to make the plant assume some definite form is essentially a method of shearing or heading-in. If it is desired to have a very regular and definite shape, it is well to shear the plant at least two or three times a year in order to keep down the exuberant growths. It is a common practice to shear the plants only in the winter, but if this shearing is somewhat violent, as is usually the case, the plant throws up numerous strong shoots very early in spring and it remains shapeless during a large part of the growing season. Except in very special cases and for formal landscape work, it is much better to let shrubs and trees assume their natural and characteristic forms: these forms, in fact, constitute the beauty of the species.

Training.

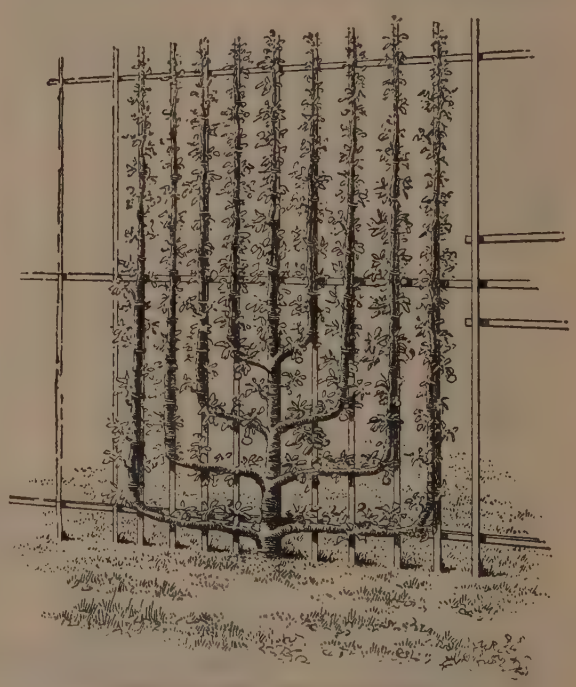
There is relatively little careful training of plants in North America, largely because of the expense of the skilled labor necessary to perform it. Land is also relatively cheap, and room can be given for the natural development of most plants. In many parts of the Old World, fruit-plants must be grown in very small areas, and it may be necessary to train them on walls, sides of buildings, or on trellises of various kinds. Trained fruit-trees may generally be referred to one of three categories: the wall tree, which is trained against a continuous surface; the espalier, which is trained on a trellis, the branches starting at nearly right angles from a central shaft; the cordon, or training to a single or double strand near the ground. Properly, an espalier is a trellis (page 1146), but the word is commonly used for the plant that is trained on the trellis. There are many variations in the methods of training and pruning in each of these three classes, and the methods are such as can scarcely be well elucidated in writing. The Old-World literature is replete with instructions. In recent American literature, the fullest account is to be found in "The Pruning-Manual." In order that trees may be well trained on walls, espaliers, and cordons, it is necessary that the training be begun in the nursery. The Old-World nurseries grow plants that are trained for various uses, but the American nurseries do not. If, therefore, the American is to train trees in any of these formal shapes, he should secure specimens that are not more than one year from the bud or graft, and begin the training himself. The illustrations (Figs. 3204–3206) suggest some of the special methods of training fruit-trees. On such trees, if skilfully trained and carried out in patient detail, the best excellence in individual fruits may be attained.

Pruning after frost-injury.

When woody plants have been much injured by freezing, it is the best practice to remove all dead parts as soon as the line of demarcation is evident.

The kind of corrective pruning to be employed when trees have been much shattered by winter cold is a subject that needs further investigation. It is not a single or a simple problem, as much depends on the previous state of the trees and on other conditions. Speaking of peach trees, Chandler writes (Research Bulletin No. 8, Missouri Experiment Station): "Pruning the trees severely following a winter when the wood has been killed, although apparently in the best condition of maturity, seems to reduce the amount of killing. However, such pruning following winters when the wood has been killed on account of its not having reached the proper condition of maturity in the fall, generally due to the presence of wet weather following a drought the season before, is liable to result in greater loss than if no pruning were done."

On the proper practice to pursue in the case of frozen citrous trees, T. F. Hunt issued the following advice



3206. Apple tree trained on an espalier.

to California growers following the freeze of January, 1913: "Relative to badly injured trees, it appears best not to prune until the new growth has started. It is best to delay the pruning until a distinct line of demarcation develops between the injured and uninjured wood. At the Citrus Experiment Station last year five-year-old lemon trees were frosted. Good results were obtained by waiting until the new growth had reached from 4 to 5 inches in length; in that instance about six weeks were required. Allowing the injured limbs to remain not only makes it possible to determine how much it is best to prune, but the limbs and leaves afford shade to the bark of the tree, which is accustomed to protection.

3207. A proper cut.—The healing tissue arises from the side of the wound, not from the hard wood.

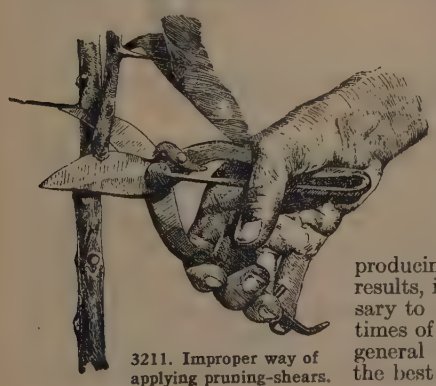
3208. A well-covered wound. The pruning was properly performed, no stub being left.

It may be desirable, in some instances, to spray the trunks and limbs of large and severely pruned trees with whitewash in order to reflect the sun's rays. Wrapping the trunks of young trees with loose sun protectors would seem extremely desirable.

"It seems reasonably certain that no injury to the tree can result from any of the materials passing from the frozen oranges into the tree. An examination of those oranges which have been too badly frozen to be fit for shipment shows that most of them only partially have been killed; consequently, they are presumably respiring carbon dioxide. This loss of energy would be saved if the oranges were removed from the tree. There is no experimental evidence, however, to show whether this loss is sufficient to warrant the cost of early removal by hand."

When to prune.

It will be gleaned from the above discussion that the time of pruning depends on many circumstances, and chiefly on the result which it is desired to reach. So far as the healing of the wound is concerned, it is perhaps best to prune when the vegetative activities begin in spring so that the wound is quickly covered or "healed." For the purpose of checking growth and producing other definite results, it may be necessary to prune at other times of the year. As a general rule, however, the best time to prune is in late autumn to early spring, when labor can be had and before the rush of spring work comes on. In practice, it resolves itself largely into a question of the convenience of the operator.



3211. Improper way of applying pruning-shears.

The wound.

The wound made by severing a branch heals by means of a callus which forms from the growing tissue between the bark and wood. (Fig. 3207.) This tissue rolls over the wound, finally joining in the center and completely covering the old wood. The old wood itself takes no part in the healing process; in fact, it dies. When the healing is complete, the old wood is merely covered and preserved from external injury and infection, much as fruit in a jar is preserved by being protected with a tight cover. There is no dressing that will hasten the healing process except as it keeps the wood from decay. In other words, the whole object of dressing a wound is to protect it. The dressing hinders bacteria and fungi from securing a foothold and thereby prevents the rot. Wounds that are exposed for some years nearly always become unsound at the center because of the intrusion of these organisms, and even if the wounds should subsequently heal over, the infection may still extend down the heart of the tree and finally cause its death. The best covering for a wound is one that protects it best from weather, microbes, and fungi and which persists the longest. Ordinarily, good white lead paint, applied heavily and renewed occasionally, is a good protection for fruit trees. Grafting-wax may afford a fair protection, if it is applied warm and thin so that it soaks into the tissue. If it is merely spread over the surface, it soon blisters and becomes loose and affords relatively little protection. For shade and forest trees, which are treated by "tree surgeons," special dressings and disinfectants are employed.

3209. The stub is longer than necessary, although the fault is not a serious one. It will heal well if the old wood is kept healthy.

3210. Common fault in pruning. This wound cannot heal until the stub rots away, and by that time the tree may be irreparably diseased.

The rapidity with which wounds heal depends very largely on their position on the tree and the way in which they are made. Wounds along the main branches, which are the leading avenues for distribution of food, heal more speedily than those on the weaker side branches. If the wound is close to the branch it may be expected to heal better. (Figs. 3208, 3209.) If a stub is left several inches long (Fig. 3210), it seldom heals until it rots back to the main branch or trunk; and by that time the decayed part may have extended deep into the tissue of the tree. It is a common notion that a limb should be cut at right angles to the direction of the limb itself and beyond the bulge at its base. It is a better plan, however, to make the wound parallel to the direction of the branch or trunk that remains, and closer to it. This wound may have a somewhat larger superficial area, but it is much nearer the source of the healing food-supply.

Tools.

A good large-bladed large-handled sharp knife, a narrow and pointed rather fine-toothed saw, and a pair of shears are the essential pruning tools. Many forms of these three primary implements are on the market. In tools that require such incessant use, when the work is in progress, and that meet such resisting obstacles, only the best makes and materials should be secured. The operator must learn by practice how to use them, for even in such simple implements as these there is a right way and a wrong way. Fig. 3211 (from Wester), for example, shows an improper way of using shears, cutting at such a long acute angle rather than crosswise or merely oblique as to render the work difficult, leave a long sharp stub, and injure the shears. A good ladder is also necessary for large trees. When the top or head of the tree is low enough, the pointed ladder shown in Fig. 3212 (from Wester, a bamboo ladder used in the Philippines) is one of the best types; it is easily inserted among the branches and it may be rested securely in a crotch. Many other pruning implements are useful for special work, and suggestions of these will be found in various bulletins and in the catalogues of dealers. See also the discussion in Vol. IV, page 1950.

3212. A good ladder for pruning or picking.

L. H. B.

PRŪNUS (ancient Latin name of plum). *Rosàceæ.* The Stone-Fruits, as Plum, Cherry, Peach, Nectarine, Apricot, Almond. Pink-flowered and white-flowered shrubs and trees of wide distribution, grown for fruit, and also for ornamental foliage and flowers.

All woody plants: lvs. alternate, simple, usually serrate and more or less gland-bearing: fls. mostly in spring, sometimes preceding the leaves, either solitary or in clusters, perfect, the pistil single (more than 1 in abnormal forms) in a cupule or cup (usually designated the calyx-tube), the stamens numerous and perigynous, the petals and calyx-lobes 5: fr. a drupe, usually 1-seeded by the abortion of one of the 2 ovules. (Fig. 3213.)—The species are probably 175, mostly in the North Temperate zone, although a number of species are native in the Andean parts of S. Amer.

The genus as here outlined includes several well-marked groups, some of which are regarded as distinct genera by many authors. In their extreme or typical forms, these subgenera are very distinct, but the group as a whole is well defined and nothing is contributed to clear definition by raising the groups into generic rank, and it is an advantage for easy reference to have all forms treated in one place rather than to scatter them under several different names. A marked group is Padus, with flowers in true racemes; and its ally, Laurocerasus, is also fairly well distinguished.

Horticulturally, Prunus is one of the most interesting of all genera. It includes important orchard fruits,—peaches, plums, cherries, apricots, and almonds. It is also prolific of ornamental subjects, as double-flowered, variegated-leaved, colored-leaved and weeping forms. Most of the cultivated species are hardy in the latitude of Philadelphia and many are hardy in Ontario. All are of easy culture. Nearly all the species are spring-flowering. Only *P. Cerasus* var. *semperflorens*, amongst the commoner kinds, blooms as late as midsummer. They are very useful for spring gardens, therefore, where they make great display, but their short season of bloom and the very ordinary foliage of most of them have limited the planting of the ornamental kinds. All members of the genus are easily grown.

Some of the ornamental species are not grown on their own roots, but are worked on stocks that can be grown easily and cheaply and of which seeds can be secured in abundance. The commonest stocks for the ornamental kinds are the plum (*P. domestica*), peach, and sweet cherry. On the plum are grown the dwarf almonds and the double-flowering and fancy-foliage plums. The Myrobalan plum (*P. cerasifera*) is sometimes used for the same purpose. Peach stocks may be used for the same species, as a rule; and they are also employed, particularly in the South, for many fruit-bearing plums. The sweet cherry (*P. avium*) is a good stock for the various kinds of double-flowered, weeping and fancy-leaved cherries. It is an important point in the growing of these grafted prunuses to remove all sprouts from the stock as soon as they appear. This is particularly true of the dwarf almonds, since the stocks are usually stronger-growing species and tend to sucker from the root.

In North America there has been a remarkable contemporaneous evolution of fruit-bearing plums from the native species. Several hundred orchard varieties have been described, and the trees are grown commercially over a wide range of country in the South, in the Mississippi Valley and on the Plains,—in regions in which the common *Prunus domestica* does not thrive. An interesting group of pubescent-fruited species of the Southwest may have horticultural importance in future. (See S. C. Mason, Journ. Agric. Research, 1913.)

In Europe and Eurasia, the fruit-bearing cherries and plums had their original development, chiefly from the three species-groups, *P. Cerasus*, *P. avium*, and *P. domestica*. Ornamental forms are incidental or secondary. In North America, the horticultural development has been chiefly in edible forms of plums. In the Orient—farther Asia and the Chino-Japanese region—the peach and apricot groups probably had their origin, as well also as the fruit known to us as the Japanese plum; but Japan is noted for its cherries cultivated for bloom rather than for fruits. Only the indifferent *P. Pseudo-Cerasus*, among the cherries, is natively grown for fruit in China and Japan.

The Japanese flowering cherries are singularly beautiful and attractive. They should be better known in this country. A number of forms have been long introduced and a few of them are advertised, but apparently they have not been carefully chosen as to hardiness and adaptability. David Fairchild reports that the trunks of the less vigorous forms of his ten-year-old collection in Maryland are sometimes winter-killed, especially on the southwest side, but there are many which, at least in Maryland, are hardy and form good-sized trees. The drooping single forms (*P. subhirtella* vàr. *pendula*) are among the hardiest and most showy from a distance, but are surpassed by the wonderful double forms (*P. serrulata*) which produce great masses of flowers as beautiful and quite as large as many semi-double roses. The question of stock is important. In Europe, nurserymen have generally grafted the Japanese cherry on *P. Cerasus* and *P. avium*, as well as on the Mahaleb. Most of the specimens of the pendula varieties commonly seen are grafted high on one of these stocks, but the effect in old specimens is grotesque and the trees are short-lived. The Japanese grafted trees sent to this country

3213. Flowers of plum. The ovary, or young plum, with the ovule inside, is at *o*. (Natural size.)

are on a wild stock called the Mazakura (*P. Lannesiana*) which grows easily from cuttings and according to experiments made by the Department of Agriculture is almost immune to the cherry leaf-spot. As the grafting is at the surface of the ground, and as the trunks of the trees are the parts winter-killed, it is yet an open question as to whether the substitution of a longer-lived hardier stock would produce hardier longer-lived trees. E. H. Wilson, of the Arnold Arboretum, who has made a critical study of the Japanese cherries both in the Orient and at the Arboretum, thinks it will, and has suggested the trial for this purpose of *P. serrulata* var. *sachalinensis*. The Mazakura grows readily from cuttings, but *P. serrulata* var. *sachalinensis* does not. Buds have been successfully placed on the latter, and we shall be able to determine whether the stock transmits a greater longevity to them. With the tests being made by the Arnold Arboretum, the Department of Agriculture and in New York city, and the botanical studies of Wilson and Miyoshi, we should soon have a reliable planting of these very desirable oriental cherries. In anticipation of this, the names of many of the Japanese forms have been inserted in the following systematic account, although one may expect variations in the rendering of them into English.

In very recent years, the knowledge of the genus has been greatly extended by explorations in China, whence many new species (particularly in the subgenera Cerasus and Padus) have been derived that will probably find their way into cultivation. The taxonomy of the American native plums has also received much recent attention. Aside from the older writings of Bailey and Waugh on the native edible plums and cherries, see Hedrick, "The Plums of New York," 1911, and "The Cherries of New York," 1915 (also with similar accounts of all other pomological species), and Wight, "Varieties of Plums Derived from Native American Species," Bulletin No. 172, Bureau of Plant Industry, United States Department of Agriculture, 1915, and "Native American Species of Prunus," Bulletin No. 179 (1915). For the oriental Prunus, particularly those native in China, see the work by Koehne and others in "Plantæ Wilsonianæ," vol. 1, 1911–1913, and Wilson's "Cherries of Japan" (1916), published by the Arnold Arboretum, Boston. As this writing is being closed in the printery, a paper on the Japanese cherries appears in Japan: Miyoshi, "Japanische Bergkirschen," in Journ. Coll. Sci. Tokyo, vol. 34, art. 1 (1916) with eighty-nine colored figures.

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KEY TO THE GROUPS.

A. *Lvs. convolute in the bud (i. e., rolled up, showing well as the lvs. begin to emerge from the bud): ovary usually furrowed lengthwise.* There are exceptions in some of the American native plums (Nos. 14, 15, 19 and others) in which the lvs. are conduplicate in vernation; also No. 10: these species and their allies are intermediate between the true plums and the cherries.
I. PRUNOPHORA, PLUMS, PRUNES, AND APRICOTS, Nos. 1–26.

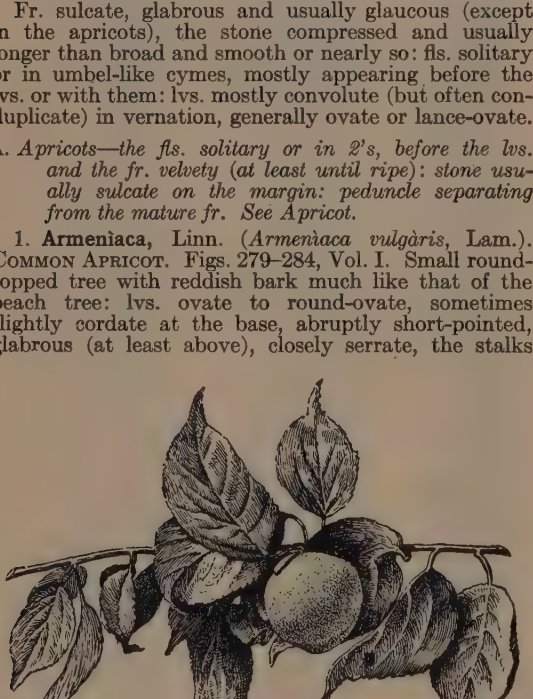
AA. *Lvs. folded or conduplicate (trough-shaped, folded lengthwise along the midrib) in the bud.*
B. *Fr. normally soft-hairy (except in 33 var.); stone or pit often furrowed and pitted: fl.-cup short and wide-spreading.*
II. AMYGDALUS, ALMONDS, AND PEACHES, Nos. 27–34.
BB. *Fr. very juicy, glabrous or only very slightly hairy; stone smooth or roughish.*
C. *Fls. in fascicles or cymes.*
III. CERASUS, COMMON OR FASCICLED CHERRIES, Nos. 35–69.
CC. *Fls. in racemes.*
IV. PADUS, RACEMOSE CHERRIES, Nos. 70–82.

Subgenus I. PRUNOPHORA. Apricots and Plums.

Fr. sulcate, glabrous and usually glaucous (except in the apricots), the stone compressed and usually longer than broad and smooth or nearly so: fls. solitary or in umbel-like cymes, mostly appearing before the lvs. or with them: lvs. mostly convolute (but often conduplicate) in vernation, generally ovate or lance-ovate.

A. *Apricots—the fls. solitary or in 2's, before the lvs. and the fr. velvety (at least until ripe): stone usually sulcate on the margin: peduncle separating from the mature fr. See Apricot.*

1. **Armenìaca,** Linn. (*Armenìaca vulgàris,* Lam.). COMMON APRICOT. Figs. 279–284, Vol. I. Small round-topped tree with reddish bark much like that of the peach tree: lvs. ovate to round-ovate, sometimes slightly cordate at the base, abruptly short-pointed, glabrous (at least above), closely serrate, the stalks



3214. Prunus Mume (×⅓). No. 2.

stout and gland-bearing: fls. pinkish, solitary and sessile or very nearly so, appearing from lateral buds of last year's growth (sometimes on short year-old spurs) before the lvs.: fr. variable, nearly smooth when ripe, short-stalked like a peach, usually somewhat flattened, mostly yellow and overlaid more or less with red, the stone flat and smooth, ridged or sulcate on one edge. Probably Siberia (Dahuria, Manchuria) to China as a native plant. It early reached Eu., where it was once supposed to be native of Armenia, whence the name *Armeniaca.* The Russian apricot is a hardy race of this species. Var. **péndula,** Dipp., has hanging or pendulous twigs. Var. **variegàta,** Hort., has white-variegated foliage.—*P. Armenìaca* is apparently widespread in farther Asia and it is variable. By some authors the main forms are separated as species but the differences appear to be too unimportant or inconstant for clear definition and they are here retained as varieties.

Var. **sibírica,** Koch (*P. sibírica,* Linn. *Armenìaca sibírica,* Pers.). SIBERIAN APRICOT. Bush or small tree, 10 or 12 ft. high: lvs. small and glabrous, or sometimes sparingly bearded beneath, ovate to rounded, long-pointed, unequally crenate-serrate: fls. white or pink, appearing early in the season and usually in great profusion, subsessile, the calyx minutely puberulent: fr. globular, rarely more than ½in. diam., yellow with a reddish cheek, scarcely fleshy, practically inedible, finally splitting; stone smooth, very sharp-edged. Mongolia, Dahuria. L.B.C. 17:1627.—Sometimes planted as an ornamental bush.

Var. **mandshùrica,** Maxim. (*P. mandschùrica,* Koehne). Lvs. rounded, subcordate or cuneate at base, at apex long-cuspidate and acute, margin strongly double-toothed, the teeth sharp and twice longer than wide: peduncle long (about ¼ in.): fr. nearly globular, scarcely 1 in. long, yellow, red-spotted, succulent and sweet; stone small and smooth, the margin obtuse, the seed sweet. Manchuria.—Distinguished by the narrow sharp teeth and double serration of the lvs.; kept as a distinct species by some authors.

Var. **Ansù,** Maxim. (*P. Ansù,* Komar.). Lvs. broad-elliptic, at base short-cuneate, at apex acuminate, very glabrous, the margins crenate-serrate: peduncles hispid: fls. twin: fr. subglobose, deeply umbilicate or sulcate, red, tomentose, the flesh grayish brown and sweet and free from the minutely reticulated stone which has one very sharp edge. Japan; cult.—Retained as a separate species by some, being marked by the cuneate base of the lf.

2. **Mùme,** Sieb. & Zucc. (*Armenìaca Mùme,* Sieb.). JAPANESE APRICOT. Fig. 3214; also Fig. 279, Vol. I. Tree of the dimensions of the common apricot, but the bark greenish or gray and the foliage duller in color: branchlets green: lvs. relatively small, narrow-ovate to nearly round-ovate, long-pointed, finely and sharply serrate, more or less scabrous, lighter-colored beneath, the petioles mostly gland-bearing: fls. sessile or nearly so, fragrant: fr. mostly smaller than that of *P. Armeniaca,* yellow or greenish, the dry flesh adhering to the pitted stone. Japan, where it is much grown for its fls. Gn. 50:164. R.H. 1885:564. G.C. III. 29:183.—Planted to some extent in the S., particularly in the form known as Bungo or Bongoume apricot or plum, but of minor value. When top-worked on plum, it withstands the winters of Cent. N. Y., but does not bear. The apricot cult. as Chinese or Shense is also of this species. There are many double-fld. forms in Japan, where it is much prized for decoration. Var. **Goethartiàna,** Koehne. Lvs. as in *P. Mume,* rather large: calyx-tube and lobes pubescent. Japan. Var. **álbo-plèna,** Hort., fls. double, rose in bud then white. Gt. 52:1513*b*. Other Latin-named varieties are recorded, as forms *laciniàta,* Maxim., var. *microcárpa,* var. *viridicalyx,* and var. *cryptopétala,* Makino.

3. **brigantìaca,** Vill. (*Armenìaca brigantìaca,* Pers. *P. Armenìaca* subsp. *brigantìaca,* Dipp.). ALPINE PLUM. Shrub or small thornless tree, with mostly smaller lvs. and smaller smooth subacid fr. the size of a small green-gage plum: lvs. broad-oval or ovate, the blade 2–3 in. long, abruptly short-pointed, very sharp-serrate, above glabrous or essentially so, beneath lighter-colored and more or less hairy on rib and nerves, the petiole gland-bearing and usually less than 1 in. long: fls. white, about ½in. across. French Alps.

4. **dasycárpa,** Ehrh. (*P. Armenìaca* var. *dasycárpa,* Koch). PURPLE OR BLACK APRICOT. Small tree, of

the stature of the common apricot: lvs. smaller and narrower, mostly elliptic-ovate, finely and closely serrate, thin, dull green, the stalks slender and nearly or quite glandless: fls. large and long-stalked, showy: fr. globular and plum-like on a distinct st., pubescent at maturity, dark purple, the flesh soft and sourish; stone fuzzy. Probably native to Manchuria. B.R. 1243. L.B.C. 13:1250.—Sometimes planted, mostly as an ornamental tree, for the fr. has little value compared to that of the common apricot. Hardy in the N.

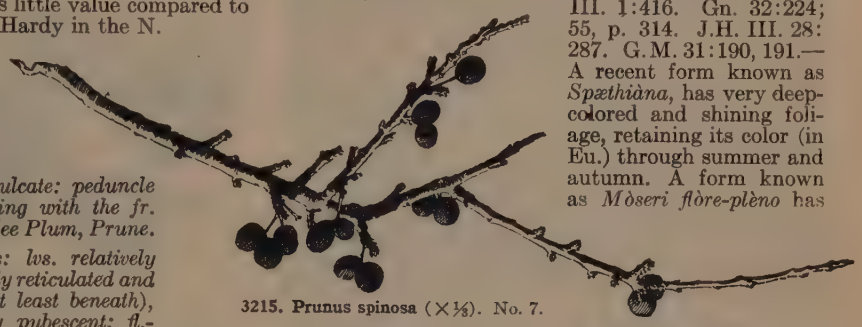
AA. *Plums,—the fls. mostly in cymes, in most species appearing with the lvs. in the N. (before the lvs. in the S.), and the fr. smooth and glaucous: stone not prominently sulcate: peduncle slender, usually remaining with the fr. (exception in No. 12). See Plum, Prune.*

B. *Group of Eurasian plums: lvs. relatively broad, usually prominently reticulated and more or less pubescent (at least beneath), the young twigs mostly pubescent: fl.-clusters with mostly 1 or 2 fls. from each bud.*

C. *Fl.-sts. glabrous.*

5. **cerasífera,** Ehrh. (*P. doméstica* var. *Myrobálan*, Linn. *P. Myrobalàna*, Loisel.). Cherry Plum. Slender twiggy grower, often thorny, the tree small or sometimes shrub-like; twigs usually soon becoming glabrous: lvs. rather small and thin, also lightish green, becoming nearly or quite glabrous, short-ovate and short-pointed, finely serrate: fls. rather small as compared with most forms of *P. domestica*, white or blush, slender-stalked: fr. small (usually 1 in. or less diam.), globular and cherry-like, depressed about the st., yellow or red, the flesh soft, juicy, and sweet-flavored. Probably native to the Caucasus and S. W. Asia, although early attributed to N. Amer. B.M. 5934. Gn. 33, p. 252. J.H. III. 28:267.—The Myrobalan plum is a culture-form of this species, with rather large and good fr., by some regarded as a subspecies or variety *Myrobalana*. It is extensively used in this country as a stock on which to bud the domestica plums, the seedlings being imported in great quantities from Eu. It is a smaller tree than *P. domestica*, with much more slender growth, smoother twigs and lvs., smaller and mostly earlier fls., and also smaller softer fr. with a depression about the st. It tends to dwarf the domestica plums, but its influence in this direction is not sufficient to discourage its use as a stock. Its advantages as a stock are its cheapness, the ease with which all domestica varieties "take" on it, and the readiness with which it can be grown in the nursery row. It is not used to any extent as stocks for other plums than the domesticas. Spontaneous trees are sometimes found about old nursery grounds, and it occasionally appears in orchards when the top of a plum tree dies and sprouts arise from the root. There are also a few varieties prop. for the early juicy frs., but they are little known. It makes a good ornamental tree. The Marianna, much used for stocks of many kinds of plums in the S. (and growing from cuttings), is probably a hybrid of this species with *P. hortulana* or *P. angustifolia*. There are several cult. forms of *P. cerasifera*, one of the best being the plant known as *P. planteriénsis*, Hort., with full double white and red fls. There are also forms with yellow- and white-variegated lvs., and a weeping form (var. **péndula,** Hort.). A form with narrow willow-like lvs. (var. **acutifòlia** or **angustifòlia,** Hort.) is also advertised. A form with twisted or contorted foliage is shown in R.H. 1895, p. 201.

Var. **Pissárdii,** Koehne (*P. Pissárdii*, Carr. *P. cerasífera* var. *atropurpùrea*, Dipp.). A handsome form with purple lvs. and dark wine-red fr.—Intro. into France by Pissard, gardener to the Shah of Persia, and first fully described in Revue Horticole in 1881. It is a cultural form of *P. cerasifera*. It is one of the best of all small purple-lvd. trees, holding much of its color in the American summers. It seems to be hardy wherever the common plum will stand. The best color is secured on the strong growths; therefore it is well to head back the tree frequently. R.H. 1881:190; 1884:396. G.C. III. 1:416. Gn. 32:224; 55, p. 314. J.H. III. 28: 287. G.M. 31:190, 191.—A recent form known as *Spæthiàna*, has very deep-colored and shining foliage, retaining its color (in Eu.) through summer and autumn. A form known as *Mòseri flòre-plèno* has double pink fls. G.M. 55:819. The form called *Héssei* (*P. Pissárdii* var. *Héssei*, Purp.) has narrow irregularly cut and toothed usually long-acuminate lvs., red with a broad greenish yellow or crimson-red border. *Púrpusii* (*P. Pissárdii* var. *Púrpusii*, Hesse) has lvs. similar in shape to those of usual var. *Pissardii*, dark red and variegated with yellow and bright rose. The form *nìgra* has very dark purple lvs. *Blirieàna* (*P. Blirieàna flòre-plèno*, Carr.) is a very handsome form with long slender branches bearing purple-tinted foliage and semi-double apple-blossom-pink fls. R.H. 1905:392. Gn. 78, p. 203. G.M. 57:334.



3215. Prunus spinosa (×⅓). No. 7.

Var. **divaricàta,** Bailey (*P. divaricàta*, Ledeb. *P. cerasífera* subsp. *divaricàta*, Schneid.). Branching from the base, the branches wide-spreading and some of them nearly or quite prostrate: lvs. broader toward the base: fr. not depressed about the st., yellow. Macedonia to N. Persia. B.M. 6519.

6. **Cocomília,** Ten. Italian Plum. Allied to *P. cerasifera*. Bush or small tree, with thorny branches and young growth glabrous: lvs. oval or broadly ovate to roundish obovate, sharp-serrate, glabrous above, more or less pubescent on nerves beneath or glabrous, tapering below, somewhat pointed: fls. usually in pairs, appearing with the lvs. or just preceding them, white or greenish white, the calyx-tube about the length of the pedicels: fr. small and yellow, globular or oblong-ovoid, rather good for eating. Italy.

7. **spinòsa,** Linn. Blackthorn. Fig. 3215. Low and spreading, making a very thick thorny top, the young growths distinctly pubescent: lvs. small, oblong-obovate or elliptic-ovate, very numerous on the branches, nearly or quite obtuse, very finely and closely serrate: fls. white, small, borne singly or in pairs (or sometimes in 3's) and often on the thorns: fr. little larger than a very large pea, very deep glaucous-blue, usually persisting until winter, scarcely edible. Cent. and S. Eu. and N. Afr. to N. Persia and Siberia. G.C. III. 42:308. —Sometimes planted in this country, chiefly in the double-fld. form, var. **plèna,** Hort. (Gn. 59, p. 76; 61, p. 363. G.M. 44:165). It is an excellent bush or small tree for protecting the borders and corners of drives and walks. The short stiff thorny branches make a good barrier. The tree is perfectly hardy where the plum can be grown. The little frs. are usually astringent, but there is a sweet-fruited form. It has been supposed by some that the domestica plums may have come from this species, but this is very doubtful, at least within the period of human experience with them. Var. **purpùrea,** Hort., has purple foliage; fls. small and very numerous, pink: tree less spiny than the type.

cc. *Fl.-sts. usually more or less hairy.*

8. **domĕstica,** Linn. (*P. commùnis,* Huds.). Common Garden Plum. Figs. 3068 to 3072. Strong-growing small tree with pubescent twigs: lvs. large and thick, dull green, much reticulated, pubescent beneath, ovate or obovate, coarsely and irregularly serrate: fls. white, large, usually in clusters: fr. various, but firm in texture and usually not depressed about the st.; stone large, slightly rough or pitted.—Native country unknown, but of Eu. or the Eurasian region. If it exists in a truly wild state, it is to be sought in the Caucasus and trans-Caucasus regions. It is run wild in many parts of the world. Focke says that *P. domestica* is unknown in an originally wild state, and that the typical form of the species is the prune (Zwetsche), *P. œconomica,* Borkh. There are various forms of *P. domestica* grown for ornament, as double-fld., yellow-lvd., and variegated-lvd. As a fr.-plant it is widely variable. It is the parent species of the old-time or common plums, as distinguished from the Japanese and American plums. The synonymy of the main varietal groups is shown by Waugh, Bot. Gaz. 26, pp. 417–27 (Dec., 1898), and 27, pp. 478–81.

Var. **insititia,** Bailey (*P. insititia,* Linn. *P. doméstica* subsp. *insititia,* Schneid. *P. itálica,* Borkh.). Damson, Bullace, and probably also St. Julien, and other kinds of plums. A form with small foliage and small firm oval or ovoid frs. borne mostly in clusters: tree small and compact.—Damson is a general name for small-fruited and small-lvd. forms of the plum. When the plum runs wild, it usually reverts to this form. Some of the Damsons (as the French, Shropshire, Farleigh) are commercial orchard varieties, being used for culinary purposes. The Mirabelle plum is *P. insititia* var. *syrìaca,* Koehne. There is much difference of opinion as to the systematic position of the plum designated by Linnæus as *P. insititia,* but in character it is somewhat intermediate between *P. domestica* and *P. spinosa.* It is probably one

3216. Prunus salicina.—Japanese plum.
From specimens in the herbarium at the Royal Gardens, Kew, as *P. triflora,* Roxbg. (No. 9.)

stage in the reversion of the plum toward wild or half-wild forms. The *P. domestica* var. *damascena,* Linn., is indefinite, and the name may well be dropped.

Other forms of *P. domestica* have received Latin class-names, as var. **malifórmis,** Linn. (*P. syrìaca,* Dipp.), including the Mirabelle (a small-lvd. form with small yellow fr., not unlike the Damsons) and others;

3217. Prunus Simonii
(×¼). No. 12.

var. **Cerèola,** Linn., the green-gages or Reine Claudes; var. **galatĕnsis,** Auth., the prunes. Var. **élegans,** Hort., a recent form, has narrow white-margined lvs.

bb. *Group of oriental plums: lvs. relatively longer (mostly oblong-obovate), not roughened or pubescent, often shining, the young twigs glabrous or nearly so: fls. mostly 3's from each bud in the cluster.*

9. **salícina,** Lindl. (*P. triflòra,* Roxbg., nomen nudum. *P. japónica,* Hort., not Thunb. *P. Háttan,* Tamari. *P. ichangàna,* Schneid. *P. Bòtan,* Hort. *P. Màsu,* Hort.). Japanese Plum. Fig. 3216; also Figs. 3073, 3074. Strong-growing small tree, with smooth often shining reddish or cinnamon-brown twigs: lvs. mostly oblong-obovate, abruptly but prominently pointed, closely obtuse-serrate, the veins looping near the margin, bright often shining green above and dull beneath: fls. few from each bud (most commonly about 3), showy, white or very nearly so, slender-stalked: fr. various, mostly large and firm, yellow or light red (never blue-purple) with pronounced suture and tending to be pointed at the apex. R.H. 1895:160. Gn. 78, p. 195.—Chinese, but intro. into this country from Japan (in 1870), and now widely distributed and much grown for its fr. The Japanese plum is hardy, in some of its varieties, as far north as Ottawa. It is prized because of its great productiveness, long-keeping qualities and beauty of its fr., and its greater immunity from black-knot. As a class, the fr. is of lower quality than the domestica plums. The season of the Japanese plums begins considerably in advance of the domesticas and holds nearly as late. The greater number of the varieties are clingstones, but there are some freestones among them. A race of hybrids with *P. hortulana* and *P. angustifolia* is now appearing.

Var. **pùbipes,** Bailey (*P. triflòra* var. *pùbipes,* Koehne). Pedicels densely pubescent or only rarely subglabrous: calyx-tube pubescent a third or half the length.—Cult. abroad.

10. **gymnodónta,** Koehne. Shrub, with crowded unarmed branches: lvs. large and more or less fascicled, conduplicate in vernation, narrow-obovate or obovate-oblong, about 2–3 in. long, at base acute or cuneate; at apex short-acuminate and very acute, serrate with glandless teeth, glabrous or slightly hairy beneath; stipules linear or nearly filiform, often cut: fls. appearing with the lvs., white; calyx-lobes oblong and obtuse, entire or nearly so; petals spatulate-obovate, short-clawed, about ⅓in. long: fr. not described. Manchuria. Cult. abroad.—From *P. salicina* (*P. triflora*) this species differs in the conduplicate lvs., which are little involute

on margin, glandless lf.-serratures, very short pedicels and smaller fls.

11. **thibética,** Franch. Ornamental tree, 15–20 ft., with blush-pink fls., and with convolute lvs. which are oblong and obtuse, crenate, the teeth glandular-callose at their apex: fls. with the lvs., on pedicels ⅓–¾in. long, blush-pink; petals ⅓in. or less long, scarcely equaling the stamens. W. China, in thickets.

12. **Simonii,** Carr. (*Pérsica Simonii,* Decne.). Simon or Apricot Plum. Fig. 3217. A straight-growing fastigiate tree: lvs. rather long-oblanceolate or lance-obovate, somewhat thick and heavy, dull, very veiny below, finely but unevenly obtuse-serrate, conduplicate or trough-shaped in habit: fls. nearly white, on short stalks, often 2 or 3 together, preceding the lvs.: fr. 1–2 in. diam., flattened lengthwise, very firm in texture, perfectly smooth, handsome maroon-red, possessing a deep suture, the yellow flesh closely adhering to the small spongy-roughened nearly orbicular pit; peduncle usually not adhering to the mature fr. Named in honor of Eugene Simon, who sent pits from China to France, prior to 1872; botanical position in the genus doubtful, as it has some of the characters of apricots. The fls. are sometimes described as appearing with the lvs., but in N. Y., at least, they are distinctly precocious. China. Not known as a native plant. R.H. 1872:110. Gn. 70, p. 225.—Intro. into the U. S. about 1880, or shortly after. Although much advertised by nurserymen, it has not attracted great attention from fruit-growers in the E. On the Pacific slope it is popular. The fr. is usually bitter, with an almond-like astringency, but sometimes it is very palatable. The tree is very hardy and vigorous somewhat north of the limit of peach-growing, but, except in the Pacific region, it does not appear to be uniformly productive. The fr. is handsome, with a pleasing odor and it keeps a long time. The tree is conspicuous for its narrow erect growth. The fls. are borne on short spurs on wood 2 and more years old; also singly on the last year's growth. The Wickson plum is apparently a hybrid of this species and *P. salicina.*

bbb. *Group of American or native plums: lvs. relatively narrow and smooth, and the young growth glabrous (P. subcordata and P. americana partial exceptions), the fr. comparatively small and in shades of yellow and red, not deep blue-purple: fls. mostly more than 3 (sometimes 2) from each bud in the cluster.*

c. *Lvs. mostly broad and thick, pubescent or roughish beneath, very sharply serrate or even jagged: fr. thick-skinned.*

d. *Shape of lvs. mostly oval to orbicular, and usually obtuse: far western.*

13. **subcordàta,** Benth. Pacific Plum. Small tree or bush, usually only a few feet high, but sometimes rising to 20 or 25 ft.: lvs. round-ovate, or orbicular, obtuse, mostly broad or subcordate at base, either sharply or obtusely serrate (usually incised-serrate), thick, soft-pubescent beneath but becoming more or less glabrous: fls. white fading to rose, less than 1 in. across, in clusters of 4 or less and appearing before or with the lvs.: fr. globular or short-oblong, usually dark red, in the largest wild forms somewhat over 1 in. diam., the flesh subacid and clinging to the flat, smooth, or slightly roughened stone. High lands and mountains, Calif. and Ore. S.S. 4:154.—The fr. is gathered for domestic uses, and the tree is sometimes planted about settlements. It varies much, and the greater part of the trees do not produce agreeable fr. In many cases it is only a tree-like bush. The bark is blackish, and is sometimes pubescent on young shoots, which are reddish.

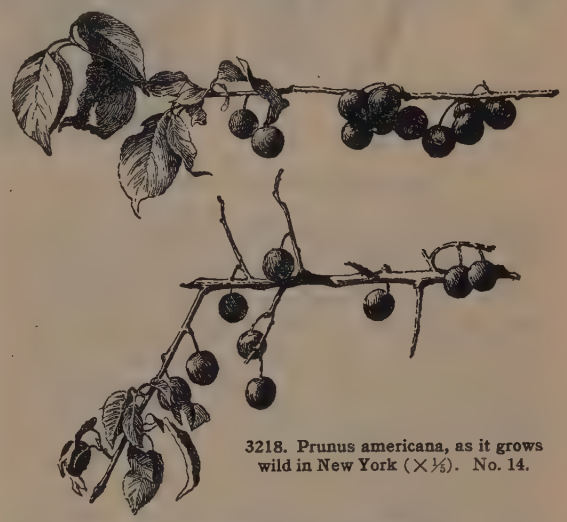
Var. **Kélloggii,** Lemmon. Sisson Plum. Taller and more slender: bark ash-gray: lvs. usually not cordate, orbicular or elliptical, nearly glabrous, but apparently not constantly different from the species itself: fr. larger (1 in. or more long), ovate, yellow or red, the flesh soft and palatable. N. Calif.—Much recommended by Mr. Sisson, near Mt. Shasta, whose name it bears, and now planted in some places in Calif. It is superior to *P. subcordata.* The tree rarely exceeds 15 ft. in height and 4–6 in. diam. of trunk. It seems to lack good botanical characters of separation from the type of the species.

Var. **oregàna,** Wight (*P. oregàna,* Greene). Oregon Plum. Fr. pubescent at maturity: lvs. oval or ovate, not so large as usual in the type species, pubescent at least beneath. Ore.—Apparently not cult.

dd. *Shape of lvs. on the ovate or oblong order, mostly acuminate: the Americana set, mostly with lvs. large in proportion to size of plant.*

e. *Stature of trees: lvs. and fls. large.*

14. **americàna,** Marsh. (*P. latifòlia,* Moench. *P. hiemàlis,* Michx., at least in part. *P. ignòta,* Nels.). Common Wild Plum. Figs. 3218, 3219; also Figs. 3075, 3076. Small twiggy spreading usually thorny tree



3218. Prunus americana, as it grows wild in New York (×½). No. 14.

mostly forming thickets, with gray branches or gray-brown twigs: lvs. obovate, oblong-obovate or sometimes oblong-ovate, acuminate, thickish, the margins mostly sharp-serrate or sometimes almost incised, not glossy, strongly reticulated beneath and pubescent on the veins: fls. large, white, slender-stalked, the calyx-lobes entire and pubescent on the inside, appearing in small clusters in advance of the lvs.: fr. various, but mostly small and hard, the skin tough and glaucous and not shining, yellow and variously overlaid with red; stone turgid. Woods and copses. Mass. and N. Y. to Man., Utah, and New Mex., and in the E. to Savannah, Ga., and nearly to the Gulf; the most widely distributed of the native true plums. It sometimes reaches a height of 15–20 ft. S.S. 4:150.—In the E., the frs. are usually austere, and often not fit for eating; but in the W., edible-fruited forms are found in abundance. It is the most prolific source of cult. native plums for the cold N., giving rise to such varieties as Blackhawk, Cherokee, Craig, Forest Garden, De Soto, Golden Queen, Gaylord, Rollingstone, Newton, Hawkeye.

Var. **mōllis,** Torr. & Gray (*P. lanàta,* Mack. & Bush. *P. americàna* var. *lanàta,* Sudw.). Lvs. and shoots soft-pubescent or sometimes almost tomentose. Ill., Iowa, Mo.—To this form belong the Wolf, Van Buren, Quaker, and American Eagle plums. There is also a double-fld. variety.

15. **nigra,** Ait. (*P. boreàlis,* Poir. *P. móllis,* Torr. *P. americàna* var. *nìgra,* Waugh). Canada Plum. Lvs. mostly broader, the teeth glandular and remaining on mature lvs. as small callous points, but the teeth otherwise nearly or quite blunt and thereby differing from the sharply and deeply serrate lvs. of *P. americana;*

3219. Prunus americana.—The Weaver (×⅔). No. 14.

petioles bearing 2 glands, near the top: fls. larger, on slender dark red pedicels, white changing to pink, the calyx-lobes glandular-serrate and glabrous on the inside: fr. mostly somewhat oblong and orange-red, the stone large and much compressed. New Bruns. to Assiniboia, and in New England, N. Y., Mich., Wis., and N. Ohio; possibly intro. in some of its southern ranges. S.S. 4:149.—A more showy tree than *P. americana,* blooming earlier, and in its extreme forms appearing to be very distinct. It has given rise to some of the best fr.-bearing varieties, such as the Cheney, Itasca, Oxford, Aitkin, Crimson, although not nearly so prolific of cult. forms as *P. americana.*

16. **mexicàna,** Wats. (*P. austràlis,* Muns. *P. reticulàta, P. tenuifòlia, P. polyándra* and *P. arkansàna,* Sarg.). Big-Tree Plum. The southern representative of *P. americana,* as *P. nigra* is the northern: it is tree-like, not sprouting from the roots or forming thickets: lvs. oblong-obovate to obovate, 3–5 in. long, rounded or subcordate at base, abruptly acuminate at apex, sharply and sometimes doubly serrate, short-pubescent above at least when young and long-pubescent beneath (and often confused with *P. americana* var. *mollis*); petiole usually bearing 1 or more short-stalked glands at or near the apex: fls. ¾in. across, white, in small nearly sessile umbels, the pedicels usually glabrous; calyx-lobes mostly reflexed, nearly or quite as long as the tube, dentate at apex or sometimes entire, obscurely glandular, pubescent within; petals variable in shape, usually pubescent and mostly entire: fr. globose or rarely oblong, sometimes 1 in. or more diam., purplish red with bluish bloom; pit or stone obovoid or nearly globular, turgid, the surface smooth or essentially so. S. W. Ky. and W. Tenn. to Okla. and Mex.—Wild fr. is sometimes gathered, and it varies in size and quality, but the species has received little attention horticulturally, although used experimentally as a stock to which its non-suckering habit adapts it. It is said that a hybrid has been produced with *P. salicina.* Wight, who has recently re-characterized this species, writes that "Although long confused with *Prunus americana,* and in the herbarium sometimes difficult to distinguish from *P. americana* var. *lanata,* the species is nevertheless a very distinct one. It never forms thickets, as does *P. americana* and its subspecies, but occurs always as a tree with a well-defined trunk, which in the older trees differs in its furrowed bark. The young leaves as they appear are mostly somewhat obtuse at the apex instead of acuminate; the older leaves are usually broader in proportion to their length, and the serration of the margin is slightly less pronounced. The flowers also have petals somewhat broader in proportion to their length than in *P. americana,* while the stone is obovoid or round and more turgid."

17. **hortulàna,** Bailey (*P. hortulàna* var. *Wàylandii,* Bailey). Hortulana Plum. Fig. 3220. Tree distinct, not sprouting from the root or forming thickets or hedges, 15–30 ft. tall, with thinnish exfoliating bark and brownish twigs: lvs. oblong-obovate or elliptic-ovate, the blade 3–4 in. long, rather broad to rounded at the mostly oblique base, long-acuminate, yellowish green, glabrous above and more or less shining, lightly pubescent or practically glabrous beneath, the margins shallowly and obtusely serrate or crenate-serrate; petiole usually bearing 1 or 2 or more small glands toward the apex: fls. preceding the lvs., white, small (about ½in. broad), the pedicels slender and glabrous; calyx-lobes about as long as the tube, oblong-ovate, glandular on margin but otherwise glabrous or nearly so on exterior, mostly obtuse; petals oval to nearly orbicular, clawed: fr. globose or short-oblong, ¾–1 in. diam. in the wild, red to yellow and mostly white-dotted, with little or no bloom, not thick-skinned; pit or stone various, globose to oval or oblong, the surface more or less reticulated. Cent. Ky., Tenn., to Iowa and Okla.—This species has yielded a good number of cult. varieties, as Kanawha, Golden Beauty, Cumberland, Leptune, Wayland, Moreman, Sucker State. The species was first distinguished in 1892 to designate varieties of plums intermediate between *P. americana* and *P. angustifolia* (the two species at that time clearly separated); these intermediate varieties were then said to "represent at least two other species, and perhaps even more" (G.F. 5:90), one of which it was proposed to separate as *P. hortulana.* Later students have separated *P. Munsoniana* from these varieties, and have redefined other species. Subsequently it was supposed that *P. hortulana* represents a range of hybrids between *P. americana* and *P. angustifolia,* and it is not yet known what part hybridization has played in the origin of these forms, although the evidence accumulates that separate specific types are involved.

3220. Prunus hortulana (×½) No. 17.

Var. **Mineri,** Bailey, is nearer to *P. americana,* and represents the northward extension of the group; it is known by its thicker and duller lvs. which are very veiny below and coarsely toothed and somewhat obovate in outline, and by a late firm fr.

To this form belong the Miner, Langsdon, Clinton, Forest Rose. The Miner is apparently the first horticultural variety of native plum to receive a name; the seed that produced the original tree was planted in 1814.

EE. *Stature of bushes: lvs. and fls. small: far S. W.*

18. **rivulâris,** Scheele (*P. texàna,* Scheele). CREEK PLUM. Slender-stemmed shrub to 8 ft., forming thickets, with gray or reddish twigs and early-ripening fr. (June):

3221. Prunus angustifolia var. Watsonii (×⅓). No. 20.

lvs. ovate to oblong-ovate or somewhat obovate, rounded at base, short-acuminate at apex, 1–3 in. long, glandular-serrate, glabrous above, more or less pubescent beneath; petioles with 1 or 2 glands near apex, or glandless: fls. white, with the lvs. or before them, less than ½in. broad, on slender glabrous pedicels; calyx-lobes as long as tube, ovate or oblong-ovate, usually pointed, glandular, little pubescent on exterior, with age reflexed; petals obovate-orbicular or oblong-obovate, short-clawed: fr. nearly globose, ½in. or somewhat more diam., red and with light bloom; pit or stone oval to subglobose, the surface smooth or obscurely roughened. Texas.—Apparently of little horticultural value, as the fr. is small and poor, although eaten by Indians. No improved varieties are reported.

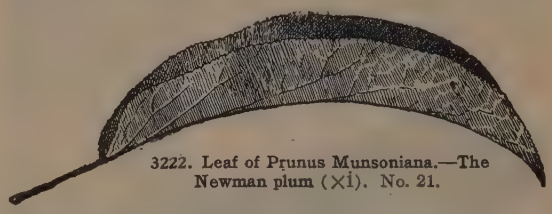
19. **Réverchonii,** Sarg. (*P. pýgma,* Muns., not *P. pygmæa,* Willd.). HOG PLUM. Shrub, 2–6 ft., with gray bark and chestnut-colored twigs, forming dense thickets and yielding late-ripening fr. (Aug., Sept.): lvs. ovate-lanceolate (sometimes lanceolate), acuminate, usually 3 in. or less long, strongly conduplicate, either rounded or narrowed at base, glandular-serrate, glabrous and green above, pale and somewhat pubescent beneath; petiole bearing 2–4 glands near apex: fls. with the lvs. or preceding them, white, less than ½in. broad, on glabrous pedicels; calyx-lobes oblong or ovate-oblong, obtuse, glandular; petals obovate to oblong-obovate, narrowed or somewhat clawed, entire, or erose near apex: fr. globose or nearly so, sometimes nearly 1 in. diam., usually yellow (rarely red) and blushed with orange or crimson and marked with whitish dots, with little or no bloom; stone oblong, the surface smooth or slightly reticulate. Okla., Texas.—No horticultural varieties of this species are recorded; its fr. is sometimes good, although usually poor. Said to be well adapted to limestone soils and to withstand drought. Wight writes that the species is closely related to *P. rivularis* and may be a form of it. "The apparent differences are its more branching and less slender stems, trough-shaped leaves, later-ripening fruit, and more pointed stone."

CC. *Lvs. mostly narrow and peach-like, firm, and more or less shining, glabrous, the young growths not pubescent: fr. thin-skinned: the Chickasaw and Wild Goose set.*

20. **angustifòlia,** Marsh. (*P. Chicàsa,* Michx. *P. stenophýllus,* Raf.). CHICKASAW PLUM. MOUNTAIN CHERRY. Small bushy-topped twiggy tree, 8–10 ft. high or often only a shrub forming dense thickets, with slender zigzag reddish branches: lvs. lanceolate or oblong-lanceolate and conduplicate (trough-like), shining, 2 in. or less long, mostly narrowed toward base, at apex acuminate or short-acute, glabrous or sometimes sparingly pubescent on nerves beneath, finely and closely serrate; petiole glandular or not near apex: fls. white, preceding lvs., about ½in. across, on glabrous pedicels; calyx-lobes ovate-obtuse and shorter than tube, not glandular, exterior glabrous: fr. small and early, cherry-like, slender-stemmed, red or yellow and yellow-dotted, shining, thinly glaucous, the flesh soft and juicy and clinging to the small rough stone. Del. to Fla. and Texas, being abundant in sandy places. S.S. 4:152.—This species has given rise to several pomological varieties, as Caddo Chief and Ogeeche; it is an early-fruiting species, more or less thorny.

Var. **Wâtsonii,** Waugh (*P. Wátsonii,* Sarg.). SAND PLUM. Fig. 3221. Bush, 3–6 ft. high, with more zigzag twigs than in *P. angustifolia,* more spiny, the lvs. smaller, less pointed and less conspicuously serrate, the fls. smaller, the fr. with thicker skin. Dry regions of Kans. to Texas and New Mex. (also reported from Neb. but perhaps intro.), and planted by the settlers, who prize it for its fr. G.F. 7:135 (adapted in Fig. 3221). Several named pomological varieties issue from this variety, as Strawberry, Welcome, Red, Yellow, and Purple Panhandle. Var. *Watsonii* is named for Dr. Louis Watson, of Kans.

Var. **vàrians,** Wight & Hedr. BIG CHICKASAW PLUM. Rather larger than *P. angustifolia* itself, more robust and a less crabbed grower, lvs. and pedicels longer, and stone usually more pointed at apex. Okla., Texas, in more fertile soil than the species.—Apparently a range of forms growing under better conditions than those in which the plants taken as the type of *P. angustifolia* are found, and giving rise to many early-fruited plums, such as Yellow Transparent, Emerson,



3222. Leaf of Prunus Munsoniana.—The Newman plum (×⅓). No. 21.

Coletta, Clark, African. Supposed to have furnished hybrids with *P. Munsoniana* and *P. salicina.* The Marianna most probably represents a cross between some form of *P. angustifolia* (perhaps var. *varians*) and *P. cerasifera.*

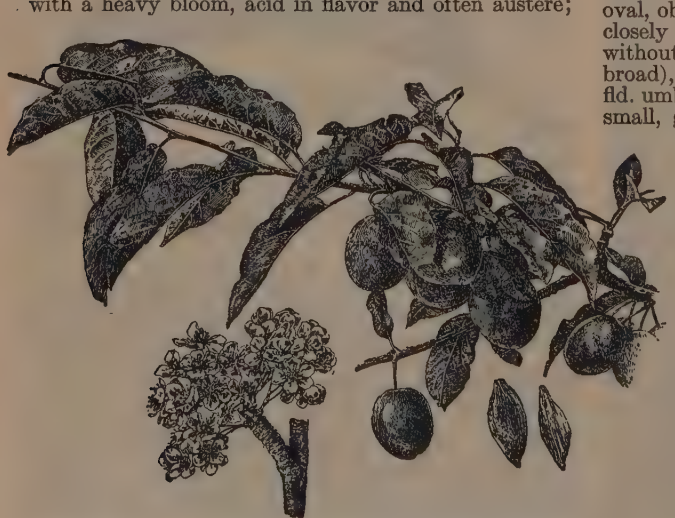
21. **Munsoniàna,** Wight & Hedr. WILD GOOSE PLUM. Figs. 3222, 3223; also Figs. 3076, 3077. A range of forms separated out of the old Hortulana class, of larger and freer growth than the variants of *P. angustifolia,* hardier, with larger and more pointed lvs., and larger fls. bearing glandular calyx-lobes: forming thickets, reaching 20–25 ft. in height: lvs. 3–4 in. long, lanceolate to oblong-lanceolate, rounded at base, at apex acute or acuminate, margins closely glandular-serrate, shining and glabrous, usually slightly pubescent on veins beneath; petioles usually with 2 glands near apex. fls. white, ½in. or more broad, either with the lvs. or preceding them, on slender glabrous pedicels; calyx-

lobes ovate-oblong to oblong, obtuse, equaling the tube, glandular on margin, mostly glabrous on exterior: fr. globular or oval, bright red or yellowish and marked with whitish dots, late-ripening; pit or stone mostly oval, pointed at apex, the surface usually roughened. Ky. and Tenn. to Miss., Texas, Mo., and Kans.—The botanical status of this group is yet doubtful, although well marked in some forms. From it have come many pomological forms, as Wild Goose, Newman, Milton, Robinson, Pottawattamie, Osage, Whitaker, Jewell, and Texas Belle.

ccc. *Lvs. mostly as narrow as lanceolate-ovate, or else small and shortish, thin or thinnish (except P. maritima), finely and usually evenly serrate, becoming glabrous or nearly so (except in forms of P. umbellata and P. maritima), beneath at maturity: fr. mostly thick-skinned. Species of the beach plum or P. maritima group, mostly plants of low growth and dwarf habit.*

22. **orthosépala,** Koehne. Fig. 3224. A much-branched spreading bush about 4 or 5 ft. high, with young branchlets chestnut-colored: lvs. oblong-lanceolate to obovate-lanceolate, about 2 in. or less long, narrowed at base, at apex acute or acuminate, glabrous and shining, serrate; petiole glandless or with 1 or 2 glands near apex: fls. white, or pink with age, about ½in. broad, on glabrous pedicels; calyx-lobes oblong-obtuse, ciliate on margins, glabrous or nearly so on the exterior: fr. late, globose, about 1 in. diam., red, white-dotted, with bloom; stone oval, rounded at apex and slightly pointed at base, the surface somewhat rugose. —Not clearly known in the wild, but probably from Kans. to Texas. The Laire, grown in Kans. for the fr., is perhaps to be referred here. The species was founded on plants grown in the Arnold Arboretum from seeds said to have been sent from S. Texas. G.F. 7:187 (reduced in Fig. 3224).

23. **alleghaniénsis,** Porter. Alleghany Plum. Fig. 3225. Tree, 12–15 ft., or oftener a straggling bush, usually not thorny, the young growth reddish and glabrous: lvs. lance-ovate to elliptic-obovate, about 3 in. and less long, prominently acuminate, sharply fine-serrate, pubescent on the veins beneath but becoming glabrous with age; petiole usually glandless but sometimes with glands at apex: fls. small (½in. across), white, in clusters of 2–5, appearing with or before the lvs., the calyx minutely pubescent and with narrowly oblong-ovate slightly hairy lobes, the petals round-obovate: fr. globular or ovoid, ⅝in. or less diam., dark purple with a heavy bloom, acid in flavor and often austere; stone somewhat obovoid and obtusish at apex, the surface slightly roughened. Pa., Conn. S.S. 4:153. G.F. 3:429, from which Fig. 3225 is reduced.—In a very limited way the species has come into botanic gardens and collections. As an ornamental subject it has merit, for it bears profusely of fls. and fr. The plums, or "sloes," are collected from the wild for the making of pies and preserves.



3223. Prunus Munsoniana.—The Wild Goose plum (×⅓; stones×⅔). No. 21.

3224. Prunus orthosepala (×½). No. 22.

Var. **Dàvisii,** Wight, along gravelly ridges in the northern part of the southern peninsula of Mich., bearing blue frs. used locally for jellies and conserves, is distinguished by lvs. broader in proportion to their length and less acuminate. From *P. maritima,* which it resembles, it differs in the reddish color of twigs, more glabrous lvs. and pedicels, and the stone pointed rather than rounded at base.

24. **umbellàta,** Ell. Black Sloe of the S. Twiggy small tree (10–20 ft.), with compact head and very slender glabrous branchlets, often more or less thorny: lvs. small (mostly 2 in. or less long), light green and rather thin, oblong, lanceolate, oblong-lanceolate or oval, obtuse or acute, closely serrulate, sometimes very closely pubescent beneath even at maturity; petiole without glands: fls. small to medium in size (½–¾in. broad), white, on slender glabrous pedicels in few-fld. umbels, appearing with or just before the lvs.: fr. small, globular, slender-stalked, from pure yellow to orange-yellow and red-blotched, thinly glaucous, the flesh usually sour and bitter and free from the oval or subglobose stone. Near the coast from S. C. to Fla. S.S. 4:155.—Not intro. as a fr.-plant, but sometimes planted for the profusion of its white fls. The fr. is not unlike a cherry in shape, and is sometimes used in conserves. The foliage suggests *P. cerasifera.*

Var. **injucúnda,** Sarg. (*P. injucúnda,* Small. *P. mìtis,* Beadle). A hill-country form: lvs. oval or oblong-oval, usually somewhat longer and broader than in *P. umbellata* itself, narrowed toward the base, acute or acuminate, mostly pubescent beneath and somewhat pubescent above: fls. appearing later (March, April); calyx pubescent rather than glabrous. N. C. to Ga., Ala., and Miss., apparently passing into var. *tarda.*

Var. **tárda,** Wight (*P. tárda,* Sarg.). Tree, 18–20 ft., distinguished from *P. umbellata* by lighter-colored bark, later-ripening fr., and more oblong stone. W. Miss. to Texas and S. Ark., the nearly globular, yellow, red, purple, or blue fr. (about ½in. diam.) ripening in Oct. and Nov.

25. **marítima,** Marsh. (*P. pygmæa* and *P. sphærica,* Willd. *P. sphærocárpa,* and *P. acuminàta,* Michx.

3225. Prunus alleghaniensis (×⅓). No. 23.

P. pubéscens, Pursh. *P. littoràlis,* Bigel. *P. pubígera,* Steud.). Beach Plum. Shore Plum. Fig. 3226. Decumbent straggling more or less thorny bush with rough and warty branches and slightly pubescent young growth: lvs. oval or obovate-oval, short-acute or nearly obtuse, closely serrate, dull green, often somewhat pubescent beneath: fls. small, white, slender-stalked, borne in few-fld. umbels preceding the lvs.: fr. about ½in. diam., depressed-globular (somewhat flattened at the ends), with a slight cavity about the st., mostly deep dull purple when ripe and covered with a heavy bloom, the flesh brittle and mostly sweet and juicy and free from the small turgid cherry-like stone (which is pointed at both ends), the skin thick, tough, and more or less acrid. Sands of the seashore, New Bruns. to Va., and also some miles inland; its reported occurrence at the head of Lake Michigan has not been verified. B.M. 8289. Gng. 4:257 (bush in bloom).—The main sts. are decumbent, and strong shoots stand upright to a height of 2–6 ft., or sometimes even 10–12 ft. *P. maritima* is a handsome plant in cult. because of the great profusion of its early spring bloom, and the frs., when produced, are also ornamental. As a fr.-plant, it is known in the variety Bassett American, which, however, has never become popular because of its small size. The species is very variable, and no doubt several botanical varieties could be distinguished. Yellow-fruited forms are known (forma **flàva,** G. S. Torr.). A species related to *P. maritima,* but not in the trade, is **P. Grâvesii,** Small, with orbicular very obtuse and often apiculate lvs. and stone pointed only at base. Known only from the original locality at Groton, Conn., near Long Island Sound, an unarmed bush about 3 ft. high, with a dark rather rough bark and usually puberulent twigs.

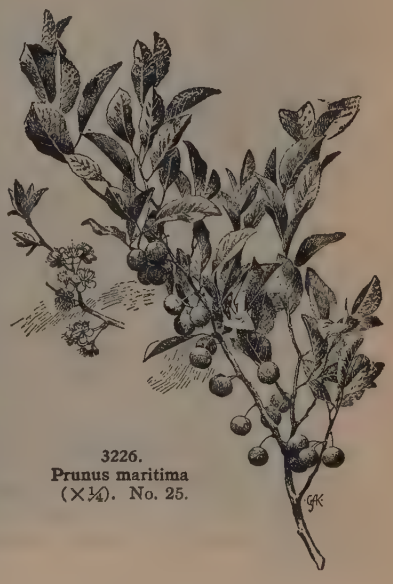
26. **grâcilis,** Engelm. & Gray. Oklahoma Plum. A straggling shrub, closely allied to *P. maritima,* in clumps or thickets, 1–4 ft. high, with grayish bark and reddish brown pubescent young twigs: lvs. oval or ovate, rarely ovate-lanceolate, 1–2 in. long, narrowed either way but sometimes obtusish at apex, finely but lightly pubescent above, strongly pubescent beneath, finely serrate; petiole glandless or with 1 or 2 glands near apex: fls. preceding the lvs., white, ⅓ to nearly ½in. broad, on pubescent pedicels; calyx-lobes ovate and acute, entire or denticulate, glandless: fr. globular or ovoid, ½–¾in. diam., mostly red and with light bloom; pit or stone oval, somewhat obtuse at the ends, the surface nearly smooth. W. Ark., Okla. and N. Texas, in dry sandy places.—This species appears to have yielded no named pomological varieties, although the fr. is sometimes collected from the wild for market. **P. venulôsa,** Sarg., is a larger shrub, forming denser thickets, with larger and more coarsely serrate lvs. and glabrous pedicels. It is from N. Texas, but whether a good native species or a hybrid of *P. gracilis* and *P. Reverchonii* is undetermined; of no horticultural promise.

Subgenus II. Amygdalus. Almonds and Peaches.

Fr. sessile, large, mostly pubescent: fls. solitary from lateral buds on the previous year's growth, appearing in advance of the lvs., the latter conduplicate in the bud.

A. *Plant low and bushy as seen in cult.: flowering almonds.*

27. **trîloba,** Lindl. (*Amýgdalus pedunculàta,* Bunge. *Amygdalópsis Líndleyi,* Carr. *Prunópsis Líndleyi,* André. *Prùnus ulmifòlia,* Franch.). Flowering Almond. (See Nos. 39, 40.) Fig. 3227. Lvs. broadly ovate or obovate, usually broadest above the middle, soft-hairy, abruptly pointed, coarsely doubly serrate, tending to be 3-lobed above: fls. solitary, short-pedicelled, and mostly in advance of the lvs., clear pink, sometimes white, usually double (var. **plèna,** Hort. Fig. 3234); calyx-tube hairy inside between stamens, the sepals pilose or glabrous on outside; sepals and petals (in single fls.) 5–10: fr. small, red-hairy when young, but becoming glabrous. China. B.M. 8061. I.H. 8:308. F.S.15:1532. R.H. 1862:91; 1870, p. 388 (fr.); 1883, p. 367 (fr.); 1884:396; 1907, pp. 154, 155. Gn. 21, p. 275; 28:346; 55, p. 374; 59, p. 135; 79, p. 17. G.M. 44:210; 52: 247. G. 26:462; 33:19. H.F. II. 7:139. Gng. 5:165; 6:289; 8:196.—A most desirable bush, hardy in Cent. N. Y. and Ont. It is a good subject for blooming in pots. It is sometimes grown as a standard worked on plum, but it is then short-lived; better results are to be expected from own-rooted plants (by layering or root-grafting). Sometimes it rises to the stature of a small tree. The double-fld. form (var. *plena*) is the one commonly seen in grounds, but the single-fld. form is the better. A sport producing several pistils has been recorded (Amygdalopsis). Not to be confounded with the forms of *P. japonica* and *P. glandulosa,* which have smaller and relatively longer-stalked fls. and usually more than 1 from the bud, and different lvs.



3226. Prunus maritima (×⅓). No. 25.

Var. **Pétzoldii,** Bailey (*P. Pétzoldii,* Koch. *P. virgàta,* Hort.). Branchlets and adult foliage glabrous: lvs. ovate or elliptic, usually at or below the middle, not 3-lobed, gradually narrowed or acuminate above, glabrous, with narrow sharp teeth: fls. smaller than in *P. triloba* and with shorter pedicel, rose-colored; calyx-tube glabrous inside as are the lobes or sepals on the

outside, the sepals and petals usually 10: fr. spherical; stone hard, bony and more rugose. Probably China.

28. **orientàlis,** Koehne (*Amýgdalus orientàlis*, Mill. *A. argéntea*, Lam.). ORIENTAL ALMOND. Shrub, 3–10 ft. high, with woolly twigs: lvs. small (¾–1½ in. long), nearly or quite sessile (petiole less than ½in. long), oval, oblong or narrow-obovate, nearly obtuse or short-

3227. Dwarf almonds. Prunus nana at left; P. glandulosa in middle; P. triloba at right in the lobed form that sometimes occurs on spring or strong shoots. (× about ½)

pointed, entire or obscurely serrulate: fls. solitary, nearly 1 in. across, light rose-color, with or just preceding the lvs.: fr. ovate or oblong, more or less pointed, thinly pubescent but becoming glabrous. Asia Minor, Syria. L.B.C. 12:1137.—Variable; several species-names of the same general geographical region are probably to be referred to it, or they may represent very closely related species.

29. **nàna,** Stokes (*Amýgdalus nàna*, Linn.). RUSSIAN ALMOND. Fig. 3227. Bush, 3–5 ft. high: lvs. narrowly elliptic or elliptic-lanceolate, 2 or 3 in. long, thick and rather stiff, scarcely pointed, lighter colored and the veins prominent beneath, smooth, the edges set with sharp spreading saw-like teeth: fls. usually solitary, rose-color or white, nearly 1 in. or less across, sessile, with or just preceding the lvs.: fr. small and hard, pubescent, bitter, with a large wrinkled sharp-pointed somewhat cordate, unequal-sided pit. Russia and W. Asia. B.M. 161. L.B.C. 12:1114. —This plant has been intro. into this country recently as a fr.-plant, although it possesses little merit for that purpose. It is cult. in Eu. for its fls. and it has been thought that the flowering almond of our gardens belongs to it; but our flowering almonds are *P. triloba* and also in part *P. glandulosa* and *P. japonica*. This Russian almond is very hardy, enduring the climate of the northern Prairie states, where it ripens its little almond-like frs. in July. A small-fruited form of the apricot (*P. Armeniaca*) has been intro. as Russian almond. *Prunus nana* is cult. in 2 or 3 forms. Var. **campéstris,** Hort., has white fls. of larger size. Var. **geórgica,** DC., has dark rose-colored somewhat smaller fls. and narrower, longer lvs. Var. **cochin-chinénsis,** Hort., is a larger plant with white fls. Var. **rùbra,** Hort., has red fls. over ½in. across. G.C. III. 52: suppl. Nov. 23 (1912). For another use of the name *P. nana* (for the choke cherry), see No. 72.

30. **Sweginzòwii,** Koehne. Small glabrous shrub very like *P. nana*, distinguished by large and lf.-like stipules and unequal very sharp double teeth of the lvs.: fls. deep rose-colored; calyx tubular, nearly ½in. long, the lobes oblong and glandular-fimbriate; petals oblong-obovate with cuneate base, nearly ½in. long. Turkestan.

31. **Fenzliàna,** Fritsch. Much like *P. communis*, but lower and more bushy and thorny: lvs. smaller, gray-green or bluish green: fls. more nearly white: fr. more peachlike in form, being not so pointed or elongated as in *P. communis*, but scarcely fleshy; stone shorter and more nearly orbicular in outline. Caucasus.—Said to be a very showy early-blooming species.

AA. *Plant a tree or tree-like.*

B. *Fr. hard, splitting at maturity.*

32. **commùnis,** Fritsch (*Amýgdalus commùnis*, Linn. *Prùnus Amýgdalus*, Stokes). ALMOND. Figs. 161–163, Vol. I. Peach-like tree, 10–25 ft. tall, with gray bark: lvs. lanceolate, firm and shining, very closely serrate: fls. large (1 in. and more across), solitary and appearing before the lvs., pink, showy: fr. a large compressed drupe with hard flesh, splitting open at maturity and liberating the pitted stone (or almond). Asia. Gn. 50:312 and G. 29:291 (var. *macrocarpa*); Gn. 54:122. —Grown as an ornamental tree, but chiefly for the nuts (pits or stones of the fr.). There are double-fld., white-fld., and variegated-lvd. forms, also dwarf and weeping forms, under such names as *albo-plena*, *roseo-plena*, *purpurea*, *compacta*, *variegata*, *pendula*. The forms may be ranged in two classes: Var. **týpica,** Schneid., the hard-shelled almond, grown mostly for ornament, although there are bitter-kerneled and sweet-kerneled forms (vars. *amara* and *dulcis*); var. **frágilis,** Schneid., the soft-shelled or brittle-shelled almond, of which there are also vars. *amara* and *sativa*. See *Almond*. **P. persicoìdes,** Asch. & Graebn. (*Amýgdalus commùnis* var. *persicoìdes*, Ser. *A. persicoìdes*, Zabel), is an old hybrid of *P. Persica* and *P. communis*, with foliage much like the latter but usually more sharply toothed, and fr. intermediate or perhaps more peach-like, usually ovoid-obtuse and little succulent.

BB. *Fr. soft and fleshy, usually not cracking or opening to the stone.*

33. **Pérsica,** Sieb. & Zucc. (*Amýgdalus Pérsica*, Linn. *Pérsica vulgàris*, Mill.). PEACH. Figs. 2785–2791. Much like the almond in botanical characters and by some thought to be derived from that plant, but now generally agreed to be an original species and to be native to China (Fig. 2791, p. 2495): lvs. broad-lanceolate or oblong-lanceolate, coarsely serrate, the petiole usually gland-bearing and ½in. or less long (shorter than the width of one side of lf.-blade): fls. solitary, pink, appearing before the lvs., the sepals more or less pubescent on outside: fr. soft, pubescent at maturity, the stone deep-pitted and very hard. Widely cult., especially in N. Amer., where it thrives under a great variety of conditions.—There are 2 well-marked forms, the clingstones or pavies (*Persica vulgaris*, Risso), and the freestones (*Persica domestica*, Risso). There are many ornamental forms of the peach tree: double-fld., Fig. 2789. (F.S. 10:969; 13:1299, 1300. R.H. 1852:221); white-fld., dark-fld., etc.; purple-lvd.; variegated-lvd.; dwarfs. These forms are catalogued

3228. Prunus Davidiana (×½). No. 34.

XCIII. Prunus serrulata var. sachalinensis.—The form Fugenzo.

under such names as *Persica vulgaris flore albo-plena, flore roseo-plena, flore sanguinea plena* representing different colors of double-fld. peach, and *P. vulgaris foliis purpureis* representing the purple- or blood-lvd. peach. One of the best of these fancy forms is var. **camelliæflòra,** Hort., with its subvar. *plena,* the former with very large carmine fls. and the latter with double fls. (Fig. 2789). There are forms (var. *versicolor*) with different colors of fls. on different branches of the same tree; also compact or dwarf, pyramidal, weeping, and purple-lvd. forms. See *Peach.*

Var. **nucipérsica,** Schneid. (*Amýgdalus Pérsica* var. *nucipérsica,* Linn. *Pérsica nucipérsica,* Borkh. *Pérsica lævis,* DC. *Prùnus Pérsica* var. *lævis,* Gray. *Amýgdalus nectarìna,* Ait. *Prùnus Pérsica* var. *necturìna,* Maxim.). NECTARINE. Fig. 2453, p. 2116. Fr. smooth, usually smaller: lvs. usually more strongly serrate. The nectarine is said to have sprung from the peach, both through seed- and bud-variation. There are 2 types, as in the peach: clingstones or *brugnons* (*Persica lævis,* Risso), and freestones (*Persica violacea,* Risso). The nectarine is not generally cult. in this country, although it is popular in Calif.

3229. Prunus pumila.—Sand cherry (×½). No. 35.

Var. **platycárpa,** Bailey (*Pérsica platycárpa,* Decne.). FLAT PEACH. Fr. much flattened endwise, and scarcely thicker in that direction than the length of the pit or stone, with a calyx-like eye or broken cavity at the top; stone small, flat, compressed, rough, and irregular. China. R.H. 1870:111. Trans. Hort. Soc., Lond. 4:512.—Grown in the southern states, where it has given rise to various globular peaches. The Peen-to is a form or variety (Fig. 2784, p. 2493) originated in 1869 with P. J. Berckmans, Augusta, Ga., from seeds sent from Austral., where it was probably intro. from China; on account of its very early blooming, this variety is not grown commercially in any of the regular peach sections of the U. S., as it is very likely to be caught by frosts, nor is the quality superior; for S. Fla. and the tropics, it is of value; the fr. is of medium size, strongly flattened on the ends, greenish, with red cheek, flesh light yellow and of good flavor but with a slight bitter-almond taste, cling, the stone small and flat.

34. **Davidiàna,** Franch. (*Pérsica Davidiàna,* Carr. *Prùnus Pérsica* var. *Davidiàna,* Maxim.). Fig. 3228. Slender willow-like tree: lvs. narrower and smaller than those of the peach, tapering from near the base into very long acuminate points, very sharp-serrate, light green, willow-like: fls. appearing very early, 1 in. or more across, blush or light pink, solitary, the sepals glabrous: fr. nearly globular, the suture prominent, about 1 in. diam., pubescent, grayish or yellowish; stone small and nearly spherical, ruminated, free from the whitish dry flesh. China. R.H. 1872, p. 75. G.F. 10:503. Gt. 44:1412. G.C. III. 11:529. Var. **álba,** Bean (var. *albiflòra,* Schneid. *Pérsica Davidiàna* var. *álba,* Carr.). Fls. white. Gn. 50, p. 165. G. 28:5. Somewhat grown as an ornamental subject. Hardy in the North, but the fl.-buds are usually killed. It blooms very early, much in advance of peaches. It is said to be used in China as stock for many stone-fruits, and tests (particularly as a peach stock) are now under way in this country.

Subgenus III. CERASUS. Cherries.

Fr. globular or oblong, not sulcate, glabrous and usually not glaucous, the stone turgid (usually nearly globular), and rarely conspicuously longer than broad and smooth: fls. in umbel-like fascicles (mostly solitary in *P. tomentosa*), commonly with or immediately preceding the lvs.

A. *Fls. arising from 2 lateral buds (the central one usually a lf.-bud or branch-bud) on the previous season's growth, usually appearing in advance of the lvs., the pedicels having no common peduncle outside or beyond the bud-scales: petiole usually very short: plant dwarf.* (*Microcerasus.*)

B. *Sepals or calyx-lobes reflexed: fls. pedicelled and umbellate, 4 or less (sometimes only 1).*

C. *Lvs. entire at base or below the middle, very shallowly serrate toward the apex: fr. black at maturity.*

35. **pùmila,** Linn. SAND CHERRY. DWARF CHERRY. Fig. 3229. Decumbent or prostrate at the base when old, but the young growth strictly erect and often reaching 5–8 ft. in height, the slender twiggy growth reddish and glabrous: lvs. narrowly oblanceolate, acuminate, short-pointed or nearly obtuse, the margins above very closely serrate, dull green above and whitish green beneath: fls. small, in 2–5-fld. umbels, the pedicels slender: fr. nearly globular, purple-black, on slender sts. On sandy and rocky inland shores from E. Que. to Man. and south to the District of Columbia; common on sand-dunes along the Great Lakes.—The fr. is small and usually scarcely edible, the flesh being astringent. The species is common on dunes of the Great Lakes. It is in cult. as an ornamental plant, for which it is worthy, although it is much attacked by the twig-blight (caused by the fungus Monilia). There are reputed crosses between this species and native plums.

36. **cuneàta,** Raf. (*P. pùmila* var. *cuneàta,* Bailey). Fig. 3230. Erect, 1–4 ft.: lvs. thin, oval, short-obovate or spatulate, strongly toothed, especially at apex: fls. larger. Bogs and cool woods and about lakes in the northern states, and in the mountains as far south as N. C.—Not in the trade, so far as known, and not promising horticulturally.

37. **Bésseyi,** Bailey (*P. pùmila* var. *Bésseyi,* Waugh. *P. Ròsebudii,* Reagan. *P. prunélla,* Daniels). WESTERN SAND CHERRY. Figs. 3231, 3232. Known from *P. pumila* by its more prostrate habit, lvs. spreading (more erect in *P. pumila*), broad and thick, usually elliptic, elliptic-oval, or elliptic-lanceolate: stipules on strong shoots, large and green, serrate: fr. nearly or quite twice larger, on short stalks, usually sweet, in certain selected forms as much as ¾in. diam. This is the sand cherry of the Plains and the W., ranging from Kans. to Man., and west to Wyo. and Colo. B.M. 8156.—The original of the Improved Rocky Mountain cherry, a plant grown for its large sweet fr. Large-fruited forms of this species are much prized on the Plains for pies and other cookery, and the species is promising horticulturally. Many hybrids with other species of Prunus have been secured by Hansen. The species is useful as a stock for certain other cherries, plums, and

3230. Prunus cuneata (×½). No. 36.

even peaches for cold countries where the trees must be protected. See Hansen, Bull. No. 87, S. Dak. Exp. Sta. (1904), and subsequent bulletins.

cc. *Lvs. usually serrate or crenate to the base, sometimes double-serrate: fr. red.* Nos. 39 and 40 are the dwarf or "flowering" cherries of gardens, often confused with the flowering almond (*P. triloba*) but distinguished by the longer pedicellate fls. which usually are not solitary from the bud.

38. **utahénsis,** Dieck. Utah Hybrid Cherry. Apparently a hybrid of *P. angustifolia* var. *Watsonii* and *P. Besseyi*. A small tree-like bush: lvs. lance-elliptic to oblong-oval, short-pointed or nearly blunt, finely serrate, slightly conduplicate, glossy above and much reticulated beneath: fr. cherry-like, somewhat larger than that of *P. Besseyi* (about ⅝ or ¾in. diam.), of deep mahogany-color, with a thin plum-like bloom, a thin flesh and a relatively large cherry-like stone.—Appears to have been raised about 50–60 years ago from seed of *P. Besseyi* (*P. Watsonii* grew near) by J. E. Johnson, in Nebr. Mr. Johnson subsequently moved to Utah, whence the fr. was distributed. It has little value as a fr.-plant, but it is an attractive ornamental subject, both in fl. and fr.

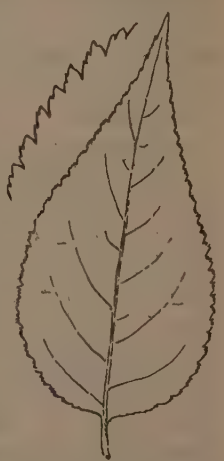
39. **japónica,** Thunb. (*P. nàna,* Hort., in part. *P. sinénsis,* Hort., of Amer. gardens). Fig. 3233. Bushy plant, rarely over 5 ft. high: lvs. ovate, ovate-orbicular, or otherwise on the broad order (rarely as narrow as ovate-lanceolate) acuminate or even caudate, not at all inclined to be lobed, coarsely double-serrate or crenate, glabrous beneath or short-hairy on midrib and nerves: fls. in 2's and 3's, rose-colored or blush, stalked (the stalks lengthening), appearing with the lvs.: fr. globular or short-oblong, ½in. diam., smooth and shining, wine-red. Cult. from Japan, but probably native to China. To what extent this species is cult. in this country is yet to be determined. It runs into several well-marked forms. Var. **eujapónica,** Koehne. Branches erect and virgate: lvs. short- and broad-acuminate, the primary teeth short and obtuse but not truly triangular; blade beneath glabrous at maturity or lightly hairy on rib and nerves, rounded at base: fls. simple (not double). Var. **gracíllima,** Koehne. Branches wide-spreading, the branchlets very slender and somewhat deflexed: lvs long- and narrow-caudate, mostly cordate at base, the primary teeth longer and more acute, and exactly triangular: fls. simple (not double), white or rose. Var. **Thúnbergii,** Koehne. Mature lvs. glabrous beneath: lvs. long- and narrow-acuminate, the teeth truly triangular: fls. pale rose, on pedicels about ⅛in. long; petals ⅛in. long, the stamens shorter; style sparsely pilose at base. Var. **Éngleri,** Koehne. Differs from var. *Thunbergii* in the mature lvs. being short-hairy and the midrib and nerves beneath and pedicels twice or more as long (becoming ¾in. long in fr.): petals ⅓in. or more long, pale flesh-color; stamens ¼–⅓in. long; style glabrous or hairy at base. Var. **Kérii,** Koehne. Fls. semi-double, the petals numerous; ovaries usually 2: lvs. glabrous beneath. B.R. 27 and R.H. 1852: 301 (both as *P. japonica*). B.M. 2176 (as *Amygdalus pumila*).

3231. Prunus Besseyi (×½). No. 37.

40. **glandulòsa,** Thunb. Fig. 3227. Long confused with *P. japonica,* but differing markedly in the foliage: lvs. ovate-oblong, oblong, oblong-lanceolate, or otherwise on the narrow order, little or not at all acuminate but gradually tapering, widest at or below the middle, closely serrulate or crenate-serrate, sometimes in part somewhat doubly serrate, glabrous beneath or slightly hairy along the midrib: fls. about 2 from the bud, slender-stalked (pedicels about ⅜in. long at anthesis), blush, pink or white. China. B. M. 8260 (as *P. japonica*).—*P. glandulòsa,* Torr. & Gray (*Amygdalus glandulòsa,* Hook.), the "wild peach," a very different plant on prairies in Texas, promising, must take the name *P. texana,* Dietr. (*P. Hookeri,* Schneid.). The *P. glandulosa,* Thunb., assumes many forms. Var. **glàbra,** Koehne. Fls. simple or double, white or rose, with glabrous pedicel and style: stipules persistent: lf.-blade glabrous both sides or hairy in the axils of veins beneath: young branchlets pulverulent at base. B.R. 1801, (as *P. japonica,* white-fld.). I.H. 5:183 (as *P. japonica flore albo-plena*). Var. **Púrdomii,** Koehne, probably not cult.: differs from var. *glabra* in petioles and pedicels being puberulent: fls. simple; style glabrous. Var. **trichóstyla,** Koehne. Fls. single or double, white or rose, the pedicels glabrous or puberulent, style pilose at base: stipules persistent: young branchlets glabrous or pulverulent: fls. white, about ¾in. across. Frequent in cult.; it has been described under such names as *Prunus sinensis, P. japonica flore-pleno,* and *Cerasus japonica.* The growth is wiry and erect, the branches glossy and purple-brown. Var. **salicifòlia,** Koehne. Stipules deciduous: fls. mostly only 1 from a bud: branches erect and virgate, to 3 ft. high, glabrous: lf.-blade narrow, or linear-elliptic, acuminate or acute, simply or doubly serrate. Liao-tung Peninsula; probably not cult.—*P. glandulosa* is a common "flowering almond" of American gardens. It is cult. chiefly in two forms, the double white (var. *glabra* forma *albiplena,* Koehne), and the double pink (var. *trichostyla* forma *sinensis,* Koehne). What other botanical forms may be in cult. as flowering almond needs to be determined.

3232. Western sand cherry.—Prunus Besseyi (×½). No. 37.

41. **hùmilis,** Bunge. Erect shrub, 1–4 ft. high, with slender dark brown branches: lvs. 2 in. or less long, elliptic-ovate, somewhat acute, short-petioled, serrulate, bright green above, lighter colored beneath, the linear stipules glandular-ciliate: fls. solitary or in pairs, broadest above the middle, short-peduncled and short-pedicelled, white with red-based petals, ½in. diam., appearing with the lvs.; calyx-lobes oblong, obtuse, and ciliate, as long as the tube; petals twice exceeding calyx-lobes or sepals, orbicular and crenulate: fr. ½in. long, ovoid-globose, red. N. China. B.M. 7335.



3233. Leaf of Prunus japonica (×1). No. 39.

BB. *Sepals or calyx-lobes erect or erect-spreading: fls, mostly 1 or 2, pedicels short or none.*

42. **tomentòsa,** Thunb. (*Cérasus tomentòsa,* Wall.). Small compact but wide-spreading tree, or in Amer. a tree-like bush, the young growths pubescent-tomentose: branches close-jointed, causing the lvs. and fls. to be numerous: lvs. broad-oval to short-obovate, short-stalked, abruptly contracted into a short point, the margins incisely and sometimes unequally serrate, dull and rugose above, densely pubescent-tomentose beneath: fls. white as to petals but with bright red calyx and pedicel, small, sessile, usually 1 or 2 at a joint, appearing just before the lvs. or as the lvs. begin to unfold, from pink buds: fr. light red, globular, the size of a very small cherry, sessile or very short-stalked, sparsely hairy, eaten in Japan. N. China and Manchuria. B.M. 8196. A.G. 12:77. G. F. 5:581.—A worthy hardy small tree, making a very dense top, and quite unlike most other cherries in appearance. On floral characters the species gives rise to many forms, 2 or 3 of which are in cult.

3234. Prunus triloba var. plena. (Nearly nat. size.) No. 27.

Var. **Spaethiàna,** Koehne. Fls. white, appearing with the lvs., and somewhat scattered on the branches, the petals about ⅓in. broad; calyx-lobes or sepals somewhat longer than the tube. Var. **Graebneriàna,** Koehne, differs from var. *Spaethiana* in the large fls. (petals ⅓in. broad) which are crowded, and calyx-lobes about equaling the short-tubular calyx-tube. Var. **endôtricha,** Koehne. Lvs. elliptic or oblong, 1–2 in. long, the petiole very short: fls. white, very abundant: fr. about ½in. long and nearly as broad, dark red, sparingly pilose.—*P. tomentosa* is hardy even in the Dakotas, and improved fruit-bearing races of importance are likely to arise.

43. **incàna,** Stev. (*Cérasus incàna,* Spach. *Amýgdalus incàna,* Pall. *A. nàna* var. *incàna,* Loud.). Slender-twigged shrub of medium size (3–5 ft.): lvs. small, the petiole short and soft-hairy and glandless or bearing glands at the top, the blade about 2 in. long (1–2½ in.), ovate-oblong, elliptic or lance-elliptic, short-pointed or obtuse, finely sharp-toothed, white-tomentose beneath: fls. mostly in 2's, appearing with the lvs. or just in advance of them, light rose-color, about ½in. across, the petals emarginate, the pedicels not exceeding the bud-scales: fr. bright red, the size of a pea, smooth, juicy. S. E. Eu. and W. Asia. R.H. 1853:281. B.R. 25:58. Gt. 44, p. 243 (lf.).—**P. Maûreri,** Zabel, is a hybrid of *P. incana* and *P. pumila.*

44. **prostràta,** Labill. (*Cérasus prostràta,* Loisel.). Crooked or scraggy shrub to 6 ft., with tomentose somewhat erect or spreading branches: lvs. 1 in. or less long, short-ovate or ovate-orbicular, rarely lanceolate, obtuse, serrate, mostly very white beneath, the petiole short and glandless: fls. mostly single (sometimes fascicled), rose-red, appearing with the lvs., nearly sessile; calyx-tube about ¼in. long, cylindric, pubescent or glabrous, the lobes oblong, obtuse, and entire; petals exceeding calyx-lobes or sepals, very broad: fr. ⅓in. diam., ovoid or nearly globular, dry, red-purple. S. E. Eu. and S. W. Asia.

45. **microcárpa,** C. A. Mey. (*Cérasus microcárpa,* Boiss. *P. diffùsa,* Schneid.). Shrub of variable habit, 7 ft. or less high, bark dark brown or tawny, branches usually pubescent when young: lvs. small (about 1 in. or less long), broad-ovate or ovate-elliptic or lance-oblong, somewhat acute, serrate, glabrous or somewhat pubescent; petioles very short, thinly pubescent: fls. 2 or few together, about ½in. across, pale rose or white, appearing with the lvs. or just preceding them, on pedicels ½in. or less long; calyx-tube reddish outside. the lobes very short and ovate and ciliate; petals obovate, ¼in. or less long: fr. ovoid, about ¼in. long, red or yellowish. Asia Minor, Persia. B.M. 8360.

AA. *Fls. from a single bud above the lf.-scale, rather than from 2 lateral buds that spring from the scales at the base of the central bud as in* A (*where the buds are therefore typically in 3's, whereas in* AA *they are placed singly on the axial growth of the previous year or are clustered on spurs): infl. umbellate and sessile or branching and peduncled: petiole usually long, or at least prominent: plant a tree or tree-like in most species.* (*Typocerasus.*)

B. *Sepals or calyx-lobes reflexed.*

C. *Lvs. roundish,—nearly as broad as long: fl.-clusters on the ends of the branchlets.*

46. **Mahàleb,** Linn. (*Cérasus Mahàleb,* Mill. *Prùnus odoràta,* Lam. *Pàdus Mahàleb,* Borkh.). MAHALEB CHERRY. ST. LUCIE CHERRY. Small slender tree with hard glabrous branchlets: lvs. 2–3 in. long, light green, round-ovate to orbicular, abruptly very short-pointed, often subcordate at base, the margins closely callous-serrate: fls. small, fragrant, white, in small terminal umbels in May and June (in. N. Y.), appearing when the tree is in nearly full leaf: fr. very small, dark red, not edible. Cent. and S. Eu. and the Caucasus.—Extensively imported for cherry-tree stocks, and frequently run wild. There are several cult. forms, as: var. **chrysocárpa,** Hort., with yellow fr. (Gn. 62, p. 181); var. **álbo-marginàta,** Dipp., with white-edged lvs.; var. **variegàta,** Hort., with variegated foliage; var. **péndula,** Hort., with weeping or drooping branches (G.M. 44:210); var. **globòsa,** Dieck, with rounded head; var. **compácta,** Hort., with compact condensed head; var. **monstròsa,** Kirchn., has very short and thick branches and branchlets; var. **Cupaniàna,** Fiori & Paol. (*P. Cupaniàna,* Guss.), is smaller than the type: lvs. much smaller (½ to about 1 in. long): peduncles short, 3–6-fld.: fls. smaller. Sicily. Var. **transilvánica,** Schur. Fls. small, numerous in the cluster; sepals reflexed. Transylvania.

3235. Prunus pennsylvanica (×½). No. 49.

CC. *Lvs. distinctly longer than broad: fl.-clusters mostly lateral.*

D. *Fl.-clusters branching and leafy (with prominently broad lf.-like bracts).*

47. **Maximòwizcii,** Rupr. Tree, to 50 ft., with horizontal branches: lvs. obovate or elliptic-obovate, coarsely double-toothed, prominently veined, glabrous, rather short-acuminate, the petiole hairy and glandless and about ½in. long: fls. white, about ¾in. across, long-pedicelled, appearing with the full foliage on slender open leafy-bracted peduncled clusters, the stalks, broad serrate bracts, and calyx hairy: fr. size of small pea, black. Manchuria, Korea, Saghalin, Japan.—A distinct and attractive species.

DD. *Fl.-cluster a small umbel, very short-pedunculate.*

48. **pilosiúscula,** Koehne. Shrub, or tree to 40 ft., and a trunk to 16 in. diam.: lvs. obovate or obovate-oblong, some specimens broader, base mostly rounded or emarginate, more or less acuminate, very strongly and often somewhat incisely doubly or simply serrate, the teeth acuminate and glandless or very nearly so, mostly glabrous above and hairy or glabrous beneath; petiole ¼–½in. long, slightly hairy or glabrous, with 2 glands at apex or on the base of the blade: fls. with or just preceding the lvs., pink, solitary or mostly 2 or 3 together, the bracts oblong to rotundate and glandular-serrate, persistent, the peduncle very short to ½in. long, the pedicels ½ to more than 1 in. across; calyx-tube glabrous; lobes triangular, obtuse or acute, glabrous or at the apex sparsely ciliate; petals about ⅛in. long, oval: fr. oblong, red. Cent. and W. China. Var. **mèdia,** Koehne, differs in having hairs on the midrib and nerves of the lf. underneath.

DDD. *Fl.-clusters sessile, umbellate, not branching.*

E. *Teeth of lvs. very short or small: native bird cherries, bearing very small white fls. on slender pedicels in naked small lateral umbels, and a profusion of very small red or black frs.*

49. **pennsylvánica,** Linn. (*Cérasus pennsylvánica,* Loisel. *C. boreàlis,* Michx. *Prùnus boreàlis,* Poir. *P. persicifòlia,* Desf. *Cérasus persicifòlia,* Loisel.). Common Wild Bird or Pin Cherry. Fig. 3235. Shallow-rooted tree with slender red-barked branches, 25–40 ft. high and sometimes 1½ ft. in diam. of trunk: lvs. oblong-lanceolate-acuminate, light green and rather thin, closely sharp-serrate: fls. small, white, slender-stalked, appearing with the lvs., in 2's or 3's: fr. the size of a pea, light cherry-red, the flesh thin and sour and somewhat puckery; stone oblong. Sandy and rocky lands, Newfoundland to Brit. Col., and south in the mountains to Colo. and N. C. S.S. 4:156. B.M. 8486. —Where the tree grows naturally, it often sprouts inveterately and becomes a nuisance. When bruised, the wood has a strong peach-like odor. It is an interesting ornamental tree, however. In poor soils, it is often little more than a bush. On large trunks the bark tends to peel in transverse strips. Var. **saximontàna,** Rehd., of the Rocky Mt. region, is shrubby in growth, with smaller and broader pale green lvs. and few-fld. sessile umbels.

50. **emarginàta,** Walp. (*Cérasus emarginàta,* Douglas). Shrub, 3–10 ft. high, sometimes a small tree, forming dense thickets: lvs. oblong-ovate or oblanceolate, mostly obtuse, closely serrate, often somewhat pubescent beneath: fls. tinged green, appearing with the lvs. in 6–12-ft. glabrous or pubescent corymbs: fr. larger than that of *P. pennsylvanica,* almost black when ripe, the flesh thin and bitter; stone ovoid. Mountains, Brit. Col. to Calif. S.S. 4:157.—Sometimes offered as an ornamental tree.

51. **móllis,** Walp. (*P. emarginàta* var. *móllis,* Brew. *Cérasus móllis,* Douglas). Small tree, reaching 30–50 ft., straight and graceful, with reddish cherry-like bark: young growth soft-pubescent: lvs. 1–3 in. long, obovate to oblong or oblanceolate, mostly acute, serrate, nearly or quite glabrous above, pubescent underneath, the stipules narrow and laciniate: fls. white, in 5–10-fld. clusters; calyx-lobes oblong, obtuse, and entire, becoming reflexed, much shorter than the tube; petals obovate, about 2 lines (⅙in.) long: fr. ⅓in. or less long, bright red, very bitter; stone wrinkled, keeled on one edge. Woods, Brit. Col. to Calif.

3236. Weeping dwarf cherry of Europe, grafted on Morello stock. One of the best of the small ornamental species, and known under several names in nurseries.—Prunus fruticosa var. pendula. (No. 52.)

EE. *Teeth of lvs. mostly prominent (exception in No. 52).*

52. **fruticòsa,** Pall. (*P. Cérasus* var. *pùmila,* Linn., not *P. pùmila,* Linn., *P. Chamæcérasus,* Jacq. *P. pùmila,* Hort. *P. intermèdia,* Poir. *Cérasus Chamæcérasus,* Loisel. *C. hùmilis,* Hort. *Cérasus sibírica,* Hort.). Dwarf Cherry, or Ground Cherry, of Eu. Spreading bush, 2–4 ft. high, with slender glabrous branchlets: lvs. varying from obovate to oblanceolate and lanceolate, the apex acuminate or sometimes almost obtuse, closely serrulate, thickish, shining above, the petiole short: fls. white, in nearly or quite sessile umbels: fr. small, globular, purple-red, very sour. Highlands and mountains of Germany, Austria-Hungary, and S. Russia.—**P. éminens,** Beck, is a hybrid of *P. fruticosa* and *P. Cerasus.*

Var. **péndula,** Dipp. (*Prùnus* and *Cérasus japónica péndula,* Hort.), is a most ornamental form with drooping branches, excellent for top-working on standard stocks (Fig. 3236). G.W. 10, p. 511. This is sometimes confounded with *P. semperflorens* (No. 53), but is distinguished at once by its foliage, its early blooming, its fls. in clusters, and its dwarf habit. This is the form of *P. fruticosa* chiefly known in this country. A similar pendulous form, but with larger and more crenate-serrate lvs., is known as *P. reflèxa,* Hort.; perhaps a hybrid of *P. fruticosa* and *P. semperflorens.* Var. **variegàta,** Hort., has lvs. marked with yellowish white.

53. **Cérasus,** Linn. (*Cérasus vulgàris,* Mill. *C. caproniàna,* DC. *P. austèra,* Ehrh.). Sour, Pie, or Morello Cherry. Figs. 907, 910, Vol. II. Rather low round-headed tree with gray bark and no central leader (compare Figs. 907 and 906, Vol. II), suckering from the root: lvs. ovate-obovate or short-ovate, abruptly short-pointed, stiff and parchment-like and

more or less glossy above, light or gray-green: fls. in small clusters from lateral buds mostly in advance of the lvs., the scales of the fl.-buds small; calyx-tube glabrous, little if any constricted at top, the lobes deflexed and crenate, obtuse: fr. roundish or depressed-globular, red, soft-fleshed, acid; stone globular. Native to Asia

3237. Prunus Cerasus var. semperflorens (×⅓). No. 53.

Minor and perhaps to S. E. Eu.—*P. Cerasus* is the common pie cherry of old yards. It escapes into fencerows and other waste places, forming dense thickets, as does the plum. It sprouts from the root. The various Morellos belong here; also the Montmorency, Louis Phillippe, and others. There are at least 2 well-marked groups of these pomological cherries—those with uncolored juice (Amarelles, the *Prunus acida* of some), and those with colored juice (Morellos or Griottes). To the former group belong the Montmorency, Early Richmond, and several early varieties. Many botanical Latin names have been applied in this group of cherries, and the interpretation of the relative systematic standing of the different forms is much confused. For our purpose, the leading forms may be ranged as follows: Var. **frutéscens,** Schneid. (*P. ácida,* Koch), comprising the bushy small-fruited spontaneous or run-wild forms. Var. **týpica,** Schneid., comprising the tree-like cult. forms of many kinds. To this latter group or class belong not only the orchard sour cherries, but also such ornamental varieties or groups as follow. Var. **Rhéxii,** Kirchn. (var. *ranunculiflòra,* Hort.). Fls. double, white. F.S. 17:1805. Gn. 78, p. 228. Var. **persiciflòra,** Koch. Fls. full, double, light rose or pink. Var. **variegàta,** Hort. Lvs. variegated with yellow and dull white. Var. **aucubæfòlia,** Dipp. Lvs. spotted with yellow. Var. **cucullàta,** Kirchn. Lvs. puckered or blistered. Var. **globòsa,** Spaeth. Low round-headed small-lvd. bush.

By some authors, the species is divided into the Eucerasus (i.e. true Cerasus) group, comprising the tree-form kinds, with strong branches erect or ascending or perhaps somewhat drooping with age, lvs. and petioles with or without glands, large or good-sized fr. with globular or only rarely ovoid stone; and the Acida group (*P. acida,* Koch, not Ehrh.), comprising the more bush-like forms (as the Ostheim), with more drooping or hanging branches, short gland-bearing petioles, and smaller globular fr. with ovoid stone about ½in. or less long. To this latter race probably belong several forms more or less cult. for ornament, as *P. ácida* var. *dumòsa,* Hort., a bushy form blooming profusely when young. Gn. 78, p. 201.

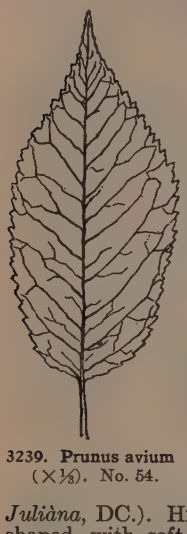
Var. **semperflòrens,** Loud. (*P. semperflòrens,* Ehrh. *Cérasus semperflòrens,* DC.). Everblooming Cherry. All-Saints' Cherry. Figs. 3237, 3238. A horticultural state of *P. Cerasus* var. *typica:* small tree or a bush, usually top-worked on other stock, with a straggling or drooping habit, the slender twigs glabrous: lvs. oval to oblong-obovate, short-pointed (or acuminate on the strong shoots), irregularly dentate, rather hard and firm in texture: fls. white, on long axillary and terminal peduncles from May till September: fr. like a small pie cherry, but mostly longer-stalked and smaller, dark red.—Its habit of blooming all summer makes it a desirable ornamental subject. The lvs. resemble those of *P. Cerasus,* except that they are smaller. Known in France as *Cerisier de la Toussaint* ("All-Saints' cherry") and in Germany as *Allerheiligen Kirsche.* There is a form with yellow-variegated lvs. The Everblooming cherry appears to be very little planted in this country, but it is an interesting form.

54. **àvium,** Linn. (*Prùnus Cérasus* var. *àvium,* Linn. *Cérasus àvium,* Moench. *C. nìgra,* Mill. *C. dúlcis,* Gaertn.). Sweet Cherry. Mazzard. Figs. 3239; also Figs. 906, 908, 909, Vol. II. Tall robust tree with red-brown bark, sometimes 100 ft. high, the young trees with a strong central leader and pyramidal growth, the old seedling trees sometimes becoming 2 ft. and more in diam. (see Fig. 908, Vol. II): lvs. generally oblong-ovate and gradually taper-pointed, dull and soft in color and texture, hanging as if limp on the young growths: fls. in dense clusters on lateral spurs and appearing with the hairy strongly conduplicate young lvs., the scales of the fl.-buds large and persistent for a time; calyx-tube glabrous, constricted near the top, the lobes reflexed and entire: fr. globular, depressed-globular or heart-like, mostly sweet, yellow or red. Eu. and W. Asia.—The parent species of the many sweet cherries (and also of the May Duke class), and now run wild in many parts of the E. The run-wild and common seedling forms, with small frs., are known under the general name of Mazzard cherries.

3238. Prunus Cerasus var. semperflorens. (Spray ×⅓)

Mazzard stocks, mostly imported, are used as stocks for cherries, although Mahaleb is more popular with propagators because (like the Myrobalan plum) it is easier and cheaper to grow, runs more uniform and is capable of being budded through a long season.

There are many ornamental forms of the *P. avium*, as: var. **pyramidàlis,** Hort., tree making a pyramidal crown; var. **péndula,** Hort., with drooping branches (Gn. 59, p. 267); var. **variegàta,** Hort., with yellow and dull white markings on the foliage; var. **asplenifòlia,** Kirchn., with deeply toothed and cut lvs.; var. **plèna,** Hort., with double fls. (G.M. 53:9. G.W. 6, p. 329. Gn. 78, p. 242); var. **salicifòlia,** Dipp., with very narrow lvs. *P. Fontanesiàna,* Schneid. (*Cérasus Fontanesiàna,* Spach. *P. grœca,* Desf.), is probably a hybrid of *P. avium* × *P. Mahaleb,* like *P. avium* in habit: young branchlets pubescent: lvs. about 4 in. long, differing from those of *P. avium* in the more crenate gland-tipped serrations: does not produce fr. To *P. avium* are to be referred such garden names as *P. angustifolia, P. heterophylla,* and others.



3239. Prunus avium (×⅛). No. 54.

Var. **Juliàna,** Bailey (*Prùnus Cérasus* var. *Juliàna,* Linn. *Cérasus Juliàna,* DC.). Heart or Gean Cherries. Fr. heart-shaped, with soft flesh, as in the varieties Governor Wood, Black Tartarian, Black Eagle. These are the *Guigniers* and *Heaumiers* of the French. A weeping form is known as *P. Juliana* var. *pendula.*

Var. **regàlis,** Bailey (*C. regàlis,* Poit. & Turp.). Duke Cherries. Differ from the Heart cherries in having an acid flesh (and for that reason often erroneously referred to *P. Cerasus*). May Duke is the leading representative. Said by Hedrick ("Cherries of New York") to be "unquestionably hybrids between the Sweet cherry and Sour cherry," *P. avium* and *P. Cerasus.*

Var. **durácina,** Bailey (*Prùnus Cérasus* var. *durácina,* Linn. *C. durácina,* DC. *C. Bigarélla,* Roem.). Bigarreau or Hard-fleshed Cherries. Distinguished by the firm breaking flesh of the fr., which is mostly of light color. Here belong the Windsor, Yellowish Spanish, Napoleon.

Var. **decumàna,** Koch (*C. decumàna,* Delann. *P. macrophýlla,* Poir. *P. nicotianæfòlia,* Thomps.). Lvs. very large (sometimes nearly 1 ft. long and 4–6 in. broad), somewhat heart-shaped. Grown for ornament.

bb. *Sepals or calyx-lobes erect-spreading.*

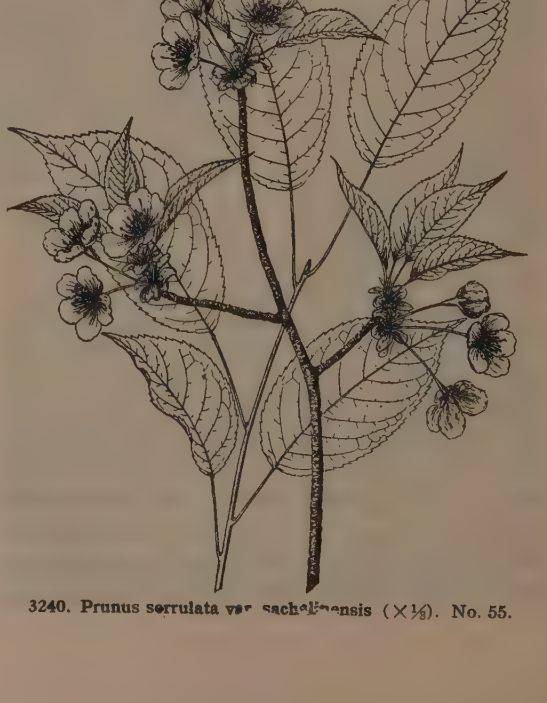
c. *Floral involucre (at base of infl.) large, about ½in. long or more: lvs. not lobulate or incised-double-serrate.*

d. *Fruiting pedicel not thickened, or only very gradually so at apex.*

e. *Calyx-tube acute at base, narrowly tubular or turbinate-tubular: fr. black. This group comprises the famous Japanese flowering cherries of midspring and later.*

55. **serrulàta,** Lindl. (*Cérasus serrulàta,* Don. *C. serratifòlia,* Carr. *Prùnus Pseudo-Cérasus,* Hort., not Lindl. *P. mutábilis,* Miyoshi, in part.) Japanese Flowering Cherry. Large tree, long in cult., but, like other Japanese and Chinese cherries, little known in Amer.: lvs. large (3–6 in. long and 2 in. or more broad), oval, ovate to obovate, abruptly long-acuminate, glabrous, glaucescent beneath, deep green, the prominent teeth short-aristate; petiole glabrous, glandless or with 1 or 2 small glands near apex: fls. white, not fragrant, semi-double, in a large glabrous infl., appearing with lvs. or just preceding them, in 3–5-fld. clusters on short or long peduncles, the bracts large, fimbriate, the pedicels to 1 in. long; calyx-tube glabrous, the ovate-acute lobes or sepals mostly exceeding the tube; style glabrous: fr. size of small pea, black. China, Japan, Korea. G.C. III. 7:609; 19:467. Gn. 56:300. A.G. 12:399.—This showy species occurs in cult. in many forms, with fls. whitish or pink and otherwise variable, often under the name of *P. Pseudo-Cérasus.* A very double pink and rather small-fld. form is forma *ròsea* Wilson (f. *Shidare-Sakura,* Koehne). Var. **spontànea,** Wilson, is a wild form in China, Korea, and Japan, with single white or pink fls. about ½in. across, and lvs. greenish brown to reddish brown when unfolding. This form is also cult. in the Orient. It makes a tree to 75 ft. high and 12 ft. in girth. Formæ of this variety are f. *hùmilis,* Wilson, bush or small tree with pale fls. and rather glaucous under surface of lvs., the peduncle elongated, cult. in Japan; f. *Kosioyama,* Wilson, fls. single, pinkish, lvs. slightly hairy on upper surface of midrib, cult. in Japan and intro. in this country; f. *prœcox,* Wilson, fls. single and rather small, pale pink, blooming in late winter in Japan, and also intro. in this country. Var. **pubéscens,** Wilson (*P. tenuiflòra, P. Leveilleàna, P. mesadènia, P. Veitchii, P. verecúnda,* Koehne. *P. quelpaertènsis,* Nakai). Lvs. pale green below and more or less sparsely pubescent, the petiole somewhat bearded, and pedicels pubescent: fls. single, white or pink. China, Korea, Japan; said by Wilson to have the widest distribution of any Japanese cherry, and it is there cult., and forms of it have been intro. in this country. Wilson recognizes the following formæ of this variety: *sáncta* (*Meigetsu*), lvs. slightly villous above and pale beneath, the fls. single, white changing to pale pink; *Shibayama,* fls. single and pink, of little horticultural value; *Taizanfukun,* first described under this species, is now referred by Wilson to *P. yedoensis.*

Var. **sachalinénsis,** Makino (*P. Pseudo-Cérasus* var. *sachalinénsis,* F. Schmidt. *P. sachalinénsis,* Koidz. *P. Sárgentii,* Rehd. *P. floribúnda,* Koehne). Fig. 3240. Large tree attaining a height, in its native places, of 60–80 ft. with trunk 9–13 ft. in girth and head 30–50



3240. Prunus serrulata var. sachalinensis (×⅛). No. 55.

ft. across, producing valuable wood: bark reddish and lustrous; older branches chestnut-brown. lvs. large, oval or ovate, abruptly slenderly acuminate, coarsely sharp-toothed, glabrous and lustrous, turning to crimson and yellow in autumn, mostly with glands on petiole or base of blade: fls. 2–4, very showy, rose-pink, appearing before the lvs., simple (not double), light rose-color, about 1½ in. across, the pedicels slender, to 1½ in. long and with glandular serrate bracts or involucre; petals obovate and emarginate; calyx-lobes ovate-lanceolate, acute, entire; stamens 20–25: fr. size of pea, bright red and becoming black and shining at maturity. June. N. Japan, Saghalin, Korea. B.M. 8411. G.C. III. 19:517; 55:346. G.F. 10:463 (shown reduced in Fig. 3240).—A tree of great ornamental value, hardy in N. Y. and Mass., bearing profusely of its handsome broad fls. From *P. serrulata* it is distinguished by its broader more coarsely serrate lvs., of which the serratures are scarcely pointed: lvs. glabrous, bronze-metallic green when unfolding, becoming yellow, orange, and crimson in autumn; serration simple and double on same lf., the teeth gland-tipped and mucronate or aristate: fls. appearing with the lvs. or slightly in advance, ½–1¾ in. across, rose, pink, or nearly white. The forms of var. *sachalinensis* comprise some of the hardiest and best of the flowering cherries of Cent. and N. Japan. Of this important and very worthy variety, the following formæ are recognized by Wilson, most of which have been intro. into N. Amer. recently and all of which are named flowering cherries of Japan: *Bénden*, pale pink single, or nearly single fls., of small horticultural value; *Hakkasan*, fls. pale pink, single or nearly so, of little value; *álbo-ròsea* (*P. Pseùdo-Cérasus*, var. *Shirofugen*, Spaeth), fls. pink in bud and changing to white as they expand, bearing 2 leafy green carpels in the center, handsome; *Fugenzo* (*P. Pseùdo-Cérasus*, G.C. III. 19:517. *P. Pseùdo-Cérasus* var. *James Veitch*, Gt. 51:497. *P. serrulàta* f. *Veitchiàna*, Koehne), one of the handsomest and known in cult. as James H. Veitch, with rose-pink fls. bearing 2 leafy carpels in center; *Hisakura*, fls. pale pink, double, one of the handsomest; *Horinji* (*Cérasus Juliàna flòre ròseo plèno*, Carr. R.H. 1874, p. 20. *C. Capronìana flòre ròseo plèno*, Van Houtte. F.S. 21:2238), fls. in clusters, pale pink and semi-double; *fasciculàta* (*Itokukuri*), fls. double pink, clustered at ends of shoots; *Kirin*, late-flowering, with large very double rose-colored fls., one of the best; *homógena* (*Kokonaye*), fls. pink, long-pedicelled and usually short-peduncled, double or semi-double, pink; *Masuyama*, a fine form with double rose-pink fls.; *Ohnanden*, a fine form with rose-pink double or semi-double fls.; *Sekiyama*, late, with large double rich rose-colored fls., thought by Wilson to be "the handsomest of all Japanese double-fld. cherries;" *supérba* (*Shogetsu*), rather late, good, very large, double, pale pink, long-pedicelled; *Shujaku*, fls. borne in great profusion, double, rose-pink; *spiràlis* (*Udzuzakura*), a good form producing pink double fls. freely near ends of branches, with short peduncle and long pedicels.

Prunus Pseudo-Cerasus, Lindl. (*P. involucràta*, Koehne), with which *P. serrulata* and other Japanese flowering cherries have been confused, is an entirely different species. It is not hardy in the northern states, and apparently is not in cult. in this country except perhaps under test in Calif. or elsewhwere. It belongs to another subsection of the genus, more nearly allied to *P. canescens* and *P. lobulata*, described under Nos. 65 and 66. It is grown in China and also in Japan for its edible red subglobose apiculate fr., which is about ½in. or less in diam.: small tree, to 25 ft., the shoots pale gray to purplish and sparsely pubescent when young: lvs. sparsely pubescent but glabrous above at maturity, ovate to broad-ovate, secondary veins few, acuminate, rounded at base, doubly serrate with broadly triangular teeth: calyx-tube or cupula broadly obconic and pubescent: fls. white, 2–5 in a cluster, 1 in. across; style glabrous. Wilson states that "as a fruit tree it does not compare in value with the European varieties derived from *P. Cerasus* and *P. avium*."

56. **Lannesiàna,** Wilson (*Cérasus Lannesiàna*, Carr. *P. serrulàta Lannesiàna*, Koehne. *P. Pseùdo-Cérasus* var. *horténsis*, Maxim. in part). Fig. 3241. Differs from *P. serrulata* in its pink fragrant fls. (white in some of the formæ), teeth of lvs. long-aristate (rather than short-aristate), bark pale gray rather than dark chestnut-brown: lvs. unfolding green or slightly reddish, pale green beneath: calyx-tube or cupula campanulate, glabrous. Japan. B.M. 8012 and G.C. III. 19:466 (both as *P. Pseudo-Cerasus*). R.H. 1872, p. 198 (note); 1873:351. Forma *álbida*, Wilson (*P. serrulàta* ff. *álbida* and *speciòsa*, Koehne *P. mutábilis*, Miyoshi, in part), has single white fls. This forma is considered by Wilson to be the parent of the cult. kind taken as the type of *P. Lannesiana* and "also of the greater number of the double-fld. Japanese cherries;" thought to be indigenous on island of Oshima. It makes a tree to 30 ft. or more tall, with thick spreading or somewhat ascending branches, with a pale gray bark which is smooth even on old trees: fls. pinkish in the bud, white when open, glabrous throughout, either with the lvs. or preceding them, the peduncle usually ½–1 in. long but sometimes wanting: fr. ovoid, black, and shining.

3241. Japanese flowering cherry.—*Prunus Lannesiana* (×½). No. 56.

Some of the cult. kinds of *P. Lannesiana* in Japan, many of which have recently been intro. into this country, are ranged by Wilson under the following formæ: *donàrium* (*P. donàrium*, Sieb.), fls. white and double, fragrant; *Fudanzakura*, a precocious form that blooms at almost any season, the single fls. white or nearly so, of little horticultural value; *Gozanomanioi*, fls. white, single, very fragrant; *Habutai*, fls. single, white, and fragrant, of minor value; *Minakami*, fls. very fragrant, white, single or nearly so; *Ohshibayama*, of minor value, the fls. white flushed pink, single or semi-double; *subfúsca* (*Sumizome*), one of the handsomest; with very large fragrant single or nearly single white fls. flushed pink; *catarácta* (*Takinioi*), fls. very fragrant, single, white: *Wasinowo*, fls. single, fragrant, white; *Amayadori*, excellent, botanically much like *P. serrulata* var. *sachalinensis*, with double fls. clustered at ends of branchlets, pale pink passing to white; *Hatazakura*, fls. semi-double, white tinged pink, the inner petals reduced and rudimentary, said by Wilson to be "a very beautiful cherry, with fls. suggestive of apple

blossoms;" *Horaisan*, fls. white, semi-double; *Hosokawa*, "a pleasing form" with fls. single or semi-double, pure white, and fragrant; *affìnis* (*Jonioi*), "A lovely plant with fls. of remarkable whiteness," very fragrant, single or semi-double; *Kokesimidsu*, of minor horticultural interest, the fls. single or semi-double, white suffused pale pink; *Kunrinjishirotai*, fls. white, fragrant, semi-double; *Miyako*, one of the best of the late-flowering forms, with fragrant double fls. white flushed pink; *Senriko*, beautiful form, with very large fragrant semi-double fls. pale pink passing to white; *Sirotae*, "the finest of all the double-fld. white cherries," the fls. large and fragrant and pure white; *Sobanzakura*, fls. double, white; *Surugadai-odora*, late-flowering, the fls. nearly white, semi-double, fragrant, pendulous on long slender pedicels; *Ariake*, "a very striking form," with very large and fragrant single or semi-double pale pink fls.; *excélsa* (*Banriko*), of minor horticultural value, with single fls. "pale washy pink;" *campanulata* (*Gijozakura*), pink, single or semi-double; *Kirigaya*, fls. fragrant, single, pale pink; *Kongosan*, of minor interest, with single pink fls.; *Mazakura*, "the cherry used by the Japanese for a stock on which to graft all the garden forms of *P. Lannesiana* and *P. serrulata*," with few white or pinkish fls.; *Ranzan*, "a very pleasing form," with single pink fls. on long slender pedicels; *Temari*, fls. congested near end of branchlets, pale pink, single and semi-double; *erécta* (*Amanogawa*), "a beautiful form and very distinct in its habit of growth," branches fastigiate, the fls. fragrant, semi-double, pale pink; *Benitoranowo*, "a good form," with rose-pink semi-double fls. clustered near ends of branchlets; *Moùtan* (*Botanzakura*), "one of the very best forms," bearing very large, pale pink, fragrant, semi-double fls.; *Gosiozakura*, fls. semi-double, pale pink; *amabilis* (*Higurashi*), "a good form," with slightly fragrant, double and semi-double, pale pink fls.; *Isezakura*, semi-double, fragrant, pink; *Mikurumakaisi*, double, pale rose; *Ochichima*, fls. large, double, pale pink; *Ogon*, "a very beautiful form, commonly cult. in the temple grounds at Kyoto," with fls. pale pink and semi-double; *Ojochin*, "one of the best forms," the very large fls. semi-double and pale pink; *versìcolor* (*Yayeakebono*), fls. very large, fragrant, semi-double, soft pink, very beautiful; *nóbilis* (*Yedozakura*), resembles *P. serrulata* var. *sachalinensis*, "a fine cherry," with pink double clustered fls. of good size; *Gioiko*, semi-double fls., pale yellow with greenish stripes, free-flowering; *grandiflòra*, "a very striking cherry," with profusion of large semi-double or double greenish yellow fls. (Gn. 76, p. 229, as *P. serrulata flore luteo pleno*. Gt. 52:1513 as *P. serrulata grandiflora*).

57. **Sièboldii**, Wittm. (*Cérasus Sièboldii*, Carr. *P. Pseùdo-Cérasus* var. *Sièboldii*, Maxim. *Cérasus Wátereri*, Hort.). JAPANESE FLOWERING CHERRY Strong-growing tree, like a sweet cherry, producing showy pink double fls. with the lvs. or just in advance of them: lvs. oval or ovate, abruptly acuminate, rounded at base, densely soft-pilose beneath, the margins very sharply gland-serrate; petiole hairy, usually bearing 1 or 2 small glands at apex: fls. 1–1½ in. across, 2–4 on each short peduncle, the pedicels more or less pilose; calyx-tube sparsely hairy or nearly glabrous, the ovate rather obtuse entire lobes about equaling the tube; style hairy at base. Japan, China. Known only in double-fld. forms. R.H. 1866, p. 371. Gn. 33, p. 420. G.W. 16, p. 355. Gt. 51:1494*a*. A.G. 12:400, 401.—Wilson writes that in habit and general appearance this species strongly resembles *P. Lannesiana*, but is distinguished by the pubescent caudate-acuminate lvs. which are sharply and often obscurely doubly serrate with small teeth: fls. double or semi-double, normally pink and preceding the foliage; if the fls. precede the lvs. the peduncle is very short, when coetaneous with the foliage the peduncle is much elongated and the fls. may then be nearly or quite white.

58. **yedoénsis**, Mats. (*P. paracérasus*, Koehne. *P. yedoénsis* var. *nudiflòra*, Koehne). Near *P. serrulata*, differing in the pedicels, style, and usually exterior of calyx being hairy; and near *P. Sieboldii*, differing in young lvs. pale green rather than bronzy, and calyx-lobes sharp-serrate rather than entire. From Japan, but wild specimens unknown.—A tree-like shrub or good-sized tree, with young growth hairy but becoming nearly or quite glabrous in autumn or the second year: lvs. obovate or broadly ovate-elliptic, 3–5 in. long, acuminate, strongly double-serrate with serratures acuminate and gland-tipped, glabrous above, hairy on midrib and veins beneath: fls. in a 3–6-fld. short-peduncled corymb or cluster, with narrowly spatulate bracts, the pedicels ½–1½ in. long and densely pilose; petals broad-ovate or suborbicular, about ½in. long or a little more, deeply emarginate; stamens about 37–39. The fls. are slightly fragrant, in clusters of 2 to several, usually preceding the lvs. but sometimes coetaneous, white to pink. "This is the cherry," writes Wilson, "so generally planted in the parks, temple grounds, cemeteries, and streets of Tokyo. Its flowering is the occasion of a popular festival in the city of Tokyo. The oldest authentically known trees were planted only a little over 40 years ago, and the species was not recognized as distinct till 1901. To Wilson the species is strongly suggestive of a hybrid between *P. subhirtella* var. *ascendens* and the wild form of *P. Lannesiana*. It is hardy at the Arnold Arboretum. *Taizanfukun* (*P. fruticòsa* f. *ambígua*, Miyoshi) is a form with young shoots and petioles pubescent, fls. borne near ends of shoots, moderately double and of medium size, pink.

EE. *Calyx-tube obtuse at base, campanulate or cylindrical: fr. red to black.*

F. *Blossoms appearing before the lvs.: teeth of lvs. large, acute, acuminate, or setaceous-acuminate: stone nearly or quite smooth.*

59. **Conradìnæ**, Koehne. Graceful tree, to 25 ft., with rather thin glabrous or canescent shoots and large foliage: lvs. obovate or obovate-oblong, rarely roundish ovate, 2–6 in. long and about half as wide, the base usually rounded or even subcordate, apex narrow-acuminate, double-serrate, the teeth gland-tipped, glabrous or becoming so above and below; petiole about ½in. long, glabrous, mostly with 2 glands; stipules linear, glandular-fimbriate: fls. whitish or pink, before the lvs.; peduncle sometimes ½in. long but usually very short; pedicels (mostly 2–4 in the umbel) ¼–¾in. long, glabrous; calyx-tube glabrous; lobes or sepals erect-spreading or spreading, more or less ovate, entire; petals about ½in. long and ⅓in. broad, emarginate-bilobed; style glabrous: fr. ovoid, ⅓–½in. long, red. Cent. China.

FF. *Blossoms appearing with the lvs.: teeth of lvs. small or minute: stone prominently rugose.*

60. **sérrula**, Franch. Tall tree, with young branches thinly pubescent but becoming nearly or quite glabrous in autumn: lvs. lanceolate, 2–4 in. long, base rounded, apex acuminate, strongly but shortly double-serrate, the teeth slender and gland-tipped, soon glabrous above, hairy along rib and in nerve-axils beneath, at base usually with 3–5 glands; petiole ⅓–½in. long, glabrous, purplish. Apparently known to cult. in the var. **tibética**, Koehne, which has smaller teeth on the lvs.: fls. white, usually in 3's: fr. ovoid or globular-ovoid, about ½in. long, red. W. China.—Cult. abroad; hardy in Mass.

DD. *Fruiting pedicel prominently thickened.*

61. **cerasoìdes**, D. Don (*P. Púddum*, Roxbg. *Cérasus Púddum*, Wall. *C. Phòshia*, Hamilt.). A Himalayan representative of *P. Pseudo-Cerasus*, described by Hooker as a large tree of brilliant appearance in flower, glabrous except the puberulous young shoots, the rose-red or

white fls. solitary, fascicled, or umbelled, the calyx-tube narrowly campanulate and the petals obovate or linear-oblong: lvs. ovate-lanceolate or oblong-lanceolate, caudate-acuminate, sharply serrate, glabrous, 3–5 in. long, the petiole with 2–4 glands: fr. oblong or ellipsoid, obtuse at both ends, with scanty yellow or reddish acid flesh; stone bony and furrowed. Temp. Himalaya, 3,000–8,000 ft.—The name is catalogued in S. Calif., with the statement that the tree "blossoms in November and ripens its fruit in April." Hooker (Fl. Brit. India) places it with species having "flowers appearing before the leaves."

62. **campanulàta,** Maxim. (*P. cerasoìdes* var. *campanulàta,* Koidz.). Closely related to *P. cerasoides:* tree, to 25 ft.: lvs. ovate to elliptic-ovate, glabrous, usually doubly serrate, 3–5 in. long: fls. pendulous, campanulate, ¾in. long, deep rose-colored; calyx purple: fr. ovoid, ⅜in. long, red. Formosa, probably Liu-kiu Isls., cult. in S. Japan. Gn. 56:300 (as *P. pendula*).—Very ornamental; not hardy N. A beautiful species as grown in Japan. The Himalayan species (*P. cerasoides*) has more coriaceous and more sharply toothed lvs. in which double serration is usually not so marked.

63. **rùfa,** Steud. Small tree, to 20 ft., the young growth densely tomentose: lvs. elliptic-lanceolate or oblong-lanceolate, 1–4 in. long, narrowed to very short petiole, long-acuminate, glabrous or puberulent on rib or nerves above and beneath, very sharply glandular-serrate; petiole pubescent, glandless; stipules thread-like and laciniate: fls. pink, ½in. diam., solitary, paired or fascicled in the axils of previous year's growth, appearing with the lvs., the stalks longer than petiole; calyx-tube urn-shaped, glabrous, the lobes triangular and dentate; petals small and orbicular: fr. ellipsoidal, on lengthened stalks, fleshy, red. Nepal and Sikkim, 12,000 ft. altitude.—Recently cult. in England.

cc. *Floral involucre either small or the lvs. prominently lobulate or incised-double-serrate.*

d. *Lvs. shortly or rather deeply serrate: involucre small, ⅛ to about ¼in. long: fls. with the lvs. or preceding them, the umbels sessile or the peduncles ⅜in. or less long: fr. mostly black. The early spring-flowering cherries of Japan.*

64. **subhirtélla,** Miq. (*P. Miqueliàna,* Maxim. *P. Herincquiàna* var. *ascéndens,* Schneid.). Plant a large shrub or small forking tree, with erect branches: lvs. shorter and relatively broader than in var. *pendula* (blade about 2 in. long except on terminal shoots), oval or ovate, abruptly narrowed above and below, sharply and more or less doubly serrate, more hairy beneath and sometimes thinly short-hairy above, the glands small or wanting: fls. 1 in. across. Much cult. in Japan, but unknown wild; less known in this country than var. *pendula,* but perhaps more beautiful. B.M. 7508. G.C. III. 33:163; 53:285. Gn. 63, p. 177. G. 25:147; 31:283.—This is the spring cherry of Japan and said by Wilson to be "the most floriferous and perhaps the most delightful of all Japanese cherries." Appears to have been intro. into N. Amer. first in 1894 by the Arnold Arboretum. The fls. normally appear in advance of the lvs., varying in color from nearly white to pink; calyx reddish. Sometimes a few fls. appear in autumn. Wilson writes that in its typical form this species may be separated from its varieties in herbarium material by its usually smaller and more glabrous lvs. and by its very numerous fls. which have less hairy and more highly colored calyx-tube and sepals. In living trees, the species is marked by its small size and ascending branches.

Var. **péndula,** Tanaka (*Cérasus péndula,* Sieb. *C. itosakùra,* Sieb. *Prùnus itosakùra,* Sieb. *P. péndula,* Maxim. *C. japónica* and var. *ròsea,* Hort.). Rose-Bud Cherry. Japanese Weeping Rose-flowered Cherry. Fig. 3242. Small tree, with drooping crooked branches: lvs. lance-elliptic to oblong-oval or oval on older shoots (blade 3–4 in. long), acuminate, mostly narrowed at base, sharp-serrate, usually with a pair of large glands at base of blade or on apex of petiole, glabrous above, thinly hairy on rib and veins underneath: fls. ¾in. across, on long minutely pubescent stalks, in small clusters, from lateral buds before the lvs. appear, rose-pink, the petals notched at the tip, the calyx-tube funnelform and red; style hairy: fr. very small, globular, black-red, somewhat astringent. Japan. B.M. 8034. R.H. 1876, p. 328. Gn. 50:454. F.M. 1871:536. G. 30:177. G.F. 1:198.; 2:487 (old tree). Gng. 2:269. M.D.G. 1890:320, 321.—One of the handsomest of early-flowering trees, producing its chaste pink fls. in profusion. Hardy in Cent. N. Y. Seedlings sometimes have more erect and spreading

3242. Prunus subhirtella var. pendula, the rose-bud cherry (×½). No. 64.

branches. Should be grown from seeds or worked on the upright forms of the species, according to Wilson, for it does not thrive on the European cherry stocks.

Var. **ascéndens,** Wilson (*P. péndula* var. *ascéndens,* Makino. *P. itosàkra* var. *ascéndens,* Koidz. *P. Herincquiàna,* Koehne. *P. micrólepis,* Koehne). Regarded by Wilson as the prototype of *P. subhirtella* and var. *pendula.* A tall strong tree with massive wide-spreading branches but the branchlets rather sparse and causing the head to have a thin appearance: lvs. somewhat larger than in *P. subhirtella* itself. Differs only in habit from var. *pendula,* and the two cannot be distinguished on the herbarium sheet. It is cult. in Japan, but is yet unknown as a horticultural plant in N. Amer. and Eu., although recently intro. Indigenous in Cent. China and probably also in Korea and Japan.

Var. **autumnàlis,** Makino (*P. subhirtélla* var. *Fukubàna,* Makino. *P. autumnàlis,* Koehne. *P. Makinoàna,* Koehne. *P. micrólepis* var. *Smithii,* Koehne. *P. Cérasus Chèalii péndula,* Hort.). An abnormal form, semi-double, blooming in April and again in Oct.; bush-like in stature, with slender wide-spreading branches. G.C. III. 52:432; 58:244. Gn. 76, p. 628 (all as *P. Miqueliana*).—"The flowers in

autumn are smaller than those of spring, and in each case when the flowers are produced before the leaves or after the leaves have fallen the peduncle does not elongate and the plants present no striking differences. But on some individuals in the spring the leaves and flowers unfold at the same time and the peduncle is then much elongated. Such specimens look utterly dissimilar, yet whether the flowers open before or at the same time as the leaves is not fixed and may vary on the same individual from year to year."—Wilson.

DD. *Lvs. prominently incised- or lobulate-double-serrate or -crenate: fls. usually appearing with the lvs.*

65. **canéscens,** Bois. Attractive shrub, 5–7 ft.: lvs. lanceolate, 2–2½ in. long, short-hairy on both surfaces, deeply bidentate, the teeth broader than long, cuspidate or mucronate, gland-tipped: fls. 2–5 together, rarely single, on the young shoots, white tinted rose; calyx-tube about ⅛in. long; calyx-lobes or sepals shorter than the tube, serrulate or rarely entire, glabrous or nearly so on the inside; petals nearly ¼in. long, oblong: fr. small, red. Cent. and W. China.

66. **lobulàta,** Koehne. Tree, to 35 ft. or so, lately cult. abroad: lvs. oblong, obovate, or oblong-lanceolate, 1–3 in. long, somewhat acuminate, doubly serrate with the teeth strongly acuminate and either glandless or the gland a minute terminal point, glabrous or nearly so except perhaps sparsely hairy on nerves, with 1 or 2 glands at base of blade or at apex of petiole, apex of blade obtuse or obscurely emarginate: fls. white: fr. globose or nearly so, about 1 in. long, red. W. China.—Hardy in Mass.

67. **incìsa,** Thunb. (*Cérasus incìsa,* Loisel.). Allied to *P. lobulata.* Shrub, to 15 ft., or sometimes tree, to 30 ft.: lvs. ovate to obovate, acuminate, incisely doubly serrate, pubescent above and on the veins beneath or nearly glabrous, ¾–2½ in. long: fls. 1–3, nodding, with leafy bracts at base; calyx vinous-red; petals white or pink, rather fugaceous: fr. ovoid, purplish black, ¼in. long. Japan. S.I.F. 1:28.—Cult. in Japan, making a very ornamental bush, but apparently unknown to planters in N. Amer.; it is now growing at the Arnold Arboretum.

68. **nippónica,** Matcum. (*P. iwagiénsis* and *P. nikkoénsis,* Koehne). Allied to *P. incisa.* Bushy tree, to 20 ft.: older branches chestnut-brown: lvs. ovate, long-acuminate, usually rounded at base, incisely doubly serrate, pubescent while young, finally nearly glabrous; petioles glabrous: fls. 1–3, slender-stalked, white or pale pink, 1 in. across: fr. globose, ⅓in. across, black. Japan, at high altitudes, probably adaptable to cold locations in this country. Var. **kurilénsis,** Wilson (*P. kurilénsis,* Miyabe). Petioles pubescent: fls. somewhat larger; pedicels and calyx pubescent. Japan, Kurile Isls.

69. **apétala,** Franch. & Sav. (*Cerasèdos apétala,* Sieb. & Zucc. *P. crássipes,* Koidz. *P. Tschonéskii,* Koehne). Shrub or tree, with young branches glabrous: lvs. oblong or obovate-oblong, 1–2 in. long, caudate at apex, doubly serrate and as if somewhat lobed, the teeth narrow and tipped by gland, close-villous above and villous beneath, especially on the nerves; petiole short, densely villous, usually with 1 or 2 glands: fls. with deep purple calyx and sepals and very small fugaceous petals, 1–2 together, appearing with the lvs., the pedicels nearly 1 in. long and hairy; sepals or calyx-lobes ovate, about ⅕in. long, very slightly hairy outside; stamens 26, shorter than the style. Japan.—The *P. apetala* mentioned in horticultural literature may be a form of *P. Maximowiczii;* but the present description is of the true species. Var. **pilòsa,** Wilson, has much larger fls. and the branches are less hairy, and rather more floriferous than the type; superior horticulturally. *P. apetala* is little known in cult. in this country.

Subgenus IV. PADUS (including *Laurocerasus*). Racemed Cherries.

Fr. small and globular, rarely used for eating: fls. white, small, in distinct racemes, not preceding the lvs. or else arising from the axils of persistent lvs. of the year before.

A. *Padus proper: lvs. deciduous: fls. on leafy shoots of the season (exception in No. 71).*

B. *Calyx-lobes persistent at the base of the fr.: fls. appearing relatively late in the season: large trees.*

70. **serótina,** Ehrh. (*Pàdus serótina,* Agardh. *Cérasus serótina,* Loisel.). WILD BLACK CHERRY. Strong straight tree, reaching 100 ft., with very dark brown bitter aromatic bark: lvs. oblong, lance-oblong or oblong-ovate, tapering to a point, thickish and firm, shining above, with many small incurved callous teeth: fls. in long, loose racemes, appearing when the lvs. are nearly full grown: fr. size of a pea, purple-black, bitterish, ripening in late summer and Sept. Generally distributed from Nova Scotia to Dakota, south to Fla. and Texas. S.S. 4:159. F.E. 32:533.—A valuable timber tree, furnishing lumber for cabinet work and house finishings; also a fine lawn tree. It is much used in forestry plantings. Var. **péndula,** Dipp., has drooping branches. G.Z. 26:241. Var. **pyramidàlis,** Zabel, is of narrow pyramidal growth. Var. **variegàta,** Hort., has yellow-marked lvs. Var. **cartilagínea,** Dipp. (var. *carthagèna,* Hort., by error. *P. cartilagínea,* Lehm.), is a handsome form with very long, shining lvs. Var. **asplenifòlia,** Hort. (*Cérasus serótina* var. *asplenifòlia,* Kirchn.), has narrow deeply toothed lvs. For a note on the nomenclature of *P. serotina,* see No. 72.

Var. **neomontàna,** Sudw. (*Pàdus serótina* var. *neomontàna,* Small), of the high mountains in the southern Alleghanies, has ample leathery coarsely serrate lvs. which are pale or whitish beneath, stout few-fld. diverging racemes, and sepals and filaments pubescent.

The *P. serotina* group is now held to include other species in the southern states and southward, but apparently they are not in cult. outside botanic gardens: *P. eximia,* Small (*Pàdus eximia,* Small), differs from *P. serotina* in having sepals or calyx-lobes deltoid and slightly broader than long rather than ovate, and lvs. delicately reticulated rather than plain. River-valleys, Texas. *P. Cúthbertii,* Small (*Pàdus Cúthbertii,* Small), differs from *P. serotina* in having young parts (young shoots, raceme-axis and pedicels) pubescent rather than glabrous: lvs. obovate and blunt, finely and rather sparingly pubescent beneath and becoming glabrate and glaucous with age: drupe red. Woods, Ga. *P. alabaménsis,* Mohr (*Pàdus alabaménsis,* Small), is distinguished from *P. Cuthbertii* in having lvs. ovate, oblong, or elliptic and acute or acuminate, and drupe purple. Mountains, Ga., Ala. *P. austràlis,* Beadle (*Pàdus austràlis,* Small), has young parts pubescent: lvs. not glaucous but densely and permanently clothed with colored tomentum. Ala. *P. Capóllin,* Koehne (*P. Cápuli,* Cav. *Cérasus Capóllin,* DC.), from Mex., a very large tree with long and slender pedicels: lvs. lanceolate, long-acuminate: fr. large. *P. salicifòlia,* HBK., in S. Amer. and probably not in Mex. as reported: evergreen, differing little from *P. Capuli* and presumably in need of closer definition: apparently not in cult., although the name occurs in horticultural literature.

BB. *Calyx-lobes or sepals not persistent on the fr.: fls. early: small trees.*

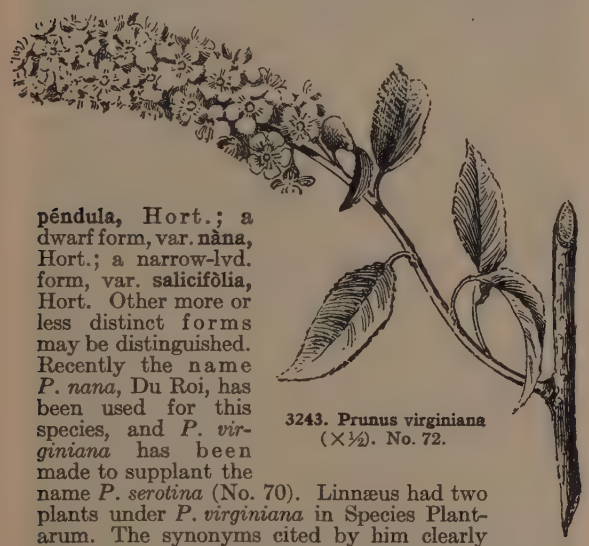
C. *Peduncle nude (not bearing lvs.).*

71. **Maàckii,** Rupr. (*Laurocérasus Maàckii,* Schneid.). Tree, to 50 ft., with shoots finely pubescent or becoming glabrate: lvs. oblong to oblong-ovate or elliptic, acuminate and pointed (2–4 in. long), finely and very sharply glandular-serrate, glabrous, gland-dotted

beneath, with 1 or 2 large glands near base of blade or at apex of the petiole (which is ⅜–¾in. long): fls. appearing on the ends of leafless shoots, white, long-stalked, less than ½in. across, the racemes 2–3 in. long and dense (1–1½ in. long). Amurland, Manchuria.

CC. *Peduncle bearing lvs.*

72. **virginiàna,** Linn. (*Cérasus virginiàna,* Loisel. *Prùnus nàna,* Du Roi. *Pàdus nàna,* Roem.). CHOKE CHERRY. Fig. 3243. Bush or sometimes a small tree 30 ft. tall, with rough speckled bark and a strong odor when bruised: lvs. thin, oval-oblong or obovate, abruptly pointed, very sharply serrate, with spreading or at least not incurved teeth: fls. in short, dense racemes in spring with the lvs.: fr. size of pea, in summer, red or amber-colored (the latter var. **leucocárpa,** Wats.), puckery; stone smooth. Generally distributed over N. N. Amer. to the Arctic Circle and occurring in the mountains of Mex. S.S. 4:158.—Now and then a large-fruited variety is found fit for eating. Sometimes planted for ornament. There is a weeping form, var. **péndula,** Hort.; a dwarf form, var. **nàna,** Hort.; a narrow-lvd. form, var. **salicifòlia,** Hort. Other more or less distinct forms may be distinguished. Recently the name *P. nana,* Du Roi, has been used for this species, and *P. virginiana* has been made to supplant the name *P. serotina* (No. 70). Linnæus had two plants under *P. virginiana* in Species Plantarum. The synonyms cited by him clearly designate *P. serotina* (the black cherry), except one, which is an Itea; but his original description, to which he gave the name *P. virginiana* and which is based on material preserved in his herbarium, is of the choke cherry; and there seems to be no occasion to change the names of these well-known plants.



3243. Prunus virginiana (×½). No. 72.

73. **demíssa,** Walp. (*P. virginiàna* var. *demíssa,* Torr. *Cérasus demíssa,* Nutt.). Lvs. more rounded than in *P. virginiana* or even subcordate, thicker, pubescent, serrate with straight teeth, the petioles glandular: fr. red, large, and edible. Wash., Ore., Calif., and probably eastward.—Considered by many to be worthy of improvement as a fruit-plant.

Var. **melanocárpa,** Nels. (*P. melanocárpa,* Shafer), has smooth lvs. and fr. nearly black when mature and more astringent: shrub or small tree: lvs. smooth or nearly so on both surfaces, the small serratures incurved or appressed, the petioles glandless: fls. white, in erect or ascending compact racemes. Rocky Mt. region and probably westward.

74. **Pàdus,** Linn. (*P. racemòsa,* Lam. *Pàdus racemòsa,* Schneid. *Pàdus vulgàris,* Borkh. *Cérasus Pàdus,* DC.). EUROPEAN BIRD CHERRY. Very like *P. virginiana,* but has larger fls. on longer pedicels, in longer and looser often drooping somewhat leafy racemes: lvs. elliptic to oblong-ovate to oval, broad at base, abruptly acuminate, very sharply serrate, glabrous, the petiole gland-bearing at apex: fls. appearing a week later; petals ¼–⅓in. long and twice exceeding the stamens: stone rough. Eu. and Asia. Gn. 53, p. 92. G.M. 44:209. G. 20:601; 27:269.—Common in cult. in many forms: Var. **péndula,** Dipp., drooping; var. **variegàta,** Hort., in several forms, as *aurea, aucubæfolia, marmorata, Alberti.* Var. **leucocárpa,** Koch, has white or yellowish lvs. Var. **bracteòsa,** Ser., has very large lvs. at the base of the racemes. Var. **commutàta,** Dipp. (*P. Grayàna,* Hort., not Maxim.), is noteworthy because it is one of the earliest of all trees to leaf out in spring. G.F. 1:295. Var. **plèna,** Hort., is a double-fld. form. Variable in its foliage. Makes a shapely tree 10–20 ft. tall. Var. **cornùta,** Henry (*P. cornùta,* Steud.), of the Himalayas, has lvs. rounded at base and bluish green beneath with reddish hairs in the axils of the veins: pedicels and long racemes pubescent: fr. ½in. or less diam., the stone smooth. *P. Laucheàna,* Bolle, is a hybrid of this and *P. virginiana.*

75. **Grayàna,** Maxim. (*P. Pàdus* var. *japónica,* Miq.), is allied to *P. Padus.* A small tree, 20–30 ft. high, with a slender trunk, ample membranaceous long-pointed setaceo-serrate lvs., biglandular at the base but without glands on the petioles, a peculiarity which best distinguishes this species, although the hair-like teeth of the lvs. are characteristic and apparently constant: style long rather than short as in *P. Padus.* Japan.

76. **Ssiòri,** Schmidt (*Pàdus Ssiòri,* Schneid.). Smaller-fld. than *P. Padus,* with a smooth or only obscurely roughened stone: lvs. ovate, long-acuminate, strongly serrate with narrow teeth, not papillose beneath; petiole ½–1½ in. long, with usually 2 or more glands at apex: raceme 4–7 in. long, glabrous; petals white, about ⅓in. long, equaling the stamens. Manchuria, Saghalin, Japan.

AA. *Laurocerasus: lvs. persistent (evergreen): fls. in spring in the axils of the lvs. of the previous year. (Cherry-laurels.)*

B. *Racemes longer than the lvs.*

77. **lusitánica,** Linn. (*Pàdus lusitánica,* Mill. *Laurocérasus lusitánica,* Roem.). PORTUGAL LAUREL. Tree, 20 ft. tall, but usually grown as a tub-plant and comparable with *Laurus nobilis:* lvs. thick and leathery, ovate-lanceolate to long-lanceolate, sharp-serrate: fls. white, in racemes that exceed the lvs., appearing in late spring or early summer: fr. round-oval, nearly black, small. Spain, Portugal, and Canary Isls.—It is a small tree in its native places, but becomes a bush farther north. It is sometimes planted in the open in our southern states, but in northern parts it is wintered inside. There is a form (var. **angustifòlia,** Hort.) with narrow lvs., another (var. **myrtifòlia,** Nichols.) with small lvs. and compact habit, and another (var. **aùreo-variegàta,** Hort.) with yellow-variegated lvs., and one (var. **variegàta,** Nichols.) with lvs. variegated white. Var. **azòrica,** Nichols., is a free grower with red sts.: lvs. more coriaceous and more coarsely serrate than the type: racemes short and densely fld.: shrubby. Azores. G. 30:123. Var. **Híxa,** DC. Lvs. narrower and more oblong than in the type, about 5 in. long: racemes 6–8 in. long, the fls. less crowded. Madeira and Canary Isls.

BB. *Racemes not longer than the lvs.*

C. *Calyx-lobes toothed or undulate.*

78. **Laurocérasus,** Linn. (*Cérasus Laurocérasus,* Loisel. *Pàdus Laurocérasus,* Mill. *Laurocérasus officinàlis,* Roem.). CHERRY-LAUREL. ENGLISH LAUREL. Bush or small tree (reaching 10 ft.) with handsome evergreen foliage: lvs. coriaceous and glossy, short-stalked, oval, lanceolate, oblong-elliptic or oblanceolate, narrowed into a short point, remotely serrulate, with 2–4 glands at the base of the blade: fls. small, white, in axillary or terminal short racemes in spring, the calyx-lobes 3-toothed: fr. ovoid-acute, small, blackish. S. E. Eu. to N. Persia. Gn. 50, p. 313.—One of

the most popular broad-lvd. evergreen plants in Eu., and somewhat planted in the southern states. It is also grown in tubs and used for house-decoration. Some of the forms will stand as far north as Washington, and var. *schipkaensis* is hardy in Cent. N. Y. When grown in the open, the cherry-laurel should be allowed to ripen its wood thoroughly before winter sets in. Protection from severe winds is always desirable. The plant may be prop. by means of long cuttings of ripe wood; also by layers. Named varieties are worked on common stocks. The cherry-laurel is very variable. Some of the many horticultural forms are as follows: Var. **angustifòlia,** Nichols., lvs. very long and narrow, and plant hardy as far north as Washington; var. **Bértinii,** with very broad lvs.; var. **camelliæfòlia,** Nichols., with recurved lvs.; var. **caucásica,** Hort., and var. **cólchica,** Hort., with slender twigs and dark foliage which is gray-green beneath, also hardy; var. **japónica,** Hort., a narrow-lvd. form, like var. *angustifolia;* var. **latifòlia,** Hort., with broad lvs., hardy at Washington; var. **versaillénsis,** Hort., also with broad foliage; var. **microphýlla,** Hort., with small, narrow lvs., only 4–5 in. long; var. **rotundifòlia,** Nichols., with short-oblong blunt lvs. (Gn. 28, p. 405); var. **parvifòlia,** Nichols., lvs. only 1½ in. long and ½in. broad, coarsely serrate: shrub; var. **schipkaénsis,** Spaeth, with small nearly or completely entire lvs. dark green above and very light green beneath, shrubby, hardy in N. Y. (R.H. 1905. p. 409. G.W. 5, p. 177, var. *schipkaensis Zabeliana*); var. **variegàta,** Nichols., lvs. marbled or blotched with dull white.

79. **caroliniàna,** Ait. (*Prùnus sempérvirens,* Willd. *Cérasus caroliniàna,* Michx. *Pàdus caroliniàna,* Mill. *Laurocérasus caroliniàna,* Roem. WILD ORANGE. MOCK ORANGE of the S. Tree, 20–40 ft.: lvs. oblong-lanceolate-acuminate, usually entire but sometimes remotely spinose-serrulate, thick, dark green and shining above, the margins usually somewhat revolute: fls. cream-colored, in short rather close racemes, the calyx-lobes with undulate margins: fr. ½in. long, oblong-pointed, black, and shining, persisting for a year. S. C. to Fla. and Texas, in stream-valleys and near the coast. S.S. 4:160.—A handsome evergreen, prized for planting in the S. Blooms from Feb. to April.

80. **sphærocárpa,** Swartz (*Laurocérasus sphærocárpa,* Roem.). Small glabrous tree, 30–40 ft.: lvs. elliptic, 2–4 in. long, acuminate, shining, entire, the petioles slender but less than ½in. long: racemes rather dense, shorter than the lvs., the slender pedicels subtended by deciduous bracts; sepals or calyx-lobes laciniate and acute, deciduous, much smaller than the reflexed white petals which are yellow near base within: fr. nearly globular, pointed at apex, ⅓–½in. diam., orange. S. Fla., W. Indies, Brazil.

cc. *Calyx-lobes entire.*

81. **ilicifòlia,** Walp. (*Cérasus ilicifòlia,* Nutt. *Laurocérasus ilicifòlia,* Roem.). ISLAY. WILD CHERRY. EVERGREEN CHERRY. MOUNTAIN HOLLY. Evergreen bush or small tree, rarely becoming 30 ft. tall, with a dense crown: lvs. holly-like, ovate to ovate-lanceolate, obtuse, acute, or sometimes even acuminate, mostly broad and sometimes rounded at the base, the margins coarsely spiny-toothed, the blade thick and shining: fls. white, in slender racemes less than 2 in. long in spring, about ½in. across: fr. rather large (sometimes ⅔in. long), nearly globose, purple or nearly black; stone ovate. San Francisco to Low. Calif. Gn. 3, p. 131. S.S. 4:162. G.F. 5:475 (tree).—A most worthy garden-plant.

82. **Lỳonii,** Sarg. (*Laurocérasus Lỳonii,* Eastw. *Prùnus occidentàlis,* Lyon, not Swartz. *P. ilicifòlia* var. *occidentàlis,* Brandeg. *P. integrifòlia,* Sarg., not Walp. *P. ilicifòlia* var. *integrifòlia,* Sudw.). ISLANDS CHERRY. Lvs. longer and more acuminate, usually entire: fr. larger. Islands off the coast of S. Calif. (Santa Cruz and Santa Catalina). S.S. 4:163.—Considered to be more desirable as a garden-plant than No. 81. It grows rapidly under cult., making a compact very dark green crown. Useful also in pots and tubs. *P. occidentalis,* Swartz, a different plant, grows from Cuba to Trinidad. It is not in the trade. Grisebach describes it as a high tree: lvs. oblong or ovate-oblong, rounded at the base, bluntish, with 2 glandular spots at the base beneath: racemes lateral, puberulous or glabrous: fr. ovoid, slightly apiculate, nearly 1 in. long, purple. The fr. is said to be "of very fine flavor."

P. bícolor, Koehne. Allied to P. Padus. Tree, to 40 ft.: branchlets finely velutinous: lvs. obovate-oblong, acuminate, subcordate or rounded at base, serrulate, glabrous and whitish beneath, 2–4 in. long: fruiting raceme to 5 in. long: fr. globose, ½in. across. W. China.—*P. conadènia,* Koehne. Allied to P. Maximowiczii. Tree, to 30 ft.: lvs. obovate, acuminate, usually rounded at base, doubly serrate, finally glabrous, 1½–3½ in. long: fls. white, about ½in. across, in 5–8-fld. racemes: fr. ovoid, red. W. China.—*P. concinna,* Koehne (P. Zappeyana, Koehne). Allied to P. lobulata (and has been cult. as P. subhirtella). Shrub, to 15 ft.: lvs. rhombic-oblong to obovate-oblong, acuminate, rounded at the base, doubly incised-serrate, nearly glabrous, 1–3 in. long: fls. white, 1–2, precocious, about ¾in. across; pedicels and calyx glabrous: fr. dark red or black. Cent. China.—*P. consociiflòra,* Schneid.=P. salicina.—*P. cyclámina,* Koehne (subgen. Cerasus). Tree, to 25 ft.: lvs. obovate-oblong, acuminate, rounded at base, sharply simply or doubly serrate, at first sparingly pubescent on the veins, 2–4 in. long: fls. umbellate, 3–4, pink, 1⅓ in. across; sepals reflexed: fr. subglobose, red, ½in. across. Cent. China.—*P. dehíscens,* Koehne (subgen. Amygdalus). Spiny shrub, to 12 ft.: lvs. usually fascicled, oblong to oblanceolate, acute or obtuse, cuneate at the base, crenulate, glabrous, ½–1⅓ in. long: fls. subsessile; sepals roundish: fr. roundish, slightly compressed, about ¾in. across, greenish, densely tomentose, finally dehiscent; stone slightly compressed, keeled, slightly rugose. W. China.—*P. Dielsiana,* Schneid. (subgen. Cerasus). Shrub or tree, to 30 ft.: lvs. oblong, abruptly acuminate, cuneate or rounded at the base, simply or doubly serrate, pubescent beneath, 3–6 in. long: fls. umbellate, 3–5, with persistent involucre, white or pink, 1¼ in. across; sepals reflexed, oblong to lanceolate: fr. globose, red, ½in. across. Cent. China.—*P. discadènia,* Koehne. Allied to P. Maximowiczii. Shrub or tree, to 35 ft.: lvs. ovate or obovate, acuminate, usually rounded or cordate at base, unequally serrate, glabrous, 2–4 in. long: fls. white, ¾in. across, in 3–9-fld. racemes: fr. subglobose, ⅜in. across. Cent. China.—*P. glyptocárya,* Koehne. Allied to P. lobulata. Tree, to 30 ft.: branchlets pubescent: lvs. oblong to obovate-oblong, acuminate, usually rounded at base, deeply doubly serrate, pubescent beneath, 2–4½ in. long: fls. umbellate: fr. globose, ½in. across, dark red; stone reticulate and ribbed. W. China.—*P. Jacquemóntii,* Hook. f. Allied to P. prostrata. Low shrub, glabrous: lvs. elliptic-oblong, acute or short-acuminate, cuneate at base, serrate, light green beneath, ¾–1¾ in. long: fls. 1–3, short-stalked, pink, ½in. across; calyx tubular: fr. ovoid, ½in. long, dark purple. W. Himalayas. B.M. 6976.—*P. macrophýlla,* Sieb. & Zucc. Allied to P. Laurocerasus. Evergreen tree, to 30 ft.: lvs. oblong, acuminate, broadly cuneate at base, serrulate, glabrous, 4–7 in. long: fls. white, in dense racemes 1–1½ in. long: fr. ovoid, ¾in. long. S. Japan. S.I.F. 1:29.—*P. mìra,* Koehne. Allied to P. Persica. Tree, to 30 ft.: lvs. lanceolate, long-acuminate, rounded at base, crenulate-serrulate, villous beneath along the midrib, otherwise glabrous, 2–4 in. long: fr. short-stalked, subglobose, 1¼ in. across, tomentose, edible; stone ovate, compressed, keeled, smooth. W. China. Differs from all peaches in its smooth stone. Hardy at Arnold Arboretum.—*P. perulàta,* Koehne (subgen. Padus). Tree, to 40 ft.: lvs. elliptic to oblanceolate, acuminate, rounded or broadly cuneate at base, serrulate, sparingly pubescent beneath, 2½–4½ in. long: racemes 2–3 in. long, velutinous, with a persistent involucre at base, leafless: fr. globose, ½in. across; calyx persistent. W. China.—*P. pleiocérasus,* Koehne. Allied to P. Maximowiczii. Tree, to 25 ft.: lvs. obovate-oblong, caudate-acuminate, rounded or cuneate at base, unequally serrate, glabrous or nearly so beneath, 1¾–3½ in. long: fls. white, in 4–7-fld. racemes: fr. globose, dark red or black. W. China.—*P. pleuróptera,* Koehne. Allied to P. lobulata. Tree, to 30 ft.: branchlets hairy: lvs. obovate to rhombic-oblong, acuminate, usually cuneate at base, incisely doubly serrate, pubescent beneath on the veins, ¾–2⅓ in. long: fr. usually solitary, subglobose, ½in. long, black; stone sulcate and foveolate. W. China.—*P. polýtricha,* Koehne. Allied to P. Maximowiczii. Tree, to 30 ft.: branchlets villous: lvs. obovate to obovate-oblong, caudate, usually rounded at base, doubly serrate, pubescent on both sides, 1½–3 in. long: frs. 1–2 on a bracted peduncle ½–½in. long, ovoid, red, ½in. long; pedicels villous, about 1 in. long. Cent. China.—*P. pubígera,* Koehne (P. pubigera var. Potaninii, Koehne). Allied to P. Padus. Tree, to 60 ft.: branchlets minutely velutinous: lvs. obovate-oblong, short-acuminate, subcordate or cordate at the base, minutely serrulate, glabrous and whitish beneath, 1½–4¼ in. long; petioles puberulous: racemes 3–6 in. long: fr. about ¼in. across. W. China. Var. *Práttii,* Koehne. Lvs. cuneate or rounded at base; petioles glabrous. Var. *obovàta,* Koehne. Lvs. obovate, rounded at base; petioles glabrous.—*P. rufomícans,* Koehne (subgen. Padus). Tree, to 80 ft.: lvs. of flowering branchlets lanceolate to oblong-lanceolate, about 2 in. long, of sterile branches usually obovate, 3–4 in.

long, sharply serrulate, rufous-tomentose beneath: fruiting raceme 5 in. long, glabrous: fr. subglobose, ⅔in. across. W. China.—*P. sericea*, Koehne (P. napaulensis var. sericea, Batal). Tree, to 80 ft.: lvs. elliptic to oblong, rounded or cuneate at base, remotely serrate, white-tomentose at first, later grayish tomentose, 3–5 in. long: racemes 4–5 in. long, densely short-pilose: fr. subglobose, ⅔in. long, black. W. China.—*P. stellipila*, Koehne (subgen. Padus). Tree, to 20 ft.: lvs. elliptic to narrow-oblong, long-acuminate, broadly cuneate or nearly rounded at base, sharply serrate, sparingly pubescent beneath, 2–4 in. long: racemes upright, 1¾–2 in. long, without lvs. at the base: fr. globose, ⅓in. across. Cent. China.—*P. tangutica*, Koehne (Amygdalus communis var. tangutica, Batal). Spiny shrub: lvs. fascicled, lanceolate, obtuse or acutish, crenulate-serrulate, 1–2 in. long: fls. sessile, about 1 in. across: fr. subglobose, ¼in. across, somewhat compressed, rather dry; stone irregularly furrowed. N. W. China.—*P. tatsienensis*, Batal. Allied to P. Maximowiczii. Tree: lvs. ovate to obovate, acuminate, serrulate, 1½–2½ in. long: fls. white, ¾in. across in 3–7-fld. racemes with large leafy bracts. W. China. Var. *stenadenia*, Koehne. Tree, to 30 ft., quite glabrous: lvs. obovate-oblong, caudate, cuneate or rounded at base: fr. globose, dark red, ⅔in. across. W. China.—*P. venosa*, Koehne (subgen. Padus). Tree, to 35 ft.: lvs. oblong-obovate to obovate-oblanceolate, acuminate, cuneate or nearly rounded at base, sharply serrate, reticulate beneath, glabrous except the bearded axils, 2½–4½ in. long: racemes without lvs. at base, 1½–4 in. long: fr. globose, about ½in. across. Cent. China.—*P. Wilsonii*, Koehne (Padus Wilsonii, Schneid.). Tree, to 30 ft.: lvs. elliptic-oblong to obovate-oblong, acuminate, usually cuneate at base, remotely serrate, whitish pubescent beneath, 3½–5 in. long: racemes pubescent, 5–6 in. long: fr. ovoid, ½in. long, black. Cent. China. Var. *leiobotrys*, Koehne. Lvs. closely serrulate, grayish beneath; racemes glabrous.—*P. Zappeyana*, Koehne=P. concinna.

L. H. B.

PSÁMMA: *Ammophila.*

PSEUDERÁNTHEMUM (Greek, *false Eranthemum*, the genus resembling Eranthemum from which it was separated). *Acanthàceæ.* Smooth bushes or shrubs with often coarse-toothed leaves and mostly brilliant colored flowers; glasshouse subjects.

Inflorescence racemose, 1–3-branched or simple in the axils of the bracts; fls. long-tubed, corolla with the limb spreading; lobes almost equal or the 2 rear ones smaller; stamens short, fastened in the tube, 2 staminoids present, true stamens 4 or less.—Sixty to 70 species, occuring in the tropics of both hemispheres. Pseuderanthemum, as characterized by Lindau in Engler and Prantl, Pflanzenfamilien IV 3*b*:330, includes Eranthemum of Auth. not of Linn., and Eranthemum of Linn. is used for Dædalacanthus as treated in this work (see Vol. II, p. 950); and this constitutes the accepted treatment. There are a large number of horticultural species, a partial list of which occurs under Eranthemum (see Vol. II, p. 1126). Many of the species are cult. for their variegated foliage while others are grown for their fls. Warmhouse plants, prop. by cuttings any time from March to June.

Andersonii, Lindau (*Eranthemum Andersonii*, Mast.). Lvs. large, lanceolate, acute at both ends, glabrous: spike 10 in. long, lower clusters distant, many-fld., upper few-fld., continuous; corolla white, midlobe of lower lip spotted with purple; ovary ovoid-oblong. Asia(?). B.M. 5771. Gn. 45:11. G.Z. 25:49. See p. 1126.

cinnabarinum, Radlkf. (*Eranthemum cinnabarinum*, Wall.). Lvs. large, elliptic, acuminate at both ends: panicles compound, stout; corolla crimson, tube linear to the apex, sometimes a yellowish spot on the middle lobe of the lower lip. Burma. B.M. 5921 (as *E. cinnabarinum* var. *ocellatum*, the variety differing in the maculate lvs.).

laxiflorum, Hubb. (*Eranthemum laxiflorum*, Gray). Two to 4 ft. high, glabrous: lvs. oval or lanceolate-oblong: cymes few or many-fld., axillary, usually with a pair of lf.-like bracts; corolla salver-shaped, reddish purple; ovary oblong, conical, glabrous. Fiji Isls. B.M. 6336. See p. 1126.

lilacinum, Stapf. About 3 ft. high: lvs. lanceolate, long-acuminate: infl. paniculate; corolla-tube narrow, straight, almost white, limb 2-lipped, lilac-blue with a white or yellowish blotch, midlobe of lower lip red-specked. Malaya. B.M. 8446.

malaccense, Lindau (*Eranthemum malaccense*, C. B. Clarke). Three to 5 ft. high: lvs. lanceolate to elliptic-lanceolate, base cuneate: infl. ½–2 in. long, numerous-fld., many opening together in whorls, finally raceme-like; corolla salver-shaped, tube nearly straight, pale violet, limb 2-lipped, pale violet or violet-white with red specks on the midlobe of the lower lip. Malaya. B.M. 8368.

pulchellum, Merr. (*P. bicolor*, Radlkf. *Eranthemum pulchellum*, Hort., not Auth. *E. bicolor*, Schrank). About 3 ft. high: lvs. thin, elliptic-ovate to oblong-lanceolate, acute or acuminate: corolla white, middle lobe of lower lip with a large purple spot. Malaya and Polynesia.

reticulatum, Radlkf. (*Eranthemum reticulatum*, Hort. *E. Schomburgkii*, Hort.). Lvs. opposite, lower ovate-lanceolate, dark green above with arching golden nerves, upper narrower, reticulated golden yellow and green: corolla white, speckled with blood-red around the mouth of the tube. Austral. or Polynesia (?). B.M. 7480. I.H. 26:349. See p. 1126.

setícalyx, Stapf (*Eranthemum setícalyx*, C. B. Clarke). Erect, somewhat hirsute: branches terete: lvs. ovate, acuminate: infl. spicate, terminal also in upper lf.-axils; calyx with white-spreading bristles; corolla salver-shaped, tube long, pale red, limb cinnabar-red above, paler beneath, 1 in. across. Trop. Afr. B.M. 8244.

tuberculatum, Radlkf. (*Eranthemum tuberculatum*, Hook. f.). Small shrub, much branched: lvs. small, elliptical or subovate: fls. very numerous, axillary, solitary, pure white, almost sessile. Polynesia. B.M. 5405. See p. 1126.

F. Tracy Hubbard.

PSEUDOLÀRIX (Greek, *pseudos*, false, and Larix; being similar to, but not a true larch). Syn., *Laricópsis. Pinàceæ.* Golden Larch. Ornamental tree, grown for its handsome feathery foliage.

3244. Pseudolarix Kaempferi. (×⅓)

Deciduous, with horizontally spreading whorled branches: lvs. linear, in dense clusters on short spurs, those of the young shoots spirally arranged: staminate fls. catkin-like, slender-stalked and clustered at the end of short spurs; cone short-stalked, pendent, with ovate-lanceolate deciduous scales and with bracts about half as long as the scales; each scale with 2 seeds with the wings nearly as long as the scale.—The only species is known wild only from a restricted region in E. China, where it grows in the mountains at an altitude of about 3,000–4,000 ft. It is closely allied to Larix, but differs by the stalked, pendulous, clustered, staminate fls. and by the deciduous cone-scales, which separate from the axis at maturity, as in the fir.

The golden larch is a beautiful tree with its long, spreading branches pendulous at the extremities and clothed with light green feathery foliage turning to a clear yellow in fall. The tree seems to remain free from insect pests and fungous diseases and is hardy in Massachusetts, and probably farther north. It requires a sunny open position and a well-drained moderately moist soil; it does not thrive nor look well if crowded by other trees. The golden larch should be raised only from seeds. If grafted on its own roots or on the common larch, as is sometimes done, it rarely grows into a symmetrical tree.

Kaémpferi, Gord. (*P. Fórtunei,* Mayr. *Làrix Kaémpferi,* Fort. *Laricópsis Kaémpferi,* Kent). Fig. 3244. Tree, becoming 130 ft. high: lvs. linear, acuminate, soft, light green, bluish green beneath, 1½–3 in. long and 1–1½ lines broad: staminate fls. yellow, about ¼in. long, slender-stalked; pistillate fls. about ¾in. long: cone ovate, reddish brown, 2½–3 in. long, 1⅔–2 in. broad; scales triangular, ovate-lanceolate, cordate at the base, emarginate at the apex, woody; bracts ovate-lanceolate, much smaller than the scales; seeds about ⅛in. long. F.S. 17:1777, 1778. R.H. 1868:331; 1871, pp. 608, 609. G.C. II. 19:88. Gn. 8, p. 325; 29, p. 397. G.W. 3, p. 123; 14, p. 603. F.E. 19:236 (pl. 94). B.M. 8176. Var. **nàna,** Beissn. Dwarf form, cult. in China and Japan; without much decorative value.

ALFRED REHDER.

PSEUDÓPANAX (*false Panax*). *Araliàceæ.* A small and horticulturally unimportant group of greenhouse aralias grown for their foliage, flowers having never developed in cultivation, so far as known, in America.

Glabrous shrubs or rarely trees in cult.: lvs. digitately compound, and sometimes simple, the juvenile lvs. quite unlike mature specimens: fls. dicœcious, in racemose or paniculate umbels; calyx-limb entire or toothed; corolla of 5 distinct, valvate petals; stamens 5; ovary 5-celled: fr. fleshy.—Only 6 species are known, as here understood all from the islands of New Zealand. Cult. as in Dizygotheca.

crassifòlium, Koch (*Aràlia crassifòlia,* Soland. *Dizygothèca crassifòlia,* Taylor). In cult. a shrub, often a tree 20–40 ft. high in nature: lvs. very variable, those of seedlings rhomboid to ovate-lanceolate; of young, unbranched plants very narrow-linear, sometimes 1-foliolate and rigid, erect or sometimes 3–4-foliolate: umbels terminal, compound: fr. globose, ½in. diam.

P. Kerchoveànum, Hort. (Aralia Kerchoveana)=Dizygotheca. See Polyscias for related plants.

N. TAYLOR.

PSEUDOPHŒ̀NIX (Greek, *false Phœnix*). *Palmàceæ,* tribe *Arèceæ.* Until very recently only one recognized species, a pinnate-leaved palm discovered in 1886 on Elliott's Key, Florida, and distinguished from all other North American palms by its scarlet-orange fruit, which is about the size of a cherry.

3245. Fruit of Pseudophœnix Sargentii. (×⅝)

Unarmed palms, with spindle-shaped trunk: spadix shorter than the lvs., pendulous, branched, almost zigzag: female fl. with calyx small, spreading, somewhat denticulate; petals 3, ovate, obtuse, green, bent back; staminodia 6, distinctly dark purple at the top: fr. a drupe, stipitate, containing 1–3 globular carpels. Allied to royal palm (Oreodoxa), but differing in color of fr. and in spreading rather than ascending or erect spadix-branches.

Sargentii, Wendl. Fig. 3245. Trunk slender, 20–25 ft. high, 10–12 in. thick: lvs. abruptly pinnate, 4–5 ft. long; pinnæ lanceolate, acuminate, 12–16 in. long, bright green above, glaucous beneath, folded backward at the very base: spadix appears from among the lvs.; main and secondary branches light yellow-green and flattened: fr. usually 3-lobed, ½–¾in. thick, bright orange-scarlet. Fla. Keys and the larger W. Indies. G.F. 1:353, 355 (adapted in Fig. 3245).—The tree is somewhat planted in S. Fla. (see p. 2445), but the plantings in S. Calif., appear to have been lost.

P. vinifera, Becc. (Euterpe? vinifera, Mart.), of Haiti, is apparently not in cult. Evidently this palm was once common in that island, but probably it has been destroyed by the natives who fell the trees to extract the saccharine juice of the inflated part of the trunk and from which a fermented drink is made. The trunk is apparently more ventricose than that of P. Sargentii, the spadix is more diffuse and the branchlets more elongate, and the fr. pedicillate but 1-seeded.

N. TAYLOR.†

PSEUDOTSÙGA (Greek, *false Tsuga*). Syn., *Abiètia. Pinàceæ.* Ornamental woody plants grown for their regular pyramidal habit and evergreen foliage; also important timber trees.

Tall evergreen trees with whorled branches: lvs. more or less 2-ranked, linear, flattened, green and grooved above, with a stomatiferous white band on each side of the prominent midrib beneath, with only 1 vascular bundle in the center: staminate fls. axillary, cylindric: cones pendent, ovate-oblong, maturing the same season; scales rounded, rigid, persistent; bracts longer than the scales, 2-lobed at the apex with the midrib produced into a rigid awn; each scale with 2 nearly triangular seeds with a wing shorter than the scale.—Four species, 2 in W. N. Amer., 1 in Japan, and 1 in W. China. Very similar in habit and foliage to Abies, from which Pseudotsuga without cones can be easily distinguished by the more slender and flexible lvs. and the elongated, ovate or ovate-oblong, acute, not resinous winter buds; from Tsuga it may be distinguished without cones by the smooth branches, not roughened by the persistent lf.-bases, and the longer lvs. The light red or yellow wood is hard and durable and much used for construction, for railway ties and for masts. The bark is sometimes used for tanning leather.

The Douglas spruce, which is the only species well known in cultivation, is a tall tree of symmetrical habit with regularly whorled branches clothed with more or less two-ranked linear leaves, with orange staminate and purplish pistillate catkins and with pendulous medium-sized cones of somewhat bristly appearance on account of the protruding bracts, falling off as a whole. It is one of the tallest and most important forest and timber trees of western North America, and in its forms of the higher altitudes it is hardy as far north as Canada. When it finds a congenial home it is among the most desirable conifers for park planting and it grows rapidly, but where rapid growth is not desired, the var. *glauca* may be planted, which is of much slower growth and more compact habit. It thrives best in a porous sandy loam, and its cultivation does not differ from that of Picea, which see. Varieties may be grafted on the type.

The Douglas spruce is a tree for the million. It would be difficult to overrate its beauty. As a forest tree it perhaps produces a greater crop of lumber to the acre than any other species. It probably grows faster than any other conifer. Indeed, the complaint is sometimes made that it grows too fast to make a compact lawn tree. It is desirable to have groups of Douglas spruce, because the foliage is so soft that single specimens are sometimes injured by high winds. Specimens planted on the prairies without protection from hot winds may sometimes have their buds injured by late spring frosts. It is, of course, a mistake to use this kind of spruce for a windbreak. The Douglas spruce is generally propagated by seeds. Seeds of conifers gathered on the Pacific slope are tender, while those gathered in Colorado produce hardy trees which endure

both drought and cold. Unlike the firs, the Douglas spruce has fine fibrous roots like the Norway spruce and transplants as readily. The writer has transplanted many stocky young trees growing in the open to the nursery and has saved 90 per cent of them. They seemed to thrive as well as nursery-grown Norway spruces of the same size. The yield of seed from a wagon-load of cones is light, and it is somewhat difficult to grow seedlings. In some circumstances it will be cheaper in the end to procure young trees. The Douglas spruce is remarkable for its wide variation in form and color. The needles may be short or long, light green, dark green, or have a bluish or silvery cast. The deep blue and silvery foliage is characteristic of the deep gorges of high altitudes. (C. S. Harrison.)

taxifòlia, Brit. (*P. Douglasii*, Carr. *P. mucronàta*, Sudw. *P. Lindleyàna*, Carr. *Abies Douglasii*, Lindl. *Abiètia Douglasii*, Kent). Douglas Spruce. Red Fir. Fig. 3246. Pyramidal tree, attaining 200 ft. and sometimes more, with a trunk becoming 12 ft. diam. clothed with ridged dark red-brown bark: branches horizontal, with

3246. Pseudotsuga taxifolia. (×⅓)

pendulous branchlets: lvs. linear, straight or curved, obtuse, slender and flexible, dark green or bluish green, ¾–1¼ in. long: staminate catkins orange, pistillate reddish: cones pendulous, oval-ovate, with broad rounded scales and much exserted bracts 2–4½ in. long; seed ¼in. long, with broad wing, light reddish brown. Brit. Col. to Mex., west to Mont. and Colo. S.S. 12:607. G.F. 10:295. Gn. 31, p. 288. R.H. 1868: 151. M.D. 1901:1; 1909, p. 69. G.W. 10, p. 565; 13, p. 411. There are many forms in cult. Var. **víridis,** Schneid. (*P. Douglasii víridis*, Schwerin), is the typical green-lvd. rapid-growing form. Var. **cæsia,** Schneid. (*P. Douglasii cæsia*, Schwerin), agrees with the type except that the lvs. are bluish green; it seems to be somewhat hardier. Var. **glaùca,** Schneid. (*P. Douglasii glaùca*, Mayr. *P. glaùca*, Mayr). Of more compact habit: branches more ascending: lvs. shorter, bluish green: cones smaller, with often reflexed bracts. Colo. G.C. III. 36:53. Hardier than the type, but of slower growth. Var. **argéntea,** Schneid. (*P. Douglasii argéntea*, Koster). Similar to the preceding, with almost silvery white foliage. *P. Douglasii glaùca élegans*, Mottet, is scarcely different. R.H. 1914, p. 344. Var. **glaucéscens,** Schneid. (*P. glaucéscens*, Bailly). With bluish white foliage and pendent branchlets. N. Mex. R.H. 1895:88; 1903, p. 208. Var. **péndula,** Schneid. (*P. Douglasii péndula*, Engelm.). With pendulous branches and dark green foliage. Var. **glaùca péndula,** Schneid. (*P. Douglasii glaùca péndula*, Beissn.). With pendulous branches and bluish green or bluish white foliage. Var. **fastigiàta,** Schneid. (*P. Douglasii fastigiàta*, Carr.). A narrow conical pyramid with ascending branches and shorter lvs. Var. **compácta,** Schneid. A compact conical form with short and dense foliage. Var. **globòsa,** Rehd. (*P. Douglasii globòsa*, Beissn.). A dwarf globose form. M.D. 1905, p. 75. Var. **Frétsii** (*P. Douglasii Frétsii*, Beissn.). Compact: lvs. very much shortened. Var. **Moerheìmii** (*P. Douglasii Moerheìmii*, Ruijs). With compact habit and finer deeper blue foliage than in the type. There are also some forms with variegated lvs.

P. japónica, Beissn. (Tsuga japonica, Shirasawa). Tree, to 60 ft.: branches glabrous: lvs. shorter, emarginate, often curved: cones smaller, 1¾–2 in. long, with reflexed bracts. Japan. G.C. III. 45:307. S.I.F. 1:7. Has proved tenderer than P. taxifolia at the Arnold Arboretum.—*P. macrocárpa*, Mayr (P. Douglasii var. macrocarpa, Engelm. Abies macrocarpa, Vasey). Tree, to 60 or 80 ft., with remote and usually pendulous branches: lvs. acute, bluish gray: cones 4–6½ in. long, with shorter bracts; seeds ½in. long. S. Calif. S.S. 12:608. G.F. 10:25. Seems not yet intro.; not hardy N.—*P. sinénsis*, Dode. Tall tree: branches pubescent: lvs. emarginate: cones about 2 in. long. S.W. China. Probably tender. —*P. Davidiàna*, Bertrand, *P. Fórtunei*, Carr., and *P. jesoénsis*, Bertrand=Keteleeria.

Alfred Rehder.

PSÍDIUM (Greek, *psidion*, the pomegranate). *Myrtàceæ*. A large group of tropical and subtropical trees and shrubs, all native to America, many of which produce edible fruits. The common guava of the tropics, *P. Guajava*, is the best known. It has become naturalized in many parts of Asia and Africa. See *Guava*.

Leaves opposite, petiolate, glabrous, pubescent or tomentose, pinnately veined: fls. usually rather large, whitish, on axillary or lateral 1–3- (rarely many-) fld. peduncles; calyx-tube urceolate or pyriform, lobes 4–5, persistent; calyx sometimes closed before anthesis and splitting irregularly into 2–5 lobes; petals 4 or 5, spreading; stamens numerous, disposed in many series and inserted upon the disk, filaments filiform, anthers oblong or linear, basifixed, longitudinally dehiscent; ovary with 2–7, commonly 4, locules, the style slender, stigma peltate or subcapitate: fr. a berry, ovoid, globose or pyriform, commonly 1–3 in. long, yellow to red in color, sometimes green, crowned with the calyx-limb; seeds few to numerous, small, hard.—About 150 species. The genus is somewhat confused and in need of further study. A large number of species doubtless exist in S. and Cent. Amer., which have not as yet been described. The genus is allied to the myrtles (Myrtus), the pomegranate (Punica), and the various Eugenias, of which a number are cult. in the tropics for their frs. The following treatment includes the principal ones known to horticulture.

A. *Branchlets 4-angled.*

Guajàva, Linn. Guava. Fig. 3247. An arborescent shrub or small tree, up to 25 or 30 ft. high, the trunk rather slender, usually dividing close to the ground, the bark scaly, smooth, greenish brown: lvs. oblong-elliptic, elliptic, or oval, 3–6 in. long, 1½–2½ in. broad, chartaceous, rounded to acute at apex, rounded at base, light green, finely pubescent below, the venation conspicuously impressed above and raised below; petiole 1½–2½ in. long: fls. produced on branchlets of recent growth, solitary or on 2- or 3-fld. peduncles, axillary; pedicel ¾in. long, bearing at its upper end 2 small, slender bracts; calyx-tube oblong-ovate, slightly constricted above the ovary; calyx closed before anthesis, splitting into 2–4 irregular segms., whitish and sparsely hairy within; petals broadly oval, about ¾in. long, thin and delicate, white; stamens erect or spreading,

in a broad cluster, the filaments about ½in. long, anthers pale straw-colored; style about ⅜in. high, stigma subcapitate, greenish: fr. globose, ovoid or pyriform, 1–4 in. long, commonly yellowish in color with flesh varying from whitish or yellowish to deep pink; flavor sweet or somewhat acid, with a pronounced musky aroma; seeds usually numerous, reniform or flattened. Flowers most abundantly in spring and produces the main crop of frs. in Aug. and Sept. Mex. and Cent. Amer., perhaps as far south as Peru.—This species is variable, and occurs in a wide range of horticultural forms. The two species *pyriferum* and *pomiferum* of Linnæus are considered to be nothing more than round and pear-shaped varieties, and are no longer accorded botanical standing. A large guava, which appears to be a horticultural form of this species, was formerly offered by Reasoner Bros. of Fla. under the name of *P. guineénse*, but is now being called Guinea guava and referred to *P. Guajava*. It is a large sweet fr. of excellent flavor, with unusually few seeds and thick flesh. In Calif. this variety has been called *P. guianénse*. A round red-fleshed guava intro. to Calif. by Franceschi under the name of *P. aromáticum* also appears to be a horticultural variety of *P. Guajava*. The variety Perico has been disseminated in Fla.; other forms are commonly listed by nurserymen under such names as "sweet," "sour," "red-fleshed," and the like. In Calif., where this species is less commonly grown than in Fla., an oval yellow-fleshed form is called lemon guava, a pyriform white-fleshed one is known as pear guava, and a yellow one with pink flesh is called Hawaiian guava.

The name guayaba, by which the fruit is known in Spanish (the plant guayabo) is generally considered to have come from the island of Santo Domingo. Both Barbosa Rodrigues and Tavares, however, assert that it originated with the Tupi Indians in Brazil. In French the fruit is called goyave, the plant goyavier; in Portugese goiaba, the plant goiabeira; and in German gujava, the plant gujavabaum. The aboriginal name in Mexico is xalxocotl, meaning sand-apple or sand-plum. Xocotl was the name applied by the Aztecs to all sour fruits, in contradistinction to zapotl which indicated all sweet ones.

Friedrichsthaliànum, Niedenzu (*Calyptropsídium Friedrichsthaliànum*, Berg). Costa Rican Guava. Cas. Tree, 25–35 ft. high, with rather slender branches and smooth, dark brown bark, the young branchlets dark-colored, slightly pubescent: lvs. oval or oblong-oval, 1½–3 in. long, acuminate, the base acute, deep green, thickly chartaceous, smooth, almost glossy above, puberulent below, sparsely pellucid-punctate, midrib prominent below: peduncles axillary on the young branchlets, 1-fld.; petals 5, suborbicular; stigma peltate; ovary 5-locular: frs. globose, small, sour. Costa Rica, Guatemala, and probably other parts of Cent. Amer.—Of comparatively recent intro. into the U. S. It grows well in S. Fla., but seems too tender for most parts of S. Calif. It may succeed in protected locations. The frs. are considered especially valuable for jelly-making, because of their acidity. A plant which has been disseminated in this country under the name of *P. laurifòlium*, intro. from Trinidad, appears to be this species.

mólle, Bertol. Güisaro. Sour Güisaro. Guayaba Acida. Shrub or small tree, of rather slender growth, the young branchlets, peduncles, and lower surfaces of the lvs. reddish velvety: lvs. oblong-oval, 3–5 in. long, the apex obtuse, apiculate, base obtuse or shortly acute, rigidly chartaceous, light green, puberulent above: peduncles erect, 3-fld.; ovary 4-locular: fr. globose, about 1 in. thick, pale yellow when fully ripe, with whitish pulp containing many rather small seeds. The flavor is acid and not especially agreeable. S. Mex. and Cent. Amer.—This species has been offered in Fla. for years but has never been extensively planted. It is fairly hardy, and has been grown in Calif. It fruits very prolifically, its season being late summer.

aa. *Branchlets terete.*

Aràca, Raddi. Brazilian Guava. Araçá do Campo. Large shrub, the young branchlets hirsute: lvs. oblong-oval, large, obtuse, subvelutinous above, pubescent below, the veins reticulate, somewhat raised: peduncles axillary, 1–3-fld.: fr. ovoid or oblong, yellow, sweet only when fully ripe. Common on the dry uplands of Brazil.—The species disseminated in Calif. by Franceschi under the name of *P. Araca* does not agree with this description; it is a plant strongly resembling *P. Cattleianum* var. *lucidum*, but with broader and somewhat thicker lvs., the frs. usually larger, of a deep yellow color, with few seeds and a more prominent calyx.

Cattleiànum, Sabine. Strawberry Guava. Shrub or small tree, up to 20 ft. high, the bark smooth, green-

3247. Psidium Guajava.—Guava. (×⅓)

ish brown, the branchlets glabrous: lvs. obovate-elliptic, acute at apex and acute to cuneate at base, 2–3 in. long, glabrous, thick and coriaceous, dark green, almost glossy: peduncles axillary, 1-fld.; calyx-tube turbinate, 4- or 5-lobed, the lobes broadly oblong; petals obovate, thin; style slender, stigma peltate; ovary 4-locular: fr. obovate to roundish, 1–1½ in. long, purplish red, with a thin skin and soft flesh, white toward the center, containing numerous hard seeds; flavor sweet and aromatic, sometimes likened to that of the strawberry, whence the common name. Brazil.—It flowers in late spring and ripens its fruits in Sept. and Oct. This species is extensively cult. in Calif., being hardier than most others, and is also grown in Fla. Var. **lùcidum,** Hort., the yellow strawberry guava, usually listed by the trade as *P. lucidum*, differs in the color of its fr., which is sulfur-yellow. It is thought to be somewhat more delicate in flavor, but is less commonly grown in both Fla. and Calif. than the type. Plants intro. under the names of *P. chinense* and *P. sinense* have proved to be nothing more than this variety.

A species intro. by Franceschi under the name of *P. àcre*, Ten., resembles P. Cattleianum var. lucidum, but has more elongated and usually larger frs. The foliage is of the same type.—*P. drchótomum*, Weinm., is properly P. Araca; a species intro. by Franceschi as this species is evidently something else, having broad coriaceous, glabrous lvs. and somewhat resembling P. Cattleianum in habit.—*P. guayábita*, A. Rich., is a species recently intro. from W. Cuba, where it grows wild: the frs. are small and not considered very

valuable.—*P. guianénse*, Pers., is a synonym of P. fluviatile, Rich., a species with branchlets terete, glabrous: lvs. oval, glabrous: pedicels opposite, 1-fld. Cayenne.—*P. guineénse*, Swartz, is a synonym of P. Araca, Raddi, according to Berg, but DeCandolle considers it a distinct species. He distinguishes it from P. Araca by the lvs. less soft, glabrous above, with the nervation not raised as in the latter. More recently Urban uses it in preference to P. Araca, which latter is made a synonym; he states that it resembles P. Guajava, but is easily distinguished by the less numerous transverse veins, not impressed above. Swartz, in describing P. guineense, stated that it came from Afr., and was cult. in Santo Domingo, but as all psidiums are now known to be American, he was doubtless mistaken regarding its origin.—*P. littorále*, Raddi, intro. by Franceschi, resembles P. Cattleianum very closely, but has lvs. somewhat more attenuate toward the base, and obovate or pyriform frs. Berg (in Linnæa, xxvii) groups this species, P. Cattleianum and P. humile together under the name of P. variabile. S. Brazil.—*P. montánum*, Swartz, is a species from the mountains of Jamaica, with 4-angled branchlets: lvs. oblong-oval, acuminate, glabrous: peduncles many-fld.: fr. subrotund.

F. W. Popenoe.

PSILOSTRÒPHE (Greek, *naked bud*, referring to the naked receptacle). Syn. *Riddèllia*. *Compósitæ*. Low and corymbosely branched woolly perennial herbs with alternate and spatulate or linear lvs., the cauline entire, and with small heads of yellow fls., the ligules large in proportion, pale or whitish in age and thin-papery: achenes narrow, terete, obscurely striate and angled. About 7 species, N. Amer. *P. tagetìna*, Greene (*Riddèllia tagetina*, Nutt.). Loosely or somewhat villously lanate, fairly widely branched: radical and even lower cauline lvs. often laciniate-pinnatifid: heads numerous, mostly cymosely clustered. W. Texas, E. Colo. and Ariz.—Intro. in botanic gardens abroad.

PSOPHOCÁRPUS (Greek, *noise* and *fruit*, referring to the fact that the pods when gathered and laid in the sun, blow up and explode with a noise). *Leguminòsæ*. Tall twining herbs, with large tuberous roots, one of which is used as a vegetable in subtropical gardening: lvs. 3-foliolate, stipellate; stipules fastened above the base: fls. rather large, lilac; calyx with the 2 upper teeth connate; corolla much exserted, standard suborbiculate, wings obliquely obovate, keel obtuse, incurved; stamens monadelphous, the upper free downward; ovary stipitate: pod square, with a distinct wing to each angle.—About 5 species, Trop. Afr. and Asia.

tetragonólobus, DC. Goa Bean. Root large, annual: sts. weak, wide-twining, glabrous: lfts. entire, ovate, acute, 3–6 x 2–6 in.: racemes lax, few-fld.; pedicels elongated: fls. large, light blue; calyx glabrous, lateral teeth oblong, lowest shorter and deltoid: pod 6–9 x 1 in., the wings ⅛–¼in. broad, usually much crisped and toothed. India.—Also grown in tropical and subtropical regions for the young tubers which are eaten raw or cooked, and for the young pods which are an excellent vegetable.

F. Tracy Hubbard.

PSORÀLEA (Greek, *warty;* referring to the glandular dots which occur on the plants). *Leguminòsæ*. Scurfy Pea. Herbs, shrubs, or subshrubs useful as border plants.

Usually copiously sprinkled with resinous black or pellucid dots and strongly scented: lvs. pinnate or trifoliate, rarely unifoliate; stipules free or adnate to the petiole: fls. in racemes or spikes, axillary or terminal, blue, purple, or white; calyx not enlarged after flowering, unequally 5-lobed; standard ovate or orbicular, clawed, wing oblong or falcate, keel incurved, obtuse, dark-colored; ovary sessile: pod ovoid, short, indehiscent, 1-seeded.—About 115 species common in the tropics and subtropics of both hemispheres, over 30 species in N. Amer. The genus comprises both greenhouse and hardy plants, some annual, others biennial, and still others perennial. The shrubby kinds are prop. by cuttings of half-ripened shoots, the herbaceous species by divisions when the new growth begins. The S. African species thrive in well-drained sandy peat, the others in ordinary garden soil.

A. *Plants hardy in the N.*

B. *Number of lfts. 7.*

subacaùlis, Torr. & Gray. Perennial herb, stemless or nearly so, about 1 ft. high, with numerous, usually purple fls. in ovate or oblong, dense spikes: lfts. 7, digitate, obovate-oblong, 1 in. long: fl.-st. longer than lvs., rigid. April–June. Rocky hills, Tenn.

BB. *Number of lfts. 3.*

C. *Lvs. digitately compound.*

lanceolàta, Pursh. Perennial herb, much branched, glabrous or nearly so, densely dark-glandular, 1–2 ft. high: lfts. sessile, bright green, entire, linear or oblanceolate: fls. bluish white, 3 lines long. June, July. Kans to W. Canada west to Wash., etc. B.B. 2:281.

CC. *Lvs. pinnately compound.*

physòdes, Douglas. Perennial herb, slender, 1–2 ft. high: lfts. ovate, about 1 in. long: fls. in short, close racemes; calyx ¼in. long, becoming enlarged and inflated until nearly ½in. long; corolla ¼in. long, white or purplish. Mountains of coast ranges, Calif.

BBB. *Number of lfts. 5.*

esculénta, Pursh. Pomme Blanche. Hardy herbaceous perennial 4–18 in. high: lfts. 5 and digitate, short-stalked, oval or obovate, entire; obtuse, narrowed at base, 1–2 in. long: fls. bluish; spikes dense, 1½–3 in. long: root large, often clustered, starchy. June. Prairies, Man. and Dak. south. B.B. 2:284.—The following points, by Sprague, on the pomme blanche (also called prairie apple, prairie turnip, and Indian or Missouri bread-root) are taken from Goodale's Wild Flowers of America: "In the autumn the top of the plant dies and separates from the root, near the ground, and is blown about the prairies. After the top has gone the root cannot be readily found, and hence the Indians dig them in August for their winter use. The root lies deep in the ground and is about the size of a hen's egg. The outside is covered with a thick integument almost as tough as wood and of a dark brown color. The inside is whitish and not unlike a chestnut in appearance and taste, but not so sweet. The Indian women dig the roots with great facility by means of a pointed stick 2 or 3 feet long." The roots are spindle-shaped or turnip-shaped. If the Indians use them immediately, they generally roast them in ashes. They are also dried and stored for winter, and when wanted they are mashed between stones, mixed with water and baked into cakes over the coals. The root was frequently found in the canoes of the Indians by early travelers before the plant which produced it was known to white men. Nuttall wrote: "The taste is rather insipid, but not disagreeable either raw or boiled. Texture laminated, always tenacious, solid and never farinaceous." In 1846 the pomme blanche was proposed as a substitute for the potato. Its claims to consideration were discussed in several publications, with the result that it was thought to offer no possibilities of advance over the potato.

AA. *Plants tender.*

B. *Number of lfts. 3.*

C. *Habit herbaceous.*

bituminòsa, Linn. Perennial herb, 1½–3 ft. high, appressed hirsute: lfts. nearly entire; lower ones ovate, obtuse; upper ones much narrower, acute: peduncles longer than lvs.; fl.-heads dense, involucrate, becoming elongated in fr.; fls. nearly 1 in. long. Spring and early summer. Poor soil, Arabia.

CC. *Habit shrubby.*

glandulòsa, Linn. Petioles scabrous; lfts. 3, digitate, ovate-lanceolate, acuminate: fls. blue and white, in usually axillary racemes. Chile and Peru. B.M. 990.

BB. *Number of lfts. 7–11.*

pinnàta, Linn. Arborescent or shrubby, 6–12 ft., densely branched and leafy: lfts. 7–11, pinnate, linear or lanceolate-linear, acute, commonly 10–15 lines long by about 1 line wide: fls. axillary, solitary or clustered, sessile or pedicelled, blue with white wings. S. Afr. G.C. III. 5:693; 33:301. J.H. III. 33:591. G.M. 46:611.

3248. Psychotria undata. (×½)

affînis, Eckl. & Zeyh. (*P. pinnàta* var. *subglàbra,* Harv.). Shrub, to 10 ft., with 4-angled branches with resinous glands: lvs. odd-pinnate; lfts. opposite, 3–4-paired, linear, acute, dotted with black glands: fls. solitary, axillary, clustered at the ends of the branches; corolla blue with a dark purple keel-tip. S. Afr. B.M. 8331.—Only distinguished from *P. pinnata* by technical characters, principally the longer peduncles of *P. affinis.* Long grown in gardens under the name of *P. pinnata.*

F. W. Barclay.
F. Tracy Hubbard.†

PSYCHÒTRIA (Greek, *life-preserving;* referring to medicinal properties). Incl. *Grumîlea* and *Glonèria. Rubiàceæ.* Shrubs or small trees or rarely herbs, erect, climbing or twining, suitable for the warmhouse.

Leaves opposite, rarely whorled, with deciduous or persistent stipules: infl. terminal or rarely axillary corymbose cymes, or occasionally fascicled in the axils or capitate; fls. greenish white, yellow or rose; calyx short-tubed, limb rarely persisting; corolla-tube usually short or straight, elongate limb 5- or rarely 4- or 6-lobed; ovary 2-celled: fr. a berry or small drupe with 2 small hemispherical stones.—Over 500 species in the tropics and subtropics, frequent in Amer. Only occasionally cult.

A. *Fls. yellow.*

capénsis, Vatke (*Grumîlea capénsis,* Sond.). An evergreen shrub or tree with shining lvs. 3–5 x 1½–2 in., and fls. in trichotomous, pedunculate corymbs: stipules coriaceous, broad: pedicels appressed, hairy, bracteated at the base; ultimate pedicel bearing a 6–12-fld. umbel; calyx ½ line long; corolla 3 lines long, yellow: fr. black. S. Afr. B.M. 7916.—Cult. in S. Fla.

AA. *Fls. white.*

undàta, Jacq. Fig. 3248. A glabrous shrub: lvs. papery, elliptical, acute-veiny; stipules large, connate, sheathing half-way, obovate: panicle sessile, trichotomous, much exceeded by the lvs.; fls. clustered, white; corolla-lobes shorter than tube. Bahamas, Jamaica.

jasminiflòra, Mast. (*Glonèria jasminiflòra,* Lind. & Andrè). Shrubby: bark whitish: lvs. 3 in. long, coriaceous, pale beneath; nerves obscure; fls. white, 1–1¼ in. long. Brazil. G.C. II. 12:201. B.M. 6454. G. 34.275 (as *P. jasminoides*).—Offered in England.

F. Tracy Hubbard.†

PTÆRÓXYLON (Greek, *sneeze-wood,* so called because the wood causes sneezing). *Meliàceæ.* Small tree or shrub with bitter bark, whose wood has a commercial value.

Leaves odd-pinnate; lfts. unequal-sided, 5–8 pairs: infl. axillary, panicled racemes crowded at the ends of the branches; fls. polygamous-dicœcious, small, white or yellowish; sepals 4, short, obtuse; petals 4; disk hypogynous, glandular; stamens 4, alternate with the petals; ovary obcordate, 2-celled, ovules solitary: fr. a compressed, 2-celled, 2-seeded caps., bi-lobed at the apex and cordate at base.—One species in S. Afr. extending into Trop. Afr.

obliquum, Radlkf. (*P. ùtile,* Eckl. & Zeyh.). Sneezewood. A tree 20–30 ft. high: lvs. opposite; lfts. ovate-oblong, obtuse, mucronulate: racemes shorter than the lvs.—Said to grow up to 50 ft. with a trunk 2–4 ft. diam. and a beautiful crown. The wood is extremely heavy and hard, strong and close-grained, very durable in contact with the ground and easily split. Among its uses are for piles of bridges and jetties, fence-posts and recently for wood-engraving. It is said to turn readily even when green and to take a fine polish like mahogany. The seeds have short vitality.

F. Tracy Hubbard.†

PTÈLEA (Greek name of the elm tree, transferred to this genus on account of the similarity of the fruits). *Rutàceæ.* Hop Tree. Ornamental woody plants grown for their handsome foliage and also for their attractive light green fruit.

Deciduous shrubs or small trees: lvs. alternate,

3249. Ptelea trifoliata, the hop tree, in fruit. (×⅓)

exstipulate, 3–5-foliolate; lfts. entire or crenulate, punctate with pellucid dots: fls. small, polygamous, in terminal corymbs; lobes of the minute calyx, petals and stamens 4–5; ovary flattened, 2-celled, with short style: fr. a 2-seeded, indehiscent, small, flattened nut, furnished usually with a broad thin wing.—Usually 5 to 7 species distributed from Lake Ont. to Fla. and N. Mex. are recognized, but recently about 60 species have been distinguished by Greene. Bark and foliage are sometimes used medicinally and emit (as well as the frs.) when bruised, a strong, pungent odor resembling somewhat that of the hop, for which the frs. are said to have been used as a substitute—hence the name hop tree.

3250. Ptelea aptera.

The hop trees are ornamental shrubs or small round-headed trees with long-petioled leaves and greenish white flowers, followed by flattened usually broadly winged and nearly orbicular fruits. The one species chiefly cultivated is hardy North—if it proves tender, as it sometimes does, it is probably raised from southern seed—and is a small round-headed rather loosely branched tree with glossy green foliage, adorned in fall with numerous clusters of light green fruits which form a pleasing contrast with the dark green foliage and remain on the branches for some time after the leaves have fallen. It thrives best in a porous moderately moist soil and prefers a somewhat shaded position. Propagation is by seeds sown in fall; the varieties by layers or by grafting in spring under glass or budding in summer on seedlings of the type.

trifoliàta, Linn. Hop Tree. Wafer Ash. Fig. 3249. Shrub or small round-headed tree, attaining 25 ft.: lfts. 3, sessile, ovate to elliptic-oblong, narrowed at both ends, sometimes acuminate, the lateral ones unequal at the base, crenulate or entire, dark green and lustrous above, pale below, glabrous or pubescent when young, 3–5 in. long: fls. ⅛–½in. across; filaments villous below: fr. about 1 in. long, broadly winged. June. Ont. and N. Y. to Fla., west to Minn., and sometimes escaped from cult. elsewhere. S.S. 1:33, 34. G.C. III. 16:375. Several varieties are in cult., of which var. **aûrea,** Behnsch (*P. aùrea,* Hort.), the Golden Hop Tree, with yellow foliage, is the best known. Var. **glaûca,** Kirchn. Lvs. grayish green, pubescent when young. Var. **móllis,** Torr. & Gray (*P. móllis,* Curtis. *P. tomentòsa,* Raf.). Branchlets, infl., and lvs. beneath pubescent or tomentose. N. C. and Fla. to Ariz. More tender than the northern glabrous form and rarely cult.

áptera, Parry. Fig. 3250. Shrub, to 15 ft.: lfts. 3, sessile, the terminal one elliptic-obovate or obovate, ½–¾in. long, the lateral ones smaller, obscurely crenulate, pubescent: clusters few-fld.: fr. broadly ovate, turgid, wingless or nearly so, ¼–½in. long. Low. Calif. G.F. 3:333 (adapted in Fig. 3250).—Possibly cult. in Calif.; not hardy North.

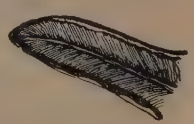
Alfred Rehder.

PTERÍDIUM (Greek, *with the form of Pteris*). *Polypodiàceæ.* Large ternately divided ferns commonly known as Bracken or Brakes, with the sporangia borne on a marginal line-like receptacle as in Pteris (Fig. 3251) and covered with a marginal indusium, but with an additional membranous indusium within the receptacle. Commonly known as Pteris.

aquilìnum, Kuhn. Lvs. scattered from an underground rhizome, 2–9 ft. high, ternately compound. Fields and waste places, in some of its forms throughout the world.—In some parts of the world it is used as food, in New Zeal. especially. It is counted a weed in the western states and a Farmers' Bulletin mentions methods of eradicating it.

L. M. Underwood.

PTERIDOPHÝLLUM (Greek, *fern leaf,* referring to the pinnate lvs.). *Papaveràceæ.* Perennial acaulescent herbs with a rather thick præmorse rhizome: roots fibrous: lvs. all radical, petiolate, pectinate-pinnatifid: scapes naked, longer than the lvs. with a simple or at base subramose many-fld. raceme; sepals 2, deciduous, very short; petals 4, deciduous, elliptic-concave; stamens 4, deciduous; ovary orbicular, 1-celled, 2–4-seeded: fr. unknown. One species, Japan, *P. racemòsum,* Sieb. & Zucc. A small glabrous herb with narrowly obovate lvs. 4–6 in. long, about 1 in. broad: segms. oblong-linear, rounded at the apex: scape slender, 6–9 in. tall, bearing a loose raceme of small white fls. Intro. into botanic gardens abroad; probably not otherwise cult.



3251. Fruiting pinnule of common brake.—Pteridium aquilinum. (Natural size.)

PTÈRIS (Greek name for a fern, from a word meaning *wing;* alluding to the prevalence of pinnate forms). *Polypodiàceæ.* A large genus (60 species) of widely distributed ferns with sporangia borne on a marginal line-like receptacle that connects the free ends of the veins, and with the more or less altered margin of the leaf rolled over to form a continuous indusium. Many of the forms are among the commonest species of ferns in the trade and are very generally used for table decoration, especially as small plants for fern-dishes. For culture, see *Fern.*

The common brake, *P. aquilina,* Linn., is by some authors now referred to a separate genus; see *Pteridium,* above.

Pteris probably contains as many cultivated forms as Nephrolepis, but in America at least does not rank with this fern in importance in the trade. As pot-plants for the house, the species *cretica* and *serrulata* and their varieties will probably succeed as well as most of the nephrolepis forms, and better than some. They are, however, extremely uncommon, except as already noted, as small plants for fern-dishes. Apparently only one dealer in America makes a specialty of growing pteris. His list is given at the end of this article.

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A. *Veins free throughout.*

B. *Lvs. simply pinnate, the lower pinnæ not divided.*

1. **longifòlia,** Linn. Lvs. 1–2 ft. long, 4–9 in. wide, lanceolate, often narrowed below; pinnæ 20–30 on each side, linear, entire. Tropical regions all around the world, extending to S. Fla. Var. **Màriesii,** Hort. Fronds shorter and pinnules straighter, the plant keeping closer to the pot; a good horticultural form.

BB. *Lvs. simply pinnate, but the lower pinnæ forked.*

2. **crética,** Linn. Fig. 3252. Lvs. 6–12 in. long, on slender, straw-colored stalks, consisting of a terminal pinna and 2–6 opposite sessile pairs, the upper often decurrent, the lower pairs cleft nearly to the base into 2 or 3 pinnules. Quite generally distributed in tropical regions, extending to Cent. Fla. Many varieties are in cult., of which var. **álbo-lineàta,** Hort. (Fig. 3253), is one of the finest, with broader pinnæ and a broad, central, whitish band. Var. **màjor** and var. **nóbilis** are larger horticultural forms, and var. **magnífica,** Hort., and var. **Màyii,** Hort. (*P. Màyii*) are still more developed. Var. **Wílsonii,** Hort., Fig. 3252, is one of the common garden forms.

3. **serrulàta,** Linn. f. Lvs. 3–12 in. long, on slender brownish stalks, consisting of a terminal pinna and 5–6 pairs of lateral ones, the upper ones decurrent and the lower forked into 2 or 3 branches or with second branch above the basal one; pinnæ narrow, the indusium not extending to the apices, which are sharply serrulate. China and Japan.—Many monstrous and distorted forms appear in cult., giving rise to such varietal horticultural names as **angustàta, cristàta, cristàta nàna compácta, cristàta variegàta, dénsa, Gílbertii, Ouvrárdii** (*P. Ouvrárdii*, Hort.), **volùta,** and the like, but these cannot be regarded as true varieties in any scientific sense.

3252. Pteris cretica var. Wilsonii.

4. **ensifórmis,** Burm. Lvs. of two sorts, the sterile with elliptic or elliptic-lanceolate segms. the lower pinnæ 5–7-parted, the upper gradually simpler: sporophylls similar but taller and with longer and much narrower divisions. India to Polynesia; often confused with the preceding species, as both are more or less common in cult. Var. **Victòriæ** (*P. Victòriæ*, Hort.) is a garden variety with lvs. variegated with white.

BBB. *Lvs. with lowest pinnæ pinnate.*

5. **inæquàlis,** Baker. Lf.-blades ovate-deltoid, 18–24 in. long, 10–15 in. wide, with 4–5 pairs of pinnate or pinnatifid pinnæ followed by 2–3 pairs of broadly linear simple ones and ending in a long, terminal, irregularly pinnatifid portion; divisions of the lower sides of the pinnæ uniformly much longer and larger than the upper ones. China and Japan.

6. **semipinnàta,** Linn. Lvs. 12–18 in. long, the upper portion simply pinnate with decurrent pinnæ, the 4 or more lowest pinnatifid on the lower side, the upper side of the secondary rachises bordered by a narrow lamina. India, China, Japan, and E. Indies. Var. **Baûsei,** Hort. (*P. Baûsei*, Hort.), is a garden form.

BBBB. *Lvs. with lowest pinnæ bipinnatifid.*

C. *Lowest pinnæ enlarged.*

7. **quadriaurìta,** Retz. Lvs. up to 2–3 ft. long, on strong, pale stalks, with a terminal pinna cut down to the rachis into numerous linear-oblong lobes, and below this several similar pinnæ on each side, the lowest of which are usually again compound with similar but smaller ones branching from the lower side at base. All tropical regions. Var. **argyræa,** Hort. (*P. argyræa*, Moore) is a form with a white band down the centers of the pinnæ. Var. **trícolor,** Hort. (*P. tricolor*, Lind.), is similar but has a tinge of red in addition.

8. **heterophýlla,** Linn. Lvs. 6–8 in. long, on pale stalks, of two sorts; sterile lvs. elliptic, deeply incised; fertile lvs. narrowly linear-elliptic, with broad indusia and sterile apices ending in 2–3 teeth; both sorts bipinnate in the lower portions. W. Indies to Brazil. Sometimes referred to a distinct genus, Anopteris. Var. **internàta** (*P. internàta*, Moore) is a garden variety with smaller sporophylls and broader segms.

9. **trémula,** R. Br. Lf.-blades 2–4 ft. long, on polished chestnut-brown stalks; upper pinnæ simply pinnate, lower often much compound: sori copious, sometimes filling up the whole segm. except the rachis. Austral., New Zeal.—Many forms occur in cult., as var. **Smithiàna** (*P. Smíthii*, Hort.), **variegàta,** and the like.

CC. *Lowest pinnæ not enlarged.*

10. **scabérula,** Richard. Lf.-blades 12–18 in. long, on brownish scabrous stalks, lanceolate-ovate in outline, tripinnate or quadri-pinnatifid throughout; rachis flexuous, scabrous; sori at maturity covering nearly the entire surface of the narrow lanceolate segms. New Zeal.

AA. *Veins free, except for a single low arch next the midvein.*

11. **biaurìta,** Linn. (*P. máxima*, Baker. *P. nemoràlis*, Willd.). Lf.-blades 15–30 in. long, with a terminal pinna 6–9 in. long, cut into narrow round-pointed divisions on 7–10 pairs of similar lateral ones, the lowest pair bearing a fork on the lower basal side. All tropical regions.—Habit very like *P. quadriaurita*, from which it differs chiefly in the venation. Var. **cristàta** (*P. máxima* var. *cristàta*, Hort.) is a cult. form.

12. **Wallichiàna,** Agardh. Lf.-blades tripartite, with the lateral divisions again forked, the central one reaching 2 ft. long, with numerous lanceolate sessile opposite pinnules, cut again into numerous narrow lobes ⅛in. wide. India, Japan, and the Philippine Isls. Known also as *Campteria Wallichiana.*

AAA. *Veins uniting, forming copious meshes.*

13. **leptophýlla,** Swartz. Lf.-blades triangular, 9–12 in. each way, on straw-colored stalks; upper pinna simple, those below pinnatifid to a winged rachis, the lowest similarly bipinnatifid at the base; veins fine: sori not reaching the tips of the segms. Brazil. Known also as *Litobrochia leptophylla.*

3253. Pteris cretica var. albo-lineata.—One of the standard house ferns.

Besides those already given, there are a number of forms the exact relationship of which has not been ascertained, and a few forms often listed under Pteris which belong properly under other generic names. These undetermined and transferrable names mentioned in North America are: *P. adiantoides,* Hort.; *P. chinénsis,* possibly a variety of *P. serrulata; P. geraniæfòlia,* see Doryopteris; *P. hastàta,* see *Pellæa viridis; P. palmàta,* see Doryopteris; *P. metállica,* Hort.; *P. Súmmersi,* Hort.; *P. plumòsa,* Hort.; *P. regina,* Hort.

The following list contains forms of Pteris actually in the American trade. It represents the list of forms which are being or have been grown by H. A. Dreer, and is arranged in the order of the commercial importance of the varieties named. The writer is indebted to J. C. Clark, of Dreer's, for the information. It will be noted that there are several forms which have not already been described. The numerals are given for purposes of identification and they refer to the numbers of the species described in this article.

Wilsonii, 2.
cretica albo-lineata Alexander, 2.
cretica Ouvrardi, 2.
Wimsettii Distinction, 2.
Wimsettii Dutrei, 2.
Wimsettii Gautherii, 2.
Wimsettii grandis, 2.
Wimsettii tripartita, 2.
Wimsettii Sieboldii, 2.
Wimsettii rivertoniana, 2.
Wimsettii multiceps, 2.
Childsii, 2.
flabellata, 6.
Grevilleana variegata, Hort.
leptophylla argentea, 13.

Discarded varieties. (by Dreer)
biaurita.
nemoralis variegata, 11.
tricolor.
cretica Drinkwaterii, 2.
cretica Harrisonii, 2.
longifolia.
longifolia Mariesii.
metallica, Hort.
Summersii, Hort.
tremula Smithiana.
Wimsettii, 2.

P. Wilsonii, Hort. (Fig. 3252), represents about half the total sales. *P. Childsii* (G. 37:293) is an important form, but it produces no spores, and therefore can be reproduced only by division. *P. Wimsettii rivertoniana* is a new form intro. in 1915 which shows considerable promise. Numbers of other forms of Pteris may be expected to appear in the trade.

L. M. UNDERWOOD.
R. C. BENEDICT.†

PTEROCÁCTUS (*wingcactus*). *Cactàceæ.* Low cacti, with numerous slender round sts.: fr. a caps.; seeds flat, winged. Three species described, all from Argentina, little cult. **P. Kûntzei,** Schum. Roots several, tuber-like: branches glaucous: spines 9–12, minute, appressed: fls. yellow, terminal.

J. N. ROSE.

PTEROCÁRPUS (Greek, *wing fruit;* the pods are girded by a broad wing). *Leguminòsæ.* Trees or woody climbers without prickles: lvs. alternate, uneven-pinnate; lfts. alternate or irregularly opposite, without stipules: fls. yellow, rarely mixed with violet and white, often showy, in axillary or terminal racemes; calyx turbinate; standard orbicular or broad-ovate, wings obliquely obovate or oblong, keel with its petals resembling or shorter than the wings, free or shortly connate; stamens all connate in a sheath slit above, or both above and below, or the upper one free; ovary sessile or stipitate: pod compressed, indehiscent, orbicular or broad-ovate.—About 45 species, natives of the tropics of both hemispheres. The following species may be in cult. in some greenhouses: *P. Dràco,* Linn., growing 30 ft. high, native of Trop. Amer. *P. indicus,* Willd., "Burmese rosewood," growing about as high, but a native of the E. Indies. *P. Marsùpium,* Roxbg., a pale yellow-fld. tree reaching a height of 40 ft. Coromandel. *P. Ròhrii,* Vahl, from Trop. Amer., which grows to be 20 ft. high.

PTEROCÀRYA (Greek, *pteron,* wing, and *karya,* nut; referring to the winged nuts). *Juglandàceæ.* Ornamental trees grown for their handsome pinnate foliage and the attractive pendulous racemes of winged fruits.

Deciduous: branches with lamellate pith; winter buds naked or scaly, more or less stalked and usually several in each axil, one above the other: lvs. alternate, exstipulate, odd-pinnate, with almost sessile lfts.: fls. monœcious, in pendulous catkins, appearing with the lvs.; staminate catkins rather dense, fls. consisting of 3 connate bracts, 1–4 sepals and 6–18 stamens; pistillate catkins slender, the 1-celled ovary inclosed in a connate involucre elongated into a 4-toothed beak; stigmas 2: fr. a small 1-seeded, winged nut, 4-celled at the base. In germination the 4-lobed cotyledons are borne above the ground and become green, while in Juglans and Carya they remain inclosed in the nuts.—Eight species: 6 in China, 1 in Japan, and 1 in W. Asia.

The pterocaryas are handsome trees of rapid growth usually dividing into several stems from the base, with large pinnate leaves, rather inconspicuous flowers appearing with the foliage and adorned in summer and fall with long drooping racemes of winged fruits. They thrive best in rich and moist soil, but grow well also in drier localities. *P. fraxinifolia* and *P. rhoifolia* are hardy as far north as Massachusetts, but need some protection while young. *P. stenoptera* is more tender and the other Chinese species have not yet been sufficiently tried. Propagation is by seeds sown in autumn or stratified, also by layers and suckers.

A. *Winter buds naked, usually several in each axil.*

B. *Fr. with 2 distinct wings.*

C. *Wings of fr. suborbicular: rachis of lf. terete, glabrous.*

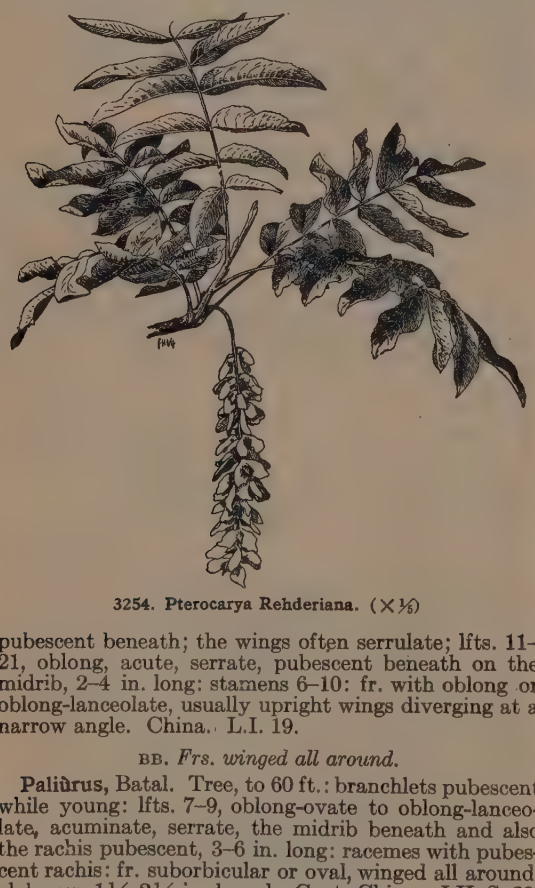
fraxinifòlia, Spach (*P. caucásica,* C. A. Mey. *P. Spachiàna,* Lav.). Tree, to 60 ft., with spreading branches, often rising in several sts. from the ground: young branchlets slightly pubescent: lvs. 8–15 in. long, lfts. 11–25, ovate-oblong to oblong-lanceolate, acute or acuminate, serrate, pubescent only in the axils of the veins beneath, 2–4 in. long: stamens 10–16: fr. including the semi-orbicular wings, ½–¾in. broad, in racemes to 18 in. long. W. Asia. Gn. 34, p. 219; 62, p. 235. G.C. III. 4:381. G.W. 9, p. 10. L.I. 20, 21. Var. **dumòsa,** Schneid. (*P. dumòsa,* Lav.). More shrubby: lfts. smaller, about 2–2½ in. long. Seems more tender.

hupehénsis, Skan. Tree, to 60 ft.: branchlets glabrous or sparingly hairy: lfts. 5–9, oblong to oblong-lanceolate, acuminate, rounded at the base, serrate, glabrous above, bearded in the axils of the veins beneath, 3–5 in. long: racemes to 18 in. long, glandular: fr. including the suborbicular wings 1–1½ in. across. Cent. China.

cc. *Wings oval to oblong-lanceolate, longer than broad: rachis more or less winged.*

Rehderiàna, Schneid. (*P. fraxinifòlia* × *P. stenóptera*). Fig. 3254. Tree, similar to *P. fraxinifolia:* rachis of lf. narrowly winged, the wings not serrulate and often wanting between the lower lfts.; lfts. 11–25, oblong to oblong-lanceolate, serrate, acute or acuminate, pubescent in the axils beneath, 2–4 in. long: frs. with oval or oval-oblong wings about ⅓in. long. S.T.S. 2: 137.—Originated at the Arnold Arboretum and surpasses both parent species in vigor and hardiness.

stenóptera, DC. (*P. sinénsis,* Hort. *P. japónica,* Hort.). Tree, to 60 ft.: young branchlets villous: lvs. 6–12 in. long, with the rachis distinctly winged and



3254. Pterocarya Rehderiana. (×⅓)

pubescent beneath; the wings often serrulate; lfts. 11–21, oblong, acute, serrate, pubescent beneath on the midrib, 2–4 in. long: stamens 6–10: fr. with oblong or oblong-lanceolate, usually upright wings diverging at a narrow angle. China. L.I. 19.

bb. *Frs. winged all around.*

Paliùrus, Batal. Tree, to 60 ft.: branchlets pubescent while young: lfts. 7–9, oblong-ovate to oblong-lanceolate, acuminate, serrate, the midrib beneath and also the rachis pubescent, 3–6 in. long: racemes with pubescent rachis: fr. suborbicular or oval, winged all around, glabrous, 1½–2½ in. broad. Cent. China. J.H. S. 28, p. 65.

aa. *Winter buds covered with 2–3 dark brown, large scales, falling off early in spring: accessory buds wanting.*

rhoifòlia, Sieb. & Zucc. (*P. sorbifòlia,* Sieb. & Zucc. *P. lævigàta,* Hort.). Tree, attaining 80 ft., with spreading branches: branchlets glabrous: lvs. 8–15 in. long, with terete pubescent or almost glabrous rachis; lfts. 11–21, oblong or oblong-lanceolate, acuminate, pubescent on the veins beneath or almost glabrous, 2–4 in. long: fr. with a broad rhombic wing, about 1 in. across. Japan. S.Z. 2:150. S.I.F. 1:16.—This species is an important forest tree in Japan and has proved hardy at the Arnold Arboretum. ALFRED REHDER.

PTEROCÉLTIS (Greek, *pteron,* wing; referring to the winged fr. and the close affinity of the tree to Celtis). *Ulmàceæ.* A deciduous tree from N. W. and Cent. China, in foliage and habit very much like Celtis, but with a winged fr., resembling a small elm fr. Cult. and prop. like Celtis; probably hardy as far north as Mass. The only species is **P. Tatarinówii,** Maxim. Tree, to 50 ft.: branchlets glabrous: lvs. ovate to ovate-oblong, acuminate, broadly cuneate at the base, irregularly and sharply serrate, 3-nerved at the base, glabrous, 1½–3½ in. long: fr. axillary, solitary, slender-stalked, suborbicular, often broader than high and the wing usually emarginate at the apex.—Rare in cult. and without particular ornamental qualities. ALFRED REHDER.

PTEROCÉPHALUS (Greek, *wing head,* so named because the head appears covered with a lot of feathers after the fls. fall off). *Dipsacàceæ.* Herbs, half-shrubs and shrubs, annual or perennial: bracteoles narrow: involucral mouth short, ciliate, pubescent; calyx-limb 12–24 long bristles; corolla 5-fid; mostly without palea. About 20 species chiefly in the Medit. region but also in Asia. This genus was formerly included in Scabiosa but is now kept distinct. *P. Parnássi,* Spreng. (*Scabiòsa Pterocéphala,* Linn.). A densely tufted perennial with woody sts. and branches, procumbent: lvs. narrowed into the stout petiole, ovate, obtuse, deeply crenate-toothed or lyrate-pinnatifid: heads depressed-hemispherical; fls. lilac-pink; corolla 2-lipped, upper 2-lobed, lobes short rounded; lower 3-lobed, lobes ovate, obtuse. Greece. B.M. 6526. Perfectly hardy in England, used for carpeting in the herbaceous border or suitable for rockwork.

PTERODÍSCUS (Greek, *wing* and *disk,* having reference to the wings of the disk of the fr.). *Pedaliàceæ.* Perennial succulent herbs: st. tuberous at the base: lvs. opposite or alternate, coarsely dentate to pinnate-laciniate, rarely subentire: fls. solitary, short-pedicelled in the lf.-axils, yellow or purple; calyx small, 5-parted; corolla-tube funnel-shaped, oblique or slightly gibbous at base, limb somewhat 2-lipped, lobes subequal, orbicular; ovary 2-celled, cells undivided: fr. indehiscent, laterally compressed, with 4 longitudinal wings, unarmed. About 15 species in Trop. and S. Afr. *P. speciòsus,* Hook. St.-base globose: st. densely glandular, 3–6 in. high: lvs. rather numerous, crowded in the upper part of st., linear to linear-oblong: calyx-segms. lanceolate, acuminate; corolla bright red-purple: fr. suborbicular, cordate at base. Trop. and S. Afr. B.M. 4117. G.Z. 21, p. 49. *P. lùridus,* Hook. f., having dull yellow fls. and a native of S. Afr., is also occasionally cult. B.M. 5784.

PTEROLÒBIUM (Greek, *wing* and *pod;* the pods are produced into a wing at the extremity). *Leguminòsæ.* Woody climbers having the habit of Cæsalpinia, from which they differ only in the pod: lvs. bipinnate; lfts. small, numerous; stipules small or inconspicuous: fls. small, white, racemose, the racemes in lax panicles at the tips of the branches; calyx deeply cleft, lobes imbricated; petals spreading, oblong and clawed; stamens 10, free, declinate; ovary sessile, 1-ovuled: pod indehiscent, with a large horny oblique wing. About 7 species in the tropics of the Old World. *P. indicum,* A. Rich. (*Cæsalpìnia lácerans,* Roxbg.). Branches slender, finely downy and with minute prickles: lvs. alternate with 8–16 pinnæ, 12–16 lfts., pale green: racemes copiously panicled at the end of the branches; calyx with the lowest sepal longest; corolla yellow, not showy. Old World tropics.—Has been

intro. into England and is occasionally cult., the treatment being the same as that given Cæsalpinia. The species varies in the size of the lvs. and in the width and size of the wing of the pod.

PTERÒNIA (Greek, *wing*, referring to the chaffy receptacle). *Compósitæ*. Small dry or glutinous shrubs: lvs. opposite or rarely alternate, mostly entire, glabrous or hairy, often ciliate: heads terminal, solitary or corymbose; involucral scales scarious, often shining; fls. yellow, rarely purple. About 60 species, natives of S. Afr. *P. incàna*, DC., a scrubby divaricate branched bush with the twigs and lvs. thinly tomentose-canescent: lvs. opposite, sessile, linear-oblong, obtuse: heads sessile, 6–9-fld., golden yellow, involucral scales oblong, subobtuse, at first greenish yellow then fulvous and finally the centers brown: achenes top-shaped, densely and rigidly hairy. B.M. 8380.—Occasionally cult. abroad.

PTEROSPÉRMUM (Greek, *wing seed;* referring to the fact that the seeds are winged). *Sterculiàceæ*. Scaly or stellate-tomentose trees or shrubs, suitable for the warmhouse and outdoors in the southern part of the country.

Leaves 2-ranked, leathery, simple or lobed: infl. 1–3 axillary and terminal peduncles, 1- or few-fld.; fls. often elongated; calyx tubular, 5 more or less connate sepals; petals 5, deciduous with the calyx; staminal column short, bearing opposite the sepals 3 linear 2-celled anthers between each part of 5 anti-petalous ligulate staminoides; ovary inserted within the top of the staminal column: caps. woody or coriaceous, terete or 5-angled.—About 25 species, confined to Trop. Asia. Pterospermums are said to need considerable warmth, and perfect drainage is most essential. They grow best in a mixture of sandy, fibry loam and lumpy peat. Prop. by cuttings of half-ripened side shoots, cut close to the st.

acerifòlium, Willd. Large tree: lvs. 10–14 x 6–12 in., roundish or oblong, often lobed, palmately 5–7-nerved; nerves prominent beneath: bractlets laciniate: fl.-buds oblong, obtuse, 5-angled, rusty tomentose: fls. 5–6 in. across, pure white, fragrant; sepals linear-oblong, thick; petals linear-oblong: caps. 4–6 in. long, 5-celled; seeds many; wing large, thin. B.M. 620. G.W. 7, p. 121.—Cult. in S. Calif.

F. Tracy Hubbard.†

PTERÓSTYLIS (Greek, *wing column;* the column is broadly winged). *Orchidàceæ*. Terrestrial herbs with small underground tubers: radical lvs. ovate; st.-lvs. developed and linear or lanceolate, or reduced to scarious sheathing scales: fls. usually green, often tinged red or brown, large and solitary or smaller and several in a raceme; dorsal sepal broad, erect, incurved and very concave; petals lanceolate-falcate, attached to the basal projection of the column; labellum on a short claw at the end of the basal projection of the column, movable; column with a pair of hatchet-shaped or quadrangular wings.—About 50 species, mostly Australian but a few in New Zeal. and New Caledonia and 1 in New Guinea. *P. cúrta*, R. Br. Lvs. in a radical rosette, usually on long petioles, ovate or broadly elliptical, 5–9-nerved: scapes 1-fld.; usually about 6 in. high; galea erect, acute; lip linear, obtuse, entire, rather longer than the column; wings of the column with the lower lobe long and obtuse, the upper lobe short and broad. Austral. B.M. 3086. O. 1910:104. Cult. to some extent in greenhouses abroad as are the following: *P. acuminàta*, R. Br. Austral. B.M. 3401; *P. Bánksii*, R. Br. New Zeal. B.M. 3172; *P. Baptístii*, Fitzg. Austral. B.M. 6351; and *P. nùtans*, R. Br. Austral. B.M. 3085. They are prop. by division and thrive in lf.-mold lightened by a little sand; the lower third of the pots should be filled with broken crocks.

F. Tracy Hubbard.

PTEROSTŸRAX (Greek, *pteron*, wing; alluding to the winged or ribbed fruit, by which it is distinguished from the allied genus Styrax). *Styracàceæ*. Ornamental woody plants grown chiefly for their drooping panicles of white flowers.

Deciduous trees or shrubs, stellate-pubescent: lvs. alternate, denticulate: fls. in large panicles, terminal on short branchlets; calyx 5-toothed; corolla 5-parted almost to the base; stamens 10, somewhat longer than the corolla and slightly exceeded by the slender style; ovary 3-celled: fr. a ribbed or winged 1–2-seeded nut.—Three species in China and Japan. Sometimes united with Halesia, from which it is distinguished chiefly by the panicled drooping infl. and the 5-merous fls.

These are handsome trees or shrubs with rather large light green leaves and white flowers in showy pendulous panicles, followed by small rather inconspicuous fruits. They are only precariously hardy in sheltered positions as far north as Massachusetts. In June they are very attractive, with their graceful drooping panicles of numerous deutzia-like fragrant flowers. They thrive best in a moderately moist sandy loam and are propagated by seeds or layers and also by greenwood cuttings under glass.

3255. Pterostyrax hispida. (×⅓)

híspida, Sieb. & Zucc. (*Halèsia híspida*, Mast.). Fig. 3255. Tree, attaining 50 ft., with slender spreading branches forming an open head: lvs. short-petioled, ovate to oblong, narrowed at the base, acute or acuminate, denticulate, almost glabrous or pubescent on the veins beneath, light green above, grayish green beneath, 3–7 in. long: panicles 5–10 in. long; fls. creamy white, fragrant, about ½in. long: fr. 10-ribbed, thickly covered with bristly hairs, ½in. long. June. China, Japan. G.C. II. 22:177; III. 46:88; 48:125. Gn. 8, p. 243; 26, p. 23; 34, p. 111. R.H. 1875, p. 308. G.F. 5:389. M.D.G. 1899:353. G.W. 3, p. 37. F.E. 14:36 (pl. 21); 17:457. B.M. 8329. S.I.F. 2:65. G.M. 57:538.

corymbòsa, Sieb. & Zucc. (*Halèsia corymbòsa*, Nichols.). Small tree or shrub: lvs. short-petioled, oval or ovate, abruptly acuminate, serrulate with usually bristly teeth, sparingly stellate-pubescent on both sides, 2½–4½ in. long: panicle corymbose 3–5 in. long: fr. with 4–5 narrow wings, tomentulose, ½in. long. June. China, Japan. S.Z. 1:47. S.I.F. 2:65.—Seems to be more tender than the preceding species and is but rarely cult.

Alfred Rehder.

PTYCHOCÓCCUS (Greek, *fold* and *grain*, probably referring to folds on the fruit). *Palmàceæ*. Separated from Ptychosperma by technical characters of the endocarp of the seed. Two species, New Guinea. *P. paradóxus*, Becc. (*Ptychospérma paradóxa*, Scheff.). St. simple, 9–12 ft. high, rather slender, covered with dense white arachnoid tomentum: lvs. at top of st. regularly pinnate-divided; segms. 6–15, in young plants subsemi-rhomboid, later broad-lanceolate, contracted toward the base, tip oblique-truncate: fls. dicœcious; ovary ovate-conical, 1-celled; seed 5-sulcate.

PTYCHORÀPHIS (Greek, *folded* and *rape*). *Palmàceæ*. Malayan and Indian palms grown in warm greenhouses.

Stems slender, ringed: lvs. pinnate, the lfts. long-acuminate: spadix from between the lvs., much branched, the spirally arranged fls. usually staminate only toward the apex.—Three species, one from Singapore, 1 from the Philippines and 1 from Nicobar. The genus is placed next to Rhopaloblaste by Drude in Engler and Prantl's Natürlichen Pflanzenfamilien and distinguished by the ridge of the forked raphe and deeply ruminate seed, while the rumination of the upper parts of the seed is flattish. Cult. as for any tropical palm, requiring abundance of moisture.

augústa, Becc. Trunk becoming 80–100 ft. high in the wild, much lower in cult., slender, smooth: lvs. 6–10 ft. long; pinnæ 1–2 ft., linear, acuminate, bright green: spadix much branched, 2½–3 ft. long: fr. elliptical-oblong, red; seed grooved on one side. Nicobar. G.W. 2, p. 198.—Wm. Watson writes: "It is as graceful as *Cocos Weddeliana* or *Geonoma gracilis*, and it grows as freely under cult. as either of these popular palms." This rare palm has been offered in Amer., but is not known to be cult. at present.

Siebertiàna, Hort. Sts. slender: lvs. copper-colored when young, afterward rich green; petioles colored with small brownish scales; lfts. 10 in. long, ¾in. broad, tapering to a long thread-like point. Malaya. G.C. III. 43: suppl. Apr. 25. Gng. 16:278. G.W. 13, p. 31.—An elegant species resembling a kentia. N. Taylor.†

PTYCHOSPÉRMA (Greek words, probably referring to the ruminate albumen of the seed). *Palmàceæ*. A small and unimportant group of palms little known in America.

Trunks smooth, ringed, crowned at the summit by a dense cluster of pinnately divided lvs.: lfts. acuminate, either entire or jagged at the apex: spadix simple or sometimes branched, appearing below the lvs.: fls. monœcious in the same spadix: fr. an ovoid drupe. For cult., see *Archontophœnix*, to which belong many of the plants in the trade under Ptychosperma. For *P. elegans*, consult *Seaforthia*.

Macárthuri, H. Wendl. Described as dwarf, and most cult. specimens are so; in nature 20–30 ft.: lvs. pinnate, the lfts. arching, from 3–9 in. long, usually obliquely cut at the apex: infl. unknown. Austral. G.Z. 23, p. 265.—Suckers freely from the base, thus making a bushy plant.

P. álba, Scheff.=Dictyosperma alba.—*P. Alexándræ*, F. Muell. =Archontophœnix Alexandræ.—*P. Cunninghamiàna*, H. Wendl.= Archontophœnix Cunninghamii—*P. élegans*, Hort.=Seaforthia.—*P. Rámphii*=Drymophlœus.—*P. Seèmanii*=Balaka.

N. Taylor.

PUCCOON: *Lithospermum*. **P., Red**: *Sanguinaria*. **P., Yellow**: *Hydrastis*.

PUERÀRIA (M. N. Puerari, botanist of Geneva). *Leguminòsæ*. Twining herbs or shrubs, often climbing; grown for ornament.

Closely allied to Dolichos and Phaseolus, but differing among other things in the beardless style, tumid nodes of the racemes and monadelphous stamens: lvs. 3-foliolate and stipellate, the lfts. sometimes lobed: fls. often large, pea-shaped, in long and dense, often compound, racemes; standard usually spurred at the base, about equaling the wings and keel: pod flattish, linear, many-seeded.—Eleven species, Asian and Milanesian.

A. *Lfts. not deeply lobed.*

B. *Pod not constricted.*

hirsùta, Schneid. (*P. Thunbergiàna*, Benth. *Dòlichos japónicus*, Hort. *Pachyrhìzus Thunbergiànus*, Sieb. & Zucc.). Kudzu Vine. Perennial, with large tuberous starchy roots, making a vigorous growth of slender, hairy, twining sts.: lfts. rhombic-ovate to nearly orbicular-ovate, variously lobed, but the margins entire and ciliate: fls. pea-shaped, purple, in axillary spikes late in the season, not showy: pod large and flat. Japan and China. A.G. 13:387; 21:505. G.F. 6:505. R.H. 1891, p. 31. Gt. 45:1429. Gn. 61, p. 161. G.W. 5:605.—A hardy vine remarkable for the great rapidity of its growth, and most useful for covering arbors and verandas. It is also used as a forage plant. From a well-established root, vines will grow 40–60 ft. in a single season, producing a profusion of very large lvs. In the N. the plant dies to the ground in the winter, but in the S. the top becomes woody. The large fleshy root assumes most curious shapes, the main branches often being 4–5 ft. long. Georgeson writes of the plant in Japan: "The roots are fleshy and yield starch of excellent quality; the tough fiber of the inner bark is manufactured into a sort of cloth which combines fineness with remarkable strength; and in certain situations the vine is unparalleled for ornament and shade." The fls. are borne on the old or woody sts., but these sts. usually do not persist north of Philadelphia, and even rarely there. With age, the tops are more likely to survive the winter. Prop. by division of the roots, or by seeds when they can be had; also by cuttings.

BB. *Pod constricted.*

tuberòsa, DC. (*Hedýsarum tuberòsum*, Roxbg.). Root tuberous, very large: st. shrubby: branches finely grayish pubescent: stipules minute, deciduous, ovate-cordate: lfts. membranous, roundish, 6–12 in. long, glabrescent above, below densely covered with a whitish appressed pubescence: fls. in slender, dense, often panicled racemes 6–9 in. long; pedicels very short, densely fascicled; calyx ⅛–¼in. long, densely silky; teeth rather obtuse, shorter than the tube; corolla bluish, not twice as long as the calyx; limb of standard orbicular, distinctly spurred: pod 2–3 in. long, membranous, flat, 3–6-seeded, clothed with long, gray, silky bristly hairs. India. Wright, Icones, 412.—Intro. into U. S. in 1911. Suitable as an ornamental for the southern parts of the United States. The root contains a saccharine matter, an easily oxidizable resin; and a resin acid. It is also said to be used as a food and in medicine in India. When cut, the root exudes a bitter, acrid, opalescent gum.

AA. *Lfts. usually deeply lobed.*

phaseoloìdes, Benth. (*Dòlichos phaseoloìdes*, Roxbg.). St. twining, often scarcely woody, clothed with dense spreading brown hairs: stipules small, lanceolate: lfts. membranous, sparingly covered with appressed bristly hairs above, gray and densely matted below; terminal lft. roundish, broadly ovate or rhomboidal, entire or shallowly or deeply lobed, 3–6 in. long: fls. clustered on numerous long-peduncled racemes; pedicels very short; bracts and bractlets lanceolate, strongly nerved, more or less persistent; calyx ¼–⅜in. long, densely clothed with appressed bristly hairs, lowest tooth lanceolate, as long as the tube, others shorter, all setaceous pointed; corolla reddish, twice as long as the calyx; standard roundish above, distinctly spurred: pod glabrescent, 3–4 in. long. India, China, Malaya.—Intro. into U. S. in 1911. Suitable as an ornamental in the southern states.

P. L. Ricker.

PULMONARIA (Latin, *lung;* the herb having been considered a remedy for diseases of the lungs). *Boraginàceæ.* LUNGWORT. Perennial herbs with a creeping rootstock, used in flower-gardens and hardy borders.

Leaves radical, often broad, cauline few and alternate: fls. in terminal cymes, rather large, blue or purple; calyx tubular-campanulate, 5-toothed or cleft to the middle only; corolla-tube straight, naked or pilose, limbs spreading, 5-lobed; stamens included in the tube: nuts smooth.—About 8–10 species in Eu. and 1 species said to extend into N. Asia. Mertensia, an allied genus, has a short open more deeply-cleft calyx, exserted, stamens, and slightly fleshy nuts.

Pulmonarias are of easy cultivation, preferring light soil, not very dry, in open or partially shaded positions. They are readily propagated by division. Divide the clumps every two or three years.

A. *Lvs. white-spotted.*

B. *Plant very glandular.*

saccharàta, Mill. BETHLEHEM SAGE. Height 6–18 in.: st. setose-hairy, with articulate glands: radical lvs. oval-acuminate at both ends, slightly decurrent, larger than in following species: fls. whitish or reddish violet. April, May. In shady places, Eu. G. 29:147.

BB. *Plant rough-hairy but slightly if at all glandular.*

officinàlis, Linn. (*P. maculàta,* F. G. Dietr.). Height 6–12 in.: radical lvs. in distinct tufts, ovate-oblong to nearly linear, on long footstalks, coarsely hairy, more or less spotted: fls. in terminal forked cymes, red fading to violet. April. Woods, Eu. Gn. 74, p. 213.—Commonly cult.

AA. *Lvs. entirely green.*

B. *Radical lvs. linear- or oblong-lanceolate, tapering to the petiole.*

angustifòlia, Linn. Height 6–12 in.: st. setose-hairy, having a few glands: radical lvs. linear-lanceolate to oblong-lanceolate, gradually tapering to and decurrent on petiole: fls. blue. April, May. Woods, Eu. Var. **azùrea,** Hort., has been listed.

BB. *Radical lvs. broadly elliptic-lanceolate, abruptly contracted into the petiole.*

montàna, Lej. (*P. móllis,* Wolff, not Auth.). Height 6–20 in.: lvs. bright green, radical broadly elliptic-lanceolate, abruptly contracted to the petiole: fls. violet. April. Cent. Eu.—Some of the material cult. as *P. mollis* and its varieties is probably not the *P. mollis* of Wolff and is referable to *P. officinalis.*

P. álba, Hort. Saul., is presumably Mertensia sibirica var. alba.—*P. avernénsis,* Hort., with purple-blue fls. and compact growth, and its var. *álba,* Hort., with pure white fls., and good green lf., flowering in March, are listed.—*P. sibírica.* See Mertensia sibirica.—*P. virgínica.* See Mertensia virginica.

F. W. BARCLAY.
F. TRACY HUBBARD.†

PULSATÍLLA: *Anemone.*

PULTENÆA (probably named after Dr. Richard Pulteney, 1730–1801). *Leguminòsæ.* Shrubs suitable for the warmhouse, not commonly in cultivation, although many species have been occasionally grown.

Leaves alternate or rarely ternate-verticillate: fls. axillary and solitary or in terminal heads, usually yellow, orange or mixed with purple; ovary sessile or rarely short-stipitate: pods ovate, compressed or turgid, 2-valved.—About 90 species in Austral. Pulteneas grow best in a mixture of peat and silver sand and are said to need firm potting and careful watering with soft water. Prop. by seed or by cuttings made of the points of shoots when about three parts matured.

ròsea, F. Muell. Erect heath-like shrub with virgate branches: lvs. linear-terete; stipules subulate-pointed: fls. pink, in terminal heads; calyx silky pubescent: pod acuminate. Austral. G.Z. 21:193.

PUMMELO (possibly contraction of Dutch *pompelmoes*). A generic term including most of the varieties of *Citrus grandis* (see page 782, Vol. II), other names for forms of this species being grapefruit (page 1391, Vol. III) and shaddock (Vol. VI).

The grapefruits long grown in the West Indies and the United States comprise a group of very juicy subglobose (not pear-shaped) thin-skinned varieties differing widely from the common pummelos of the East Indies which are usually more or less pear-shaped, thick-skinned, and have a firm pulp. These latter are called shaddocks in the West Indies and United States. These two extremes are well separated in the character of the fruit and also show differences in the leaves and twigs, the pummelos having more or less hairy twigs, leaves downy on the under surface and very broadly winged petioles, while the grapefruits have nearly smooth, slender twigs, leaves smooth on the under surface, and narrower petioles.

In the Orient, however, there are a multitude of forms of pummelos, among which occur all the intermediates between the two extreme types noted above. Under these circumstances it seems advisable to retain the word pummelo in its usual East Indian sense, i. e., to include all varieties of *Citrus grandis* with the exception of the grapefruit group which is sufficiently distinct to merit a separate name. The attempt was made some years ago to apply the name pomelo to the grapefruit in this country but this name never attained any currency among growers, shippers, dealers, and consumers and was largely restricted to books and bulletins on descriptive horticulture. Pomelo is really a variant of pummelo, also written pummelow, pummeloe, pummalo, pumelo, pomello, and so on. In view of this confusing perplexity of similar names, it seems inadvisable to attempt to distinguish by the name pomelo the grapefruit of America from the pummelo of the East Indies.

As a result of a trip to Japan, China, and the Philippine Islands made by the writer in 1915, it was found that some varieties of pummelos were very resistant to citrus canker (caused by *Pseudomonas citri*), unlike the grapefruit which is very susceptible to this disease. Unless citrus canker can be wholly eradicated from the southeastern United States it will be necessary to hybridize the grapefruit with the most canker-resistant sorts of citrous fruits in the hope of securing new varieties combining the juiciness and high flavor of the grapefruit with the canker-resistance of the other parent. In this work the canker-resistant varieties of the pummelo, some of them of excellent quality, promise to be of capital importance.

In view of this unforeseen importance of the pummelo, the following sketch of the more promising known varieties is given:

Malayan varieties.—*Banda navel,* from Plo-ay, Banda Islands, Malaysia. Fruits very large, nearly round but bumpy, growing in clusters of five or six; peel an inch thick; pulp white, juicier and sweeter than the common pummelo, nearly or quite seedless; the fruits sometimes show an included navel, a smaller fruit the size of a peeled orange being formed near the top of the larger fruit. Navel fruits are very rare in seedlings grown in Amboyna from seed brought from Banda. This very interesting variety described by Rumphius about 200 years ago does not seem to have been noticed since.—*Cassomba.* Rumphius describes this as a depressed globose variety as large as a man's head, commonly grown on the island of Amboyna. It has red vinous pulp as sweet as currants when ripe, often seedless.—*Labuan,* or *Bali* (?). A seedless pummelo of very superior quality is said to have been introduced by Sir Hugh Low from the island of Bali to Labuan Island off the coast of Borneo, from whence it was sent some fifteen years ago to the West Indies. The tree is said be thornless.

Indian varieties.—Bombay Red. Fruit subglobose, 7 inches diameter; skin ¼–½ inch thick; pulp very juicy, deep red (color of raw beef), pleasantly subacid, with a characteristic flavor. This is said by E. E. Bonavia to be "by far the finest variety of pummelo" he had seen. He describes a number of other sorts varying in shape, size, color, and juiciness. The leaves and twigs of some varieties are smooth; of others downy or hairy. In 1904 a collection of thirteen sorts of Indian pummelos was received by the Department of Agriculture from the Botanic Garden at Calcutta. A number of these have fruited both in California and Florida. One of these Indian pummelos (shown in Fig. 3256) was grown at Eustis, Florida, in 1915, and has pink flesh.

Siamese varieties.—The Siamese seedless pummelos, grown in the Nakon chaisri district, have long been

3256. Pummelo. (Branch and fruit ×¼; details ×½)

famous and have recently been studied there by H. H. Boyle (Phil. Ag. Rev. 7:65-9, pls. 3, 4, Feb., 1914. Journ. Heredity, 5:440–7, pls. 1–3, Oct., 1914). *Oval Nakon chaisri.* The best variety is slightly oval, 4½ inches diameter, 4 inches high: skin pale yellow; flesh white, juicy, aromatic, not bitter; seeds few or none. Boyle considers this variety superior to any other pummelo and to any grapefruit and says it is a good fruit for market purposes.—*Flat Nakon chaisri.* A very flat fruit, 4⅞ inches diameter, 3¼ inches high; skin bright yellow; flesh white, juicy, aromatic; seeds few or none. Boyle considers this an excellent fruit for market purposes. Two other seedless varieties, but of somewhat inferior quality, were found by Boyle.

Japanese varieties.—In Japan many varieties of pummelos, there called Buntan, Uchimurasaki or Jabon are known, variously estimated from 75 to 200. The following are among some of the more promising studied by T. Tanaka in the course of a survey of the citrous fruits of Japan: *Hirado.* Large, depressed globose, about 4–5 inches in diameter and 3–4 inches high, with grapefruit-like smooth skin of lemon-yellow color; pulp juicy, rind thin, segments regular, core rather small, very good flavor; seeds small but numerous. This variety originated at Hirado near Nagasaki, Japan, some seventy-five years ago as a seedling of a pummelo brought from Java. The writer saw bearing trees of this variety at the Nagasaki agricultural experiment station in 1915 and found the fruits to be juicy and of excellent quality and noted that the tree remained almost entirely exempt from citrus canker (caused by *Pseudomonas citri*) which was attacking seriously Washington navel orange trees grown only a few yards distant. On account of its superior quality and high degree of canker-resistance, hybrids were made in June, 1915, between it and American grapefruit by means of pollen shipped from Florida to Nagasaki in vacuum tubes (Science N.S. 42:375–377. Sept., 1915). It is hoped to secure in this way canker-resistant hybrids equal to the grapefruit in quality. Seedlings of the Hirado pummelo are now being grown by the Department of Agriculture.—*Ogami,* vicinity of Kagoshima; rare; very large, very flat; rind smooth; thin, pinkish; core large, segments numerous, sometimes twenty-five, pulp pinkish, fine-grained, juicy, very good quality; seeds numerous.—*Hata-jirushi,* experiment farm of Count Tachibana, Yanagawa, Fukuoka-ken. A very large flat pummelo like the Ogami, very much like the latter in general characters but rind much thicker and pulp vesicles coarser, good-flavored; seeds numerous.—*Yoko-jirushi,* experiment farm of Count Tachibana, Yanagawa, Fukuoka-ken. A large round variety with rough skin; oil-glands remarkably large and prominent, not much rag, segments regular, pulp slightly pinkish, good quality, vesicles long and parallel; seeds numerous.—*Take-jirushi,* experiment farm of Count Tachibana. Long-oval in shape, with salmon-colored flesh, segments large and rather irregular, very sweet and of good quality; seeds few.—*Tamura.* Shinkai-mura, Kôchi-ken; a round, smooth-skinned variety, with pale pink flesh, segments irregular, large, pulp coarse-grained and good quality; seeds very few.

Formosan varieties.—Matô. Matao, Ensuikô-chô, Formosa. Common; fruit small, conical; rough-skinned, rind very thin; core small, pulp similar to the Ogami, very high quality; practically seedless; very early ripening. Besides the Matô pummelo, red (*To yu*) and white (*Pei yu*) pummelos of fairly good quality are commonly grown in Formosa.

Chinese varieties. Canton varieties.—There are at least half a dozen varieties grown about Canton. The Sung-ma is one of the best for export. The sorts commonly exported are pear-shaped, with a very fragrant thick peel and a very firm greenish yellow pulp of aromatic flavor. These pummelos are exported to all parts of the world where Cantonese Chinese live.—*Amoy,* a very large slightly pear-shaped pomelo with a thick skin and very firm white flesh, is produced near Amoy. In spite of its reputation it is of mediocre quality.

California seedlings.—There are many pummelo trees in northern California grown from seeds planted years ago by the Cantonese Chinese immigrants. Until a few years ago Canton pummelos were regularly imported by Chinese merchants in San Francisco. G. P. Rixford has located two score or more seedling trees in California which show considerable variation in the size, color, shape, and quality of the fruit. Some are of fairly good quality. These seedlings are mostly old bearing trees and furnish excellent opportunity for crossing with grapefruit in the hope of securing canker-resistant hybrids.

Florida shaddocks.—In Florida, pummelos have been grown for a long time under the West Indian name shaddock. The grapefruit is so much better, however,

that shaddocks have almost disappeared. H. H. Hume lists only two varieties, the *Mammoth*, oblate, 5–6 inches diameter, flesh firm, white, sweetish, bitter; and the *Pink*, oblate-pyriform, 6 x 6⅝ inches, flesh rough, pink, bitterish, subacid. Other forms are occasionally found but almost all are of very poor quality.

Hybrids.—Natural hybrids of the pummelo are common in Japan. They are mostly between the pummelo and the Mandarin types of oranges. Some are of great promise, however, being large, juicy, and very good-flavored. The common *Natsu mikan*, a very flat fruit 4–5 inches diameter, 2½–3 inches high, ripening very late in the season, is probably one of these hybrids. This group of hybrids is very similar to the tangelo, obtained by crossing the grapefruit with oranges of the Mandarin type. In India there seem to be natural hybrids between pummelos and lemons or citrons; possibly the group of citrous fruits called Amilbed by Bonavia is of this nature. After discovering that some varieties of pummelos are very resistant to citrus canker, the author inaugurated in 1915 in Japan a series of experiments in hybridizing the Florida grapefruit with different varieties of Japanese pummelos in the hope of securing canker-resistent grapefruit-like hybrids, as was noted above under Hirado pummelo.

Sour pummelos.—In India and other eastern countries very large acid-fleshed pummelos occur which are said to yield up to a quart of juice. One such sour pummelo grown near Eustis, Florida, has been used in breeding new types of acid fruits by hybridizing.

WALTER T. SWINGLE.

PUMPKIN AND SQUASH. Fruits, and the plants that produce them, of species of Cucurbita, used for food when cooked and also for stock-feed. See *Cucurbita*.

In North America, the word pumpkin (colloquially but incorrectly pronounced *punkin*) is applied to large late-maturing globular or oblong fruits of forms of *Cucurbita Pepo*, represented in the "field pumpkin" (Fig. 3257), from which pies are made and which is commonly fed to cattle and swine. The pumpkin is characterized by a five-angled stem which is not expanded where it joins the fruit (Fig. 1133, Vol. II), by rough vines and herbage, and by prominently lobed leaves. Sometimes the word is applied to some of the

3257. Connecticut or common field pumpkin.—Cucurbita Pepo.

earlier forms of this species, as to the Sugar pumpkins that ripen late in summer or early in autumn and are used for pies. It is also applied to forms of *Cucurbita moschata*, which, in the form known as Canada Crookneck squash, is sometimes called "pie pumpkin."

The word squash is adapted from an American Indian word, and is applied in an indefinite way to various members of the genus Cucurbita. The application of the name does not conform to the specific lines of the plants. What are called summer squashes are mostly varieties of *Cucurbita Pepo*, of the Crookneck and Pattypan type. The winter squashes are either *C. maxima* or *C. moschata*, chiefly the former. If the name squash belongs to one species more than to another, this species is probably *C. maxima*. This species produces fruit with very firm or "solid" yellow flesh. The pictures on pages 909–911 in Vol. II, show some of the forms of these species. Fig. 3258 is the Winter or Canada Crookneck, one of the forms of *C. moschata*. Figs. 3259–3262 are forms of the multifarious *Cucurbita Pepo*. A further discussion of the application of the vernacular names will be found in Vol. II, page 909.

3258. Winter or Canada Crookneck squash.—Cucurbita moschata.

Culturally, the pumpkins and squashes comprise one group of warm-season frost-sensitive plants. They are very easy to grow, provided they are given a warm and quick soil. They are long-season plants (except the "bush" varieties of summer squash), and therefore in the North they are very likely to be caught by frosts before the full crop has matured, unless the plants are started early and make a rapid and continuous growth. In hard rough clay lands the plants do not get a foothold early enough to allow them to mature the crop. On such lands it is impossible, also, to plant the seeds early. As a consequence, nearly all squashes are grown on soils of a loose and relatively light character. Sandy lands or sandy loams are preferred in the northern limits, but an open clay loam is probably the best soil in general for these plants. On very rich bottom lands the plants often thrive remarkably well, but there is danger that they may run too much to vine, particularly when the soil has too much available fertilizer. In order that the plants shall start quickly, it is necessary that the soil be in excellent tilth. It is customary, with many large growers, to apply a little commercial fertilizer to the hills to give the plants a start. A fertilizer somewhat strong in nitrogen may answer this purpose very well; but care must be taken not to use nitrogen too late in the season, else the plants will continue to grow over-vigorously rather than to set fruit.

Pumpkins and squashes are of two general kinds, so far as culture is involved, the bush varieties and the long-running varieties. The bush types are usually early. The vines run very little, or not at all. The various summer squashes belong to this category, and most of them are varieties of *Cucurbita Pepo*. The hills of bush varieties are usually planted as close together as 4 by 4 feet. On high-priced land they are often planted 3 by 4 feet. The fruits are borne close to the center of the plant. The long-running varieties comprise the autumn and winter types; and to this category may also be referred, for cultural purposes, the common field pumpkins. There is much difference between the varieties as to length of vine. On strong soils, some varieties will run 15 to 20 feet, and sometimes even more, producing the fruit some feet from the hill or the root. These varieties are planted from 8 to 12 feet apart each way. Sometimes they are planted in corn-fields, and they are allowed to occupy the ground after tillage for the corn is completed, but with the introduction of corn-harvesting machinery this practice is falling away.

For general field conditions, the seeds of pumpkins and squashes are usually planted in hills where the plants are to stand. If the land is mellow and rich, these hills are nothing more than a bit of ground 12 to 18

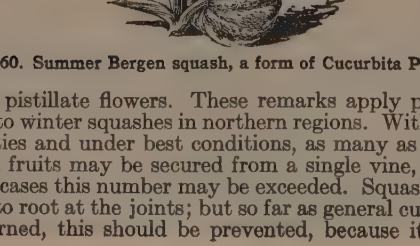
inches across, that has been freshly hoed or spaded and leveled off. On this hill, from six to ten seeds are dropped, and they are covered an inch or less in depth. In order to provide the seeds with moisture, the earth is usually firmed with the hoe. When the very best results are desired, particularly for the home-garden, hills may be prepared by digging out a bushel of soil and filling the place with rich earth and fine manure.

3259. Summer Crookneck squash.—Cucurbita Pepo form.

It is expected that not more than three to five of the plants will finally be left to each hill; but there are many contingencies to be considered. The young plants may be taken off by cutworms or by other insects, or they may be caught by frost, and it is well not to remove the extra plants too soon.

If it is necessary to start the crop in advance of the season, the seeds may be planted in pots or boxes in a forcing-house or hotbed about three weeks before it is time to set them in the field. If the seeds are started much earlier than this, the plants are likely to get too large and to become stunted. When set in the field, the roots should fill the pot or box so that the earth is held in a compact ball, and the plant should be fresh, green, and stocky. Sometimes the seeds are planted on sections of inverted tough sod, and the entire piece is transferred directly to the field. Plants that become stunted and develop one or two flowers when they are in the box are usually of little use. Sometimes seeds are planted directly in the field in forcing hills, and when the plants are established and the season is settled the protecting box is removed and the plants stand in their permanent positions.

A good vine should produce two or three first-class fruits; if, however, one flower sets very early in the season, the vine may devote most of its energies to the perfection of that single fruit and not set many others, or may set them too late to allow them to mature. If it is desired, therefore, that the plants shall produce more than one fruit, it is advisable to pick off the first fruit, providing it sets long in advance of the appearance of

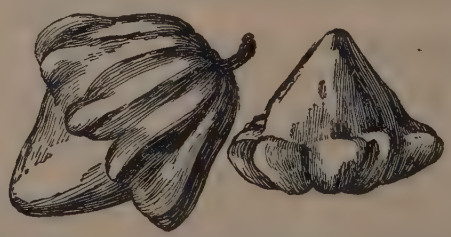


3260. Summer Bergen squash, a form of Cucurbita Pepo.

other pistillate flowers. These remarks apply particularly to winter squashes in northern regions. With small varieties and under best conditions, as many as a half-dozen fruits may be secured from a single vine, and in some cases this number may be exceeded. Squash vines tend to root at the joints; but so far as general culture is concerned, this should be prevented, because it tends to prolong the growing season of the vine, although it may have to be encouraged if the borer is prevalent. It is usually well, therefore, to lift the joints occasionally when hoeing, although the vine should not be moved or disturbed. This precaution applies particularly in the short-season climates of the North, where every effort must be made to cause the plant to set its fruit early in the season and to complete its growth before cool weather.

Tillage is simple. It consists in light working of the surface until the plants begin to run strongly, after which the big weeds are pulled by hand. For early results with bush squashes, or when the land is of a cold or backward type, the plants may be grown in hills that are raised a few inches above the general level; this adds to the expense, and in most cases it is better to practise level culture.

The varieties of pumkpins and squashes are numerous, and it is difficult to keep them pure if various kinds are grown together. However, the true squashes (*Cucurbita maxima*) do not hybridize with the true pumpkin species (*Cucurbita Pepo*). There need be no fear, therefore, of mixing between the Crookneck or Scallop squashes on the one side and the varieties of Hubbard or Marrow types on the other. The summer or bush squashes are of three general classes: the Crooknecks, the Scallop or Pattypan varieties, and the Pineapple or oblong-conical varieties, all forms of *C. Pepo*. The autumn and winter varieties may be thrown into



3261. The Pineapple Summer squash, one of the Scallop, Pattypan or Custard Marrow type.—Cucurbita Pepo.

several groups: the true field pumpkin, of which the Connecticut Field (Fig. 3257) is the leading representative, being the one that is commonly used for stock and for pies; the Canada Crookneck or Cushaw types, which are varieties of *C. moschata;* the Marrow and Marblehead types, which are the leading winter squashes and are varieties of the *C. maxima;* the Turban squashes, which have a "squash within a squash" and are also varieties of *C. maxima*. The mammoth pumpkins or squashes which are sometimes grown for exhibition and which may weigh 200 or 300 pounds, are forms of *C. maxima*.

In Europe the vegetable marrow type is much prized. It is a form of *Cucurbita Pepo*. In this country it is little grown, although it thrives well, the various summer squashes of the Crookneck and Scallop types being more popular. The following English advice on this vegetable is from a contribution to Gardening Illustrated, from which Fig. 3263, representing Moore's vegetable marrow, is also reduced: "Vegetable marrows should be eaten young—say when about one-fourth or one-sixth their full size. Cut in this state, and boiled quickly until quite tender in plenty of water, carefully strained, and served with melted butter, they are second to no vegetable that comes to table, not even excepting green peas or asparagus. Early cutting, careful cooking, and serving are the chief points to which attention should be paid; but there are others, one of the principal being rapid growth. Grow vegetable marrows quickly, and they are almost sure to be good; grow them slowly, and you will find them often tough and bitter. Hence the soil or place in which they are grown can hardly be too rich for them. Not but what they do fairly well in any

good garden soil, but the richer it is the better. On a rubbish-heap, for instance, vegetable marrows grow with wonderful vigor, and fruit abundantly." For early results, they are often started under glass in pots. There are many kinds or varieties. The custard marrows are fruits of the Scallop or Pattypan kind. The summer Crookneck is little used abroad for food.

Insect enemies and diseases of pumpkins and squashes are several. Perhaps the most serious is the striped cucumber beetle, which destroys the tender young plants. This insect is destroyed with the arsenicals applied in flour, also with tobacco powder and some other materials; but since it works on the under sides of the leaves as well as on the upper, it is difficult to make the application in such way as to afford a complete protection. The insects also are likely to appear in great numbers and to ruin the plants even whilst they are getting their fill of arsenic. If the beetles are abundant in the neighborhood, it is best to start a few plants very early and to plant them about the field in order to attract the early crop of beetles, thereby making it possible to destroy them. From these early plants the beetles may be hand-picked, or they may be killed with very heavy applications of arsenicals,—applications so strong that they may even injure the plants. Sometimes the hills of squashes are covered with wire gauze or mosquito netting that is held above the earth by means of hoops stuck into the ground. This affords a good protection from insects that arrive from the outside, providing the edges are thoroughly covered with earth so that the insects cannot crawl under; but if the insects should come through the ground beneath the covers they will destroy the plants, not being able to escape. The arsenicals should be applied when the dew is on, or the plants may be sprayed with bordeaux mixture to which the poison has been added. The squash bug or stink-bug may be handled in the same way as the striped cucumber beetle. This insect, however, remains throughout the season and, in many cases, it is necessary to resort to hand-picking. The insects crawl under chips or pieces of board at night, and this fact may be utilized in catching them. The young bugs can be killed by tobacco extract and soap, and by some of the emulsions.

The stem-borer attacks the vines later in the season, boring into the main stalk near the root, and causing the entire plant to lose vigor or to die. It is a soft white larva. As a safeguard, it is well to cover the vines at the joints with earth after they have begun to run, so that roots will form at these places and sustain the plant if the main stem is injured. The borers may also be cut out with a thin-bladed knife. Tobacco dust is said to keep the insect away. Infected vines should be burned to destroy larvæ and eggs.

3262. The Negro squash. One of the warty forms of Cucurbita Pepo.

A wilt disease, caused by a species of bacillus, sometimes does damage to species of Cucurbita. The disease is likely to be associated with the punctures of the striped beetle. Burn the infected plants.

The summer squashes are eaten before the shell becomes hard, and not afterward. A thoroughly mature Crookneck or Scallop is not used and not marketable. The late forms of *Cucurbita Pepo*, like the field pumpkin, are not long keepers, but the late squashes of the *C. maxima* type, as Hubbard, Boston Marrow, and Marblehead, can be kept till late spring. To keep these late squashes, care should be taken to have them full grown, with hard shells, not frosted or otherwise injured; they should be harvested with the stem on, and much care should be exercised to prevent any bruising or rough handling. In a rather dry and somewhat dark cellar, with a temperature of about 40°, such fruits may be kept all winter. Commercial growers store them in above-ground houses built for the purpose, placed only one layer deep on racks or shelves. The house is well insulated to prevent fluctuation, kept dry, and provided with a stove or other heat for very cold weather, the temperature maintained at about 40° to 45° F. The following advice on the storing of squashes was written for the "Cyclopedia of American Horticulture" by W. W. Rawson: "Cut the squashes just before they are thoroughly ripe. Be careful not to start the stem in the squash. Lay them on the ground one deep and let them dry in the sun two or three days before bringing to the building. Handle very carefully when putting in, and be sure that the wagon in which they are carried has springs. Put them two deep on shelves in a building. This should be done on a cool, dry day. If the weather continues cool and dry, keep them well aired by day; but, if damp weather comes, build a small fire in the stove in order to dry out the green stems. Keep the temperature about 50°, and air well in dry weather. The squashes may need picking over about Christmas if put in the building about October 1; handle very carefully when picking over. Fifty tons can be kept in a single building with a small fire. Do not let them freeze, but if temperature goes down to 40° at times it will do no harm; nor should it be allowed to go as high as 70°. The Hubbard squash keeps best and longest and does not shrink in weight as much as other kinds; but any of them will shrink 20 per cent if kept until January 1." L. H. B.

3263. Vegetable marrow.—Cucurbita Pepo.

PÙNICA (*Punicus*, Carthaginian: hence *Malum punicum*, "apple of Carthage," an early name of the pomegranate). *Punicàceæ*. A small branched tree, the branches rather terete and spiny. The common pomegranate of cultivation.

Leaves opposite, subopposite and fascicled in short branches: fls. in simple axillary racemes, small, white; calyx persistent, 5–7-lobed; petals 5–7, lanceolate, corrugate; ovary inferior: berry spherical, thick-skinned, many-celled.—Two species, Orient to N. W. India. For cult., see *Pomegranate*.

Granàtum, Linn. POMEGRANATE. A large deciduous shrub or small tree, with oblong or obovate, obtuse, entire, glabrous and more or less shining lvs.: fls. orange-red, showy; calyx tubular, the short lobes persistent on the top of the fr. (as on an apple); petals inserted between the lobes; ovary imbedded in the calyx-tube (or receptacle-tube), comprising several locules or compartments in two series (one series above the other), ripening into a large, juicy, many-seeded pome-like berry. Persia to N. W. India. G.W. 10, p. 510.—A handsome plant, with showy fls. 1 in. across

in summer. Hardy as far north as Washington and Baltimore. It is also grown as a conservatory plant, blooming in winter as well as in summer. For ornament, the double-flowering kinds are the most popular (F.S. 13:1385, as *P. Granatum Legrellei*). There are many varieties. The treatment of the fruit-bearing varieties is discussed under *Pomegranate*. Var. **nàna,** Hort. (*P. nàna,* Linn.). DWARF POMEGRANATE. Seldom growing higher than a man, and usually treated as a pot-plant in the N. It is the best kind for greenhouse use. The double-fld. form is most common. B.M. 634. It is as hardy as the species, and is suitable for outdoor work where the climate is not too severe. On the Pacific Coast it is grown as a hedge-plant as far north as San Francisco. Both this and the species are easily grown by cuttings of dormant wood, as currants are, but the cuttings should be started indoors with some heat. L. H. B.

PÚRSHIA (after F. T. Pursh, or Pursch, as is the original spelling of his name, 1774–1820; born at Grossenhain, in Saxony; traveled in this country and wrote a flora of North America). Syn., *Kúnzia. Rosàceæ.* Low deciduous spreading shrub, allied to Cercocarpus, with alternate, mostly fascicled, small, cuneate and tridentate lvs.: fls. solitary, yellowish; calyx-tube tubular; petals spatulate, 5; stamens numerous; pistils 1 or sometimes 2: fr. a pubescent leathery achene exceeding the persistent calyx. Of little ornamental value with its sparse grayish or bluish green foliage and its rather inconspicuous fls. and frs., and but rarely cult. Probably hardy as far north as Mass., requiring sunny position and well-drained soil; an excess of moisture, especially during the winter, proves fatal to it. Prop. by seeds and probably by layers. The only species is **P. tridentàta,** DC. (*Kúnzia tridentàta,* Spreng.). Diffusely branched shrub, attaining 5, rarely 10 ft.: lvs. cuneate-obovate, 3-lobed at the apex, whitish pubescent beneath, ¼–¾in. long: fls. solitary on short branchlets, almost sessile, yellowish, about ¾in. across: fr. ovate-oblong, acuminate. April–July. Ore. to Wyo., New Mex. and Calif. B.R. 1446. Var. **glandulòsa,** Jones (*P. glandulòsa,* Curran), is glandular and has very small, almost glabrous lvs., sometimes pinnately 5-lobed. ALFRED REHDER.

PURSLANE: *Portulaca oleracea.* **P., Winter:** *Montia perfoliata.*

PUSCHKÍNIA (named for Count M. Puschkin). *Liliàceæ.* Hardy or half-hardy bulbous plants which may be used in the rock-garden or border.

Leaves radical, few, the first often oblong, the others linear: infl. a simple leafless scape; fls. few, blue, loosely racemose; perianth campanulate, of 6 subequal lobes; stamens 6; ovary sessile, 3-celled: caps. membranaceous, dehiscent.—Two species, Asia Minor, the Caucasus and Afghanistan. These attractive spring-blooming bulbs have clusters of small 6-lobed white fls., each narrow lobe being prettily lined with blue. A good specimen may have as many as 10 fls., each ¾in. across. The peculiar feature of the genus is the crown on which the stamens are borne. This is a white body of petal-like texture, having 6 lobes, each of which is variously toothed. The genus is allied to Scilla and Chionodoxa.

scilloìdes, Adams (*Adámsia scilloìdes,* Willd.). Height 4–12 in.: bulb globular, about ¾in. thick: lvs. as long as scape, ½–1 in. wide: raceme 1–10-fld.; pedicels slender, erect; perianth usually bluish white; divisions elliptic-oblong, three times as long as the tube; crown one-third as long as divisions, cleft to middle into truncate or retuse teeth. April, May. Var. **libanôtica,** Boiss. (*P. libanótica,* Zucc.), differs from the type in having divisions of perianth ½in. long and the teeth of the crown more acute and bifid. Gn. 32, p. 5; 54, p. 219. B.M. 2244. F.S. 21:2220 (as *P. sicula*). F. TRACY HUBBARD.†

PUTRANJÌVA (Indian name). *Euphorbiàceæ.* Evergreen trees, cult. for ornament in the tropics: lvs. alternate, simple: fls. small, axillary, single or in small clusters, apetalous; calyx imbricate; stamens 1–4; disk absent; styles broad, spreading; ovary 2–3-celled, 2 ovules in each cell: fr. a 2-celled drupe.—Two or more species in Trop. Asia. Related to Drypetes.

Róxburghii, Wall. INDIAN AMULET PLANT. WILD OLIVE. A moderate-sized tree, nearly glabrous: branches slender: lvs. short-petioled, ovate-lanceolate, serrulate, smooth, shining, 2–3 in. long: fls. yellow: fr. globose to ovoid, about ½in. thick, white-tomentose. India. J. B. S. NORTON.

PÙYA (Chilean name). *Bromeliàceæ.* Large terrestrial xerophytic South American bromeliads.

Allied to Pitcairnia (differing in having a fully superior rather than partially superior ovary).—Forty-four species, according to Mez (DC. Monogr. Phaner. 9). For culture, see also *Billbergia.* Puya also includes the plants known in trade as Pourretia.

Puyas and pitcairnias are generally found in collections of bromeliads and are usually grown in moist tropical houses. The native home of the puyas is on the steep stony slopes of the Cordilleras at high altitudes with little other vegetation for company except some species of cereus. This would indicate that drier and cooler conditions, or such as are given cacti and succulents, would suit them best, yet they thrive equally well in the tropical house. Indeed, the writer has found most of the family Bromeliaceæ very accommodating not only to temperature and moisture conditions, but to soils and methods of growing them; for example many of the tillandsias may be grown on blocks of wood as epiphytes, yet they do equally well grown in pots. But what perhaps is more remarkable is the fact that several of the stronger-growing bromeliads appear to grow equally well either in a strong loamy mixture, or a mixture of chopped fern root and charcoal. The writer has pineapples growing in both mixtures with equal success. But the most rational treatment is to give all the bromeliads conditions and soil similar to the environment in which they are found in their native habitat, yet according to the experience of the writer few plants possess such remarkable adaptability to changed conditions as do these plants. (E. J. Canning.)

A. *Fls. yellow.*

chilénsis, Molina (*Pitcàirnia coarctàta,* Pers., and *P. chilénsis,* Lodd.). Becoming 4–5 ft. or more high, sometimes branching: lvs. in tufts, 2–4 ft. long, very narrow, often recurved, the margins armed with strong recurved spines or thorns, glaucous: blossoms in a branching, hoary, bracted infl. rising 3–5 ft. from the top of the caudex, the fls. large (2 in. across), sessile or nearly so, the 3 lanceolate sepals greenish and the obovate-oblong much-exserted petals yellow or greenish yellow, the 6 erect stamens shorter than the petals, the stigma 3-branched. Chile. B.M. 4715. F.S. 9:869, 870. J.F. 4:392. J.H. III. 62:533. G.C. III. 7:685; 48:390; 54:3.—A striking and mammoth bromeliad, making a yucca-like mass of foliage and projecting above it a very showy infl.

AA. *Fls. white or rose-color.*

gìgas, André. Still larger than the latter, sending its titanic spikes 20–30 ft. into the air, from a rosette of hard and thick spiny-toothed agave-like lvs.: infl. simple, dense, club-shaped, terminating the tall, erect, bracted scape: lvs. green above and white beneath, the spines black and hooked: fls. white, passing into rose. Colombia, 10,000 ft. R.H. 1881,p. 315, and Gn. 21, p. 309.—Can probably be handled like agaves.

AAA. *Fls. blue.*

cærùlea, Lindl. (*Pitcàirnia cærùlea,* Benth. & Hook.). Foliage pineapple-like, with linear very acute

lvs. 2 ft. long, which are spinose-dentate and nearly glabrous: peduncle 3–4 ft. tall, the bracts membranaceous, the infl. somewhat branched but not loose: fls. narrow-tubular, the petals blue and oblong-obtuse, the sepals much shorter and green and obtuse; alternate stamens shorter. Chile. B.R. 26:11.

alpéstris, Poepp. (*Pitcàirnia cærùlea,* Baker. *Pùya Whỳtei,* Hook. f. *Pitcàirnia alpéstris,* Bailey). Fl.-cluster much branched or panicled, with bracts more serrate than in *P. cærulea:* fls. very large and showy, with a flaring mouth, dull metallic blue. Chile. B.M. 5732.—A plant in bloom has the habit of a yucca. This and *P. cærulea* will probably stand considerable frost.

P. spathàcea, Mez (Pitcairnia spathacea, Griseb.). Lvs. up to 18 in. long and 1 in. broad, the spines incurved: panicle about 2 ft. long; sepals ovate, acuminate, pale rose; petals dull blue. Argentina. B.M. 7966.—*P. violàcea,* Mez. Lvs. up to 20 in. long, linear, stiff, spiny in margin: panicle 15–20 in. long; sepals green, lanceolate, 1–1¼ in. long, acute; petals deep violet. Chile. B.M. 8194.

L. H. B.
George V. Nash.†

PYCNÁNTHEMUM (Greek, *dense* and *blossom;* referring to compact flower-heads). *Labiàtæ.* Mountain Mint. Basil. Hardy aromatic perennial herbs suitable for the flower-garden.

Stems corymbosely branched above: lvs. entire, glabrous or pubescent, nearly sessile: infl. dense, many-fld. whorls, crowded with bracts and usually forming terminal heads or close cymes; fls. whitish or purplish, late summer and early autumn; calyx about 13-nerved, naked in the throat; corolla short, more or less 2-lipped; stamens 4, lower pair rather longer than the upper, which are sometimes abortive.—About 18 species, N. Amer. The oldest generic name of this is Koellia, which is used by many, but Pycnanthemum is maintained in the list of "nomina conservanda" as accepted by the Vienna Congress. The genus differs from Monarda in having smaller and canescent fl.-heads. Pycnanthemums are mint-like plants of easy cult. in any good soil. The following grow 1–3 ft. high, and bear fl.-heads ½in. across or less.

A. *Lvs. lanceolate or linear-lanceolate: calyx-teeth oxate-triangular.*

virginiànum, Dur. & Jacks. (*P. lanceolàtum,* Pursh). St. rather stout: lvs. fragrant, firm, acuminate at apex, rounded or narrowed at base, 1–2 in. long, 2–5 lines wide. Dry fields, Canada to Ga., west to Minn. B.B. 3:112.

AA. *Lvs. linear: calyx-teeth subulate, bristle-tipped.*

flexuòsum, BSP. (*P. linifòlium,* Pursh). St. slender: lvs. 1–2 in. long, ½–1½ lines wide. In fields, Mass. to Fla., Ont., Minn., and Texas. B.B. 3:111.

P. Monardélla, Michx., is properly Monarda clinopodia, Linn. A perennial herb with slender, usually simple st. 1–3 ft. high: lvs. lanceolate to ovate, membranaceous, bright green, slender-petioled, 2–4 in. long: fl.-heads solitary, terminal; corolla yellowish, 1 in. long or less. June–Aug. Fields, Ont. to Ga. B.B. 3:102.

F. W. Barclay.
F. Tracy Hubbard.†

PYCNÓSTACHYS (Greek, *thick spike,* referring to the heavy spikes of fls.). *Labiàtæ.* Erect perennial herbs: lvs. opposite, broad or narrow, sessile or petioled: whorls condensed into a dense terminal spike; fls. bright blue or violet; calyx slightly accrescent, 5-toothed; corolla-tube longer than the calyx, upper lip short, 4-toothed, lower longer, deeply concave; stamens 4: nutlets subglobose, smooth.—About 40 species, natives of Trop. and S. Afr., 1 in Madagascar. *P. urticifòlia,* Hook. A much-branched perennial herb, 5–7 ft. high: lvs. ovate-acute, deeply cut, crenate, densely pubescent: spikes very dense, 2–3 in. long; corolla bright blue. Trop. and S. Afr. B.M. 5365. More or less frequent in gardens in England. *P. Dàwei,* N.E. Br. A stout herb, 4–6 ft. high and loosely branched pyramidal habit: lvs. narrowly lanceolate, acuminate, serrate: fls. many, crowded, in short spikes terminating all the branches, cobalt-blue; calyx-teeth needle-like. Trop. Afr. Intro. into England. B.M. 8450. *P. cærùlea,* Hook., with 4-sided st. about 1 ft. high, bright blue fls. and sessile oblong or linear-lanceolate lvs., a native of Madagascar, has also been cult. in England.

PYRACÁNTHA (Greek, *pyr,* fire, and *akanthos,* thorn; alluding to the bright red fruits). *Rosàceæ.* Firethorn. Ornamental shrubs, grown chiefly for their bright red berry-like fruits and also for their white flowers and firm foliage.

Thorny half-evergreen shrubs: lvs. alternate, short-petioled, narrow, crenulate or sometimes entire, stipulate: fls. in corymbs; sepals short, petals suborbicular, spreading; stamens 20, with yellow anthers; carpels 5, free on their ventral side, on their dorsal side connate with the calyx-tube about half or less: fr. a small pome with persistent calyx, red or orange, with 5 stones.—Three species, from S. E. Eu. to Cent. China and the Himalayas. The genus is closely allied to Cotoneaster but is easily distinguished by the crenulate lvs. and the thorny branches, also by the more conspicuous stipules. From Cratægus it is chiefly distinguished by the structure of the ovary, which contains 2 equal ovules in each cell, while in Cratægus each cell contains only 1 fertile ovule and a second imperfect and smaller one.

3264. Pyracantha coccinea. (×½)

The pyracanthas are usually small shrubs with rather small and narrow leaves and with white flowers in small corymbs followed by bright red or orange fruits. *P. coccinea* is hardy as far north as Massachusetts in sheltered positions. It is a handsome low evergreen shrub, especially when loaded with its bright red fruits, these remaining on the branches all winter if not eaten by birds, which are fond of them; it is also pretty in spring with its numerous corymbs of white flowers. It is well adapted for planting on rocky slopes or sunny rockeries or for borders of shrubberies; it may also be used for low ornamental hedges or for covering walls, as it stands pruning well and is easily trained into any desired shape. It thrives in almost any kind of well-drained soil, including limestone, and prefers sunny positions. Propagation by seeds or by cuttings of ripened wood in fall under glass, kept during the winter in a temperate greenhouse; also by layers and sometimes by grafting on hawthorn or cotoneaster.

A. *Lvs. beneath and calyx glabrous.*

coccínea, Roem. (*Cotonéaster Pyracántha,* Spach. *Cratægus Pyracántha,* Borkh. *Méspilus Pyracántha,* Linn.). Firethorn. Fiery Thorn. Everlasting Thorn. Fig. 3264. Shrub, attaining 6 ft., rarely 20 ft., with numerous short spines: young branchlets and petioles grayish pubescent: lvs. oval-oblong to oblanceolate, acute, crenate, glabrous or slightly pubescent when young, ¾–1¾in. long: corymbs pubescent, many-fld., about 1½ in. broad; fls. small, white: fr. numerous, bright red, about ⅓in. across. May, June. Italy to W. Asia. Gn. 33, p. 464. Var. **Lalándii,** Dipp. (*Cotonéaster crenulàta,* Hort., not Wenzig), is of more vigorous growth, with slender branches: lvs. less deeply crenate: corymbs larger: fr. bright orange-red. Well suited for covering walls and said to be hardier than

the type. M.D.G. 1901:136. Var. **pauciflòra,** Dipp. Of low, dense habit and very thorny: corymbs small: fr. yellowish red. Hardy, and well suited for hedges. Var. **leucocárpa,** Hort. (*Cotoneáster Pyracántha leucocárpa,* Hort., var. *frùcto-álbo.* Hort.), is a form with white or yellowish frs.

crenulàta, Roem. (*Cotoneáster crenulàta,* Wenzig. *Cratægus crenulàta,* Roxbg. *P. Rogersiàna,* Hort.). Closely allied to the preceding: branchlets and petioles rusty-pubescent, glabrous at length: lvs. narrower, oblong to oblanceolate, obtuse or acutish, more leathery, bright green and glossy above, 1–2 in. long: corymbs glabrous: fr. slender-pedicelled, globose, bright orange-red. May, June. Himalayas. B.R. 30:52. R.H. 1913: 204 and p. 205. G.M. 58:31. G.C. III. 57, suppl. Feb. 20.—More tender than the preceding, with handsomer, glossier foliage. Var. **yunnanénsis,** Vilm. More vigorous: spines to 2 in. long: lvs. 2–3 in. long, finely denticulate, obtuse: corymbs more numerous, many-fld.: fr. short-pedicelled, bright coral-red, smaller. Yunnan. R.H. 1913:204.

AA. *Lvs. beneath and calyx tomentose.*

angustifòlia, Schneid. (*Cotoneáster angustifòlia,* Franch.). Shrub with long and slender, spreading and often partly prostrate branches; young branchlets yellowish tomentose: lvs. subcoriaceous, narrow-oblong, obtuse and mucronulate, recurved at the margin, entire or sparingly glandular-serrulate, glabrous, grayish tomentose beneath, ¾–2¼ in. long: corymbs few-fld., short-stalked; calyx grayish pubescent outside: fr. depressed-globose, ⅓in. thick, orange-yellow. May, June. S. W. China. B.M. 8345. G.C. III. 36:441. Gn. 67:105, p. 24.

ALFRED REHDER.

PYRENACÁNTHA (Greek, *grain, thorn;* the inner surface of the husk of the fruit is covered with many blunt prickles). *Icacinàceæ.* Climbing shrubs with alternate, hairy, 3–5-nerved, entire, or toothed or lobed lvs. and fls. in spikes: fls. dicœcious; perianth 4- or rarely 3–5-lobed; ovary superior, 1-celled, 2-ovuled: drupe compressed, with the mesocarp spinulose-verrucose within. About 15 species from Trop. and S. Afr. *P. malvifòlia,* Engl. A succulent plant with a fleshy subglobose smooth st. resembling a stone from a distance: branches short or long and scandent: lvs. kidney-shaped, irregularly 3–5-lobed, pilose: fls. small, in spikes; perianth 4-lobed. E. Afr. G.W. 10, p. 354.

PYRÈTHRUM (a name used from the time of Dioscorides, the derivation from the Greek, *much fire,* referring to the acrid roots). *Compósitæ.* This name is still commonly used in garden literature and language although the genus has long been reduced to a section of Chrysanthemum. Almost every nursery catalogue offers *P. roseum* and its numerous varieties, which is referred by botanists to *Chrysanthemum coccineum;* also *P. parthenifolium* var. *aureum,* the golden feather, and *P. uliginosum.* (See Vol. II, p. 753.) All three of these are rather common in gardens and they are known to most lovers of hardy perennials.

More recent introductions under the name Pyrethrum are *P. Tchihatchewii,* also spelled *Tchihatcheffii,* the "turfing daisy" (see *Chrysanthemum Tchihatchewii,* Vol. II, p. 756), and *P. leucopiloides,* Hausskn., a subalpine perennial with silvery white leaves and large yellow flower-heads. Asia Minor. Suitable for the rockery. This last species is not mentioned under Chrysanthemum.

PÝROLA (a diminutive of *Pyrus,* the pear tree, from some fancied resemblance in the foliage). *Pyrolàceæ.* WINTERGREEN. SHIN LEAF. Low and smooth perennial herbs with running subterranean shoots; suitable for the native garden though not commonly cultivated.

Acaulescent or caulescent, with a cluster of roundish or elliptical evergreen basal lvs. and a simple raceme of nodding white, greenish or purplish fls. on an upright more or less scaly-bracted scape: calyx 5-parted, persistent; petals 5, concave, deciduous; stamens 10: caps. depressed-globose, 5-lobed, 5-valved.—Ten to 15 species, Great Britain to N. Asia and N. Amer. south to Mex. Formerly referred to Ericaceæ, but now placed in Pyrolaceæ together with Chimaphila and Moneses. The name wintergreen is usually applied to Gaultheria.

Pyrolas grow naturally in rather poor sandy uplands and in bogs. Like many members of the heath family, wintergreens are difficult to cultivate and will not succeed in garden soil. In removing them from the woods, care should be taken to secure a large ball of earth. They may then succeed in the shade of evergreens and upon rockeries in peaty soil. The species are scarcely in general cult.; they are offered by dealers in native plants. *P. americana* is probably more cultivated than the others.

A. *Fls. greenish; style straight.*

secúnda, Linn. Height about 6 in.: subcaulescent: lvs. thin, ovate, crenate, 1–1½ in. long: fls. small, in a 1-sided, dense, spike-like raceme. N. Atlantic States to Lab., Rocky Mts. to arctic regions, N. Eu. to Japan. June–Aug.

AA. *Fls. greenish white; style curved downward.*

chlorántha, Swartz. Height 5–10 in.: lvs. small, orbicular, thick, dull, shorter than the petiole: fls. few; anther-cells with beaked tips. Lab. to Pa., Rocky Mts., north to subarctic regions. June and July.

ellíptica, Nutt. Height 8–10 in.: lvs. broadly oval or oblong, thin, dull, serrulate, 2–2½ in. long, longer than the petiole: loosely 5–10-fld.; calyx-lobes ovate, acute, one-fourth length of the obovate whitish petals. Canada to Brit. Col. and through N. Atlantic States to New Mex., Japan. June and July.

pícta, Smith. Height 5–10 in.: lvs. thick, broadly ovate to spatulate, dull, blotched with white above, pale or purplish beneath, longer than the petioles: calyx-lobes ovate, not one-half length of the greenish white petals. Pacific slope.

AAA. *Fls. white.*

americàna, Sweet (*P. rotundifòlia,* Amer. Auth., not Linn.). Height 5–12 in.: lvs. orbicular, about 2 in. long, thick, shining above, shorter than the petioles: fls. numerous; bracts conspicuous; calyx-lobes lanceolate or oblong-lanceolate, one-third to one-half length of the thick white petals. E. Canada, south to Ga., west to S. D. June–Aug.

AAAA. *Fls. pink or purple.*

asarifòlia, Michx. Lvs. transversely broad-elliptic or round-reniform, cordate: fls. ⅜–⅝in. across, purple; calyx-lobes ovate to ovate-triangular. Que. to Yukon, south to Nova Scotia, N. New England, W. N. Y., N. Mich., and Col.; also in Asia. June–Aug.

Var. **incarnàta,** Fern. (*P. rotundifòlia* var. *uliginòsa,* Gray), with pink or rose-colored fls. and subcordate to obovate, dull lvs., occurs in swamps, arctic regions, south to N. New England, Cent. N. Y., Mich., Wis., Col., and Calif.; also Asia.

F. TRACY HUBBARD.†

PYROLÍRION: *Zephyranthes.*

PYROSTÈGIA (Greek, *pyr,* fire, and *stege,* roof; alluding to the color of the flowers and the shape of its upper lip). *Bignoniàceæ.* Ornamental vines cultivated chiefly for their handsome and showy flowers.

Evergreen shrubs climbing by tendrils: lvs. 2- or 3-foliolate; tendril filiform, 3-parted: fls. in terminal panicles; calyx campanulate or nearly tubular, truncate or dentate; corolla tubular-funnelform, curved, the lobes valvate in bud; stamens exceeding the tube; disk annu-

lar or slightly cupulate; ovary linear with the seeds arranged in 2 rows or in zigzag: pod linear with leathery valves and elliptic winged seeds.—Four species in S. Amer. Formerly usually united with Bignonia, but easily distinguished by the lobes of the corolla being valvate in bud and by its tubular, nearly claviform shape. Cult. and prop. like bignonia.

venústa, Baill. (*P. ignea,* Presl. *Bignònia venústa,* Ker). Fig. 3265. Sts. striate or somewhat angled, pubescent while young: lfts. usually 3, ovate to ovate-oblong, shortly and obtusely acuminate, cuneate at the base, glabrous above, puberulous beneath, 1¾–2¼ in. long: fls. in drooping panicles; calyx campanulate, shortly 5-toothed; corolla tubular-funnelform, crimson-orange, 2–3 in. long, with oblong, obtuse, reflexing lobes. Brazil. B.M. 2050. P.M. 7:123. B.R. 249. G.C. II. 11:274. A.F. II:1023. J.H. III. 49:281. G. 5:481. H.U. 5, p. 1.—One of the best rafter plants for warm greenhouses; blooms profusely in early winter.

ALFRED REHDER.

PYRULÀRIA (diminutive of Pyrus; alluding to the shape of the fr.). *Santalàceæ.* OIL-NUT. BUFFALO-NUT. A shrub in E. N. Amer. and 2 trees in the Himalayas with alternate, deciduous, entire lvs. and greenish fls. in spikes or racemes: fls. subdicœcious, apetalous;

3265. Pyrostegia venusta. (×½)

sepals and stamens 4–5; filaments short; ovary inferior, 1-celled, with 2–3 ovules: fr. a 1-seeded drupe. The species in cult. is **P. pùbera,** Michx. (*P. oleífera,* Gray). A straggling shrub, to 12 ft., puberulous while young: lvs. short-petioled, obovate-oblong, acute or acuminate, cuneate at the base, minutely punctulate, 2–6 in. long: spikes terminal, few-fld.; calyx 5-cleft: fr. pear-shaped or subglobose, yellowish, about 1 in. long, crowned by the ovate calyx-lobes, containing an acrid oil like the whole plant. May. Pa. to Ga. and Ala. B.B. (ed. 2) 1:641.—Of no particular ornamental value, but botanically interesting; half-parasitic on the roots of Tsuga like Buckleya, which see for cult. ALFRED REHDER.

PYRUS (Latin name of pear tree). Sometimes spelled *Pirus. Rosàceæ.* THE POME-FRUITS, as all the kinds of pears, apples, and crab-apples; also many small trees and bushes grown for the very handsome early flowers and sometimes for the attractive habit, foliage, and little fruits.

Woody plants, bearing mostly on spurs, with simple but sometimes lobed alternate lvs. (pinnatifid sometimes in *P. heterophylla*): fls. usually perfect, but rarely polygamous, regular, in spring; torus urn-shaped and attached to the carpels and finally closing over them, and with them becoming fleshy in fr.; calyx-lobes 5 and persistent upon the top of the young fr., or in some cases falling away at maturity or before; petals 5, white or red, perigynous; stamens 15–20 or more; styles 2–5, crowning a 2–5-loculed inferior ovary in which the locules are usually 2-seeded. (Figs. 3266,

3266. Flowers of apple. The ovaries are shown in the section, an ovule being at *O.*

3267). Pyrus is a polymorphous genus, in the northern hemisphere. The species are mostly small trees, bearing clusters of showy white or blush fls. with the lvs. or in advance of them. They are natives mostly of cool temperate regions, and the greater part of them are hardy in the northern United States. There are widely unlike practices among botanists in defining this important and interesting genus. Half a century ago, when it was a widely prevalent practice to assemble groups which agree in general gross structure and which can be held together by a broad definition, Pyrus was held to include not only the pears and apples, but the mountain-ashes or sorbuses, the medlar and quinces, the chokeberries and other groups (Bentham & Hooker, Genera Plantarum, 1867). As late as 1894, Focke (Engler & Prantl, Pflanzenfamilien) holds Pyrus intact except for the separation of Cydonia and Mespilus. While many botanists still hold most or all of these groups in Pyrus, the present tendency to segregate all groups for which separate definitions can be found results in the dismemberment of Pyrus. As the old rather gross assemblage, resulting from the effort to find agreements, can hardly be expected to hold, so the present disunion, resulting from the effort to find differences, may be expected to pass, and the practicable and convenient grouping may be found somewhere between the two extremes. There seems to be good justification for the separation of Cydonia and Mespilus, and perhaps also for Sorbus and Aronia, but it is yet to be determined whether the separation of Malus (the apples) will meet with continuing favor. See *Malus,* p. 1973, Vol. IV.

3267. Longitudinal section of flower of Pyrus Halliana.

The many-seeded carpels of Chænomeles (Figs. 3268, 3269) and Cydonia

3268. Lengthwise section of Chænomeles Maulei, by some referred to Pyrus, to show many-seeded cores and the lack of peduncle.

3269. Lengthwise section of Chænomeles cathayensis.

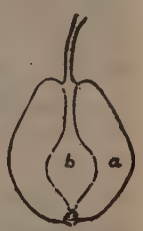
and the absence of fr.-stalk (Fig. 3270) afford good structural characters, as well as the fl.-bearing habit and other characters. Many of the species that have been named under *Pyrus* will be found in *Sorbus*.

3270. Sessile fruit of Chænomeles Maulei.

If the genus is held to comprise the pears and apples and no others (Pyrophorum and Malus), there are probably fifty or sixty species.

The aronias, by some kept as a distinct genus (page 396, Vol. I.), comprise a small group of North American bushes with white flowers in corymbs and attractive little fruits. Under Pyrus, the names are *P. arbutifolia*, Linn., the red chokeberry; *P. atropurpurea*, Bailey, the purple chokeberry, sometimes regarded as a variety of the former; *P. melanocarpa*, Willd., the black chokeberry; *P. floribunda*, Lindl. (not Hort.), of garden origin.

The fruit of Pyrus is of the kind known to botanists as a pome. The morphology of the pome is still perhaps a subject of disagreement, although most botanists now consider it to be a hollow torus (receptacle), or hypanthium, or cupula, in which the ovary is imbedded. Fig. 3271 illustrates the theoretical structure. The ovary is at *b*, wholly inclosed in the fleshy torus *a*. Most of the edible part of the apple or pear, therefore, is considered to be torus, whereas the core is ovary. This ovary, in common apples and pears, is of five carpels or cells, as shown in the cross-section (Fig. 3272). It was formerly held that the edible part is largely calyx-tube, but various morphological considerations have inclined students to regard it as stem rather than calyx; the term calyx-tube is still retained, however, in descriptive writings. One of these considerations is the fact that apples sometimes bear a rudimentary leaf (as in Fig. 3273), an organ which is commonly borne only by stems.



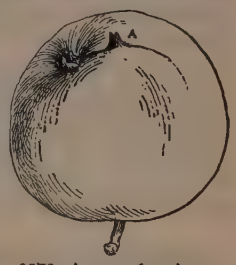
3271. Diagram of a pome (pear). Showing the torus part at *a* and the ovary part at *b*.

Apples sometimes take on most unusual and grotesque shapes, and two or more fruits may coalesce into one. Some of these forms, from an orchard of Pearmains, are shown in Fig. 3274. These malformations may be due in part to insufficient pollination, although such teratologies are yet to be well explained.

Aside from the pomological pears and apples, the genus Pyrus as here defined includes many very attractive small trees and shrubs. The outlying pear species are not much grown, although well worth cultivation for interesting foliage and for good white spring bloom. *P. salicifolia*, *P. elæagrifolia*, and *P. betulæfolia* are among the best of these, and the only ones that are likely to appear in collections. The silvery foliage of the first two is attractive. They are hardy in the northern states and probably in Ontario.

3272. Section of a pome (apple). Showing the interior or ovary part and the exterior or torus part.

It is among the crab-apples, however, particularly of the Asiatic species, that the most ornamental plants are to be found. Some of them, as *P. pulcherrima* (*P. floribunda*) and *P. Halliana*, have long been popular, but several others are fully as good and it is possible to secure considerable variety. All the species included in the numbers 21 to 36 in this account are probably hardy in parts of New York state and some of them can be grown in Canada. *P. baccata* is hardier even than the common apple tree, and is therefore sometimes used for stocks and as a parent in hybridizing. All these crabs may be raised as seedlings, for they bloom profusely when only a few years old, or they may be grafted on any of the related stocks. The Asiatic crabs are profuse bloomers, and the pink-and-white effect of blossoms and buds as the leaves are unfolding or just preceding the leafage constitutes one of the most charming prospects in the spring plantation. Some of them hold their small berry-like fruits well into the winter, or even to spring, affording a continuing interest. They are of the easiest culture in well-drained soil. All the species are probably subject to scale, and they should be well sprayed. Particularly to be recommended for the central and northern states east of the Great Lakes are *P. pulcherrima*, *P. Halliana*, *P. Scheideckeri*, *P. Sieboldii*, *P. prunifolia* var. *Rinki*, and *P. Sargentii*, the last a bush with pure white flowers.



3273. A pome bearing a rudimentary leaf (at A).

The native American crabs, described in numbers 37 to 45 in this list, are yet little known to planters, but they comprise much promising material, and they should yield horticultural subjects for the entire area of the United States, outside the semi-tropical regions, and for good parts of Canada. As a class they bloom later than the Asiatic species. As yet, only *P. ioensis* appears to have yielded a good double-flowered form. With the recent botanical discrimination in this interesting group, attention will probably be called to a closer study of the forms by collectors. They are easy of culture, and may be readily increased by grafting.

Hybridizing will probably play an important part in the horticultural development of the ornamental crabs, as they cross freely. It is probably due to this cause that the Asiatic forms are so difficult to distinguish botanically. The pears and apples appear not to intercross, although the curious *P. auricularis* is generally considered to be a hybrid between the pear and the beam-tree (*Sorbus Aria*).

The pear may be made to grow for a time when grafted on the apple, but it is usually impossible to graft the pear species permanently on the apple species with any degree of success; yet pears thrive on quinces and also on hawthorns, which are well-marked genera. In nursery practice when pear stocks are not at hand, long pear cions may be worked on apple pieces and roots may form from the cion and the pear become own-rooted on the failure of the apple stock. Apples appear not to be successful on pears.

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THE TWO GROUPS.

1. PEARS (*Pyrophorum*).—Fr. either with a conical base or possessing a cavity like an apple, the flesh bearing grit-cells (unless ripened off the tree); styles usually free or not united at the base: calyx-tube or hypanthium closed by a cushion-like formation, in fl.; fls. white. Species 1–18. Of these plants there are perhaps 15–20 species, native to S.-Cent. Eu. through the Grecian-Asia-Minor-Syrian region to China. There are no representatives indigenous, so far as known, in N. Amer. or Japan.

2. APPLES (*Malus*).—Fr. usually with a distinct depression at either end, the flesh without grit-cells; styles more or less united below: calyx-tube or hypanthium open; fls. pinkish, rose-color or light red, sometimes clear white. Species 20–45. There are probably 40 good species of this subgenus, of wide distribution. The common apple, *P. Malus*, is probably indigenous in S. W. Asia. In Siberia, China, and Japan, several species are native, of which the best known are the smooth-growing crab trees with small frs. that shed their calices. In N. Amer. is another set, represented by the Garland crab, *P. coronaria*, the Prairie States crab, *P. ioensis*, and the far western crab, *P. fusca*. The American forms have recently been re-defined into several species, the actual limitations of which are yet to be determined. It has been difficult to find good characters to separate the small-fruited apples, particularly the Asiatic forms. Carrière attempted to solve the difficulty (*Pommiers microcarpes*, Paris, 1883) by referring them all to one polymorphous species-group, *Malus microcarpa*. The recent study of the Asiatic material, however, has resolved it into a number of well-marked species-forms.

3274. Undeveloped, misshapen and coalesced apples, all from one orchard of Pearmain.

3275. Pyrus communis. (×½)

I. PYROPHORUM, or PYRUS proper. The Pears.

A. *The occidental or Eurasian pears, being the common pomological pears of this country: lvs. appressed-or crenate-serrate or entire (at least not setose-serrate), mostly abruptly pointed: calyx usually persistent at apex of fr.*

1. **communis,** Linn. COMMON PEAR. Figs. 3275; also Figs. 2805 and others, p. 2505 and following. Strong upright tree, living to a great age and sometimes attaining a height of 75 ft. and a girth of 15 ft. and more, the lvs. on short spurs as well as on the axial growths, the pedicels and sometimes the young growth pubescent, but all parts becoming glabrous: lvs. mostly oblong-ovate, with a prominent point, hard in texture and veiny, bright green, the serratures small and much appressed and obtuse, or sometimes the lf. is almost entire: fls. 4–12 in umbel-like clusters on slender (2–3-in.) pedicels, white, appearing with the lvs.; calyx persistent, or rarely deciduous; stamens 15–20: fr. very various under cult., usually tapering to the st., the flesh generally with gritty concretions. Native to S. Eu. and Asia, where it has been cult. from the earliest times.—Probably indigenous as far east as Kashmir. In the Syrio-Persian region are several very distinct pyruses of the pear group, a number of which may be outlying forms of *P. communis*. In the wild in Eu., various thorny and small-fruited forms are known.

Var. **Pyráster,** Linn. Much like the type of *P. communis*, but the fr. globose: lvs. more rounded, strongly serrate, glabrous when young: usually thorny. Probably a wilding form.

Var. **sativa,** DC. The cult. pear, in many pomological forms, the tree large and free-growing and without thorns: lvs. large.

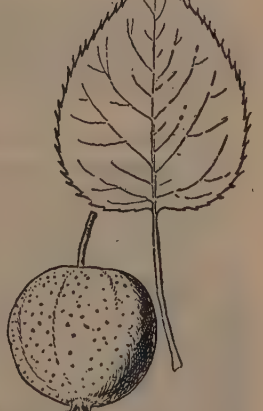
Var. **cordàta,** Hook. f. (*P. cordàta*, Desv.). A spiny shrub, wild in England and France: lvs. smaller than in the type (about 1 in. broad), ovate or nearly orbicu-

lar, subcordate: fls. smaller: fr. globose to slightly turbinate, about ½in. diam.; calyx persistent.

There are garden forms of *P. communis*, differing in foliage, as var. **trilobàta,** Hort., lvs. lobed; var. **heterophýlla,** Hort., lvs. cut; var. **variegàta,** Hort., lvs. variegated. In Algeria is var. **lóngipes,** Henry (*P. lóngipes*, Coss. & Dur.), a small tree with few spines: lvs. with long slender petiole, ovate, acuminate, subcordate, about 2 in. long and 1 in. broad: fr. globose, about ½in. diam., the calyx deciduous. In Spain is var. *mariàna*, Willk., a small tree, with ovate lvs. about 1 in. long, rounded at base, on very long slender petiole: fr. globose, about ½in. diam., the calyx persistent.

2. **nivàlis,** Jacq. Snow Pear: Tree, without thorns, the shoots grayish pubescent: lvs. 2–3 in. long, elliptic to oval to obovate-oval, obtuse or short-acute, cuneate at base, entire or toward apex minutely crenulate, gray-pubescent: fls. large, white, showy: fr. small, roundish pyriform, late-ripening, acid, becoming sweet when overripe. Austria, and wild in France and elsewhere, but probably as an escape.—The snow pear is a small tree, with thick shoots that are white- or gray-hairy when young. It is grown in parts of Eu., particularly in France, for the making of perry or pear cider, the greater part of such varieties being of this species. By some writers it is considered to be a form of *P.*

3276. Pyrus serotina. (×⅓)



3277. Pyrus ussuriensis. (×⅓)

communis, and by others to be a hybrid race of *P. communis* and *P. amygdaliformis;* Schneider, however, places it as a good species with which he associates other names as synonyms and varieties, and according to his view *P. salvifolia*, DC. (sage-lvd. pear of the French), is *P. nivalis* × *P. communis*. It is not known to be in cult. in this country, but it is to be looked for in arboreta and other collections. Said to be called "snow pear" because the frs. are fit for eating after snow falls.

The following related species may be expected to appear now and then in trade-lists or in special collections:

3. **P. amygdalifórmis,** Vill. (*P. parviflòra*, Desf. *P. cuneifòlia*, Guss. Probably *P. sindica*, Dum.). Shrub or small tree (to 30 ft.), spiny, with lightly tomentose buds and young branches: lvs. thick and coriaceous, 1–2 in. long, narrow-elliptic, oblong-lanceolate or oblong-oblanceolate, at apex short-acuminate or rounded-mucronate, mostly narrowed or cuneate at base, tomentose when young but becoming nearly or completely glabrous, the petiole short or slender and mostly glabrous, the margin entire or on large lvs. serrulate: fr. nearly globular, ¾in. diam., green and hard. France to Asia Minor, in mountainous places. B.R. 1484 (as *P. nivalis*). G.W. 14, p. 286.—The names *P. Michaùxii*, Bosc., *P. pérsica*, Pers., and *P. oblongifòlia*, Spach, probably represent hybrids of this species with *P. nivalis*.

4. **P. auriculàris,** Knoop (*P. irregulàris*, Muenchh. *P. Pollvèria*, Linn. *P. Bollwyleriàna*, DC. *Sorbopìrus auriculàris*, Schneid.). Regarded as a hybrid of *P. communis* and *Sorbus Aria;* was discovered about 1650 at Bollweiler, in Alsace: it bears very sparingly, and apparently does not come true to seed: to 50 ft., with buds and branchlets tomentose: lvs. 3–4 in. long, elliptic, unequal and rounded at base, short-acuminate, irregularly and coarsely sharp-serrate or double-serrate, lower surface pubescent: fls. 5 or more in tomentose clusters, on slender pedicels; calyx-tube and lobes tomentose; styles 2–5: fr. 1 in. diam., pyriform, reddish yellow, sweet. Now and then planted in botanic gardens and elsewhere. B.R. 1437. L.B.C. 11:1009.—*P. malifòlia*, Hort. (and Spach?) is probably a hybrid of similar or related origin.

5. **P. elæagrifòlia,** Pall. (*P. nivàlis* var. *elæagrifòlia*, Schneid.). Small spiny tree, the young shoots tomentose: lvs. lanceolate to oblong or obovate-lanceolate, entire, usually silky-tomentose, the base mostly tapering and the apex obtuse-mucronate or short-acuminate: fls. small, on densely tomentose pedicels: fr. globose-turbinate, glabrous, the calyx persistent. Caucasus, S. Russia. The specific name was first written, by Pallas, elæagrifolia (not elæagnifolia), because he considered elæagrus to be the proper spelling of the name of the oleaster genus, it having been spelled that way by Dioscorides. Var. **Kotschyàna,** Boiss. (*P. Kotschyàna*, Boiss. *P. nivàlis* var. *Kotschyàna*, Schneid.), is usually spineless, the lvs. larger (3 in. long), the fr. globose and larger (about 1 in. diam.).

3278. Pyrus ovoidea. (×⅓)

6. **P. heterophýlla,** Regel & Schmalh. Small thorny glabrous tree, with very variable foliage, some plants having lvs. that are entire at the margin, others are slit and almost of thread-like form, but the greater number with forms intermediate between these two extremes, usually ovate in outline, but mostly pinnatifid and the segms. again toothed: fr. nearly globose with the ends somewhat flattened, about 1 in. diam. Turkestan. G.C. III. 7:115.

7. **P. Korshínskyi,** Litw. Tree, to 20 ft. or more, or a shrub, with branchlets and buds gray-tomentose: lvs. coriaceous, about 3 in. long, lanceolate or ovate-oblong, somewhat tomentose above and beneath, the margins with coarse crenate or double-crenate incurved gland-tipped serratures, the petiole long and tomentose: fr. nearly globose, stout-peduncled, nearly 1 in. diam., with persistent calyx. Bokhara, Turkestan.

8. **P. salicifòlia,** Pall. Small tree, often spiny, becoming 30 ft. tall, with gray-tomentose branchlets: lvs. willow-like, 2–3 in. long, (whence the name), linear-lanceolate or lanceolate, mostly tapering toward both ends, entire or very nearly so, hoary beneath: fls. white, in corymbs, short-pedicelled: fr. round-pyriform, short stemmed, yellow or greenish, about ¾in. diam., the calyx persistent. Caucasus, Armenia. G.C. II. 14:145. G. 34:305.—A showy spring-flowering small tree, hardy in the northern states, and worthy of being better known. Var. **péndula,** Hort., has drooping branches. G. 22:649. *P. canéscens*, Spach, is perhaps a form or hybrid of *P. salicifolia:* lvs. lanceolate or narrow-elliptic, about 2½ in. long, at apex acute or mucronate, minutely crenulate, sometimes twisted, tomentose.

aa. *The oriental or Chino-Japanese pears, grown in this country to some extent for ornament and fr., and producing hybrids with P. communis: lvs. mostly markedly acuminate and very sharp-serrate or setose-serrate: calyx usually falling from the apex of the fr. in the cult. forms (not so in P. ussuriensis and P. ovoidea).* (See Rehder, Synopsis of the Chinese Species of Pyrus, Proc. Amer. Acad. Arts and Sci. 50:225–40; also Plantæ Wilsonianæ, 2:263–6.)

3279. Pyrus Lindleyi (×⅓)

9. **serótina,** Rehd. Fig. 3276. Tree, 20–50 ft., the branchlets glabrous or becoming so: lvs. ovate-oblong or seldom ovate, 3–5 in. long, rounded at base and rarely subcordate or cuneate, long-acuminate, strongly and sharply setose-serrate, with partially appressed serratures, when young villous or beneath cobwebby but becoming glabrous: infl. umbellate-racemose, 6–9-fld., glabrous or somewhat tomentose, the pedicels slender: fls. white; sepals or

XCIV. The bloom of Pyrus pulcherrima (P. floribunda).

calyx-lobes triangular-ovate and long-acuminate, ¼ to about ½in. long, glandulose-denticulate; petals oval, short-clawed, nearly ¾in. long; stamens about 20; styles 4 or 5, glabrous: fr. subglobose, brown, slender-stalked, the calyx deciduous. Cent. and W. China. B.M. 8226 represents a form named by Rehder var. **Stapfiàna,** differing in pyriform fr., less appressed serratures on the lvs., and petals attenuate-clawed. *P. serotina* or its forms is recommended on the Pacific Coast as a more or less blight-resistant stock for the European types.

3280. Pyrus Bretschneideri. (×⅓)

Var. **cúlta,** Rehd. (*P. sinénsis,* Hort., not Lindl. nor Poir. *P. sinénsis* var. *cúlta,* Makino). SAND PEAR. Fig. 2808, p. 2507, the details of lf.-margins not showing. JAPANESE and CHINESE PEAR of pomologists. Differs from the type of the species in its large pyriform or apple-form fr., larger and broader lvs. (which are often 6 in. long and 3–4 in. broad). Japan.—A very rapid-growing tree, with strong, thick shoots: lvs. broadly ovate and long-pointed, very dark green, the margins thickly furnished with very sharp, sometimes almost bristle-like teeth: fls. large, appearing rather in advance of the foliage: fr. hard and usually roughish, commonly with a depression or "cavity" about the st., the flesh tough and gritty and poor in flavor, the calyx usually falling before maturity. R.H. 1879:170; 1880:110 (as *P. Sieboldii*).—Known in this country in a number of varieties, as Chinese Sand, Japanese Sand, Hawaii, Madame von Siebold (which pomological variety Rehder writes, "may be considered as representing the type" of var. *culta*), Mikado, Diamyo, Gold Dust. The frs. are often remarkably apple-like, especially in the russet varieties, but they are distinguished by the long st. and pear-like flesh. The Japanese pear is little prized for its fr. although the pears are useful for preserving and some of the varieties are showy and the frs. are good keepers; it is used for stocks upon which to work the common pear, and it has given good results in hybridizing. It is an excellent ornamental tree, being a clean grower of great vigor. Kieffer, Le Conte, and others are hybrids of *P. communis* and *P. serotina* var. *culta* (Figs. 2809–2810). This type has a stronger growth than the common pears, the lvs. are usually broader and darker green, with closely and mostly obtusely serrate edges, the fr. is more or less pyriform and of better flavor than that of the oriental parent, and the calyx is either persistent or deciduous. Seedlings of Kieffer often produce the sharply toothed lvs. of *P. serotina* var. *culta.*

Other oriental pears are likely to appear in cult., and it is necessary to distinguish them briefly.

A. *Calyx persistent: fr. yellow.*

B. *Lvs. setosely and sharply serrate.*

C. *Fr. globose or subglobose, short-stalked: lvs. orbicular-ovate or ovate, these and infl. glabrous from the first.*

10. P. ussuriénsis, Maxim. Fig. 3277. Differs from its allies, according to Rehder, chiefly in the short stalk of the fr. which is globose and has a persistent calyx, in the broad often nearly orbicular strongly setose-serrate lvs., and in the lighter yellowish brown color of the branchlets; fl.-clusters rather dense and hemispherical, owing to the short stalks: petals obovate and rather gradually narrowed toward base; styles distinctly pilose near the base. Manchuria, Amoorland, N. China. R.H. 1872, p. 28 (as *P. Simonii,* Carr.).—Sometimes spiny; branches often yellow-gray.

CC. *Fr. ovoid, long-stalked: lvs. oblong-ovate or ovate, these and the infl. at first more or less floccose-tomentose.*

11. P. ovoídea, Rehd. Fig. 3278. Differs from *P. ussuriensis* chiefly in the narrower lvs., darker-colored branches, and longer-stalked longer-shaped fr. which has spreading persistent sepals: in longitudinal section the yellow juicy fr. is described as exactly ovate, broad and rounded at the base, tapering from the middle toward a truncate apex, thus constituting a pear of unusual and distinct shape. China.—Blooms a week ahead of other species of pears; the foliage turns bright scarlet in autumn. Hardy N. Sometimes grown as *P. Simoni.*

BB. *Lvs. denticulate or serrate but the serratures not setose-acuminate: fr. oval in outline, long-peduncled.*

12. P. Líndleyi, Rehd. (*P. sinénsis,* Lindl., not Poir.). Fig. 3279. Known only from Lindley's descriptions and figure, and perhaps a cult. form of some other species: the lvs. have short and rather small appressed teeth that are not at all acuminate, or those on the short growths nearly crenate-serrate; in shape ovate and abruptly acuminate, rounded at the base and those on the short branchlets mostly subcordate. China. B.R. 1248 (as *P. sinensis*). Lindley's name, *P. sinensis,* has long been used for the sand pears, which plants must now bear the name *P. serotina* var. *culta.*

AA. *Calyx falling: fr. yellow or brown.*

B. *Lvs. setosely serrate: fr yellow.*

13. P. Bretschneideri, Rehd. Fig. 3280. Medium-sized tree, closely allied to *P. ovoidea* but distinguished by the deciduous calyx and the ovate or elliptic-ovate-acuminate lvs. which have a broadly cuneate or very rarely a rounded base; lf.-margins sharp-serrate, at first setose-acuminate but serratures becoming only acuminate and somewhat appressed: fr. subglobose or globose-ovoid, about 1 in. long and nearly or quite as thick, the base contracted into a stalk 1–1½ in. long, hanging, yellow and marked with pale dots. China. —Supposed to be the species that yields some of edible pears of Peking. Hardy N.

BB. *Lvs. sharply serrate or dentate-serrate but the serratures not setose: fr. brown.*

C. *Styles 2–3: lvs. mostly coarsely dentate-serrate, the base usually broadly cuneate: fr. very small.*

14. P. betulæfòlia, Bunge. Fig. 3281. Tree, to 20 ft., without thorns, the buds and branchlets gray-tomentose, the head rather narrow, the foliage pale and the fls. rather small: lvs. ovate-acuminate or rhombic-ovate-acuminate, cuneate at base, long-stalked, sharp-serrate, becoming shining green above, pale tomentose or glabrous beneath: fls. white, ⅔in. across, the styles and cells of ovary 2: fr. nearly globular, size of a pea, brown and dotted, the calyx falling. China. Hardy in New England and Canada. R.H. 1879, pp. 318, 319. G.F. 7:225 (reduced in Fig. 3281). A.F. 13: 1396. Gng. 6:309.—A worthy plant for ornament, bearing a profusion of fls. in advance of the lvs. or at the time of the expanding of the lvs. It has been used as a stock for some of the pomological pears. It is subject to pear-blight.

15. P. Calleryàna, Decne., although Chinese, in lf. resembles the crenate-serrate Eurasian type rather than the sharp-serrate or

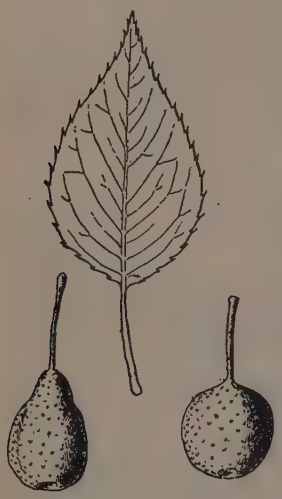
3281. Pyrus betulæfolia. (×½)

setose-serrate Chino-Japanese type: lvs. ovate, mostly rounded at base, small, crenate, glabrous: fls. small, with only 2 or 3 styles, in a glabrous infl.; stamens about 20: fr. size of a pea, globular but contracted abruptly into a long slender stalk, calyx deciduous.

CC. *Styles 3 or 4, sometimes 5: lvs. mostly rounded at base: fr. mostly larger.*

D. *Lf.-margins strongly serrate, with acute or somewhat appressed serratures.*

16. **P. serrulàta,** Rehd. Small tree, most closely related to *P. serotina* but distinguished by the not-setulose serratures, shorter lvs., smaller fls. with styles less than 5, triangular-ovate rather than long-acuminate sepals or calyx-lobes, and subglobose or globose-obovoid brown fr. which is less than 1 in. long. China.—*P. hupehénsis,* Pampan., from Cent. China, is probably this species or very closely related: described as a tree with straight slender trunk: lvs. more or less ovate, rounded or cuneate at base, long-acuminate, sharp-toothed; cream-colored beneath: fls. in dense clusters.

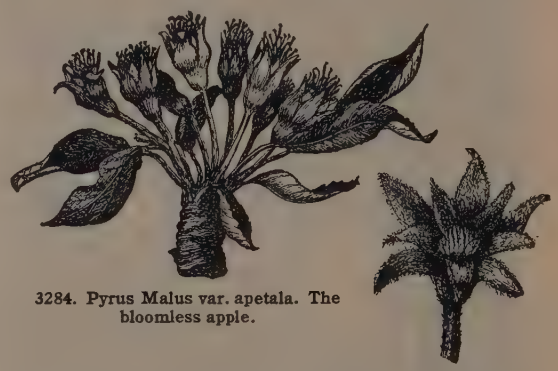


3282. Pyrus phæocarpa. (×⅓)

17. **P. Páshia,** Buch.-Ham. (*P. variolòsa,* Wall.). Tree, mostly spiny, when young with 3-lobed and doubly serrate lvs. like those of Cratægus, the young growths woolly: lvs. ovate or ovate-lanceolate, acuminate, crenulate or serrulate, becoming glabrous: fls. 1 in. diam., mostly in woolly corymbose short-peduncled clusters; calyx-lobes acute, deciduous; stamens about 30. Himalayas to W. China. Var. **kumaòni,** Stapf (*P. kumaòni,* Decne. *P. Wilhelmii,* Schneid.), in cult. at Kew, is a thornless tree attaining 50 ft., with buds and branchlets glabrous: lvs. narrow-ovate, 2–3½ in. long, glabrous, subcordate at base, long-acuminate at apex: calyx-lobes broad and rounded and the fls. in glabrous corymbs: fr. globose, 1 in. diam., the calyx early deciduous. Kashmir to Kumaon in W. Himalaya and to Yunnan. B.M. 8256.

DD. *Lf.-margins dentate-serrate, the serratures erect-spreading.*

18. **P. phæocárpa,** Rehd. Fig. 3282. Medium-sized tree: lvs. elliptic-ovate or oblong-ovate, attenuated into long point, the base mostly broadly cuneate, the serratures at first more or less incurved but becoming open or spreading: fr. pyriform, about 1 in. long, slender-stalked, brown or russet. China. Var. **globòsa,** Rehd., has globular fr. and lvs. usually ovate and round-based. The fls. of *P. phæocarpa* are unusually large, lvs. deep green and very lustrous; a handsome small tree. Hardy N.



3284. Pyrus Malus var. apetala. The bloomless apple.

II. MALUS. The Apples.

A. *The pomological apple-species, grown for their edible frs. (with ornamental forms).*

B. *Calyx persistent on the ripe fr.*

19. **Màlus,** Linn. (*Màlus commùnis,* DC. *Màlus Màlus,* Brit.). APPLE. Fig. 3283; also under Apple, Vol. I. A round-headed tree or a large bush, with foliage clustered on short shoots or spurs and also borne on the slender axial growths: lvs. oval, ovate or orbicular-ovate, mostly pointed at apex and rounded at base, soft in texture, dull, the margins irregularly serrate, on stout petioles: fls. large and showy, white or light rose, in close clusters on short pedicels, appearing with the lvs., about 5 or 6 in each cyme; sepals or calyx-lobes 5, acuminate; petals 5, obtuse, mostly pink on the outside; stamens about 20, with yellow anthers: fr. very various, with a cavity about the st., a homogeneous flesh and persistent calyx.—Cult. from remote antiquity, and thought to be native to Eu. and W. Temp. Asia to the Himalayas. It has run wild in many parts of Eu. Attempts are made to recognize two or more species in the group of common apples, but the efforts are not very successful in practice. Some authorities consider that there are two original species and that the common pomological apple represents a welding of them through hybridization.

3283. Pyrus Malus, the apple.

Var. **sylvéstris,** Linn. (*Màlus sylvéstris,* Mill. *M. acérba,* Mérat. *Pỳrus acérba,* DC.). Mostly a wild or run-wild nearly or quite glabrous form, to which not many of the cult. pomological varieties can be referred: young branchlets glabrous or soon becoming so: lvs. glabrous above, shining and only scattered-pubescent beneath, the petiole and pedicels only slightly pubescent: calyx-tube and outside of calyx-lobes glabrous but the latter pubescent inside. W. and Cent. Eu.

Var. **pùmila,** Henry (*Màlus pùmila,* Mill. *Pỳrus pùmila,* Koch). The pubescent type, the source of nearly all the pomological apples, and kept specifically separate by some writers: small or large tree, or bush-like: young branches prominently tomentose, as well as are the pedicels, calyx-tube, and both surfaces of the calyx-lobes: lvs. ovate or oval, dull and more or less tomentose beneath. Thought to be native only in S. E. Eu. and in Asia, although run wild elsewhere. A very dwarf form is the Paradise apple (*P. Malus* var. *paradisiaca,* Linn.), used as a stock on which to dwarf the pomological varieties.

Var. **astracánica,** Loud. (*Màlus astracánica,* Dum. *Pỳrus astracánica,* DC.). Distinguished by large coarsely serrate or doubly serrate lvs. which are tomen-

tose beneath, and by the long pedicels. Probably Asian.

Var. **Niedzwetzkyàna,** Asch. & Graebn. (*Pỳrus Niedwetzkyàna,* Hemsl.). Mature lvs. tinged red on midrib and nerves, the fls. deep pink, the flesh of the fr. purplish: wood and bark also red or reddish. S. W. Siberia and Caucasus. B.M. 7975. R.H. 1906:232. F.S.R. 2:344.—A very ornamental tree.

Var. **apétala,** Asch. & Graebn. (*Pỳrus apétala,* Muenchh. *P. dioìca,* Moench). Bloomless Apple. Figs. 3284, 3285. Fls. with no colored petals, these organs being represented by very small green bract-like or sepal-like bodies, the sepals appearing, therefore, to be in 2 rows; stamens absent; styles 10–15; ovary 6- or 7-celled, perhaps more: fr. (apparently produced by pollination with other apples) much as in common apples except for a deep not closed cavity at the apex, there being one "core" above the other due probably to the crowding of the many cells as the pistil grows; as the apple grows, some or all the cores split open, and cause the hole in the top of the fr.; in Fig. 3285, *b* and *c* represent the persistent points of ruptured core-walls, and *a* marks a thickened petal or bract that stood in the fl. This monstrosity has been long known, and now and then recurs.

There are horticultural forms of *P. Malus* distinguished as : Var. **aùrea,** Hort., with yellow-variegated lvs.; var. **plèna,** Hort., with more or less double fls.; var. **péndula,** Hort., of weeping or drooping habit.

3285. Pyrus Malus var. apetala.—The bloomless apple, in longitudinal section.

20. **Soulárdii,** Bailey (*Màlus Soulárdii,* Brit.). Soulard Crab. Figs. 3286, 3287. Apparently natural hybrids of *P. Malus* and *P. ioensis:* a small tree, with much the look of an apple tree, and woolly: lvs. large, round-ovate to elliptic-ovate or oblong-ovate, either rounded or tapering at the base, often very blunt or even rounded at the top, mostly bluntly and coarsely serrate or dentate when young, irregularly crenate-dentate at maturity, with a tendency to become lobed, on short pubescent petioles, thick and often rugose and woolly beneath: fls. blush, in close woolly clusters like those of the apple: fr. often 2 in. or even more in diam., flattish lengthwise, yellow and often with a tinted cheek, the basin shallow, flesh fairly edible. Wild in the Mississippi Valley from Minn. to Texas, but always local and in different forms of fr.—Named for James G. Soulard, Galena, Ill., who intro. the first variety to cult. In some forms the lvs. become nearly smooth late in the season and there is little tendency toward an irregular notching or lobing of the margins. The tree is hardy and the fr. keeps well and is useful for culinary purposes. A few named varieties are grown in the upper Mississippi Valley, where trees of great hardiness are demanded. For accounts of the pomological offshoots of our native apples, see Bailey, "Evolution of Our Native Fruits," and Craig & Hume, "Native Crab Apples and Their Cultivated Varieties," Iowa Acad. Sci., 1899.

bb. *Calyx falling from the fr.*

21. **baccàta,** Linn. (*Màlus baccàta,* Borkh. *Màlus microcárpa* var. *baccàta,* Carr. *M. baccàta* var. *sibírica,* Schneid.). Siberian Crab. Fig. 3288. Small round-headed tree, with a compact crown, smooth in all its parts at maturity; growth hard and wiry: lvs. ovate to

3286. Pyrus Soulardii. (×⅓)

ovate-lanceolate or ovate-acuminate, thin and glabrous, on slender petioles, finely and nearly evenly serrate, bright green: fls. appearing with the lvs. on long and very slender (2–3 in.) greenish pedicels, white, handsome; style mostly longer than the stamens, lightly hairy or glabrous: fr. from the size of a pea to ¾in. diam., on long, hard sts., yellow or red and firm and often translucent in texture, never becoming mellow, the calyx falling away before maturity. Siberia to Manchuria and N. China. B.M. 6112. M.D.G. 1899:454. Gt. 11:202. —Difficult to distinguish from *P. pulcherrima:* larger, becoming a distinct tree, sometimes as large as a large apple tree: lvs. with blunter teeth, and usually much longer, very slender, hard, glabrous petioles: fls. lighter colored, usually white; vernation convolute (lvs. rolled in the bud). It runs into many forms, particularly in fr. Var. **mandshùrica,** Maxim. (*Màlus baccàta* var. *mandshùrica,* Schneid.). Low densely branched tree when growing in the open but tall and wide-spreading in forests: lvs. broader, elliptic or round-elliptic, mostly entire, the petiole, rib, and nerves, as well as infl., more or less hairy: style scarcely as long as the stamens: fr. elliptic, about ½in. diam. Amur region, Korea, Cent. China, Japan. Var. **himalàica,** Maxim. (*Màlus baccàta* var. *himalàica,* Schneid.). Lvs. very broad-oval, coarsely serrate, more or less hairy underneath, particularly on midrib. W. Himalaya. A handsome form from Korea with pure white large fls., large dark green lvs. and large dark red fr., is distinguished by Rehder as forma *Jàckii:* from var. *mandshurica* it differs in being glabrous.—The Siberian crabs of pomologists belong to *P. baccata,* but to which of the several botanical forms (if to any of them) is not clearly determined; the species is also used in cold countries as a stock on which to graft the common apple. It is a species of great hardiness, withstanding the climate in the Canadian N. W. provinces. It is much subject to blight (pear-blight) and for this reason its usefulness is much limited. Hybrids with *P. Malus* promise a valuable type of apple for cold regions. See Fig. 648, Vol. I, and pp. 569

3287. Mature leaf of Pyrus Soulardii. (×½)

and 570. The large-fruited pomological crab-apples of the Hyslop and Transcendent type are supposed to be hybrids between *P. baccata* and *P. Malus*, and to these forms the name *P. prunifolia* has been applied but probably erroneously. The *P. cerasifera*, Spach, is of the *P. baccata* group, and is probably a hybrid: it

3288. Pyrus baccata. (×½)
No. 21.

makes a large tree with spreading head, and bears very large pure white fls.: the fr. is variable in size, shape, and color, and either retains or drops the calyx.

AA. *The oriental "flowering apples" (East Asian, Chino-Japanese) grown in many forms for the ornamental fls. and frs.* (Cf. Rehder, Plantæ Wilsonianæ, 2:279–95). (Most of these oriental flowering crabs are in cult. only in botanical collections but they are likely to be planted elsewhere, and it is necessary to the determination of most of them that all the others be contrasted.)

B. *Lvs. convolute (rolled up in the bud), always undivided.*

C. *Calyx deciduous from the fr. (In this group belong P. baccata, P. Halliana, and P. theifera; in the first (see No. 22) the calyx-lobes are longer than the tube, narrow-lanceolate, and the fls. white with mostly 5 styles, in these characters being distinguished from one or both of the others.)*

22. **Halliàna,** Voss (*Màlus Halliàna,* Koehne). Fig. 3289. Bush or small tree, 6–15 ft. tall, with a loose open crown: lvs. long-ovate, glabrous, leathery, crenate-serrulate, the petioles short: fls. rose-colored, more or less polygamous, hanging on slender reddish pedicels, the calyx-lobes often more or less obtuse, the styles usually 4: fr. size of a pea or somewhat larger (¼–⅓in. diam.), abruptly contracted into a thickened pedicel, brownish red, ripening late in autumn and containing very large seeds. W. China; cult. in Japan. M.D.G. 1899:457. One of the handsomest of the flowering apples. Var. **Párkmanii,** Bailey (*P. Párkmanii,* Hort.), is the double-fld. form: named for Francis Parkman, the historian, in whose garden near Boston it was first grown in this country. *Màlus Hártwigii,* Hort., is a hybrid of German origin, between *P. Halliana* and *P. baccata.*—*P. Halliana* is a beautiful little tree which was recognized among horticulturists before it was described by botanists. The first naming of it in Pyrus in such a way as to gain nomenclatorial standing with botanists seems to have been by Voss in Vilmorin's Blumengärtnerei, 3d ed., 1896. Rehder distinguishes the species as follows (in Sargent, "Trees and Shrubs," 1:35, from which also Fig. 3289 is reduced): It is allied to *P. baccata,* and *P. pulcherrima;* from the first it is distinguished by the leathery lvs., the color of the fls., the much shorter sepals, the purple calyx and pedicels, and the 4- or 5-celled very late-ripening fr.; from *P. pulcherrima* it is distinguished by the convolute vernation of the glabrous lvs., the color of the larger fls., the shorter sepals, and the glabrous purple pedicels and calyx. In foliage and fls. it much resembles *P. spectabilis,* which, however, differs by its pubescence and the much larger fr. crowned by the persistent calyx. From other species it differs in its polygamous fls. There is at least 1 staminate fl. in each umbel, and this is always terminal; sometimes there are 2 or 3, but the number of staminate fls. rarely exceeds that of the perfect ones. In the staminate fls. there is no trace of reduced pistils. The species was intro. to American gardens about 1863 by G. R. Hall (see p. 1578, Vol. III).

23. **theífera,** Bailey (*Màlus theífera,* Rehd.). A small tree with stiff spreading branches, hardy at Boston, resembling a cherry tree when in bloom, the fls. white or light pink (there is a rose-colored form) with purple calyx and the unfolding lvs. purplish: distinguished from *P. Halliana,* its nearest ally, by larger and broader ovate or ovate-oblong or elliptic-ovate sharply glandular-serrate thinner lvs., longer petioles and less slender pedicels, acute or acuminate calyx-lobes, mostly 3 styles, white or blush fls., and larger frs. China to Assam.—The fr. is globose, light greenish yellow with reddish cheek, ripening in Mass. in Oct.: fls. fragrant. Not yet grown outside botanical collections, but a handsome free-flowering species. Var. **rósea,** Bailey, has rose-colored fls. and is very beautiful.

24. **sikkiménsis,** Hook. f. Small tree, with tomentose branchlets: lvs. ovate to ovate-oblong, 2–3 in. long, not lobed, the apex long-acuminate, abruptly narrowed at base, tomentose beneath, with fine and close sharp-pointed serratures, the petiole much shorter than the blade: fls. 1 in. across, 5–8 in a corymbose cluster, appearing with the lvs., white but pinkish outside, the buds rose-colored; pedicels very slender, 1½–2 in. long; calyx-tube ellipsoid, the lobes lanceolate and recurved; petals orbicular, claw very short, tomentose; stamens many; styles slender and glabrous, connate below: fr. turbinate, not depressed at base, ⅔in. diam., dark red speckled white, the calyx wholly wanting. Himalaya. B.M. 7430.

3289. Pyrus Halliana. (×½)

cc. *Calyx persistent on the fr.*

D. *Style glabrous at base: fr. punctate: lvs. sharply and mostly doubly serrate.*

25. **Práttii,** Hemsl. (*Málus Práttii,* Schneid.). Young growths whitish hairy but becoming glabrescent: lvs. 3–4 in. long, the long petiole extra, ovate-lanceolate to ovate or elliptic, acuminate-acute, the base usually rounded, finely somewhat double-serrate with callous serrations: fls. medium size, in many-fld. terminal subsessile clusters, slender-pedicelled; calyx-lobes acuminate, white-silky inside; petals ⅛in. long, short-clawed, rounded at apex, conspicuously veined; styles 5, glabrous: fr. about ½in. long, ovoid, punctate, the calyx persistent. China.

DD. *Style villous at base: fr. smooth and not punctate: lvs. simply serrate or crenate-serrate.*

E. *Lvs. membranaceous or thin in texture, dull above. calyx-lobes acuminate and longer than the tube.*

26. **prunifòlia,** Willd. (*Màlus prunifòlia,* Borkh. *M. hybrida,* Loisel.). For years considered to be a hybrid of *P. baccata* and *P. Malus* or other species, but a plant which he considers to be a variety of it (var. *Rinki*) having been found wild in China leads Rehder to the conclusion that it is a good natural species; *P. prunifolia* itself is yet known only as a cult. plant: tree,

3290. Pyrus prunifolia var. Rinki (×⅓). No. 26.

glabrous or the pedicels and calyx more or less tomentose: lvs. much like those of *P. baccata,* but slightly pubescent on veins below and glabrous at maturity: small tree: lvs. 2–3 in. long, ovate to obovate or nearly orbicular, somewhat acute to short-acuminate, the margin with small close somewhat unequal serratures: fls. 6–10 in a sessile cluster, on pedicels 1–1½ in. long, white, 1½ in. across; calyx-tube obconical, the lobes or sepals lanceolate; petals orbicular or oblong; styles 5, connate below the middle: fr. about 1 in. diam., globose to ovoid, with cavity at base, green, yellow, or red. Probably Siberia. B.M. 6158.

Var. **Rínki,** Bailey (*Màlus pùmila* var. *Rínki,* Koidz. *M. prunifòlia* var. *Rínki,* Rehd. *M. yezoénsis,* Koidz. *M. Matsumùræ,* Koidz. *M. Ringo,* Carr. *Pỳrus Ringo,* Wenz. *P. præcox,* Miq.). Chinese Apple. Figs. 3290, 3291. Wide-spreading small tree, to 15 or 18 ft. high, more pubescent than the type (*P. prunifolia*) and representing a more southern range, the petioles shorter and the fls. pink or pinkish rather than white. China. B.M. 8265.—This tree yields an edible apple, sometimes as much as 1½ in. diam., of a greenish or yellowish color and with a bitter-sweet flavor; it was formerly grown in Japan for its fr., but its cult. has been discontinued since the intro. of the European apple, yet is now used as stocks for the imported kinds. In China it is still sparingly cult. In botanical characters the plant is much like *P. Malus,* but is distinguished by the much longer fr.-stalk, more sharply serrate and usually less tomentose lvs., the apex of the fr. not sunken but with a raised calyx which is thickened and fleshy at the base.

EE. *Lvs. paper-like in texture, shining above: calyx-lobes shorter than the tube or only equaling it.*

27. **spectábilis,** Ait. (*Màlus spectábilis,* Borkh. *M. sinénsis,* Dum.). Chinese Flowering Apple. Fig. 3292. Small tree, with darker-colored fls. than those of the apple (the opening fl.-buds almost coral-red), and blooming earlier, making an erect vase-like head: lvs. narrower, oval to oval-oblong, slender-stalked, nearly glabrous on both surfaces or becoming so, usually more closely serrate than those of the apple: pedicels and calyx-tube nearly or quite glabrous: fr. roundish or round-oval, without a cavity at the base, reddish yellow, sour. Probably China and Japan, although unknown wild and very little grown in those countries although well known in cult. in Eu.; the plant called by this name in Japan is probably *P. Halliana* or *P. micromalus.* B.M. 267. L.B.C. 18:1729. Gn. 21, p. 46. Gng. 3:273. G.F. 1:272.—A very handsome early-blooming tree, of which the double-fld. and semi-double forms are most prized. *P. Malus* itself has been disseminated under the name of *P. spectabilis.* Hardy in the northern states. Var. **Ríversii,** Booth, has very large half-double bright rose-red fls.

3291. Pyrus prunifolia var. Rinki. (×½)

28. **micromàlus,** Bailey (*Màlus micromàlus,* Makino. *M. spectábilis* var. *micromàlus,* Koidz. *Pỳrus Kaìda,* Mouill. *Màlus microcárpa* var. *Kaìdo,* Carr. *M. spectábilis* var. *Kaìdo,* Sieb.). Fig. 3293. Apparently a hybrid, *P. spectabilis* being undoubtedly one of the parents, and probably *P. baccata* or *P. floribunda* the other. From *P. spectabilis* it is distinguished by the narrower lvs. which are gradually narrowed at the base into a slender petiole, by tomentose pedicels and calyx, and the subglobose fr. which has a depression at base and apex, the calyx sometimes deciduous. Cult. in Japan, and said to have been intro. from China;

3292. Pyrus spectabilis (×⅓). No. 27.

unknown in the wild.—A useful and showy plant, bearing profusely of bright red fls., with red calices and pedicels, and holding its many little frs. well into winter or even all winter.

BB. *Lvs. conduplicate (folded together lengthwise face to face in the bud), those on the strong shoots often lobed.*

C. *Calyx persistent.*

29. **Tschonóskii,** Maxim. (*Màlus Tschonóskii,* Schneid.). Fig. 3294. Tree, 30–40 ft. with erect and open habit: lvs. ovate-acuminate, coarsely serrate, with sharp teeth, shining and pilose above although tomentose when young, somewhat tomentose beneath: fls. 2–5 together, white tinged rose, on whitish hairy pedicels about ½in. long; calyx-tube whitish hairy, the lobes or sepals ovate-acute, spreading in fl.; petals about ½in. long.: fr. obovoid, about 1 in. diam.; calyx-lobes persistent, erect or nearly so, white-tomentose, 1 in. or less diam., yellow with a rosy cheek. Japan. B.M. 8179. G. F. 7:55 (reduced in Fig. 3294).

3293. Fruit of Pyrus micromalus in winter. (×½)

30. **yunnanénsis,** Franch. (*P. Veìtchii,* Hort. *Màlus yunnanénsis,* Schneid. *Eriólobus yunnénsis,* Schneid.). Distinguished from *P. Tschonoskii* by its smaller fls. in many-fld. clusters, much smaller frs. which are red and with reflexed calyx-lobes, and by the lvs. which are more distinctly lobed and sharply close-serrate: a handsome tree with spreading branches: lvs. simple, broadly ovate, with closely or finely toothed lobes: fr. small, ½in. or less long, produced abundantly. China. G.M. 56:897.

CC. *Calyx deciduous.*

D. *Styles glabrous at base: fr. ovoid: lvs. prominently lobed.*

31. **transitòria,** Batal. (*Màlus transitòria,* Schneid.). Young twigs, lvs., and infl. more or less felty: lvs. more or less acute, 3-lobed, about 1 in. diam., petiole about ¾in. long: infl. 3–8-fld.; peduncle, receptacle, and calyx felty; petals broad-oblong, somewhat emarginate, small-clawed, 5 times as long as the calyx; stamens 15; styles 5 (rarely 4), more or less grown together, naked: fr. globose, more or less hairy, about ¼in. diam. China. Var. **toringoìdes,** Bailey (*P. transitòria* var. *toringoìdes,* Rehd.), is larger and more vigorous, the lvs. partly entire, frs. larger. W. China.

DD. *Styles villous at base: fr. ovoid: lvs. prominently lobed.*

32. **kansuénsis,** Batal. (*Màlus kansuénsis,* Schneid. *Eriólobus kansuénsis,* Schneid.). A distinct species, marked by the usually broad-ovate 3–5-lobed and sharp-serrate glabrous or glabrescent lvs. which are 3-nerved at base, and by the ovoid red fr. from which the calyx is deciduous: young twigs glabrous, red-brown; buds of the same elongate, acute; scales only finely ciliate: lvs. dark green above, somewhat glandular on the nerves, somewhat paler beneath, glabrous or slightly hairy on the nerves, subrotund in outline, upper half palmately 3-lobed, lobes triangular, acute, margin serrate, the side lobes somewhat shorter; petiole 1½ in. or less long: infl. a false umbel; calyx acute, equaling the corolla; petals round, short-clawed, more or less hairy inside; stamens 20; styles 3, hairy and grown together at base: fr. purple, 3-celled, about ½in. long. China.

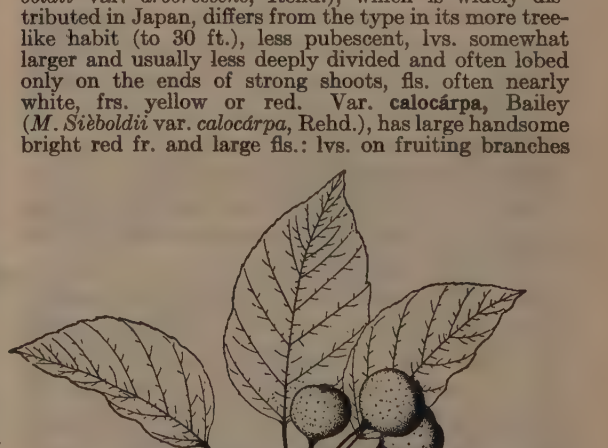
DDD. *Styles villous at base: fr. subglobose.*

E. *Fls. white, the petals nearly orbicular and at base contracted into a claw.*

33. **Sárgentii,** Bean (*Màlus Sárgentii,* Rehd.). A low bush, much branched, the branches rigid and often spinescent: lvs. ovate to elliptic-oblong or ovate-oblong, about 2–3 in. long, sharply and unequally serrate, slender-petioled, those on the vigorous branches mostly ovate and 3-lobed: fls. pure white, 1 in. across, in 5- or 6-fld. clusters, on glabrous pedicels about 1 in. long; calyx-tube and lobes glabrous outside and villous inside, the lobes ovate-lanceolate and acuminate; petals about twice as long as calyx-lobes, oval, short-clawed, glabrous; stamens 15–20; styles usually 4 (rarely 3 or 5), connate and villous below the middle: fr. subglobose, ½in. or less diam., dark red with a slight bloom. Japan. S.T.S. 1:37. G.C. III. 57:291 (as *P. Malus Sargentii*); 58:309 (fr.). G.M. 58:278.

EE. *Fls. reddish (varying to nearly white), the petals cuneate or rounded at base, obovate or oblong.*

34. **Sièboldii,** Regel (*Màlus Sièboldii,* Rehd. *Pỳrus Toringo,* Sieb. *M. Toringo,* Sieb. *P. Méngo,* Sieb. *M. microcárpa* var. *Torringo,* Carr.) Fig. 3295. Shrub: lvs. ovate or oblong-ovate in outline, pubescent, becoming colored in autumn, strongly notched or lobed on either side at or below the middle, the middle lobe often notched again near the top, the remaining margins sharply dentate: fls. small, blush, on slender sts.; styles 3–4, connate at base; sepals triangular-ovate or lanceolate, about equaling the tube: fr. the size of a pea, shedding its calyx, yellow or red. Japan. R.H. 1870:451; 1881, p. 296. Gn. 34, p. 206. M.D.G. 1899: 456.—Grown mostly for ornament, but lately recommended as a hardy stock upon which to dwarf the apple. In Japan, the little frs. are gathered after frost and preserved. Upon the fr.-spurs, the lvs. are sometimes only toothed, but upon barren or strong shoots they are prominently lobed and suggest the lvs. of hawthorns. Var. **arboréscens,** Bailey (*Màlus Sièboldii* var. *arboréscens,* Rehd.), which is widely distributed in Japan, differs from the type in its more tree-like habit (to 30 ft.), less pubescent, lvs. somewhat larger and usually less deeply divided and often lobed only on the ends of strong shoots, fls. often nearly white, frs. yellow or red. Var. **calocárpa,** Bailey (*M. Sièboldii* var. *calocárpa,* Rehd.), has large handsome bright red fr. and large fls.: lvs. on fruiting branches



3294. Pyrus Tschonoskii (×½). No. 29.

mostly ovate-oblong and crenate-serrulate, those on the vigorous shoots mostly 3-lobed with the lateral lobes short and broad: distinguished from *P. Zumi* by the 3–4 rather than 4–5 styles and by the lobed lvs.

35. **Zûmi,** Mats. (*Màlus Zùmi*, Rehd.). Low and much-branched tree, to 20 ft., with rounded head and twiggy growth, sometimes 40 ft. tall and with more ascending branches: lvs. long-petioled, oblong to ovate-oblong or elliptic-oblong, 1½–3 in. long, acute at apex, rounded or narrowed at base, entire or somewhat crenate-serrate, yellowish green above and light green beneath, soon glabrous, those on the ends of vigorous branches lanceolate and usually coarsely dentate: fls. white or slightly pinkish, borne in profusion, about 1 in. across, on loosely villous or glabrous pedicels about 1 in. long; calyx-lobes lanceolate, villous inside and less so outside; petals elliptic, obtuse, rounded at base but short-clawed, opening pink but becoming pure white; stamens about 25; styles 4 or 5, connate for one-third their length, densely villous: fr. ½in. or less diam., globose, red, the calyx deciduous. Mountains of Cent Japan. S.T.S. 1:91.—Differs from both *P. Sargentii* and *P. Sieboldii* in the oblong lvs. which are not at all or only slightly lobed, and slender petioles; from *P. Sargentii* also in longer petals rounded at base, glabrous lvs., longer petioles, and erect branches; from *P. Sieboldii* also in differences in foliage, larger fls., larger broader petals rounded at base.

36. **pulchérrima,** Aschers. & Graebn. (*P. floribúnda*, Kirchn., not Lindl. *P. Màlus floribúnda*, Hort. *Màlus floribúnda*, Sieb. *M. microcárpa* var. *floribúnda*, Carr.). Flowering Crab. Unknown in the wild but long in cult., and perhaps a hybrid of *P. buccata* and *P. Sieboldii;* intro. from Japan, where it seems not to be recognized, Rehder finding that what the Japanese botanists know under this name is *P. Halliana:* shrub or sometimes a small tree, often thorny: young growths glabrous or very soon becoming so: lvs. ovate and usually acuminate, the petioles rather thick and reddish and usually not much if any more than 1 in. long on the leading young shoots, the margins very sharply serrate or incised-serrate, not lobed, usually thickish, shining above and glabrous (or soon becoming so) beneath: fls. rose or rose-red, appearing with the lvs., produced in great abundance and very showy; styles nearly always 4, very rarely 3 or 5, connate to the middle: fr. usually about the size of a pea, on long, slender stalks, red, not persisting till winter. China. R.H. 1866:311; 1871:591; 1881, p. 296. F.S. 15:1585. G.F. 1:152; 2:523. A.G. 13:437; 18:437. F.E. 9:573. M.D.G. 1899:454.—The name of this species is somewhat in confusion. It has been known as *P. floribunda*, but Lindley earlier gave this name to a very different plant, of the section or genus Aronia (see p. 396, Vol. I), and the present species must take a new name. *P. pulcherrima* is one of the best of all early spring-flowering bushes or small trees, and is now common in gardens. The semi-double forms often improperly receive the names *Halliana* and *Parkmanii*. It makes a broad round-headed great bush, with handsome rose-colored buds and whitish expanded fls. **P. atrosanguínea,** Spaeth, is a handsome floriferous species of doubtful origin. It is probably *P. Halliana* × *P. Sieboldii* (Koehne supposes it to be *P. Halliana* × *P. fusca*): resembles in general *P. pulcherrima*, but differs in its deep carmine fls. not fading to white, rather narrower petals, shorter ovate and somewhat obtuse calyx-lobes, more shining and finally glabrous lvs., those lvs. at the end of vigorous shoots sometimes slightly 3-lobed: fr. dark red. Gt. 47:1448.

Var. **Scheideckeri,** Bailey (*Pyrus Scheideckeri*, Spaeth. *Màlus Scheideckeri*, Zabel), originated at Scheidecker's nursery at Munich from seeds of *P. pulcherrima*, but shows evidences of hybridity with some closely related species (probably with *P. prunifolia*) or else indicating the hybrid origin of *P. pulcherrima* itself: small tree of pyramidal habit, producing abundantly of large semi-double tinged pink fls.: young branchlets slightly pubescent: lvs. ovate, acuminate, about 3 in. long, scattered-pubescent beneath, petiole hairy, margins coarsely sharp-serrate or double-serrate: fr. globose, ¾in. diam., the calyx usually persistent. Gng. 6:308. A.F. 13: 1398. Gn. M. 10:20. G.M. 44:274; 54:861; 55:820; 57:256. G. 26:203; 27:234. Gn. W. 21: suppl. July 23. Gt. 53:1529 and p. 418.

Var. **Arnoldiàna,** Bailey (*Màlus floribúnda* var. *Arnoldiàna*, Rehd.). Originated at the Arnold Arboretum, Boston, as a seedling of *P. pulcherrima:* fls. more than one-half larger than in the type, pale rose: fr. much larger, yellow: of bushy habit.

3295. Pyrus Sieboldii (×½). See No. 34.

AAA. *The American native wild apples or crabs, sometimes planted in grounds but only P. ioensis yielding marked horticultural forms: fls. large, pink, fragrant: lvs. for the most part coarsely toothed and more or less lobed or notched: calyx persistent (exception in P. fusca).* Not all these species are in cult. outside botanical collections, but they have been so much confused that it is necessary to describe all of them in order clearly to distinguish them.

B. *Calyx deciduous from the fr.: western.*

37. **fúsca,** Raf. (*P. rivulàris*, Douglas. *Màlus rivulàris*, Roem.). Shrub or small tree, sometimes 30–40 ft. tall, the young growths more or less pubescent: lvs. ovate-lanceolate, acute or acuminate, very sharply and strongly serrate, often 3-lobed or notched on the strong shoots, pubescent beneath: fls. white, on slender pubescent pedicels, appearing when the lvs. are nearly or quite full grown, nearly or fully 1 in. across: fr. oblong, ¾in. or less long, yellow or greenish, the calyx-lobes caducous. N. Calif. to Alaska. S.S. 4:170.—Accord-

ing to Sargent, *P. fusca* "grows usually in deep, rich soil in the neighborhood of streams, often forming almost impenetrable thickets of considerable extent, and attains its greatest size in the valleys of Washington and Oregon." The fr. is eaten by Indians. Var. **lévipes,** comb. nov. (*Màlus fúsca* var. *lévipes,* Schneid. *M. rivulàris* var. *lévipes,* Koehne. *Pỳrus rivulàris* var. *lévipes,* Nutt.), has glabrous infl. and outer surface of calyx. Var. **diversifòlia,** comb. nov. (*Pỳrus diversifòlia,* Bong. *Màlus fúsca* var. *diversifòlia,* Schneid. *M. rivulàris* var. *diversifòlia,* Koehne), has white-tomentose infl. and outer surface of calyx. *Màlus Dawsoniàna,* Rehd., is a supposed hybrid of *P. fusca* and *P. Malus* raised at the Arnold Arboretum and named for Jackson Dawson. In habit it is like *P. fusca,* but the lvs. are usually broader and more oval, more crenately serrate and rarely lobed: fls. and frs. nearly twice as large, the calyx persistent. S.T.S. 2:91.

BB. *Calyx persistent: eastern.*

C. *Foliage glabrous at maturity.*

D. *Apex of lvs. rounded and obtuse; margins crenate-serrate.*

38. **angustifòlia,** Ait. (*Màlus coronària,* Brit. *M. angustifòlia,* Michx. *M. sempérvirens,* Desf. *P. sempérvirens,* Willd. *M. microcárpa* var. *sempérvirens,* Wenz.). Small tree, to 20 or 30 ft.: lvs. lance-oblong, crenate-serrate or almost entire, not lobed or only slightly so, thick and partially evergreen, rounded at apex, cuneate at base: fls. 1 in. across, fragrant, in few-fld. umbels, slender-pedicelled; calyx-tube glabrous or pubescent outside, the lobes narrow-acuminate and with rigid points and tomentose inside; petals narrow-obovate, slender-clawed; styles tomentose below: fr. subglobose to slightly pyriform, ¾–1 in. diam., with cavities at both ends, yellow-green and fragrant. Va. to Fla. and Miss. S.S. 4:169. B.R. 1207. A double-fld. form is sometimes described and figured as *P. angustifolia,* but it is properly *P. ioensis* (No. 44). Var. **pubérula,** Bailey (*M. coronària* var. *pubérula,* Rehd. *M. angustifòlia* var. *pubérula,* Rehd.), in Miss. and La., differs mostly in its pointed lvs., which are lightly pubescent beneath when young, and by the slightly villous pedicels.

DD. *Apex of lvs. acute or acuminate.*

E. *Lvs. not lobed, or sometimes slightly so at end of vigorous shoots.*

39. **platycárpa,** Bailey (*Màlus platycárpa,* Rehd.). Small tree, to 20 ft., with spreading unarmed branches, young growths thin-tomentose but becoming glabrous: lvs. ovate to elliptic, rounded at base, the apex rounded but with short acute point, sharply and mostly doubly serrate, those on vigorous shoots broad-ovate and usually with several pairs of very broad triangular lobes: fls. 3–6 in raceme-like umbels, about ½in. diam., on glabrous pedicels 1–1½ in. long; calyx-tube obconic and glabrous, the lobes or sepals lanceolate-acuminate and longer than the tube and densely tomentose within though glabrous without; petals orbicular-ovate, usually dentate; styles 5, villous below the middle and connate for one-third their length: fr. depressed-globose with deep depressions at both ends, broader than long (2 in. diam.), with persistent calyx, sometimes used for preserves. N. C. to Ga. in fertile bottoms. S.T.S. 2:189.—Mostly closely related to *P. coronaria,* but easily distinguished from this as well as from other species by the broad and large lvs. which are rounded and abruptly acuminate at apex, and never lobed, and by its very large fr.

3297. Pyrus glaucescens. (×½)

Var. **Hoòpesii,** Bailey (*Màlus coronària* var. *Hoòpesii,* Rehd. *M. platycárpa* var. *Hoòpesii,* Rehd.). Differs in pubescent calyx, oval to elliptic lvs. only slightly or not at all lobed, and by the larger fr. Known only in cult.

40. **lancifòlia,** Bailey (*Màlus lancifòlia,* Rehd.). Fig. 3296. Small tree, to 25 ft., with spreading spiny branches, the branchlets slightly pubescent or nearly glabrous: lvs. ovate-lanceolate to oblong-lanceolate, 1½–3 in. long, at the apex acute or short-acuminate, at the base rounded or broad-cuneate, either finely or coarsely serrate and frequently doubly serrate with the short teeth pointing forward, those on vigorous shoots ovate or oblong-ovate and often slightly lobed: fls. 3–6, in umbel-like racemes, white or rose, something over 1 in. across, on slender glabrous pedicels 1 in. or more long; calyx-tube obconic and on the outside glabrous, the lobes or sepals oblong-lanceolate and exceeding the tube and villous-tomentose within but glabrous without; petals oval, long-clawed; styles 5, densely villous below the middle: fr. subglobose, about 1 in. diam., on slender drooping pedicels, green and waxy. Pa. and Va. to Mo. S.T.S. 2:158 (a sprig of which is reduced in Fig. 3296).—Distinguished from *P. coronaria* (*P. angustifolia*) by the shape of the lvs., which are acuminate and less coriaceous, by the narrower and longer calyx-lobes, styles villous to middle, and by the different fr.

3296. Pyrus lancifolia. (×½)

EE. *Lvs. distinctly lobed, particularly on the strong shoots and sometimes on the flowering branchlets.*

41. **glaucéscens,** Bailey (*Màlus glaucéscens,* Rehd.). Fig. 3297–3299. Small tree or large shrub, with twiggy spiny head, the branchlets glabrous or at first slightly pubescent: lvs. triangular-ovate or ovate, 2–3½ in. long, at the apex acute or short-acuminate or even rounded, at base truncate villous-tomentose when young but becoming glabrous, glaucescent beneath, more or less triangular-lobed, coarsely serrate with abruptly acuminate teeth, the lowest pair of veins arising some distance above the base of the blade; petioles slender, soon becoming glabrous: fls. white or pink, 5–7 in umbel-like racemes, appear when lvs. are nearly full-grown, on slender glabrous pedicels 1 in. or so long; calyx-tube thinly villous outside, the lobes oblong-

lanceolate-acuminate and densely tomentose within; petals oval, rounded at top, more or less gradually narrowed into a claw; styles slightly shorter than the stamens: fr. flattened and concave at both ends, broader than long, not angled, yellow and waxy at maturity, fragrant. N. Y., and southward in the Appalachian region to N. C.; early-flowering. S.T.S. 2:157. This species is often confused with the following, but is easily distinguished by its distinctly lobed cratægus-like lvs. whitish on their under side.

42. **coronària,** Linn. (*Màlus frà̀grans,* Rehd. *Màlus coronària,* Mill.). Closely related to *P. glaucescens,* but differing in less deeply lobed more elongated lvs. which are green and not glaucous beneath at maturity, glabrous calyx-tube, and the fr. being strongly ribbed at the deeply sunken apex. N. Y. to Ala. B.M. 2009. B.R. 651. S.S. 4:167 (all as *P. coronaria*). R.H. 1884, p. 104 (as *P. microcarpa coronaria*). Gn. 29, p. 395; 34, p. 206.—The fr., which is produced in abundance, was often buried by the early settlers for use in the spring, when its acerbity was largely extracted; and it was sometimes used for cider. It is also useful for jellies and preserves. The species was probably never intro. into cult. for its frs., although it has been long grown for ornament and under domestication the apples are often twice their natural size. Var. **elongàta,** Bailey (*M. frà̀grans* var. *elongà̀ta,* Rehd. *M. coronària* var. *elongà̀ta,* Rehd.). Lvs. narrow-triangular and distinctly incised-serrate or lobed. N. Y. to N. C. There is a form with semi-double fls. and one (var. **aucubæfòlia,** Bailey) with variegated lvs. An attractive species. For recent discussions of the nomenclature of this species and No. 38, see Jackson, G.C. III. 55, p. 294, and Rehder, M.D., 1914, pp. 260–61.

43. **glabràta,** Bailey (*Màlus glabrà̀ta,* Rehd.). A southern representative of *P. glaucescens,* native from N. C. to Ala., distinguished by the lvs. light green and not glaucescent on the lower surface and rather thin, glabrous, deeply lobed, distinctly cordate at base, and the lowest pair of lateral veins springing from the very base of the blade: calyx-tube glabrous and purple;

3298. A wild crab of the East.—Pyrus glaucescens (×⅔). No. 42.

petals suborbicular or broadly ovate or rarely oval, abruptly contracted into a short claw, often erose-denticulate; styles 5, slightly longer than the stamens: fr. depressed-globose and slightly angled, distinctly ribbed at the deeply sunken apex. S.T.S. 2:188.

cc. *Foliage tomentose or villous or pubescent at maturity, at least on the vigorous shoots, the lvs. thickish and strongly veined.*

44. **ioénsis,** Bailey (*P. coronà̀ria* var. *ioénsis,* Wood. *Màlus ioénsis,* Brit. *Màlus coronà̀ria* var. *ioénsis,* Schneid. *P. iowénsis,* Carruth?). PRAIRIE or

3299. Pyrus glaucescens. (×½)

WESTERN CRAB-APPLE. Fig. 3300. Small tree, the younger parts gray-woolly: lvs. from ovate-oblong to elliptic-obovate, irregularly and mostly bluntly toothed and the larger ones marked with right-angled notches of shallow lobes, very tomentose below or becoming rusty and rarely glabrate with age, the petioles short and stout and pubescent: fls. usually upon shorter pedicels which, like the calyx, are tomentose: fr. oblong or at least never flattened lengthwise, sometimes angular, larger than in *P. glaucescens* and clinging later to the tree, dull heavy green with numerous light-colored dots on the skin, the surface having a greasy feel, the st. short and thick as compared with No. 41, and set in an oblique cavity, the basin narrow and shallow, with variable corrugations and a closed and pubescent calyx, the flesh sour and austere. Wild in low or flat lands in the Mississippi Valley, the typical form, as understood by Rehder, ranging from Minn. and Wis. to Neb., Kans., and Mo. B.M. 8488. S.S. 4:168 (frs. too flat).—Frs. appropriated by the settlers, but the species is probably not in cult. for its fr., although a late-blooming double-fld. variety has been lately intro.,—Bechtel's crab, sometimes referred to *P. angustifolia.* G.C. III. 25:397. R.B. 38:185. R.H. 1910:60. *P. ioensis* is a variable species, in some of its forms difficult to separate from *P. coronaria, P. angustifolia,* and other species. Var. **Pálmeri,** Bailey (*M. ioénsis* var. *Pálmeri,* Rehd.). Small and slender tree, to 18 ft., differing from the type chiefly in the smaller oblong more thinly pubescent lvs. which are rounded at apex, and those on the flowering shoots not lobed and crenate-serrate. Mo. Var. **spinòsa,** Bailey (*M. ioénsis* var. *spinò̀sa,* Rehd.). Dense bushy shrub, 6–8 ft., with slender spiny branches: differs from var. *Palmeri* in a shrubby habit, smaller lvs. and fls., and glabrescent calyx: from *P. coronaria* (*P. angustifolia*) in the pubescence of the lvs., serrate or serrulate lf.-margins and lobed ovate lvs. of the strong shoots. Mo. Var. **Bùshii,** Bailey (*M. ioénsis* var. *Bùshii,* Rehd.). Differs in bearing less deeply lobed lvs. than the type, which are glabrescent: from var. *Palmeri* it differs in having oblong-lanceolate acute glabrescent lvs. Mo. Var. **creniserràta,** Bailey (*M. ioénsis* var. *creniserrà̀ta,* Rehd.), is a slender spineless tree with branches villous when young, and crenate-serrate or entire elliptic-ovate to oblong-ovate lvs., or those on the vigorous shoots somewhat doubly serrate: calyx

tomentose. La. Var. **texàna,** Bailey (*M. ioénsis* vàr. *texàna,* Rehd.). Small much-branched tree, to 18 ft., or sometimes a shrub forming thickets, with densely tomentose branchlets which become glabrescent the first or second year, differing from the type in having smaller and much broader lvs. that are not at all or only slightly lobed and densely villous at maturity. Texas, representing the southwestern extension of the species.

45. **bracteàta,** Bailey (*Màlus bracteàta,* Rehd.). Tree, to 30 ft. or more tall, forming a broad head: a glabrescent form: lvs. elliptic-ovate to oblong-ovate, serrate or incisely serrate and less deeply so than in *P. ioensis* and with less deep lobing, sometimes slightly lobed near the base, those on the vigorous shoots usually ovate and with recurved very short lobes on either side and the margins commonly only slightly serrate, the foliage glabrous or glabrescent except the slightly pubescent lvs. at the end of strong shoots: racemes 3–5-fld., the pedicels about ½in. long, glabrous or nearly so and bearing subulate bractlets ¼–⅓in. long which persist during flowering. Mo.

P. alnifòlia, Franch. & Sav.=Sorbus.—*P. americàna,* DC., and *P. Aucupària,* Ehrh.=Sorbus.—*P. arbutifòlia,* Linn. f.=Aronia.—*P. Aria,* Ehrh.=Sorbus.—*P. Búnyardii,* Hort., said to be a hybrid of which Chænomeles Maulei is one parent, and therefore to be referred to that genus: described as having striking chamois-red fls. of large size.—*P. cardinàlis,* Hort.=Chænomeles japonica var. cardinalis.—*P. Cydònia,* Linn.=Cydonia.—*P. doméstica,* Ehrh.=Sorbus.—*P. florentina,* Sarg. (Cratægus florentina, Zucc. Malus florentina, Schneid. Pyrus cratægifolia, Savi. Malus cratægifolia, Koehne), considered by some writers to be of the Malus section, by others to belong to Sorbus, and by still others to be a hybrid between Pyrus and Sorbus (probably Sorbus torminalis × Pyrus Malus) is a bush or small tree, local in N. Italy: lvs. broad-ovate in outline, with several sharp lobes: fls. white, about 1 in. across, in open terminal corymbs, opening very late: fr. ½in. long, elliptic-oblong, red. B.M. 7423. G.C. III. 59:7.—*P. Fólgneri,* Lev.=Sorbus.—*P. germánica,* Hook. f.=Mespilus.—*P. Maùlei,* Mast.=Chænomeles.—*P. Maerlodsei,* Hort.=Chænomeles japonica var.—*P. pinnatífida,* Ehrh.=Sorbus.—*P. spùria,* DC.=Sorbus.—*P. sambucifòlia,* Cham. & Schlecht.=Sorbus.—*P. thianshánica,* Franch.=Sorbus.—*P. torminàlis,* Ehrh.=Sorbus.

L. H. B.

PYXIDANTHÈRA (Greek, *a small box* and *anthera;* the anthers opening transversely like the lid of a box). *Diapensiàceæ.* Pyxie. Flowering Moss. Pine-Barren Beauty. An evergreen creeping plant found in cushion-like masses in the sandy pine lands of N. J. to N. C. When it flowers in early April to early May, its white starry blossoms dot the light green or brownish green lf. and st. cushions. It grows best in moist sandy soil in the full sunlight and sometimes on gravel slopes of slight inclination. When growing amongst fallen lvs., its sts. become longer and the whole plant more open in character. The plant is rarely cult., although adapted to rock-gardens in sandy or gravelly pockets. Related to Diapensia, an alpine plant, and slightly to Galax. The only species is **P. barbulàta,** Michx. An evergreen herb with depressed prostrate nearly glabrous sts., much branched at the base and creeping: lvs. numerous, blades leathery, linear-oblanceolate, or linear-elliptic, imbricated, small, ¼in. long: calyx campanulate, lobes 5, oblong, obtuse; corolla white, tube oblong-campanulate, petals 5, spatulate to obovate, spreading; anthers of 5 stamens yellow, opening transversely; ovary 3-celled: caps. 3-valved, few-seeded. B.M. 4592. Mn. 8:33. B.B. 2:583. Gn. 27, p. 209. G. 36:649. J.F. 2:150.

John W. Harshberger.

3300. Prairie States crab.—Pyrus ioensis (×⅓). No. 44.

Q

QUAMÀSIA (*quamash*, the Indian name). *Liliàceæ.* A name given by Rafinesque in 1818 to the plants that Lindley, in 1832, called Camassia. On the principle of fifty years of accepted usage, the name Camassia is retained in the "nomina conservanda" of the International Botanical Congress (Vienna), and under that name the plants are treated in Vol. II. One species, variously known as *Camassia esculenta*, *Quamasia esculenta* and *Q. hyacinthina*, is native in the eastern United States, but the most showy species are from the Pacific side of the continent.

QUÁMOCLIT (Greek, *a dwarf kidney bean*). Including *Calbòa* and *Mìna*. *Convolvulàceæ.* Annual, or in tropical regions some perennial twining vines; most of them of easy culture, of rapid growth, and with a profusion of small flowers.

3301. Quamoclit pinnata. (×½)

The genus differs from all other Convolvulaceæ by its axillary often 2-forked clusters of fls., the thickened pedicels of some species, the slender corolla-tube not expanding at the base, the limb of the corolla salverform or cup-shaped, stamens and style exserted and often declinate.—About 10 species. *Q. pinnata* is the best-known species, often used to advantage upon arbors, verandas, walls, or on screens in the conservatory.

A. *Sepals without awns; pedicels thickened: lvs. pinnately divided.*

pinnàta, Bojer (*Ipomœa Quámoclit*, Linn. *Q. vulgàris*, Choisy. *Q. Quámoclit*, Brit.). Cypress-Vine. Indian Pink. Fig. 3301. St. smooth, slender, twining to a height of 10–20 ft.: lvs. short-petioled or sessile: peduncles few-fld., commonly much longer than the petioles: corolla 1–1½ in. long, scarlet, the tube narrowly funnelform, inflated above; the limb nearly flat, 5-lobed. July–Oct. Naturalized from Trop. Amer., Va. to Fla., west to Kans. and Texas; sparingly escaped from cult. farther north. B.M. 188 (as *Convolvulus Nil*); 244. Gn. 29, p. 33.—Beautiful in fl. and foliage but usually does not succeed well in the N. unless started early in the hothouse and transplanted. Var. **álba,** Hort., has white fls.

AA. *Sepals awned: lvs. entire or lobed.*

B. *Corolla-limb expanding abruptly from a slender tube, cup-shaped, ½in. broad or broader.*

coccínea, Moench (*Ipomœa coccínea*, Linn.). Star Ipomœa. Fig. 3302. St. freely twining for 10 ft.: lvs. slender-petioled, entire or angulate, acuminate: peduncle 2–6 in. long, few- to several-fld.; corolla ½–⅔in. wide, salverform; limb obscurely lobed, scarlet with yellow throat. Aug.–Oct. Apparently naturalized from Trop. Amer., on river banks in the Middle and South Atlantic states; probably indigenous to N. Mex. and Ariz. B.M. 221.—Fls. are produced in abundance, but are very small.

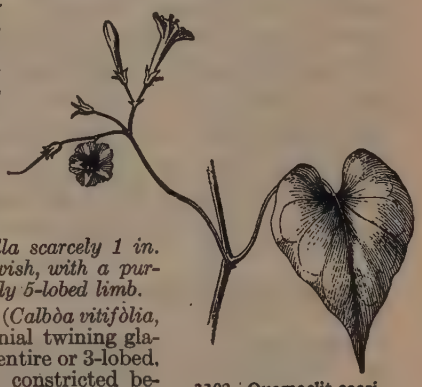
Var. **hederifòlia,** House (*Ipomœa hederifòlia*, Linn. *Ipomœa coccínea* var. *hederifòlia*, Gray. *Mìna sanguínea*, Hort.). Fig. 3303. This Plains form of the species has angulate, 3-lobed or even 3–5-parted lvs., and fls. usually larger. B.R. 9. B.M. 1769. I.H. 41, p. 159.—It is superior to the type for ornamental purposes.

Var. **lutèola,** House (*Ipomœa lutèola*, Jacq. *Ipomœa coccínea* var. *lùtea*, Hort.). Fls. yellow, an inch long. Varies to orange in color.

BB. *Corolla-limb expanding funnelform from a slender bent tube: lvs. 3-lobed.*

C. *Tube of corolla nearly 2 in. long, the limb 5-angled, scarlet.*

grandifìora, Don (*Ipomœa Fùnis*, Cham. & Schlecht.). A perennial vine with cordate-hastate, 3-lobed lvs., finely pubescent: peduncles elongated, bearing 3–9 scarlet fls.: corolla about 2 in. long, slender, bent, expanding into a 5-angled limb less than an inch broad. S. Mex.



3302. Quamoclit coccinea. (×½)

CC. *Tube of corolla scarcely 1 in. long, yellowish, with a purplish, deeply 5-lobed limb.*

vitifòlia, Don (*Calbòa vitifòlia*, Cav.). A perennial twining glabrous vine: lvs. entire or 3-lobed, the middle lobe constricted below: peduncles elongated, several-fld.: corolla about 1 in. long, the yellowish tube expanding above into a scarlet, deeply 5-lobed limb, the exserted stamens elongated and declinate. S. Mex.

BBB. *Corolla-limb cylindrical and bent, longer than the limb, yellow tinged with red.*

lobàta, House (*Mìna lobàta*, Llav. & Lex. *Q. Mìna*, Don. *Ipomœa versícolor*, Meissn.). A vigorous perennial climber, 15–20 ft. high: lvs. with a cordate base, 3-lobed, the middle lobe longest and narrowed below: fls. ½–¾in. wide, opening rich crimson, soon fading to pale yellow. July–Sept. Mex. Gn. 30, pp. 436, 437; 39:144. R.H. 1887, p. 19. G.C. II. 26:684, 685. P.M. 16:100. V. 10:34, 35. B.R. 28:24. J.F. 4:400.

—Distinguished from all other ipomœas by its bag-shaped corolla and scorpioid infl. It is a very free bloomer, and deservedly popular. H. D. HOUSE.

QUÁSSIA (from an aboriginal name). *Simarubàceæ*. Trees, sometimes cultivated in the warmhouse.

Leaves alternate, pinnate; lfts. alternate, entire, coriaceous: panicles axillary and terminal, elongated,

3303. Quamoclit coccinea var. hederifolia. (×½)

branched; fls. subcymose-dicœcious; calyx small, 5-lobed; petals 5; stamens 10 in the male, rudimentary in the female fls.; ovary sunken in the disk, deeply 5-parted: fr. 1–5 spreading sessile drupes.—About 5 species, Trop. Amer. and Trop. Afr.

amàra, Linn. Shrubby tree: lvs. opposite, odd-pinnate, dark green with bright pink veins; lfts. 5, elliptical-oblong, pointed, entire, tapering toward the base, subsessile at the petiolar strictures; petiole articulate, winged: fls. crimson, in racemes; corollas never fully expanded, the petals having a spiral twist and curling round one another: drupes biglandular ovoid, black with a pale spot at the base. Trop. Amer. B.M. 497.—It furnishes the bitter quassia wood and its medicinal extract is used as a tonic. Now cult. in the tropics of both hemispheres.

F. TRACY HUBBARD.

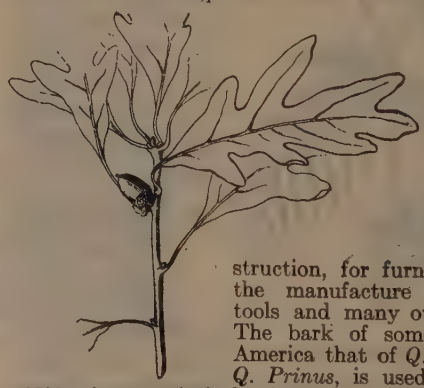
QUEEN OF THE MEADOWS: *Filipendula Ulmaria.* Q. of the Prairie: *Filipendula rubra.*

QUEKÉTTIA (in honor of E. J. Quekett). *Orchidàceæ*. Small epiphytic plants: lvs. terete, fleshy: scape filiform, branched: fls. small; sepals and petals similar, linear; lip erect from foot of column, about as long as sepals, entire, hollowed at base; column erect, with 2 recurved appendages at apex; anther terminal, incumbent; pollinia 2, waxy, ovoid, upon linear stalks.—About 6 species known, all Brazilian. Related to Ada; little known horticulturally. GEORGE V. NASH.

QUÉRCUS (ancient Latin name). *Fagàceæ*. OAK. Ornamental trees, rarely shrubs, grown chiefly for their handsome foliage and interesting habit; many species are important timber trees. See *Oak*.

Deciduous or evergreen trees, rarely shrubby: winter buds with usually many imbricate scales: lvs. alternate, short-petioled, with deciduous stipules, penninerved, serrate, lobed or pinnatifid, rarely entire: fls. monœcious; the staminate in slender, pendulous catkins with 4–7-parted calyx and 4–12, usually 6, stamens; pistillate in 1- to many-fld. spikes in the axils of the young lvs., each fl. consisting of an incompletely 3-, or rarely 4–5-celled ovary, surrounded by imbricate bracts; style short or elongated, dilated above and stigmatic on the inner face: fr. a 1-seeded subglobose to oblong nut, surrounded at the base or sometimes almost inclosed by a cup-like involucre.—More than 200 species are known, distributed through the colder and temperate regions of the northern hemisphere and in the mountains of the tropics. The numerous species are usually divided into 3 subgenera. The species of the subgenus Cyclobalanopsis which has the scales of the cup connate into concentric rings are all Asiatic. The American species belong to Lepidobalanus (*balanos* is Greek for acorn) and to Erythrobalanus. In the former, comprising the white oak tribe, the acorns mature the first year (Fig. 3304). In the latter, comprising the black oaks, the acorns mature the second year (Fig. 3305). Besides the 200 species, about 40 hybrids have been recorded. Pasania, often included under Quercus, is now usually considered a distinct genus, which see. The latest monograph of the whole genus is by A. DeCandolle in "Prodromus," vol. 16, 2, pp. 1–108 (1864–1868). Important illustrated works on American oaks are A. Michaux, "Histoire des Chênes de l'Amerique" (1801), with 36 plates; Kellogg and Greene, "Illustrations of West American Oaks" (1889), with 37 plates; Sargent, "Silva of North America," vol. 8 (1895), with 82 plates, and Liebmann, "Chênes de l'Amerique Tropicale" (1869), with 47 plates. Most of the European and west Asian oaks are figured in Kotschy "Eichen Europas und des Orients" (1862), with 40 colored plates. For comparative illustrations of lvs. see M.D. 1900, p. 32; R.B. 27, p. 61; G.W. 7, pp. 570, 571, 573; for those of frs. see M.D. 1900, p. 40; R.B. 27, p. 109.

The oaks are mostly trees, often tall with massive trunk and stout spreading limbs, with medium-sized, short-petioled leaves, usually more or less lobed, dentate or serrate, rarely entire, with inconspicuous flowers, the staminate ones in slender pendulous catkins and with fruits or "acorns" consisting of a globular to oblong nut inclosed at the base only, rarely wholly or nearly wholly, by a cup-like involucre. The oaks comprise some of the most important forest trees of the northern hemisphere. The wood of most species is strong, tough, hard and durable, and highly valued for many purposes, especially ship-building, construction, for furniture, and in the manufacture of wagons, tools and many other articles. The bark of some species, in America that of *Q. velutina* and *Q. Prinus*, is used for tanning leather. Cork is obtained from the bark of *Q. Suber* and *Q. occidentalis* in southern Europe. The bark of a few species has also been employed in medicine. The acorns of several species are edible, in America especially those of *Q. Prinus*, *Q. Emoryi* and *Q. lobata;* in Europe those of *Q. Ilex* var. *Ballota* and *Q. Ægilops;* in Japan those of *Q. glauca;* in many European countries the acorns of all species are an important food for hogs. In eastern Asia a silkworm feeds on the leaves of different species. A parasitic insect living on *Q. coccifera* in



3304. Annual-fruited oak—Quercus alba. The mature acorn is borne on the wood of the season. (×¼)

southern Europe and northern Africa yields a scarlet dye. Galls caused by the puncture of certain insects are used for tanning and dyeing and are now chiefly obtained from *Q. Ilex* var. *infectoria* in western Asia. Some of the above-mentioned species are described only in the supplementary list, page 2890.

The deciduous species are mostly hardy North, while of the evergreen ones none seems to be hardy farther north than Washington, D.C.; some half-evergreen oaks, as *Q. Pseudoturneri* and *Q. macedonica*, will probably prove hardy in the vicinity of New York.

Most of the oaks are stately trees of noble and majestic habit with stout, wide-spreading branches; some, as *Q. alba*, *Q. Garryana*, *Q. virginiana*, and *Q. chrysolepis*, often cover a space more than 100 feet in diameter; others, as *Q. macrocarpa*, *Q. montana* and *Q. velutina*, have a more oval, round-topped head, while *Q. palustris* and *Q. imbricaria* form symmetrical broad pyramids. A very few hardy species are shrubs, generally called scrub oaks, as *Q. prinoides* and *Q. ilicifolia*. Oaks rank among our most valuable park and avenue trees, and are as beautiful when grown as single trees as they are when grouped together and forming groves and woods. As avenue trees, *Q. palustris*, *Q. rubra*, *Q. coccinea*, *Q. imbricaria* and *Q. Phellos* are among the best, the last-named when medium-sized trees are desired; in the southern states, *Q. laurifolia*, *Q. nigra*, and the evergreen *Q. virginiana* are preferred. The shrubby species, like *Q. prinoides* and *Q. ilicifolia*, may be used for covering rocky hillsides and dry ridges.

3305. Biennial-fruited oak. — Quercus velutina. The mature acorn is borne on two-year-old wood: that is, the acorn does not mature until it is two years old. (×½)

Oak leaves are always beautiful. They have many shades of green; especially attractive are some with leaves of contrasting colors, the under side being silvery white, the upper one dark green, as in *Q. Muhlenbergii*, *Q. macrocarpa*, *Q. Prinus*, and some foreign evergreen species. In many oaks the leaves show a handsome pink or crimson color when unfolding, and some species assume brilliant autumnal tints. Especially beautiful in autumn are *Q. coccinea* and *Q. palustris*, with the foliage turning brilliant scarlet; *Q. rubra*, *Q. imbricaria*, and *Q. Prinus*, which turn bright or dark red; *Q. alba*, violet or vinous purple; *Q. lyrata*, scarlet or orange; *Q. Phellos*, pale yellow; *Q. montana*, orange or orange-brown; *Q. falcata* and *Q. ilicifolia*, orange-brown or yellow; *Q. stellata* and *Q. nigra*, brown or dull orange. Some of the foreign species, like *Q. sessiliflora* and also *Q. Robur*, *Q. Cerris*, *Q. lanuginosa*, *Q. glandulifera*, and others, retain the green color until late in fall. Besides our native evergreen species, the Japanese *Q. acuta*, *Q. myrsinæfolia*, and *Q. glauca* are among the best evergreen oaks for cultivation in the South; the European *Q. Ilex* and *Q. Suber* are also handsome evergreen trees.

Generally the oaks grow best in a moderately moist rich soil, including heavy clay; some, as *Q. bicolor*, *Q. nigra*, *Q. alba*, *Q. Phellos*, *Q. falcata*, and *Q. virginiana*, prefer moister situations and grow naturally in low and often even in swampy ground; while others, especially the red oaks, like *Q. rubra*, *Q. coccinea*, *Q. imbricaria*, *Q. marilandica*, *Q. montana*, and *Q. stellata*, grow well in drier, rocky or sandy soil, and the scrub oaks on dry and barren soil. The black and red oaks, especially the pin oak, are usually easily transplanted and large trees are moved successfully, while the white oaks are more particular and only younger nursery-grown trees can be safely transplanted.

Oaks are propagated usually by seeds sown immediately after gathering in fall; this is especially necessary with *Q. alba*, *Q. virginiana*, and some other white oaks which sprout as soon as they are ripe; but only the root is produced in fall, while the stem does not appear until the following spring. The seeds of red and black oaks, and also of *Q. Robur*, if not sown at once should be stratified and sown early in spring. Acorns should be packed in earth, moss, or sawdust when shipped for a great distance. Varieties are usually grafted on potted stock in the greenhouse in early spring or sometimes in August. As a stock *Q. Robur* is preferred, but *Q. rubra*, *Q. velutina*, and *Q. montana* are also employed. It is probably safer to graft varieties of white and of red oak each on stock of the same group. The evergreen species are sometimes increased by layers and also by cuttings.

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  B. *Walls of nut tomentose on the inner surface: lvs. lobed, with bristle-tipped teeth and lobes or entire, bristly-pointed, but not serrate and not evergreen: fr. ripening the second year: bark dark-colored, not scaly.* BLACK OAKS. (*Erythrobalanus.*)
    C. *Lvs. pinnatifid, slender-stalked.*
      D. *Lobes of lvs. usually toothed: under side glabrous or rarely pubescent.*

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    C. *Lvs. pinnatifid, slender-stalked.*
      D. *Lobes of lvs. usually toothed: under side glabrous or rarely pubescent.*

E. *Longest lobe of the lf. about equaling the breadth of the broadish middle portion of the lf.* ... 1. **rubra**
EE. *Longest lobes of the lf. 2–6 times as long as the narrow middle portion.*
F. *Upper scales of cup closely appressed: lvs. glabrous: winter buds glabrous or puberulous.*
G. *Cup brown, glabrous or puberulous and glabrate.*
H. *Shape of cup flat, saucer-like: lvs. usually cuneate at base*..... 2. **palustris**
HH. *Shape of cup hemispherical or turbinate: lvs. usually nearly truncate*..... 3. **coccinea**
GG. *Cup grayish or pale brown, pubescent.*
H. *Acorn about ¾in. thick: cup ¾–1 in. broad*..... 4. **Schneckii**
HH. *Acorn about ½in. thick: cup ½–¾in. broad*..... 5. **ellipsoidalis**
FF. *Upper scales of cup loosely imbricate.*
G. *Winter buds puberulous or glabrous: acorn 1–1½ in. long*..... 6. **Kelloggii**
GG. *Winter buds tomentose: acorn ½–¾in. long*... 7. **velutina**
DD. *Lobes of lvs. entire or few-toothed: under side whitish or grayish tomentose.*
E. *Plant a tree: lobes elongated, usually falcate.*
F. *Under side of lvs. tawny or grayish pubescent*..... 8. **falcata**
FF. *Under side of lvs. white-tomentose*..... 9. **pagodæfolia**
EE. *Plant a shrub: lobes broadly triangular*.....10. **ilicifolia**
CC. *Lvs. obovate, 3–5-lobed at the apex or almost entire, short-stalked..*
D. *Shape of lvs. obovate-spatulate: lvs. glabrous*.....11. **nigra**
DD. *Shape of lvs. broadly obovate: lvs. rusty pubescent beneath* .....12. **marilandica**
CCC. *Lvs. oblong or linear-oblong, entire, rarely remotely toothed.*
D. *Under side of lvs. glabrous.*
E. *Lvs. lanceolate or linear-oblong, light green above, acute*.....13. **Phellos**
EE. *Lvs. oblong, dark green above.* 14. **laurifolia**
DD. *Under side of lvs. brownish pubescent*.....15. **imbricaria**
BB. *Walls of nut glabrous on the inner surface (except Nos. 41, 42): lvs. sinuately lobed or toothed, not bristle-tipped, rarely serrate with bristly teeth; the evergreen lvs. sometimes entire: fr. ripening the first year (except Nos. 16, 37, 41, 42).* White Oaks. (*Lepidobalanus.*)
C. *Foliage deciduous.*
D. *Lvs. sinuately dentate or serrate.*
E. *Scales of cup linear or lanceolate, spreading and recurved.*
F. *Margin of lvs. serrate: lvs. white-tomentose beneath*.. 16. **variabilis**
FF. *Margin of lvs. obtusely dentate, pubescent beneath*.... 17. **dentata**
EE. *Scales of cup appressed, imbricate.*
F. *Petioles very short: lvs. usually auriculate at base, glabrous or nearly so beneath* .....18. **mongolica**
FF. *Petioles rather slender: lvs. cuneate or rounded at the base.*
G. *Lobes of lvs. acute or acutish (sometimes obtusish in No. 20).*
H. *Fr. peduncled: lvs. silky-pubescent beneath*.....19. **glandulifera**
HH. *Fr. sessile or nearly so: lvs. tomentulose beneath.*
I. *Teeth 7–15 on each side of lf.: trees.*
J. *Petiole stout, ¼–¾in. long; pairs of veins 10–15; base of lf. often rounded*.....20. **alienæ**
JJ. *Petiole slender, ½–1 in. long; pairs of veins 7–13; base of lf. cuneate*.....21. **Muhlenbergii**
II. *Teeth 3–7 on each side: shrub*.....22. **prinoides**
GG. *Lobes of lvs. rounded.*
H. *Peduncle of fr. short or almost none.*
I. *Under side of lvs. whitish or grayish tomentose*.....23. **Prinus**
II. *Under side of lvs. pubescent or nearly glabrous, pale greenish*.....24. **montana**
HH. *Peduncle much longer than petiole: lvs. tomentulose beneath.* 25. **bicolor**
DD. *Lvs. pinnately lobed.*
E. *Bark separating in thin scales, light gray or light brown. American species.*
F. *Under side of lvs. pubescent or tomentose.*
G. *Length of lvs. 5–8 in.: lvs. lyrate-pinnatifid.*
H. *Cup fringed by awned scales*.....26. **macrocarpa**
HH. *Cup not fringed.*
I. *Fr. peduncled: lvs. white-tomentose beneath*.....27. **lyrata**
II. *Fr. nearly sessile: lvs. pubescent beneath* .....28. **stellata**
GG. *Length of lvs. 2–6 in.*
H. *Upper surface of lvs. glabrous and lustrous*.....29. **Garryana**
HH. *Upper surface of lvs. pubescent and dull: acorn elongated, to 2¼ in. long*.....30. **lobata**
FF. *Under side of lvs. glabrous.* 31. **alba**
EE. *Bark furrowed and ridged, not scaly, usually dark brown or dark gray. European species.*
F. *Cup with imbricate, appressed scales.*
G. *Lvs. glabrous below.*
H. *Petioles shorter than peduncles*.....32. **Robur**
HH. *Petioles longer than peduncles*.....33. **sessiliflora**
GG. *Lvs. pubescent below.*
H. *Scales of cup small, closely appressed: lvs. usually lobed*.....34. **lanuginosa**
HH. *Scales oblong to lanceolate, loosely appressed: lvs. usually pinnatifid.*
I. *Petiole ¼–¾in. long: fr. nearly sessile*.....35. **Toza**
II. *Petiole short: fr. stalked*.....36. **conferta**

FF. *Cup with elongated, spreading and recurved scales*...37. **Cerris**
CC. *Foliage evergreen, dentate or entire.*
D. *Lvs. whitish, tomentose or tomentulose beneath: fr. ripening the first year.*
E. *Margin of lvs. dentate, rarely entire.*
F. *Bark of trunk corky*.....38. **Suber**
FF. *Bark of trunk smooth*.....39. **Ilex**
EE. *Margin of lvs. entire, shape elliptic to oblong*.....40. **virginiana**
DD. *Lvs. finally glabrous beneath.*
E. *Under side of lvs. fulvous-tomentose during the first year*.....41. **chrysolepis**
EE. *Under side of lvs. glabrous or stellate-pubescent at first*...42. **agrifolia**
AA. *Scales of cup connate into concentric rings: lvs. evergreen. (Cyclobalanopsis.)*
B. *Lvs. toothed, glaucous or glaucescent beneath.*
C. *Under side of lvs. silky, at least while young*.....43. **glauca**
CC. *Under side of lvs. glabrous*.....44. **myrsinæfolia**
BB. *Lvs. entire, dull green beneath*.....45. **acuta**

Subgenus ERYTHROBALANUS. Black Oaks.

1. **rùbra,** Linn. Fig. 3306. Tree, to 80, occasionally 150 ft., with stout spreading branches forming a broad, round-topped, symmetrical head: lvs. divided about half way to the middle by wide sinuses into 7–9 triangular-ovate or ovate-oblong lobes, dull green above, light green and pubescent at first beneath, at length glabrous, 5–9 in. long: fr. short-stalked; acorn ovoid, 1 in. long, embraced only at the base by the ¾–1-in.-broad cup. Nova Scotia to Fla., west to Minn. and Texas. S.S. 8:409, 410. Em. 1:168. F.S. 17:1812, 1813. H.W. 2, p. 84.—Beautiful oak of rapid growth, growing into a large majestic tree, with usually broad

3306. Leaves and acorns of various oaks. 1, Q. Phellos; 2, Q. alba; 3, Q. velutina; 4, Q. rubra; 5, Q. montana; 6, Q. macrocarpa; 7, Q. bicolor.

round head, the foliage turning dark red in fall. Hybrids are known with the two following species, with *Q. velutina, Q. falcata, Q. Phellos* and *Q. imbricaria*. Var. **ambígua,** Fern. (*Q. ambigua*, Michx. f., not HBK. *Q. boreàlis*, Michx. f. *Q. coccínea* var. *ambígua*, Gray). Cups deeper and somewhat turbinate; acorn usually smaller. The northern form. See also note under No. 8.

2. **palústris,** Linn. PIN OAK. Fig. 3307. Tree, to 80, occasionally 120 ft., with rather short spreading branches, forming a symmetrical pyramidal head, becoming irregular and oblong in older trees: lvs. deeply pinnatifid, sometimes almost to the midrib; lobes 5–7, oblong or oblong-lanceolate, toothed, separated by wide sinuses, bright green above, light green

3307. Quercus palustris (on the left) and Q. Phellos. (×¼)

beneath, with axillary tufts of hairs, 3–5 in. long: fr. short-stalked; acorn subglobose or ovoid, ⅓–½in. long, embraced about one-third or more by the cup. Mass., to Del., west to Wis. and Ark. S.S. 8:422, 423. Em. 1:167. A.G. 17:213. Gng. 3:129. Mn. 2:155; 6:27. F.E. 28:223. G.W. 5, p. 13.—Handsome trees, especially when young; often used for avenues; grows rapidly and prefers somewhat moist soil; foliage bright red in autumn. The tree is fibrous-rooted and transplants well. Hybrids of this with the preceding species and with *Q. Phellos* have been observed in cult.

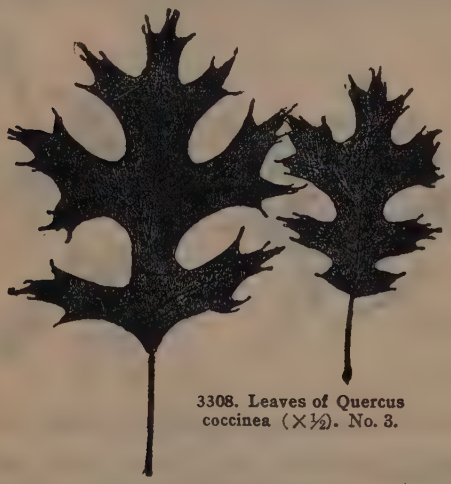
3. **coccínea,** Muench. SCARLET OAK. Figs. 3308, 3309. Tree, to 80 ft., with gradually spreading branches forming a round-topped rather open head: lvs. deeply divided by wide sinuses into 7–9 rather narrow, oblong or lanceolate, few-toothed lobes, bright green and glossy above, light green and glabrous beneath, 4–8 in. long: fr. short-stalked, ovoid to oblong-ovate, ½–¾in. long, embraced about one-half by the almost glabrous cup. Maine to Fla., west to Minn. and Mo. S.S. 8:412, 413. Em. 1:163.—Especially valuable for its brilliant scarlet fall coloring; grows well in dryish situations. Hybrids of this species with *Q. rubra* and *Q. velutina* have been found.

4. **Schnéckii,** Brit. (*Q. texàna*, Sarg., in part, not Buckl.). Fig. 3310. Tree, attaining 200 ft., with an oblong open head: lvs. almost like those of *Q. coccinea*, with axillary tufts of ferrugineous hairs beneath, 3–8 in. long: fr. ovoid, ½–1 in. long, embraced about one-third by the deeply saucer-shaped cup. Ind. and Iowa to Texas and Fla. S.S. 8:411. G.F. 7:515, 517 (adapted in Fig. 3310).—Tall tree: much like *Q. coccinea* in foliage and like *Q. rubra* in fruit, but the cup somewhat deeper and smaller and pale grayish tomentose.—The *Q. texàna*, Buckl., is a small tree of S. and W. Texas, with smaller, 2–4-in.-long, less deeply lobed lvs. and oblong nuts about ½in. long, with a hemispherical cup. B.T. 292. Probably not in cult.

5. **ellipsoidàlis,** E. J. Hill. YELLOW OAK, or BLACK OAK. Tree, to 70 ft. with ascending branches forming an oblong head: bark gray, close and smooth, yellowish within: lvs. oval in outline, truncate or broadly cuneate at the base, with 5–7 oblong lobes coarsely toothed at the summit, glabrous, lustrous and bright green above, paler beneath with axillary tufts of hairs, 3–5 in. long: fr. short-stalked or nearly sessile; acorn ellipsoid to subglobose, ½–¾in. long, inclosed about one-third or

one-half by the turbinate or deeply saucer-shaped cup gradually narrowed at the base, with closely appressed, brown-pubescent scales. S. Mich. to Man. and Iowa. S.S. 14:771.

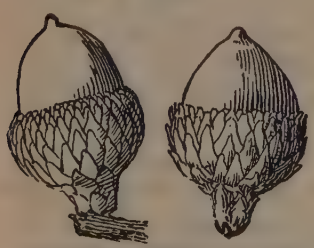
6. **Kélloggii,** Newb. (*Q. califórnica,* Coop.). CALIFORNIAN BLACK OAK. Fig. 3311. Tree, occasionally to



3308. Leaves of Quercus coccinea (×½). No. 3.

100 ft., with stout spreading branches forming an open, round-topped head: lvs. divided about to the middle by wide sinuses into usually 7 oblong, toothed lobes, pubescent when young, at length glabrous and glossy above, yellowish green and glabrous or floccose beneath, 3–6 in. long: fr. short-stalked; acorn ovoid or oblong, mostly rounded at the top, 1–1½ in. long, embraced about one-third or one-half by the deep hemispherical glabrous cup. Ore. to Calif. S.S. 8:416. G.F. 9:145.

7. **velùtina,** Lam. (*Q. tinctòria,* Bartram). BLACK OAK. YELLOW-BARK OAK. Figs. 3305, 3306, 3309. Tree, to 80, sometimes to 150 ft., with rather slender branches, spreading gradually into a narrow, open head: bark very dark brown, inner bark orange: lvs. pinnatifid to or beyond the middle, with 7–9 broad toothed lobes, dark and dull green above, brownish pubescent beneath at first, glabrous at length, except in the axils of the veins, 4–10 in. long: fr. short-stalked; acorn ovoid, ½–1 in. long, embraced about one-half by the hemispherical densely pubescent cup. Maine to Fla., west to Minn. and Texas. S.S. 8:414, 415. Em. 1:160. G.F. 5:55. —This species hybridizes with *Q. coccinea, Q. rubra, Q. imbricaria* and *Q. Phellos* (*Q. heterophylla,* Michx.).



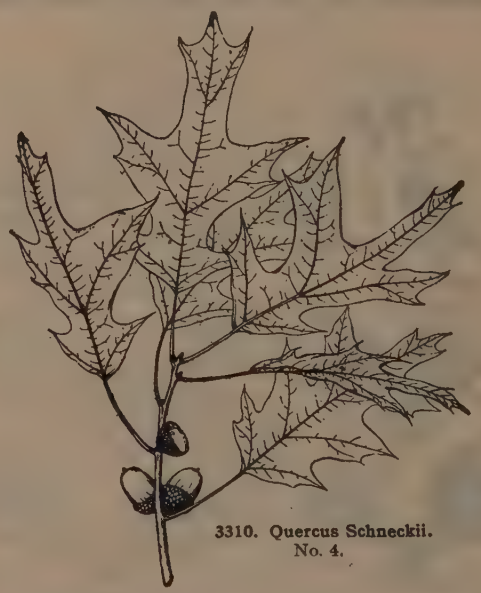
3309. Acorns of Quercus coccinea (on left) and Quercus velutina. (Natural size.) Nos. 3 and 7.

Tree of rapid growth, less beautiful than the preceding species, but the wood is more valuable; it flourishes even in rather dry soil, and the foliage turns dull red or orange-brown in fall. Var. **missouriénsis,** Sarg. Lvs. with a permanent rusty pubescence beneath: cup-scales tomentose. W. Minn. to Ark.

8. **falcàta,** Michx. (*Q. digitàta,* Sudw. *Q. cuneàta,* Auth., not Wang.). SPANISH OAK. Tree, to 70, rarely to 100 ft., with stout spreading branches forming an open, round-topped head: lvs. deeply pinnatifid, with 5–7 entire, acute and often falcate lobes gradually narrowed from a broad base and spreading at nearly right angles, separated by broad sinuses, drooping, dark green and glabrous above, tawny or grayish pubescent beneath, 3–8 in. long: fr. short-stalked; acorn subglobose, ½in. high, embraced one-half by the turbinate cup. N. J. to Fla., west to Mo. and Texas. S.S. 8:420. G.F. 8:104. F.E. 29:943.—Handsome, with peculiarly distinct foliage, but not quite hardy N. It appears that the original description of *Q. rubra,* Linn., applies to the Spanish oak (see Sargent in Rhodora 17:39); therefore, under a strict application of the rule of priority, *Q. falcata,* Michx., ought to be called *Q. rubra* and the tree heretofore known as *Q. rubra* ought to be known as *Q. borealis,* if var. *ambigua* is not considered specifically distinct; otherwise it ought to receive a new name. The name *Q. borealis* applies more strictly to the northern form (*Q. rubra* var. *ambigua*); while the more southern form becomes *Q. boreàlis* var. *máxima,* Sarg.

9. **pagodæfòlia,** Ashe (*Q. falcàta* var. *pagodæfòlia,* Ell.). SWAMP SPANISH OAK. Tall tree, sometimes 120 ft. high, with wide-spreading branches forming a broad open head, but narrow in the forest; branchlets tomentose: lvs. deeply pinnatifid, with 5–11 entire, acute, spreading lobes narrowed from a broad base and often falcate, dark green and lustrous above, white-tomentose beneath, 5–8 in. long: fr. short-stalked or nearly sessile; acorn ovate to subglobose, little over ½in. across, inclosed about one-half by the turbinate cup; scales loosely imbricate, pubescent except on the margin. Va. to Fla., west to S. Ill. and Ark. S.S. 14:772.—Handsome and valuable timber tree; about as hardy as the preceding species.

10. **ilicifòlia,** Wang. (*Q. Bánisteri,* Michx. *Q. nàna,* Sarg.). BEAR or SCRUB OAK. Intricately branched, spreading shrub to 10 ft. high, rarely small tree to 20 ft.: lvs. pinnately lobed, with usually 2 broad triangular lobes on each side, dark green and glabrous above,



3310. Quercus Schneckii. No. 4.

whitish tomentulose beneath, 2–5 in. long: fr. short-stalked; acorn globose-ovoid, ½in. or less high, embraced about one-half by the saucer-shaped cup. Maine to Va., west to Ohio and Ky. S.S. 8:424. Em. 1:170. —Growing naturally on dry rocky soil and forming dense thickets; it may be used for covering barren rocky ridges and hillsides. Hybrids with *Q. coccinea, Q. velutina, Q. marilandica,* and *Q. Phellos* are known.

11. **nigra,** Linn. (*Q. aquática,* Walt. *Q. uliginòsa,* Wang.). WATER OAK. Tree, to 80 ft., with rather

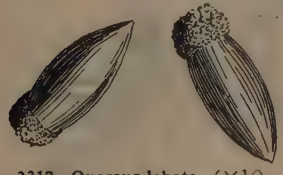
slender branches forming a conical, round-topped head: lvs. obovate, 3-lobed at the apex or sometimes entire, rarely pinnatifid above the middle, dull bluish green above, paler beneath, soon glabrous except axillary tufts of brown hairs beneath, 1⅓–3 in. long: fr. short-stalked; acorn globose-ovoid, ⅓–⅔in. high, embraced one-fourth to one-third by the saucer-shaped cup. Del. to Fla., west to Ky. and Texas. S.S. 8:428.—Of rapid growth and easily transplanted; often planted as avenue tree in the S., but not quite hardy N. Usually called *Q. aquatica.*

3311. Quercus Kelloggii. (×½)

12. **marilándica,** Muench (*Q. nìgra,* Wang. *Q. ferruginea,* Michx.). Black Jack. Jack Oak. Tree, to 30, sometimes to 50 ft., with short spreading branches forming a narrow, round-topped or often irregular head: lvs. obovate, 3–5-lobed at the broad apex, with broad, entire or sparingly toothed lobes, glabrous and dark green above, at length glabrous and yellowish green beneath, brownish tomentose at first: fr. short-stalked; acorn ovoid-oblong, ¾in. high, embraced one-third to two-thirds by the turbinate cup. N. Y. to Fla., west to Neb. and Texas. S.S. 8:426, 427.—There are hybrids with *Q. ilicifolia, Q. Phellos,* and *Q. imbricaria.* Handsome tree, with large glossy foliage; hardy N. Better known as *Q. nigra,* but this name really belongs to the preceding species.

13. **Phéllos,** Linn. Willow Oak. Figs. 3306, 3307. Tree, to 50 ft., sometimes becoming 80 ft., with rather slender branches forming a conical, round-topped head: lvs. short-petioled, linear-oblong, bright green and glossy above, pubescent below when young, glabrous and light green at length, 2–4 in. long: frs. almost sessile, acorn subglobose, ⅓–½in. high, embraced about one-fourth by the saucer-shaped cup. N. Y. to Fla., west to Mo. and Texas. S.S. 8:435. Gt. 29, p. 221. A.G. 17:195. F.E. 18:592 (pl. 87). R.H. 1898, p. 149.—Hybrids have been recorded with *Q. palustris, Q. rubra, Q. velutina, Q. ilicifolia* and *Q. marilandica.* Beautiful hardy medium-sized tree with handsome foliage turning pale yellow in fall; prefers moist or almost swampy soil.

14. **laurifòlia,** Michx. Laurel Oak. Tree, to 60, occasionally to 100 ft., with comparatively slender branches forming a dense, round-topped head: lvs. oblong or oblong-obovate, sometimes slightly lobed, acute or rarely obtusish, dark green and shining above, light green and puberulous at first, glabrous at length below, 2–6 in. long: fr. short-stalked; acorn ovoid or subglobose, about ½in. long, embraced one-fourth by the saucer-shaped cup. Va. to Fla. and La. S.S. 8:429, 430. F.E. 16:396 (pl. 62).—Handsome tree with almost half-evergreen glossy foliage, often planted as avenue tree in the southern and Gulf States; a particularly good form of this species is in the trade as "Darlington oak." Not hardy N.



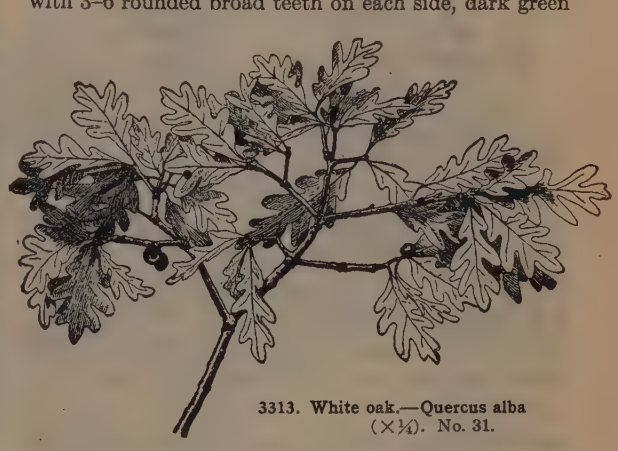
3312. Quercus lobata. (×½)

15. **imbricària,** Michx. Shingle Oak. Tree, to 60, rarely to 100 ft., with slender and somewhat pendulous branches, of pyramidal habit in its youth, round-topped when old: lvs. oblong or oblong-lanceolate, dark green and glabrous above, grayish tomentulose beneath, 3–7 in. long: fr. short-stalked; acorn subglobose, ½in. long, embraced one-third to one-half by the turbinate cup. Pa. to Ga., west to Neb. and Ark. S.S. 8:432. A.G. 17:195. Mn. 6:91.—Beautiful oak of symmetrical habit with handsome glossy foliage, turning russet-red in fall. There are hybrids of this species; with *Q. marilandica, Q. velutina, Q. rubra,* and *Q. palustris,* of which the last is in the trade as *Q. palustri-imbricària,* Engelm.: it has oblong-lanceolate lvs. entire or coarsely toothed, with bristly teeth, soon glabrous, 4–6 in. long: cup turbinate.

Subgenus Lepidobalanus. White Oaks.

16. **variábilis,** Blume (*Q. chinénsis,* Bunge, not Abel. *Q. Bungeàna,* Forbes. *Q. serràta,* Carruth., not Thunb.). Tree, to 80 ft.: lvs. slender-petioled, oblong to oblong-lanceolate, acuminate, crenately serrate, with bristle-like teeth, dark green and glabrous above, whitish tomentulose below, 3½–6 in. long: fr. almost sessile; acorn subglobose, not much exceeding the large cup; scales thick, lanceolate, recurved. N. China, Japan. S.I.F. 1:28.—Handsome tree with distinct foliage almost like that of *Castanea crenata;* has proved hardy in Mass. and W. N. Y.

17. **dentàta,** Thunb. (*Q. Daìmio,* Hort. *Q. obovàta,* Bunge). Tree, to 80 ft., with broad, round-topped head: lvs. short-petioled, obovate, sinuately toothed, with 3–6 rounded broad teeth on each side, dark green and usually glabrous above at length, light green and pubescent beneath, firm and leathery, to 12 in. long: fr. almost sessile; acorn ovate, ½–¾in. long, embraced one-half by the large cup; scales lanceolate, thin, spreading and recurved. Japan, W. China. S.I.F. 1:27. F.E. 14:542 (pl. 29).—Remarkable for its large lvs., on young plants to 1 ft. long and 8 in. broad; hardy N. Var. **pinnatífida,** Matsum. (*Q. pinnatífida,* Franch. & Sav.). Lvs. divided almost to the midrib into linear lobes with crisp irregular margins; interesting form.



3313. White oak.—Quercus alba (×⅛). No. 31.

18. **mongólica,** Fisch. Tree, to 100 ft.: branchlets glabrous: lvs. on very short petioles less than ¼in. long, obovate to obovate-oblong, obtuse at the apex, narrowed toward the rounded or auriculate base, coarsely toothed or sinuately lobed, with short and broad usually obtuse or obtusish teeth, dark green above and glabrous, paler green and glabrous beneath or pilose on the veins only, 4–8 in. long: fr. several or solitary on a short stalk or nearly sessile; acorn ovoid or ellipsoid, about ¾in. long, embraced about one-third by the cup which is grayish tomentulose with thickened tuberculate scales, thinner and acuminate at the slightly fringed margin. E. Siberia, N. China, Korea, N. Japan. Var. **grosseserràta,** Rehd. & Wilson (*Q. grosseserràta,* Blume. *Q. crispula,* Blume). Lvs. somewhat smaller, usually acutish at the apex with acute or acutish sometimes denticulate teeth: cup with thin closely appressed scales, not fringed at the margin. Japan. S.I.F. 1:27.—Some Japanese botanists distinguish *Q. crispula* as a species by the hemispherical cup inclosing the acorn about one-half from *Q. grosseserrata* which has a saucer-shaped cup inclosing the acorn one-fourth or one-third, but many specimens are intermediate in this character, and, as the lvs. of the two forms are exactly alike, it seems hardly possible to distinguish these two

forms as varieties. Var. *grosseserrata* has proved perfectly hardy at the Arnold Arboretum and forms handsome trees of vigorous growth.

19. **glandulífera,** Blume. Tree, to 40 ft., rarely to 70 ft., shrubby in cult.: lvs. cuneate or rounded at the base, oblong-obovate to oblanceolate, acute with 7–12 glandular-tipped, acute teeth on each side, light green above, glabrous, whitish or grayish green beneath, appressed silky at first, almost half-evergreen, 2½–5 in. long: fr. peduncled, usually several; acorn ovate, about ½in. high, embraced one-third to one-half by the cup. Japan. S.I.F. 1:26. —Half-evergreen shrub with handsome foliage, hardy at the Arnold Arboretum. Sometimes cult. under the name *Q. dentata*. *Q. glandulífera*, Mast., is *Q. Pseudoturneri* (see suppl. list).

3314. Staminate catkins.—Quercus Robur (×⅓). No. 32.

20. **aliena,** Blume. Tree, to 50 ft. or more: branchlets glabrous: lvs. oblong-obovate, obtuse or acutish at the apex, rounded or broadly cuneate at the base, coarsely sinuate-dentate with broad obtuse or acutish teeth, dark yellowish green and glabrous above, whitish or grayish tomentulose beneath, with 10–15 pairs of veins, 4–8 in. long; petioles ¼–¾in. long: frs. 1–3, short-stalked or nearly sessile; acorn ellipsoid to oblong, ¾–1 in. long, embraced about one-third by the cup-shaped grayish tomentulose cup, its scales thin, acuminate. S.I.F. 1:28. Japan, Korea, Cent. China. Var. **acuteserràta,** Maxim. Lvs. usually somewhat smaller and narrower, with acute or acutish gland-tipped teeth often slightly incurved at the apex. Japan, Cent. China.—This recently intro. species has proved hardy at the Arnold Arboretum.

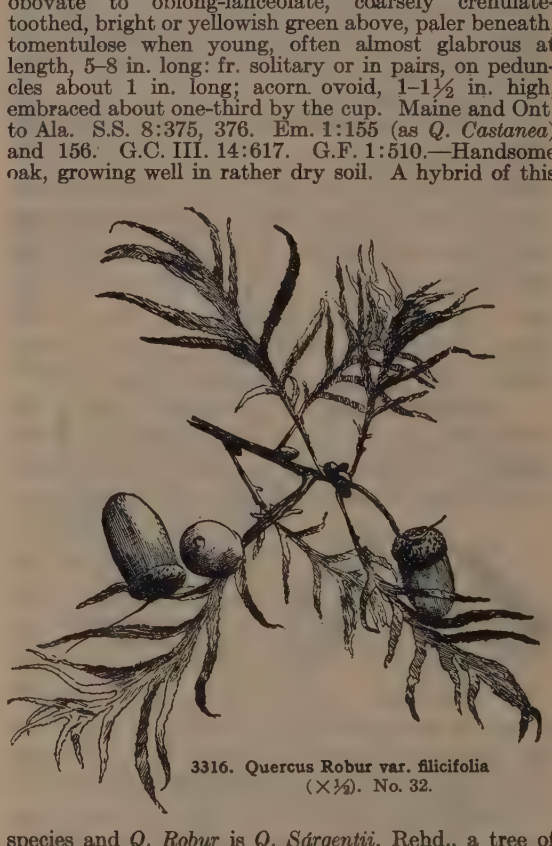
21. **Muhlenbérgii,** Engelm. (*Q. Castànea*, Willd., not Née. *Q. acuminàta*, Sarg., not Roxbg. *Q. Prìnus* var. *acuminàta*, Michx.). Yellow Chestnut Oak. Tree, to 100 or occasionally to 160 ft., with rather short branches, forming a narrow, round-topped head: lvs. slender-stalked, oblong to oblong-lanceolate, acute or acuminate, coarsely toothed with acute, glandular-tipped teeth, dark or yellowish green above, whitish tomentulose beneath, 4–7 in. long: fr. sessile or short-peduncled; acorns ovate, ¼–¾in. long, embraced about one-half by the cup. Tenn. to Va., west to Neb. and Texas. S.S. 8:377.—Beautiful tree with light gray bark and handsome foliage, glossy above and silvery white beneath.

3315. English oak.—Quercus Robur. (Natural size). No. 32.

22. **prinoìdes,** Willd. (*Q. Chìncapin*, Pursh. *Q. Prìnus* var. *Chìncapin*, Michx.). Chincapin Oak. Spreading shrub, with slender sts., usually not over 6 ft. high, rarely to 15 ft.: lvs. rather short-petioled, cuneate at the base, ovate-oblong or oblong, with 4–8 sometimes obtusish teeth on each side, bright green above, grayish tomentulose beneath, 2½–5 in. long: fr. sessile, acorn oval, about ½in. long, embraced one-half by the cup. Maine to Ala., west to Minn. and Texas. S.S. 8:378. Em. 1:158.—Pretty shrub for covering dry and rocky ridges. In trade sometimes under the misleading name of *Q. humilis*, for which see suppl. list.

23. **Prinus,** Linn. (*Q. Prìnus* var. *palústris*, Michx. *Q. Michaùxii*, Nutt.). Basket Oak. Cow Oak. Tree, to 100 ft., with round-topped, rather dense head: bark light gray, scaly: lvs. obovate or obovate-oblong, acute, deeply crenulate-toothed, with obtuse, mucronulate teeth, bright green and shining above, grayish tomentulose beneath, 4–7 in. long: fr. short-peduncled; acorn ovoid, 1–1½ in. high, embraced about one-third by the tomentose cup. Del. to Fla., west to Ind. and Texas. S.S. 8:382, 383.—The *Q. Prinus* of most recent authors is the following species. One of the most beautiful of the chestnut oaks; prefers moist soil.

24. **montàna,** Willd. (*Q. Prìnus* var. *monticola*, Michx. *Q. Prìnus*, Engelm., not Linn.). Chestnut Oak. Rock Chestnut Oak. Fig. 3306. Tree, to 70, or occasionally to 100 ft., with broad, irregular head and dark brown, ridged bark: lvs. slender-stalked, obovate to oblong-lanceolate, coarsely crenulate-toothed, bright or yellowish green above, paler beneath, tomentulose when young, often almost glabrous at length, 5–8 in. long: fr. solitary or in pairs, on peduncles about 1 in. long; acorn ovoid, 1–1½ in. high, embraced about one-third by the cup. Maine and Ont. to Ala. S.S. 8:375, 376. Em. 1:155 (as *Q. Castanea*) and 156. G.C. III. 14:617. G.F. 1:510.—Handsome oak, growing well in rather dry soil. A hybrid of this



3316. Quercus Robur var. filicifolia (×½). No. 32.

species and *Q. Robur* is *Q. Sárgentii*, Rehd., a tree of vigorous growth with handsome foliage, chiefly distinguished from *Q. montana* by the fewer lobes and the auriculate base of the lvs.

25. **bícolor,** Willd. (*Q. platanoìdes*, Sudw. *Q. Prìnus* var. *tomentòsa*, Michx. *Q. Prìnus* var. *díscolor*, Michx. f.). Swamp White Oak. Fig. 3306. Tree, to 70 ft., rarely to 100 ft., with narrow, round-topped, open head and light grayish brown, scaly bark: lvs. obovate to oblong-obovate, sinuately dentate, sometimes lobed half-way to the middle, dark green and dull above, whitish tomentulose beneath, 4–7 in. long: fr. solitary or in pairs, on peduncles 1½–4 in. long; acorn ovate-

oblong, 1–1½ in. high, embraced one-third by the cup. Que. to Ga., west to Mich. and Ark. S.S. 8:380, 381. Em. 1:153. G.F. 4:246.—It is less desirable as an ornamental tree than many other species, but the wood is valuable. By the light gray bark separating in large thin scales and the numerous small branches which appear on the larger limbs and often on the trunk, it is easily distinguished from allied species.

26. **macrocárpa,** Michx. Bur Oak. Mossy Cup Oak. Fig. 3306. Tree, to 80, sometimes 160 ft., with large spreading branches, forming a broad, round head: bark light brown, deeply furrowed; younger branches sometimes with corky wings: lvs. obovate or oblong-obovate, lyrate-pinnatifid, with 4–10 pairs of lobes, the lower ones smaller, separated by wide and deep sinuses, the upper ones much larger, or sometimes the lvs. are only sinuately dentate above the middle, bright green and shining above, grayish or whitish tomentose beneath, 4–8 in. long: fr. sessile or short-stalked; acorn broadly ovate or ovoid, ¾–1½ in. high, embraced about one-half by the large ¾–2-in.-wide cup, with the upper scales awned and forming a fringe-like border. Nova Scotia to Pa., west to Man. and Texas. S.S. 8:371, 372. Em. 1:149. G.F. 2:500; 3:407. Mn. 2:153. Gng. 4:342. Var. **oliviæfórmis,** Gray (*Q. oliviæfórmis,* Michx.). Lvs. deeply pinnatifid, lobes almost all narrow and separated by wide sinuses: cup usually elongated, much higher than broad. S.S. 8:373. M.D.G. 1901:167.—The bur oak is of vigorous growth and becomes a stately tree and is of picturesque appearance in winter with its corky branches. The crown is often fan-shaped until tree is mature.

3317. Live oak (Quercus virginiana) with Spanish moss hanging from the branches. Audubon Park, New Orleans. No. 40.

27. **lyràta,** Walt. Overcup Oak. Swamp, or Swamp Post Oak. Tree, to 100 ft., with rather small, often pendulous branches forming a symmetrical, round-topped head: lvs. obovate to obovate-oblong, deeply lyrate-pinnatifid, with 3–5 pairs of oblong or lanceolate lobes, the lower ones much smaller, separated by a wide sinus from the upper ones, dark green and shining above, whitish tomentulose beneath or sometimes light green and pubescent: fr. short-stalked; acorn globose, ½–1 in. high, almost entirely inclosed by the large scaly cup. N. J. to Fla., west to Mo. and Texas. S.S. 8:374. F.E. 17:736 (pl. 77).—Little cult.; hardy as far north as Mass.; prefers moist soil.

28. **stellàta,** Wang. (*Q. obtusíloba,* Michx. *Q. mìnor,* Sarg.). Post Oak. Tree, to 60, rarely to 100 ft., with broad, dense, round head, and with grayish brown, deeply fissured bark: lvs. short-stalked, broadly obovate, lyrate-pinnatifid, with 2 or usually 3 pairs of lobes, the middle pair being much larger, undulate, and mostly with a lobe on the lower side, separated from the lower pair by wide, from the upper pair by narrower sinuses, dark green above, brownish tomentulose beneath, 5–8 in. long: fr. almost sessile; acorn ovoid, ¾in. high, embraced one-third to one-half by the cup; scales lanceolate, loosely appressed. Mass. to Fla., west to Neb. and Texas. S.S. 8:368, 369. Em. 1:151.—Hardy and handsome tree with dense round head, growing naturally in rather dry, sandy or rocky soil; at the northern limit of its range, in S. Mass., it is usually shrubby.

29. **Garryàna,** Douglas. Oregon Oak. Tree, to 80, rarely to 100 ft., with wide-spreading branches, sometimes shrubby: bark light gray: lvs. obovate, pinnatifid, with broad, obtuse, entire or toothed lobes, dark green above, pubescent and yellowish green or whitish below: fr. short-stalked; acorn ovoid, about 1 in. high, embraced about one-third by the saucer-shaped cup; scales usually thin. Wash. and Ore. to Calif. S.S. 8:364, 365. G.F. 7:495. F.E. 32:919.—The most important oak of the Pacific States as a timber tree.

30. **lobàta,** Née (*Q. Hindsii,* Benth.). Valley or Weeping Oak (White Oak of the Pacific States). Fig. 3312. Tree, to 100 ft., with great, wide-spreading limbs and slender drooping branches: lvs. oblong or obovate-oblong, with 3–5 pairs of sometimes lobed-dentate lobes, dark green and stellate-pubescent above and usually whitish tomentulose beneath, 2–4 in. long: fr. almost sessile; acorn elongated, conical, 1½–2 in. high, embraced about one-third by the cup; lower scales tuberculate, upper one subulate. Calif. S.S. 8:362. G.F. 3:611; 10:55, 202, 205. C.L.A. 1:83.—Graceful wide-spreading tree; has not been cult. successfully outside of Calif.

31. **álba,** Linn. White Oak. Figs. 3304, 3306, 3313. Tree, to 100 ft., with stout spreading branches forming a broad, open head: bark light gray: lvs. obovate or oblong-obovate, narrowed at the base, with 3–8 pairs of rather narrow obtuse and sometimes toothed lobes, pubescent when young, soon glabrous, bright green above, glaucescent beneath: fr. short- or long-stalked; acorn oblong-ovate, 1 in. high, embraced about one-fourth by the shallow cup; scales closely appressed. Maine to Fla., west to Minn. and Texas. S.S. 8:356, 357. Em. 1:145. G.F. 3:91; 4:6, 7; 5:259, 450. F.E. 20:650 (pl. 110); 32:489.—The white oak is one of the noblest trees of the northern states and a beautiful park tree, where space can be allowed for its full development; the foliage assumes a beautiful deep vinous red or violet-purple color in fall. Var. **repánda,** Michx., is a form in which the lvs. have rather shallow sinuses and the frs. are usually short-stalked. Var. **pinnatífida,** Michx., has the lvs. deeply pinnatifid with narrow often deeply toothed lobes and the frs. usually

slender-stalked. S.S. 8:358. Hybrids of this species with *Q. macrocarpa*, *Q. montana*, and *Q. stellata* are known. S.S. 8:359–61. The hybrid with *Q. montana* was found in the nursery of John Saul, near Washington, D. C., and has been distributed as Saul's oak (*Q. Saùlii*, Schneid.).

32. **Ròbur,** Linn. (*Q. pedunculàta*, Ehrh. *Q. fémina*, Mill. *Q. Ròbur* var. *pedunculàta*, DC.). English Oak. Figs. 3314, 3315. Tree, to 120 ft., with stout spreading branches forming a broad round-topped head: lvs. short-petioled, auriculate at the base, oblong-obovate, with 3–7 rounded lobes on each side, quite glabrous, dark green above, pale bluish green beneath, 2½–5 in. long: fr. 1–7 on slender peduncles; acorn ovate or ovate-oblong, about 1 in. high, embraced about one-third by the hemispherical cup. Eu., N. Afr., W. Asia. G.C. III. 24:201; 25:168. F.S.R. 2, p. 196. G.W. 13, p. 566. H.W. 2:21, pp. 53–5. F.E. 21:100 (pl. 114).—More than 40 varieties are cult. in European nurseries and collections; some of the most important are the following: Var. **Concórdia,** Schneid. (*Q. pedunculàta Concórdia*, Kirchn.). Lvs. bright yellow. I.H. 14:537. F.E. 13:1296 (pl. 19). Var. **contórta,** Hort. A form with twisted branches and crowded lvs. of irregular shape; of slow growth. Var. **fastigiàta,** Schneid. (*Q. pedunculàta fastigiàta*, DC.). With upright branches forming a narrow columnar head. G.C. II. 19:179; III. 41:149. G.W. 15:663. F.E. 13:416 (pl. 3) (as var. *Lucombeana*). Of the same habit are var. **fastigiàta cupressoìdes,** Hort., with narrower lvs. Var. **fastigiàta aùreo-punctàta** with yellowish spotted foliage. Var. **fastigiàta víridis** with lvs. of darker green. Var. **heterophýlla,** Rehd. (*Q. pedunculàta heterophýlla*, Loud. *Q. Ròbur* var. *laciniàta*, Schneid., var. *comptoniæfòlia*, Hort.), with narrow, elongated, slightly or crenately lobed, sometimes almost entire lvs. Var. **filicifòlia,** Schneid. (var. *asplenifòlia*, var. *Doumétii*, Hort.). Fig. 3316. Lvs. deeply and irregularly divided often almost to the midrib in narrow linear lobes, with crisp margins. G.C. II. 14:632. I.H. 1, black fig., not numbered, opposite pl. 33. R.H. 1894, p. 17. Var. **pectinàta,** Schneid. (*Q. Ròbur* var. *pectinàta*, Kirchn.). Lvs. regularly pinnately divided nearly to the midrib into linear lobes. Var. **péndula,** Schneid. (*Q. pedunculàta péndula*, Loud.). With pendulous branches; a form with more slender and more decidedly weeping branches is var. **Dauvéssei,** Hort. Var. **purpuráscens,** DC. (*Q. pedunculàta purpuráscens*, DC., var. *purpùrea*, Loud. *Q. Ròbur sanguínea*, Schneid.). With the lvs. bright purple when young, becoming almost green at length, or as in the forms distinguished as var. **atropurpùrea,** Schneid., and var. **nigra,** Hort., the color is more intense and retained through the whole summer. F.S. 17:1783, 1784. There are a number of variegated forms, but of no great ornamental value; the most often cult. are: *álbo-variegàta*, *argénteo-marginàta*, *argénteo-pícta*, *aùreo-variegàta*, *marmoràta*, *joreauénsis maculàta*, *tricolor*.—Hybrids between this species and the following occur occasionally in Eu. (*Q. rosàcea*, Bechst. *Q. hýbrida*, Bechst., not Brot.). For a hybrid with *Q. montana*, see No. 24.

3319. Acorn of live oak.—Quercus virginiana; often known as Q. virens (×½). No. 40.

3318. Variation in the leaves of live oak.—Quercus virginiana (Nearly natural size). No. 40.

33. **sessiliflòra,** Salisb. (*Q. séssilis*, Ehrh. *Q. Ròbur* var. *sessiliflòra*, DC. *Q. Ròbur*, Mill., not Linn.). Similar in habit to the former, but limbs less spreading and head less broad: petioles ½–¾in. long: lvs. rounded or cuneate at base, obovate or obovate-oblong, with 5–9 rounded lobes on each side, somewhat glossy above, pale and glabrous or slightly pubescent on the midrib beneath, 2½–5 in. long: fr. almost sessile, usually somewhat larger than those of the preceding species. Eu., W. Asia to Persia. H.W. 2:22, pp. 65–7. F.S.R. 3, p. 117. A very distinct variety is var. **mespilifòlia,** Dipp. (var. *sublobàta*, Koch), with almost entire lvs. H.W. 2, p. 65. Var. **laciniàta,** Koehne. Lvs. deeply lobed with narrow lobes pointing forward. Gt. 61, p. 495. Var. **aùrea,** DC. Lvs. yellow while young, changing later to green. Var. **purpùrea,** Dipp. Young lvs. purple, changing to dark green Var. **Louéttei,** Kirchn. With pendulous branches and narrow slightly lobed or nearly entire lvs.—*Q. sessiliflora* is less common in cult. than the preceding species; both are usually called English oak and are sometimes considered varieties of one species.

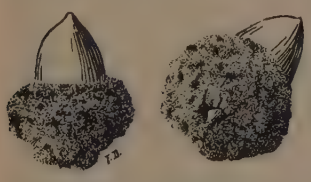
34. **lanuginòsa,** Thuill. (*Q. pubéscens*, Willd.). Tree, to 40 ft., but sometimes remaining shrubby: branches tomentose when young: lvs. pinnately lobed or pinnatifid, with 4–8 pairs of obtuse or acute lobes, glabrous above, pubescent or tomentose and grayish green beneath, 2–4 in. long: fr. almost sessile; acorn ovoid, ½–1 in. long, inclosed about one-half by the tomentose cup; scales closely appressed. Cent. and S. Eu., W. Asia. H.W. 2:23, pp. 69–71.—A very variable species, often shrubby, growing mostly on dry, rocky, and often on limestone soil; the more southern forms of it are tender. Var. **Hartwissiàna,** Dipp. (*Q. Hartwissiàna*, Hort.). Lvs. small, rather acutely lobed, yellowish tomentose beneath. Var. **pinnatífida,** Schneid. (*Q. pubéscens* var. *pinnatífida*, A. Braun). Lvs. deeply lobed. Var. **crispàta,** Beck, is similar but margin more crisp and under side more tomentose. Var. **péndula,** Jacq. (*Q. Ægilops* var. *péndula* and *Q. Pseudægilops péndula*, Hort.), with pendulous branches

and densely tomentose lvs., resembles the following species and is supposed by some authors to be a hybrid between the two.

35. **Tòza,** Bosc (*Q. pyrenàica,* Willd. *Q. camàta* and *Q. crinìta,* Hort.). Tree, to 40 ft., with slender branches; branchlets yellowish tomentose: lvs. pinnatifid halfway to the middle or more, with rather narrow and acute lobes, pubescent above, yellowish or grayish tomentose beneath, 3–5 in. long: fr. short- or long-peduncled; acorn oblong, embraced one-third to one-half by the tomentose cup; scales loosely appressed, rather large. Spain, S. France. Var. **péndula,** Dipp., with pendulous branches.—Somewhat tender N.

36. **conférta,** Kit. (*Q. pannónica,* Hort. *Q. hungárica,* Hubeny). Tree, to 120 ft., with gradually spreading branches forming a round-topped, open head: bark rather light brown: lvs. very short-petioled, auriculate at the base, obovate, deeply pinnatifid, with 5–7 pairs of often toothed lobes, dark green and almost glabrous at length, pale and tomentose beneath, 4–7 in. long: fr. short-peduncled; acorn ovoid-oblong, embraced about one-third by the cup; scales rather large, loosely appressed. Italy, S. E. Eu. G.C. II. 5:85. F.E. 19:236 (pl. 99). H.W. 2:24, pp. 72, 73.—Handsome oak with dark green foliage; hardy in Mass., but seems not reliable farther north.

37. **Cérris,** Linn. Turkey Oak. Tree, to 120 ft., with rather short spreading branches forming a broad pyramidal, at length often irregular open head: lvs. oblong or obovate-oblong, pinnatifid, with 3–8 pairs of entire or few-toothed lobes, dark green and somewhat rough above, grayish pubescent or almost glabrous beneath at length: fr. short-stalked, ripening the second year; acorn oblong-ovate, to 1½ in. long, embraced about one-half by the large mossy cup. S.E. Eu. W. Asia. Mn. 3:166. Gn. 27, pp. 476, 477. H.W. 2:25, pp. 74–6. G.W. 8, p. 181. F.E. 14:1264 (pl. 41).—Handsome oak with dark green foliage and of pyramidal habit when young, but not quite hardy N. Easily recognized even in winter by the slender subulate scales surrounding and exceeding the winter buds. Var. **austrìaca,** Loud. Lvs. longer-petioled, less deeply lobed, or almost sinuately dentate with short, acute, entire lobes. For *Q. austriaca sempervirens,* see *Q. Pseudoturneri* in suppl. list. Var. **lacinìata,** Loud. Lvs. deeply pinnatifid, often almost to the midrib divided into narrow oblong acute lobes. Var. **Ambrozyàna,** Aschers. & Graebn. (*Q. Ambrozyàna,* Simonkai). Lvs. half-evergreen, smaller, subcoriaceous, glabrous above, with bristly teeth; stipules smaller, caducous. Hungary.—There are hybrids with *Q. Suber,* for which see *Q. Lucombeana,* in suppl. list.



3320. Quercus chrysolepis. (×½)

38. **Sûber,** Linn. Cork Oak. Evergreen tree, to 50 ft., with broad round-topped head and thick, deeply furrowed, spongy, elastic bark: lvs. ovate to oblong, rounded or subcordate at the base, remotely serrate glabrous above, whitish tomentose or sometimes glabrescent beneath, 1–3 in. long: fr. short-stalked; acorn ovate or oblong-ovate, ½–1¼ in. high, embraced one-third to one-half by the cup; scales thick, usually with short and often recurved tips. S. Eu., N. Afr. H.W. 2, pp. 80, 81. G.W. 8, p. 182.—From this species cork is obtained; it is much cult. for this purpose in E. India and recently also in Calif., where it seems to thrive well. *Q. occidentàlis,* Gay, differs chiefly in the fr. ripening the second year, in the less persistent lvs., the old ones mostly falling in spring, in the shorter scales of the cup and in its greater hardiness; its bark is not distinguished commercially from that of the true cork oak.

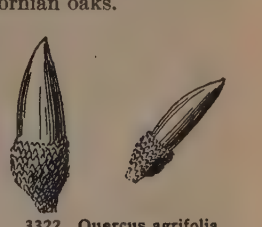
39. **Îlex,** Linn. Holly or Holm Oak. Evergreen tree, to 60 ft., with large, round-topped head: bark not corky: lvs. very variable, ovate to lanceolate, remotely serrate or almost entire and with revolute margin, dark green above, yellowish or whitish tomentose or sometimes glabrescent beneath, 1–3 in. long: fr. 1–3, usually peduncled; acorn ovate, embraced about one-half by the cup; scales thin, appressed, rarely slightly spreading. S. Eu. M. D.G. 1898:275. H.W. 2:25, pp. 77–79. G.M. 54: 895. Gn. 65, p. 320. Var. **Ballòta,** DC. (*Q. Ballòta,* Desf.). Lvs. smaller, orbicular or broadly ovate; the sweet acorn is often gathered for food. Var. **Fórdii,** Nichols. (*Q. Fórdii,* Carr.). Of pyramidal habit with narrower and smaller lvs. R.H. 1861, pp. 114, 115; 1885, pp. 352, 353. Not to be confounded with *Q. Fordiana,* Hemsl., a Chinese species with chestnut-like lvs.

3321. Quercus agrifolia (×¼). No. 42.

40. **virginiàna,** Mill. (*Q. vìrens,* Ait.). Live Oak. Figs. 3317–3319. Evergreen tree, to 50 or rarely to 70 ft., with almost horizontal limbs, forming a wide-spreading head; sometimes shrubby: lvs. elliptic or oblong, usually entire, with revolute margin, rarely with a few spiny teeth above the middle, dark green and glossy above, whitish tomentulose beneath, 1–3 in. long: fr. peduncled; acorn ovate, about 1 in. long, embraced about one-third by the cup; scales thin, appressed. Va. to Fla., west to Mex. S.S. 8:394, 395. G.F. 1:476; 5:486, 487; 6:7; 8:235. F.R. 1:643. Gng. 8:1. G.W. 9, p. 505.—One of the most beautiful of the American oaks and much planted as a shade and avenue tree in the southern states; easily transplanted and of rapid growth; also very valuable as a timber tree.

41. **chrysólepis,** Liebm. California Live Oak. Maul Oak. Fig. 3320. Evergreen tree, to 50, rarely to 100 ft., with wide-spreading head and often pendulous branches: lvs. short-petioled, oval to oblong-ovate, acute and spiny-toothed or entire, bluish or yellowish green above, glaucous beneath and covered with fulvous tomentum when young, 1–4 in. long: fr. short-stalked, ripening the second year; acorn ovoid, ½–1½ in. high, embraced about one-fourth by the shallow cup which is often very thick and densely fulvous-tomentose. Ore. to Calif. S.S. 8:398, 399. G.F. 5:127.—The most beautiful of the Californian oaks.

42. **agrifòlia,** Née. Figs. 3321, 3322 (adapted from Pacific R. R. Report). Similar in habit to the former, sometimes shrubby: lvs. broadly oval to oblong, sinuately spiny-toothed, usually convex, dull green above, light green below, pubescent at first, 1½–3 in. long: fr. usually sessile; acorn conic-ovate, often elongated, to 1½ in. long, embraced one-fourth to one-third by the cup; scales thin, slightly puberulous. Calif. S.S. 8:403. F.S. 7, p. 138.



3322. Quercus agrifolia. (×½)

Subgenus Cyclobalanopsis.

43. **glaùca,** Thunb. (*Cyclobalanópsis glaùca,* Oerst.). Evergreen tree, to 45 ft.: branchlets glabrous or nearly

so: lvs. on slender petioles ⅓–1 in. long, elliptic-oblong to ovate-oblong, acuminate, broadly cuneate or nearly rounded at the base, dentate above the middle, lustrous above, glaucous beneath and silky, at least while young, 3–5 in. long: fr. short-stalked, 1–3; cup saucer-shaped, silky-pubescent outside, with 5–7 concentric rings; nut ellipsoid, ¾in. long. Japan. S.I.F. 1:30. I.T. 4:103.—Handsome evergreen tree, planted occasionally in Calif. and in the southeastern states.

44. **myrsinæfòlia,** Blume (*Q. Vibrayàna,* Franch. & Sav. *Q. bambusæfòlia,* Fort., not Hance. *Cyclobalanópsis Vibrayàna,* Schottky). Evergreen tree, to 50 ft.: lvs. lanceolate or oblong-lanceolate, acuminate, cuneate at the base, serrate, glaucescent and glabrous beneath from the beginning, shining green above, 3–5 in. long and ¾–1¼ in. wide: fr. in short spikes; nut oblong-ovoid, ½–¾in. long, embraced about one-third by the glabrous cup consisting of about 6 concentric rings. Japan. S.I.F. 1:29.—Beautiful evergreen oak for the southern states. In the American trade confused with *Q. acuta* and in European gardens with *Q. glauca.*

45. **acùta,** Thunb. (*Q. Buèrgeri,* Blume. *Cyclobalanópsis acùta,* Oerst.). Evergreen small tree: lvs. oblong-ovate to oblong-lanceolate, acuminate, rounded at the base, entire and usually undulate on the margin, glossy green above, yellowish green beneath, glabrous, only when unfolding covered with a brownish quickly disappearing floss, 3–5 in. long: fr. in nearly sessile clusters; nut ellipsoid-oblong, about ¾in. long, embraced about one-fourth by the pubescent cup consisting of about 6 concentric rings. Japan, Korea. S.I.F. 1:32. Gn. 19, p. 285; 79, p. 388.—Handsome tree, rare in cult.

The species in the following list are not hardy North except when mentioned:

Q. acutissima, Carruthers=Q. serrata.—*Q. Ægilops,* Linn. Evergreen tree, to 60 ft.: allied to Q. Cerris: lvs. lobed-dentate with acute sinuses, fulvous-tomentose at first: cup large, with spreading, flat, lanceolate scales, not much to one-half shorter than acorn. S. Italy, Greece.—*Q. Aizòon,* Koehne=Q. Pseudoturneri.—*Q. alnifòlia,* Poech. Evergreen shrub: lvs. orbicular or oval, dentate, shining above, yellow-tomentose beneath, 1–2 in. long: cup with recurved lanceolate bracts; acorn 1½ in. long. Crete. Gn. 18, p. 486;40, p. 95. A.G. 13:436.—*Q. aquifolioides,* Rehd. & Wilson. Evergreen shrub or tree, to 30 ft.: branchlets pubescent: lvs. subsessile, elliptic or ovate-elliptic, auriculate, spiny-dentate or entire, lustrous above, yellowish brown-tomentose beneath, 1¼–3 in. long: fr. several, peduncled; cup saucer-shaped; acorn ovoid, ½in. long. W. China. Var. *rufèscens,* Rehd. & Wilson (Q. Ilex var. rufescens, Franch.). Lvs. with yellowish gray, looser pubescence, older lvs. sometimes glabrous: scales of cup thicker, more villous. W. China.—*Q. arkansàna,* Sarg. Allied to Q. marilandica. Tree, to 70 ft.: lvs. broadly obovate, cuneate, at maturity glabrous beneath except tufts in the axils, 2–3½ in. long: cup shallow; nut broadly ovate, ½in. long. Ark. S.T.S. 2:152.—*Q. austriaca sempérvirens,* Hort.=Q. Pseudoturneri.—*Q. Boyntonii,* Beadle. Allied to Q. stellata. Shrub, 3–15 ft.: lvs. obovate with 3–5 small obtuse lobes above the middle or nearly entire, 2–3½ in. long: cup turbinate: acorn about ½in. long. Ala.—*Q. brevifòlia,* Sarg.=Q. cinerea.—*Q. castaneæfòlia,* C. A. Mey. Half-evergreen tree, to 70 ft.: lvs. oblong-lanceolate, serrate, tomentulose beneath, rarely almost glabrous, 4–6 in. long: cup with lanceolate recurved scales. W. Asia to N. Persia. G.W. 11, p. 199. Not or only half-hardy N.—*Q. Catésbæi,* Michx. Tree, to 60 ft.: lvs. similar to those of Q. cuneata, but rufous-tomentose when young, glabrous at length, except axillary tufts beneath, very short-petioled: cup turbinate with the scales extending above the rim and down the inner surface. N. C. to Fla. and La. S.S. 8:417.—*Q. Chápmanii,* Sarg. (Q. obtusiloba var. parvifolia, Chapm.). Usually a shrub, rarely small tree; allied to Q. stellata: lvs. obovate-oblong and entire or slightly sinuately lobed toward the apex. S. C. to Fla. S.S. 8:370.—*Q. chinénsis,* Abel. See Q. sclerophylla.—*Q. cinèrea,* Michx. Blue Jack. Small tree: allied to Q. imbricaria, but lvs. tomentulose beneath, smaller, elliptic to oblong-lanceolate, half-evergreen: cup saucer-shaped; acorn subglobose. N. C. to Fla. and Texas. S.S. 8:431.—*Q. cleistocárpa,* Seemen=Pasania cleistocarpa, Schottky (P. Wilsonii, Schottky. Q. Wilsonii, Seemen). Evergreen tree, to 50 ft.: lvs. coriaceous, elliptic-oblong to oblong-lanceolate, acuminate, broadly cuneate at the base, lustrous above, covered beneath with a thin scaly grayish tomentum, becoming glabrescent, 2½–6 in. long: fr. in short dense spikes, subglobose, about ½in. across, the cup nearly inclosing the acorn; scales adnate. Cent. and W. China.—*Q. coccifera,* Linn. Evergreen small tree or shrub: lvs. oval to oblong, spinose-dentate, almost glabrous, 1–2 in. long: cup with spreading or recurved rigid scales: maturation biennial. S. Eu. H.W. 2:25, p. 82.—*Q. cuspidàta,* Thunb. See Castanopsis p. 2891.—*Q. densiflòra,* Hook. & Arn. =Pasania densiflora.—*Q. Douglasii,* Hook. & Arn. Tree, to 60 ft., with dense, round-topped head: allied to Q. Garryana, but lvs. bluish green, less deeply lobed, often only sinuately dentate. Calif. S.S. 8:386.—*Q. dumòsa,* Nutt. Evergreen rigid shrub to 8 ft. or occasionally tree to 30 ft.: lvs. oblong to obovate, entire or sinuately toothed, pubescent, grayish green, ¾–2, rarely to 3 in. long: fr. usually solitary and sessile; acorn oval, ½–1½ in. long, embraced one-third to two-thirds by the cup. Very variable. Calif. S.S. 8:392.—*Q. Émoryi,* Torr. Evergreen tree, to 40 ft.: allied to Q. chrysolepis: lvs. usually cordate, oblong-lanceolate, spiny-toothed, soon almost glabrous, 1–2½ in. long: acorn oblong, ½–¾in. high. Texas to Ariz. S.S. 8:397.—*Q. Engleriàna,* Seemen (Q. sutchuenensis, Franch.). Evergreen tree, about 30 ft.: branchlets brown, soon glabrous: lvs. ovate-oblong, acuminate, rounded at the base, with few small spiny appressed teeth, sometimes entire, finally glabrous, 2½–5 in. long: fr. 1–3, short-stalked; acorn ovoid, scarcely ½in.; cup with thin glabrescent brown scales, cup-shaped. Cent. China.—*Q. Æsculus,* Linn. A S. European form of Q. sessiliflora, with the lvs. pubescent when young and deeply pinnatifid.: synonym of Q. sessiliflora var. aurea, DC.—*Q. Fàbri,* Hance. Tree, to 80 ft.: branchlets pubescent: lvs. short-stalked, obovate to oblong, obtusish, sinuately lobed with 6–10 pairs of short rounded rarely acutish lobes, grayish tomentulose and reticulate beneath, 3–6 in. long: fr. short-stalked; acorn oblong-cylindric, ¾in. long, cup glabrescent, brown. China.—*Q. Fargesii,* Franch.=O. oxyodon var. Fargesii.—*Q. fruticòsa,* Brot.=Q. humilis.—*Q. fulhamnsis,* Hort. See Q. Lucombeana.—*Q. Gambelii,* Nutt. Small tree or shrub, very variable: allied to Q. alba: lvs. smaller, pale or yellowish green and usually finely pubescent below: fr. smaller, sessile. Colo. to Utah and Mex. S.S. 8:366, 367. Gt. 44, p. 7.—*Q. georgiàna,* Curtis. Shrub, 6–8 ft., rarely small tree: allied to Q. palustris: lvs. smaller, less deeply lobed and lobes mostly entire. Ga. S.S. 8:425. Hardy.—*Q. Gilliàna,* Rehd. & Wilson. Evergreen small tree, to 20 ft. or scrubby: lvs. subsessile, oval, rounded at the spiny-pointed apex, subcordate or rounded at the base, spiny-toothed, quite glabrous at maturity, 1–2 in. long: fr. sessile, ripening the first year; acorn ovoid, ½in. long, inclosed nearly one-half by the hemispherical cup. W. China.—*Q. glàbra,* Thunb.=Pasania glabra.—*Q. Gramúntia,* Linn.=Q. Ilex.—*Q. Haas,* Kotschy. Closely allied to Q. pedunculata: lvs. sparingly stellate-pubescent beneath, larger: fr. larger. E. Eu., W. Asia. Hardy.—*Q. Hénryi,* Seemen=Pasania Henryi, Schottky. Evergreen tree, to 60 ft.: lvs. slender-petioled, oblong-lanceolate, acuminate, lustrous above, covered beneath with a thin scaly tomentum, finally glabrescent, 4–8 in. long: fr. in stout spikes 4–7 in. long; acorn depressed-globose, ⅜in. across, embraced only at the base by the saucer-shaped cup. Cent. China.—*Q. heterophýlla,* Michx. Supposed hybrid of Q. Phellos and Q. velutina: lvs. oblong, narrowed into the petiole, sinuately lobed or toothed or entire. S.S. 8:436.—*Q. hùmilis,* Walt.=Q. cinerea.—*Q. húmilis,* Lam. Half-evergreen shrub, with oval, coarsely dentate lvs., grayish tomentose beneath: fr. almost sessile. Portugal. Sometimes Q. prinoides is sold under this name.—*Q. incàna,* Roxbg. Evergreen tree, to 60 ft.: allied to Q. serrata: lvs. oblong to ovate-lanceolate, acuminate, mucronate-serrate, with 14–20 pairs of veins, glossy above, whitish tomentose beneath, 3–6 in. long: fr. sessile; acorn about 1 in. long, at first almost inclosed by the campanulate, rather thin cup. Himalayas. Sometimes united with Q. lanata.—*Q. infectòria,* Oliver=Q. lusitanica var. infectoria.—*Q. insignis,* Mart. & Gal., the Mexican white oak, has been intro. recently by the U. S. Dept. Agric.: said to be best suited to a moist warm climate: a rapid-growing tree, erect, 75 ft., and making large branches 30–40 ft. from the ground: branchlets densely hairy: lvs. short-stalked, obovate-oblong, remotely serrate, hairy, on both sides, 5–9 in. long: fr. subsessile; cup ¾in across, fulvous-pubescent.—*Q. invèrsa,* Lindl.=Pasania thalassica.—*Q. Koéhnei,* Ambrozy (Q. Pseudoturneri, Veitch Cat., not Schneid.). Probably Q. Ilex × Q. sessiliflora. Lvs. oblong-obovate, cuneate, very obtuse at the apex, with few short lobes, glabrous; midrib yellow, changing to dull red in fall. Garden origin.—*Q. lanàta,* Wall. Evergreen tree, to 80 ft.: allied to Q. incana: lvs. oblong-lanceolate, with 10–16 pairs of veins, remotely toothed, 4–8 in. long: fr. smaller, cup hemispherical. Himalayas.—*Q. lanuginòsa,* Don=Q. lanata.—*Q. Leàna,* Nutt. Supposed hybrid of Q. imbricaria and Q. velutina: lvs. oblong or obovate-oblong, sinuately toothed or entire, rounded at the base. S.S. 8:434. Hardy.—*Q. Líbani,* Oliver. Half-evergeeen shrub or small tree: lvs. oblong-ovate, coarsely serrate, light green and at length almost glabrous beneath, 2–4 in. long: acorn almost wholly inclosed; scales little spreading. Asia Minor. R.H. 1872, p. 155; 1877, p. 173 (not p. 172, which is probably Q. Ægilops). Gn. 1, p. 618.—*Q. Lucombeàna,* Sweet (Q. Cerris var. Lucombeana, Loud. Q. Cerris var. subperennis, DC.). Supposed hybrid of Q. Cerris and Q. Suber. Half-evergreen tree to 70 ft., with broad, round head: lvs. oval-ovate, coarsely serrate, tomentose beneath, 2–3½ in. long: cup with subulate spreading scales. Probably of the same parentage as Q. fulhamensis, differing by symmetrical pyramidal habit and more corky bark. Gn. 27, pp. 476–8.—*Q. lusitánica,* Lam. Half-evergreen tree, sometimes shrub: lvs. oval to ovate-lanceolate, coarsely and deeply serrate, pubescent beneath, 1–2 in. long: cup with appressed scales, embracing one-half to one-third of the nut. S. Eu. Var. *infectòria,* DC., is more shrubby and has the lvs. less pubescent beneath.—*Q. macedónica,* DC. Evergreen tree or shrub: lvs. oval-oblong, serrate, light green and sparingly pubescent beneath, 1½–3 in. long: cup with the lower scales appressed, the middle ones spreading and the upper ones inversed, almost inclosing the nut. Macedonia, Albania.—*Q. macránthera,* Fisch. & Mey. Tree, to 50 ft.: allied to Q. conferta: lvs. larger and less deeply lobed, with 8–10 ovate lobes on each side, each lobe ½–1 in. long, sometimes with 1–3 teeth on its lower side, pale and densely soft-pubescent beneath, 4–7 in. long: fr. nearly sessile: acorn about 1 in. long, embraced nearly half by the cup covered with lanceolate pubescent scales. Caucasus to N. Persia. A handsome and hardy oak with large striking foliage.—*Q. macrólepis,* Kotschy. A variety of Q. Ægilops, with larger, less deeply lobed lvs, and the scales of the cup large and strongly recurved. Crete.—*Q. Margarétta,* Ashe. Allied to Q. stellata. Shrub or small tree, to 30 ft.: lvs. obovate, with 3–5 rounded lobes, pale green or glau-

cous and pubescent on the veins beneath, 2½–3½ in. long: nut ovoid-oblong, ½in. long, one-half or less included in the cup. Va. to Fla. and Ala.—*Q. Mirbéckii*, Durand. Allied to Q. lanuginosa. Tree, to 100 ft.: branchlets glabrous or nearly so: lvs. ovate-oblong, with 9–12 short obtusish teeth on each side, pubescent beneath while young, 4–6 in. long: fr. 1–4 on a stalk ½–1 in. long. N. Afr. G.M. 56:139.—*Q. mongólica*, Hort., not Fisch.=Q. lanuginosa.—*Q. oblongifòlia*, Torr. Evergreen small tree, to 30 ft., with spreading, often contorted branches: allied to Q. undulata. Lvs. ovate to obovate, entire or spiny-toothed, glabrous, bluish green, 1–3 in. long: cup embracing about one-third of the ovate nut. Ariz. to Mex. and W. Texas. S.S. 8:388. G.F. 1:140.—*Q. ozyòdon*, Miq. Half-evergreen tree, about 30 ft.: lvs. oblong, acuminate, rounded or broadly cuneate at the base, serrate, veins prominent, close and numerous, glaucescent and silky beneath, 2½–7 in. long: fr. in short spikes; acorns ovoid, about ¾in.; cup with concentric crenate rings, grayish tomentulose. Cent. China, Assam. Var. *Fárgesii*, Rehd. & Wilson. Lvs. smaller: rings of cup entire.—*Q. phillyræoides*, Gray. Evergreen tree or shrub, with broadly oval to oblong-oval lvs., crenately serrate, except at the base, glabrous, 1–2½ in. long: cup with appressed scales, small. Japan. S.I.F. 1:31.—*Q. póntica*, Koch. Tree or shrub: lvs. oblong-oval, serrate, glabrous, glaucescent beneath, 4–6 in. long: cup with ovate-lanceolate scales, inclosing about one-half of the nut. Asia Minor. Gt. 40, p. 510. Hardy.—*Q. Pseudosúber*, Santi. Evergreen or half-evergreen tree, allied to Q. Suber: bark less corky: lvs. more deeply serrate, thinner and less tomentose beneath: cup with recurved scales. Italy, N. Afr. H.W. 2, p. 82.—*Q. Pseudotúrneri*, Schneid. (Q. Aizoon, Koehne. Q. Turneri, Hort., not Willd: Q. austriaca sempervirens, Hort.). Probably hyhrid of Q. Ilex and Q. pedunculata. Half-evergreen: lvs. oblong-obovate, acute, cuneate, with about 5 pairs of ascending acutish lobes, somewhat pubescent beneath, midrib yellow, 2–4 in. long: fr. long-stalked. Garden origin.—*Q. Pseudotúrneri*, Veitch Cat.=Q. Koehnei.—*Q. púmila*, Walt. (Q. Phellos var. pumila, Michx. Q. sericea, Willd.). Half-evergreen spreading shrub, to 12 ft., similar to Q. cinerea: lvs. oblong to linear-oblong, entire or coarsely toothed, tomentulose beneath, glabrous at length: acorn subglobose, ½in. high; maturation annual. N. C. to Fla. S.S. 8:404.—*Q. Pýrami*, Kotschy. Variety of Q. Ægilops, with the lvs. less deeply and very irregularly lobed: cup embracing one-third of the acorn, with the lower scales loosely appressed, the upper ones recurved. Asia Minor.—*Q. reticulàta*, Humb. & Bonpl. Half-evergreen tree, to 30 ft., or shrub: lvs. oval or obovate, spiny-dentate toward the apex, bluish green, tomentose and reticulate beneath, 1–5 in. long: fr. in slender-stalked spikes; cup with appressed scales. Ariz. and New Mex. to Mex. S.S. 8:390.—*Q. rotúnda*, Hort.=Q. phillyreoides.—*Q. sclerophýlla*, Hort., not Lindl. Sometimes Q. Pseudoturneri is cult. under this name. The true Q. sclerophylla, Lindl., belongs to Castanopsis, see C. sclerophylla, below.—*Q. sericea*, Willd.=Q. pumila.—*Q. serràta*, Thunb. (Q. acutissima, Carruthers). Half-evergreen tree: lvs. obovate-oblong to oblong, acute, serrate, light green and glabrous below, 2–8 in. long: fr. sessile; cup with large, spreading and recurved scales, embracing two-thirds of the nut. Korea, Japan. S.I.F. 1:26.—*Q. Skinneri*, Benth. Tree, to 70 ft.: lvs. slender-stalked, ovate to ovate-lanceolate, sinuately serrate with bristly teeth, glabrous, 3–6 in. long: fr. sessile; acorn subglobose, large. S. Mex., Guatemala. G.C. 1841:116.—*Q. sutchuenénsis*, Franch.=Q. Engleriana.—*Q. thalássica*, Hance=Pasania thalassica.—*Q. Túrneri*, Willd. Half-evergreen tree: lvs. oval to elliptic-ovate, rounded at base, with 6–8 pairs of lobes, pubescent at least on the midrib beneath, midrib pale green. Origin unknown.—*Q. Túrneri*, Hort.=Q. Pseudoturneri.—*Q. undulàta*, Torr. Small tree or shrub: allied to Q. Douglasii; with smaller, less deeply lobed, bluish green lvs. pubescent below, nut smaller. Colo. to Ariz. and Texas. S.S. 8:385.—*Q. Ungeri*, Kotschy. Variety of Q. Ægilops: lvs. smaller, lobed: cup with recurved scales, not much shorter than acorn. Asia Minor.—*Q. Vèneris*, Kern. Tree: branchlets pubescent: lvs. subcoriaceous, broadly oblong, with 6–8 pairs of small acutish teeth, pubescent beneath or nearly glabrous, 1½–3 in. long: fr. nearly sessile; acorn embraced one-half by the hemispherical cup. Cyprus.—*Q. Wilsonii*, Seemen=Q. cleistocarpa.—*Q. Wislizenii*, DC. Evergreen tree, to 80 ft.: allied to Q. agrifolia: lvs. ovate to oblong-lanceolate, sinuately dentate or entire, glabrous, yellowish green beneath, 1–5 in. long: acorn embraced about one-half by the cup. Colo. to Calif. and Texas. S.S. 8:406

Note on Castanopsis. A recently concluded study of the Chinese oaks has enabled us to name these Chinese species of Castanopsis which had not yet been determined when the article on that genus was written, and has furthermore convinced us that several species usually referred to Pasania or Quercus must be included in Castanopsis.

The following species of Castanopsis are known to be in cult.: *C. ceratacántha*, Rehd. & Wilson. Tree, to 50 ft.: branchlets densely villous: lvs. oblong-lanceolate to ovate-lanceolate, acuminate, obscurely toothed above the middle or entire, brownish villous-tomentose beneath, 4–6 in. long: frs. in stout spikes to 8 in. long, ¾–1 in. across, fulvous-tomentulose, with stout prickles ¼–½in. long and divided at the apex into several spreading spiny points; nuts 2–3, wholly inclosed. W. China.—*C. chrysophýlla*, DC., see Vol. II, p. 682.—*C. cuspidàta*, Schottky (Quercus cuspidata, Thunb. Pasania cuspidata, Oerst.). This species is already mentioned under Pasania, see p. 2479. The ovate pointed involucre is marked with 4 or 5 wavy concentric ridges of small tubercles and includes wholly the solitary nut. There are two varieties in cult.: var. *latifòlia*, Rehd. & Wilson, with larger and broader lvs. to 4½ in. long and to 2½ in. broad; and var. *variegàta*, Rehd. & Wilson, with small lvs. bordered by a broad, irregular, creamy white margin. G.C. II. 12:233.—*C. Fárgesii*, Franch. Tree, to 100 ft.: branchlets glabrous: lvs. elliptic-oblong to lanceolate, acuminate, serrate above the middle, thinly and closely yellowish or grayish tomentulose beneath, finally nearly glabrous, 2–5 in. long: frs. in stout spikes to 6 in. long, about ¾in. across, with stout, often reflexed fascicled spines, about ½in. long; nut usually solitary, wholly inclosed. Cent. China.—*C. platyacántha*, Rehd. & Wilson. Tree, to 80 ft.: branchlets glabrous: lvs. ovate-oblong to elliptic-oblong, acuminate, slightly toothed above the middle or entire, covered beneath, except the glabrous midrib, with a close fulvous tomentum, becoming paler the second year, 2½–5 in. long: spikes short, 3–6-fruited: frs. about 1 in. across, grayish tomentulose, densely covered with short and stout fascicled prickles; nuts wholly inclosed, 1–3. W. China.—*C. sclerophýlla*, Schottky (Q. sclerophylla, Lindl. Q. chinensis, Abel). Tree, to 60 ft.: lvs. oval to oblong-ovate or oblong, acuminate, serrate above the middle, glabrous, glaucescent beneath, 2½–6 in. long: frs. in dense spikes with the peduncle to 4 in. long; involucre ovoid, with close concentric ridges of small tubercles, not wholly inclosing the solitary nut. E. and Cent. China.

ALFRED REHDER.

QUESNÈLIA (in honor of M. Quesnel, French Consul at Cayenne). *Bromeliàceæ*. Caulescent or acaulescent herbs: lvs. spiny, in dense tufts: scape erect, nodding or pendulous; infl. spicate; bracts membranous or coriaceous, obtuse or acuminate, entire or serrate; fls. sessile, perfect; sepals usually free; petals free, convolute; stamens 6, equaling or a little shorter than the petals.—About a dozen species, natives of Guiana and Brazil.

arvênsis, Mez (*Billbérgia Quesneliàna*, Brongn. *Q. cayennénsis*, Baker). Lvs. up to 2½ ft. long, 1½ in. wide, armed with stout upturned spines: spike dense, up to 8 in. long, many-fld., the bracts rounded at apex, usually entire; fls. up to 2 in. long; sepals webby below; petals blue above; stamens much shorter than petals. E. Brazil. B.H. 1882:46 (as *Q. rufa*). F.S. 10:1028. Gt. 1875:834.

GEORGE V. NASH.

QUILLÀJA (from *Quillai*, the Chilean name, which comes from *quillean*, to wash: the bark of the tree contains saponin, an alkaline compound, which makes it useful as soap). *Rosàceæ*. Glabrous evergreen trees, whose bark is sometimes saponaceous, occasionally grown in the greenhouse and hardy outdoors in the southern United States.

Leaves sparse, petioled, simple, thick-coriaceous, rather entire; stipules small, deciduous: peduncles axillary and terminal, 3–5-fld.: fls. polygamous-diœcious, rather large, tomentose, the lateral male, the central fertile; calyx leathery, persistent, lobes 5, broadly ovate, valvate; petals 5, small, sessile, spatulate; disk thick, fleshy, 5-lobed; stamens 10; carpels 5: follicles 5, oblong, obtuse, leathery, cohering at their base, many-seeded.—About 3 or 4 species, natives of S. Brazil, Chile, and Peru.

Saponària, Molina. SOAP-BARK TREE. A large tree: lvs. 1¼–2 in. long, ovate, shining, dentate, short-petioled: fls. white, about ⅔in. across, usually terminal, solitary, or in clusters of 3–5 on the same peduncle. Chile. B.M. 7568.—Cult. in S. Calif.

F. TRACY HUBBARD.†

QUINCE. The fruit and tree of one of the pome class, known as *Cydonia oblonga* (or sometimes as *Pyrus Cydonia*).

Few fruits play a more important part in ancient history than the quince, and yet there is hardly a fruit with equal or even poorer merit that in recent years has not received more attention. Scarcely a book is written on the quince and even practical mention of its merits, its culture, or its value is seldom made in the experiment station literature of America.

Perhaps this is due to the fact that the fruit can hardly be considered in the dessert class except when cooked; and yet it is said that in Persia and the near East it grows to such perfection that some varieties are esteemed when eaten raw.

The place of the quince in America seems to be a secondary one, to make marmalade, to preserve, to make jellies, and for flavoring purposes. The place of the tree among other fruits seems to be secondary also. It is seen most frequently in back yards and fence-corners and often in the lowest and dampest fruit land on the

farm. In a few cases, when its merits are recognized, it is given drier richer ground and cultivated with judicious care. Naturally, the quince is adapted to deep rich warm soils. The fertility of the soil should be strongly emphasized, as the root, instead of penetrating

3323. Flower of quince. It is borne on the wood of the season, not from an autumn fruit-bud. (×½)

deeply, spreads out extensively and consequently is near the surface. It is slow-growing on any soil but responds very quickly to good fertility. On cold damp soils the fruit is inclined to be woody and it may possibly be for this reason that the quince is not more popular for preserving purposes. On the richer drier soils the quality is much improved. The idea is very prevalent that the tree is adapted to low ground. The lower grounds, generally speaking, are richer, but in this respect only may the trees be said to be adapted to it. Excessive moisture is harmful to the quince as to other fruits. Cultivation must be judicious. In many respects it should resemble that given the dwarf pear. The roots being near the surface, cultivation and especially plowing must be shallow. It is common practice to ridge well up to the trees not only to protect the roots but to permit easy drainage; also the tree being very subject to fire blight, it does not permit of thorough cultivation with the consequent succulent wood-growth. Moderate cultivation in spring and early summer followed at once by a cover-crop or a good sod-mulch is considered good practice.

3324. Quince, showing method of bearing at end of contemporaneous shoots.

The quince tree is small, twisted and dwarf in its habit. It seldom reaches a height of more than 12 or 15 feet, although some grow higher. The larger number are much lower. Being dwarf in its habit, the quince tree can be planted as close as 13 to 15 feet in an orchard, the latter distance being the more popular. Planted too close, it is forced upright, like other trees. The fruiting habit is distinct and peculiar, resembling no other orchard fruit, but is similar to the hickory and the walnut. The blossoms are produced on the current season's growth (Fig. 3323). A short growth starts from the terminal winter bud and on the end of this the flower and fruit are produced (Figs. 3324, 3325). There is no proper stem or peduncle to the fruit, but the quince sits close or sessile on a short leafy branch. The wood-growth is continued by an axillary bud of the previous season. This peculiar habit of growth gives the tree its crooked bunchy appearance. (Fig. 3326.)

Pruning should receive careful attention, otherwise the quince tree will soon become too thick and also more or less unshapely. When set in orchard, the young tree may be pruned to a short whip, as shown in Fig. 3327. The trunk is kept very short; some growers prefer to start the top as low as shown in Fig. 3328, but the former and probably still the prevailing practice is to grow a trunk like those seen in Fig. 3329. These longer trunks are convenient if one is to use the curculio catcher, as shown in Fig. 3330. The pruning consists in keeping the top open and well spread (Fig. 3328). To cause the top to spread and to keep it low and within bounds, more or less heading-in may be practised; but as the fruit-shoots spring from the ends of the branches, clipping-in of all the tree would remove practically all the fruit.

The questions of cultivation and fertilizers are largely inter-related. Thorough tillage makes available a large amount of plant-food, and consequently less fertilizer is necessary. However, too thorough cultivation and consequent succulent growth increases blight. The question of fertilizers comes down to one of producing moderate growth of a hardy resistant nature. This means that in cultivated orchards, heavy applications of nitrates or nitrogenous manures must be withheld. Phosphate and potash on the other hand can be

3325. The Orange or Apple quince. (×¼)

applied in quantity, especially on the lighter soils. The cover-crops will probably supply the necessary nitrogen. If growth is very slow, a light application of farmyard manure may be made. Lime and land-plaster can also be applied in quantity.

The fruit is sold in eleven-quart baskets, bushels, and barrels, and ranges from 75 cents to $1.25 a bushel, depending on the market and the demand. In Ontario the demand is very limited and there are scarcely any orchards on a commercial basis. In the eastern states and especially New York State, there are some orchards of considerable size (Fig. 3329). The fruit, though apparently hard and long-keeping, is comparatively easily bruised or marked and must be handled with care.

The trees begin to bear a few fruits the second and third years after planting but can not generally be said to bear a profitable crop until ten to twelve years of age. The fruit is very subject to limb-rub and disease, and must be carefully grown to look well. The ordinary practice is to spray the tree with dormant-strength lime-sulfur at the same time that the apples and peaches are sprayed and then again just after the fruit is nicely set with bordeaux mixture, to each forty gallons of which has been added three pounds of lead arsenate. Summer-strength lime-sulfur with the above amount of poison would give the same results for the summer spray. Judicious pruning also tends to thin the fruit and improve the quality.

3326. Quince limb, showing branching and fruiting habit.

Seedling stocks—Quince of Angers—are largely imported from Europe for roots. These roots are used also for dwarfing the pear. The trees are grown much the same as other nursery trees. The seedlings are set in the nursery row in early spring and budded in August. By a year from the following spring, that is two years from the setting of the seedling, the trees are ready for the planter. The quince can also be propagated by cuttings, mound-layering and root-grafting, but the above-named method is the common one in practice.

Trees received from the nursery should be given the same care as other nursery trees. Heel them in carefully if the soil is not ready for planting. Plant about 2 inches deeper than the bud. Head at 15 to 20 inches. If budded trees are used and planted the proper depth, there is little or no danger from suckering.

3327. *a*, An unpruned quince tree, one year old; *b*, the same pruned.

The most damaging diseases are fire-blight, affecting the wood and especially the new growth; leaf-blight, affecting branches, fruit and foliage; and black-rot and bitter-rot, affecting the fruit. For the fire-blight, the worst disease, there is no direct remedy, but trees should not be allowed to over-grow, wild hawthorns and wild apples and pears near the plantation should be destroyed, and all affected parts should be removed promptly.

The most serious insect attacking the quince is the quince curculio (*Conotrachelus cratægi*). This may be controlled by spraying with six to eight pounds of lead arsenate to one hundred gallons of water, or in the place of water bordeaux mixture at the proper season. This must be done when the beetles first make their appearance and again about ten days later. This insect is found on the quince in Ontario. The same insects as attack the apple generally attack the quince and the treatments are similar. Sometimes the jarring method

3328. *a*, The quince unpruned; *b*, same tree pruned.

is employed, as shown in Fig. 3330, as for the plum, the beetles being knocked off by hitting the tree with a padded mallet.

Orange (Fig. 3325) and Champion are the leading varieties of quince. The former is the variety most largely grown in Ontario and previous to 1870 was the only variety. It is large in size, skin golden yellow with greenish or russet color around stem. The flesh is tender and the flavor good. The season is late September and October. Its origin was southern Europe. The latter variety, of American origin, is large, pear-shaped and on the tree has a distinctly greenish yellow color. The tree is larger and taller-growing than Orange. The fruit is very late ripening. Other commonly grown varieties are Bentley, Fuller, Rea, Meech, and Van Deman.

F. M. Clement.

QUISQUÀLIS (Latin, *who, what kind*). *Combretàceæ*. Rambling subscandent large shrubs, including the rangoon creeper which is hardy in the extreme south

3329. New York quince plantation.

of the United States and is also sometimes grown in the warmhouse.

Leaves opposite, oblong or obovate, acuminate, entire: fls. in short spikes, axillary and terminal, white or red; calyx-tube prolonged, long and slender above the ovary, deciduous; petals 5; stamens 10, short; ovary 1-celled: fr. dry, coriaceous, 5-angled or 5-winged,

1-seeded.—About 4 species, chiefly Indian, 1 in Trop. and S. Afr. The name *quisqualis* means literally *who? what?* and is said to have been given by Rumphius in astonishment at the plant's behavior, for it is said to grow erect and shrub-like to a height of 3 ft., when it throws out from the base a new growth that climbs up the neighboring trees, after which the original shrub perishes. Many other interesting statements about this plant are made in B.M. 2033.

Quisqualis indica is cultivated in northern hothouses. For best results it should be planted in beds of soil composed of fibrous loam, peat, and sand. The flowers appear from June to September, and last well when cut. After flowering the plant should be cut back severely and water applied less frequently until the wood is ripened. New growth starts the following spring. If the plant is kept in a very hot and humid atmosphere, it makes a rampant growth. It is remarkably free from insect pests and fungous diseases. Propagation is by softwood cuttings inserted in sand with bottom heat. (Emil Mische.)

índica, Linn. (*Celástrus nùtans*, Hort. Reasoner, not Roxbg.). Rangoon Creeper. Lvs. 4 in. long, nearly glabrous: calyx-tube extremely long (2–3 in.), slender, green; calyx-teeth triangular, acute, not acuminate; petals rose or scarlet: fr. with very sharp angles but hardly winged. Malaya. Widely cult. in tropics. B.M. 2033. B.R. 492. R.H. 1868:50 (as *Q. pubescens*).

F. Tracy Hubbard.†

3330. Catching the curculio in a New York quince orchard.

R

RADERMÁCHIA (after J. C. M. Radermacher, 1757-83, a Dutch resident of Java, published a list of Javanese plants). Also spelled *Radermachera*. *Bignoniàceæ*. Ornamental trees.

Plants with large opposite, pinnate or bipinnate lvs. and large fls. in terminal panicles: calyx campanulate, truncate or dentate; corolla campanulate, with 4 or 5 included stamens: caps. linear, loculicidal; septum thick, spongy with the seeds in shallow impressions.—Only two species seem to be in cult.; they can be grown in subtropical regions only, and are prop. by seeds, also by air-layering and by cuttings.—Species 8, in S. E. Asia.

R. sínica seems to revel in the light sandy soil of the Florida gardens. Its abundant, large, fern-like, crimped bipinnate foliage and its luxuriant symmetrical growth combine to make it an object of great beauty. It grows to a height of 10 to 12 feet in one season, and if not cut down by a severe freeze it attains a height of 20 feet in two years, provided the soil is made rich by a good fertilizer. Planted out in a conservatory in the North it soon reaches stately dimensions. It is easily raised from cuttings placed in sand. (H. Nehrling.)

pentándra, Hemsl. (*Oróxylum flàvum*, Rehd.). Evergreen tree, to 20 ft., glabrous: lvs. bipinnate, with the stout petiole 2–3 ft. long; lfts. oblong to oblong-lanceolate, entire, 3–7 in. long: panicle about 1 ft. long; calyx with 5 short teeth, splitting; corolla yellow; tube 2 in. long; limb spreading, about 3 in. across; stamens 5: caps. linear-cylindric, to 3 ft. long. Spring. S. W. China. H. I. 2728. S.T.S. 1:92.—Handsome tree with bold foliage and showy yellow fls. exhaling a heavy rather disagreeable odor; intro. by the Arnold Arboretum, and flowered in the greenhouse in 1903.

sínica, Hemsl. (*Stereospérmum sínicum*, Hance). Evergreen tree: lvs. bipinnate; pinnæ 8, each with about 7 stalked, ovate-lanceolate entire lfts. obtusely acuminate, glabrous, about 2 in. long: panicle large, terminal; calyx campanulate, with 5 short triangular teeth; corolla pale sulfur-yellow, with funnelform tube about 3 in. long and spreading roundish lobes about 1 in. long with crisped margin: caps. subterete, 16 in. long and ¾in. thick. S. E. China.

ALFRED REHDER.

RADÍCULA (*little radish* or *root*). Syn., *Roripa*, *Nastúrtium*. *Crucíferæ*. Herbs, not cultivated except water-cress, horse-radish, and one or two others.

Plants mostly small, perennial, biennial, and annual, with small white or yellow fls. mostly in racemes: lvs. (or at least the lowermost) usually pinnate or pinnatifid, commonly glabrous: fr. a silicle or short silique, globular to cylindrical, with strongly convex nerveless valves; seeds usually many, small and marginless, in most species in a double row in each locule, the cotyledons accumbent.—Species more than 50, widely spread in eastern and western hemispheres, inhabiting low grounds, swamps, and pools or streams, mostly weedy in character. These plants formerly appeared under the name Nasturtium, which, however, dates only from 1812 whereas Radicula dates from 1756. These plants probably should bear the name *Roripa*, which see. The nasturtiums of gardens are very different plants, members of the genus Tropæolum.

3331. Radish forms.—1, Triumph, very flat or oblate form; 2, Early Dark Red; 3, Early White Turnip radish; 4, Triumph, elongated form; 5, Triumph, typical form; 6, Early Dark Red, another form; 7, Gray Summer Oval; 8, Long Brightest Scarlet; 9, Wood Early Frame; 10, Early Deep Scarlet Olive.

Armoràcia, Robins. (*Cochleària Armoràcia*, Linn. *Nastúrtium Armoràcia*, Fries. *Roripa Armoràcia*, Hitchc. *Armoràcia rusticàna*, Gaertn.). HORSE-RADISH. Stout perennial, 2–3 ft. high, from deep hard root: root-lvs. large and dock-like, oblong, crenate or sinuate or the lower early ones often deeply pinnatifid into narrow segms.; st.-lvs. lanceolate or the uppermost linear, entire or toothed: fls. white and rather showy, numerous, the style short: pods seldom seen, globular, on ascending pedicels. Eu.; escaped in N. Amer. in moist places and along water-courses.—The long tough roots furnish the horse-radish of gardens. See *Horse-Radish*.

Nastúrtium-aquáticum, Brit. & Rend. (*R. officinàlis*, Groves. *Sisýmbrium Nastúrtium-aquáticum*, Linn. *Nastúrtium officinàle*, R. Br. *Roripa Nastúrtium*, Rusby). WATER-CRESS. Spreading and rooting soft perennial: lvs. more or less irregularly pinnate, of 3–11 oblong or roundish nearly entire or somewhat angle-toothed segms. or lfts.: fls. white, in racemes that elongate in fr., the petals twice exceeding the calyx: pods cylindrical, an inch long more or less, on spreading pedicels, short-beaked. Eu., but widely naturalized in streams in N. Amer.—The herbage of this plant is

much used for garnishing and for salads. See *Cress*. In the tropics *Nasturtium indicum*, DC. (see *Roripa*), is a desirable cress. This is an erect annual, with yellow fls. and deeply pinnatifid (rarely entire) radical lvs. It is said to have been cult. in Europe, but it is probably useless or at least unnecessary outside the tropics. L. H. B.

RADISH (Latin, *radix*, a root). A name applied to certain forms or species of *Raphanus* (of the family Cruciferæ), particularly to the kinds that produce thickened edible roots; these roots are eaten raw, except some persons cook the large summer and winter kinds. See *Raphanus*.

The radish is variable in size, shape, color, and consistency of root and in season of maturity. Varieties may be classified as spring, summer, and winter radishes; or as globular, half-long, and long radishes; or as red, white, gray, and black radishes. Figs. 3331–3333 show some of the forms.

The origin and nativity of the radish are questions of dispute. For geographical reasons, it is supposed that the radish is wild in temperate Asia, probably in the oriental part, although truly indigenous radishes are doubtfully known. Not infrequently the radish runs wild about gardens, and in that case the root soon deteriorates into a small slender woody and more or less fibrous member. It has been thought by some that the radish is only a modified form of the wild charlock, or *Raphanus Raphanistrum*. In fact, experiments were made on the charlock by Carrière, who was able in a few years to produce edible radishes from the wild plant (cf. Cyclo. Amer. Hort. IV:1487). While these investigations seem to be conclusive that the radish can be produced from the charlock, they nevertheless do not prove that such was the actual origin of the garden radish. DeCandolle, whilst accepting Carrière's experiments, was unable to understand how the radishes of India, China, and Japan could have originated from the charlock, since that plant is unknown in those countries and the radish has been grown there for centuries. It is possible that the radish was carried eastward from western Asia and Europe, but such has not been the general course of the migration of plants. It is possible that the radishes of the Orient are a different species from those in Europe, although they are generally regarded as the same species. Recent experiments in France (Yvonne Trouard-Riolle, "Recherches morphologiques et biologiques sur les radis cultivés." Nancy, 1914) indicate that the cultivated radish has not been derived from *R. Raphanistrum* by cultivation, but that *R. sativus* is specifically distinct although little known as a wild plant. It is supposed that the Japanese radish is derived from one aboriginal form of *R. sativus* which is native of China and Japan, and that the European radishes have come from another aboriginal form.

3332. Half-Long Scarlet radish. (×⅓)

The summer and winter radishes are not popular in this country unless among those of recent foreign origin. The winter radishes in particular are little grown. These are late-maturing kinds, requiring more of the season for growth, and of such large size and firm flesh that they keep well, as turnips are kept. The summer and winter radishes require no special treatment, except that plans must be made to allow them a longer period. In eastern Asia are singular kinds of radish that are little known here. In North America, the small spring radishes comprise practically the range of general cultivation.

The rat-tail radish, Fig. 3346, is grown for its much-developed soft pods, which may be used as are radishes and in the making of pickles. It is rarely grown in American gardens, although it is well worth raising as a curiosity. It is annual, and its cultivation presents no difficulties. There is also a fleshy podded radish of parts of India, with the edible pods short and soft.

The radish is one of the most popular of garden vegetables. It is of quick growth, and the product is secured at the time of the year when fresh vegetables are in demand. In order that radishes may be of the best quality, they should have made a rapid growth. The soil should be rich, light and loose,—one that drains readily and does not bake with heavy rains. Radishes fit for the table may be had in three to six weeks from the sowing, depending on the variety and the "quickness" of the soil. They are often grown as a catch-crop with other vegetables. They may be sown in the rows with early beets, peas or other crops, and they are usually mature enough for use before they seriously interfere with the main crop. Sometimes seeds of radishes are sown in the rows of slow-germinating plants, as carrots and parsnips, in order that the seedlings may mark the row and thereby facilitate tillage. Many of the radishes, in such cases, may be allowed to remain long enough to produce an edible tuber.

Aside from the root-maggot, the radish is relatively free from insects and diseases. When the root-maggot appears in any place, it is usually best to discontinue the growing of radishes in that area for two or three years, until the insects have been starved out. The maggots may be killed by an injection of bisulfide of carbon into the earth about the plants; but this is usually more expense than the product is worth. Carbolic acid emulsion may also be used. Early radishes may be grown in hotbeds or cold-frames with the greatest ease, and in these places they are usually less subject to the attacks of the cabbage maggot, since the crop is matured in advance of the maggot season.

Radishes are readily forced in the winter months. It is necessary that the house be light. The soil should be a sandy loam, free from silt and clay. It is best to grow radishes in solid beds rather than on benches. They thrive best in a low temperature. The temperature during the day should not exceed 65° to 75° in the shade, and at night it may drop to 45° to 50°. If the temperature is too high, and particularly if the beds are given bottom heat, the plants tend to run to top rather than to root. The seed is usually sown in rows from 5 to 8 inches apart, and they are thinned in the row until they stand 2 or 3 inches apart. In order that the crop shall be uniform and mature simultaneously, it is advisable either to sift the seed or to transplant the young radishes. Galloway has found by experiment that radish seeds $\frac{2}{25}$ inch in diameter are too small to give a satisfactory and uniform crop. He therefore advises that seeds be run through sieves with a mesh of that diameter in order to separate the small specimens. In a certain experiment, he secured from two pounds of commercial seed nineteen and one-half ounces of large

seed, ten and two-third ounces small seed, the remainder being bits of gravel, sticks and other impurities. The chief value of this sorting lies in the greater uniformity of the crop. Almost every plant can then be relied upon to reach maturity. It is the practice in some houses to transplant the young radishes. The seed may be sown in flats or in beds at one end of the house, and when the radishes have made two or three leaves, they are transplanted into permanent quarters. In this operation, all the small and weak plants are discarded and the crop is therefore more uniform. It is supposed by some growers, also, that the breaking of the tap-root in the process of transplanting tends to make the tuber shorter and thicker and to induce an earlier maturity. By means of transplanting, the use of the house may be economized. Whilst one crop is growing, another may be started in a seed-bed or in flats. As soon as the first crop is removed, the ground may be thoroughly raked, fertilized, and the new plants put in. In some cases the new crop is transplanted between the rows of the old crop a few days before the latter is removed; but, unless the soil is rich and in good condition, it is better to wait until the crop is removed in order that the land may be thoroughly fitted for the new plants. Radishes are often forced in connection with lettuce, and they thrive well in the same temperature. The varieties most used for forcing, as also for the early spring crop in the garden, are the globular or half-long kinds. With these varieties, a depth of soil of 4 inches is sufficient for good results.

L. H. B.

Another view of the cultivation of the radish.

There are few garden roots in which fresh crispness is more essential to palatability than in the radish, or which can be more easily held in prime condition for so long after gathering, and usually one is able to secure roots of excellent quality from the market. On the other hand, an abundant family supply can be grown on a small area and the radishes can be quickly gathered and fitted for the table, so that every country garden or even town yard may be easily made to furnish a family supply. Radishes are cool-weather plants, and although when young or quickly grown they may be killed by severe or long-continued freezing, they will endure a moderate frost without injury; the plants do not thrive and the roots become tough and unpalatable if grown in a temperature above 60°. Radishes have been in cultivation since earliest historical times and there has been developed a wide range of varietal forms. In some varieties the plants develop very rapidly and are well suited for raising under glass or for growing in gardens in the spring and early summer, while other sorts are of slower growth and come to greatest perfection when planted so that they will escape the summer heat and develop during the cooler weather of autumn.

Forcing varieties.

A group of varieties of radishes has been developed in which the roots reach usable size very quickly,—in some stocks by the time the cotyledons are full sized and before more than three or four leaves have developed,—so that under favorable conditions a culture may be planted, grown to maturity, marketed and the beds made ready for a second planting within thirty or forty days. In this group the roots are in prime condition but a short time, quickly becoming pithy and unpalatable, particularly if subjected for even a few hours to temperatures above 60° F., and uniformity as to maturity is an important quality. Often in a lot of seed of uniform varietal character, the seed varies greatly in size of grains and it has been found that plants from the larger seed mature some days more quickly than those from the smaller grains, so that the sifting out and rejection of the smaller seed is often desirable.

There are a number of varietal forms suited for forcing, ranging in shape from those distinctly flat, through flattened, thickened or long turnip-shaped, and globular, to tankard or half-long, and in color from white through various shades of red and yellow to dark purple. In some varieties the color is of uniform shade over the whole root, in others more or less of the lower part is white, while in other strains the generally white surface is marked with dots and splashes of red. In the forcing of radishes, uniformity as to rapidity of maturing and in attractiveness of color are the most important qualities. The success of any culture is very dependent upon the varietal character of the seed used, and seedsmen are continually offering under new names stocks that are in reality but superior strains of the older varieties.

3333. A dainty bunch of spring breakfast radishes. (×⅓)

Spring radishes.

These are slower in coming into usable size than the forcing sorts, but the plants are larger, hardier both to cold and heat, and the roots are larger and continue in prime edible condition much longer. In garden cultures, the first sowing should be made as soon as the ground can be worked and ordinarily it will furnish usable roots in twenty-five to thirty days and remain in edible condition from five to twenty days. To secure a succession, two to five sowings should be made at intervals of ten to twenty days, but it is useless to attempt to grow radishes in the hot weather of midsummer, as they would not only make a poor growth but the roots would be tough, strong-flavored and unpalatable.

Radishes require for their best, or even for a good development, a rich friable soil which has been made so by heavy manuring and judicious culture in previous years rather than by recent working. The use of fresh stable-manure is very likely to result in ill-shaped coarse-grained strong-flavored roots, and the uniformity and symmetry of the root is very dependent upon the fertility and friability of the soil. The seed should lie some ten to twenty grains to the foot, in drills about 2 inches deep, and covered with about an inch of soil. It has been found advantageous, just before the starting plants begin to push through the soil, to cover the row with a liberal sprinkling of either tobacco dust, or of land plaster and kerosene, as a repellant to black beetle and other insects.

Seedsmen offer a wide range of varietal forms, ranging from the quick-maturing red or white Olive-Shaped, the Half-Long or the Long Scarlet, to the later-maturing longer-seasoned Chartier, or White Vienna, and the still larger later Strasburg or Stuttgart, which might be classed as summer varieties, although when planted so as to mature in the heat of midsummer they are likely to be strong-flavored and unpalatable.

Fall and winter radishes.

There are varieties which develop to usable size more slowly than the preceding and which remain crisp and tender much longer. They should not be planted until midsummer or later so that they may come to maturity in the cooler weather of autumn. These require more room for their best development than the spring varie-

ties but are even more responsive to fertile well-prepared soil and frequent cultivation. They may be used as they reach desirable size and will stand considerable frost without injury, but should be pulled and stored much as one would carrots or parsnips so as to avoid severe freezing. The Long Black Spanish, the White Russian, the Chinese Scarlet Winter and Deep Scarlet Panier, the latter one of the most symmetrical and beautifully colored roots in cultivation, belong to this class which is well worthy of more general cultivation.

Chinese and Japanese radishes.

These are possibly the oldest of cultivated kinds. The large many-leaved plants are 2 feet or more across and form immense roots which not infrequently weigh forty to fifty pounds. The flesh is less agreeable in texture and flavor than that of the sorts more commonly grown, and though they have been loudly exploited by seedsmen, they have never come into very general cultivation in this country, except by the Chinese and Japanese who use them as a cooked vegetable more than as a salad.

Seed-growing.

There are few garden vegetables in which uniformity of varietal character is more important to satisfactory results than in the radish. This is particularly true of the quickly maturing forcing varieties, the seed of which is largely grown in Europe. As grown there, carefully bred stock-seed is sown thickly in narrow rows and when the most mature roots reach usable size, the crop is pulled, all immature or off-character roots are rejected, and those which are of satisfactory form, size, and color are promptly reset about 10 inches apart in rows about 3 feet apart and soon start into fresh growth and mature a crop of seed.

In this country, seed of both the forcing and larger-rooted sorts are commonly planted ten to twenty to the yard in drills, 3 feet apart, and when the plants are mature enough to indicate their varietal quality, the plantings are carefully gone over, the inferior and superfluous roots pulled and destroyed, and superior ones to furnish the desired quantity of stock-seed are pulled and set in a block by themselves, where there will be little danger of the flowers being fertilized by pollen from other plants.

The yield and quality of seed is very dependent upon uniformly favorable weather conditions inducing a quick, even growth, fertilization of the flowers by insects, and freedom from storms or exceptionally high temperatures. A hive or two of bees in the field will often materially increase the yield of seed. When the later and the most immature pods begin to ripen, the plants may be cut and laid in windrows or piles not over 3 to 4 feet deep on the threshing-floors and allowed to remain from ten to fifty days (depending upon weather conditions), until the stems are fully cured and dry. The seed may then be threshed out either with flails or machine and sacked, but must be watched, and if necessary, winnowed out, to prevent heating. In some localities it is a better practice, particularly with the later sorts, to leave the harvested plants under shelter until midwinter or early spring before threshing. Again, in case of some of the later harder-fleshed sorts, better yields are secured by not planting until autumn, and before severe weather, pulling, topping, and storing the small roots until spring, much as is done with seed-crops of beets or turnips.

W. W. Tracy.

RAFFIA is the Malagasy name of a palm which furnishes a staple article of commerce called raffia fiber. It is indigenous to Madagascar, where it grows without cultivation or attention of any kind. One palm leaf, or frond, produces eighty to one hundred long green divisions 2 to 5 feet in length, like the leaves of the sugar-cane, but of a dark lustrous green color and thicker and stiffer. The under part of this green leaf is of a pale greenish yellow color, and from that side the inner skin is peeled off in the same manner as the skin on the outside of a pea pod, except that it peels off straight to the tip without breaking. It is then of the palest green, and after being dried in the sun assumes a light straw-color. This is the raffia fiber of commerce.

Raffia fiber is extensively used by the natives for making cloths called silk lambas and rebannas, which bring fancy prices in Europe and America, where it is used in the manufacture of various kinds of hats, and the like. A large trade is also had in raffia fiber in Europe for use in the manufacture of fancy baskets, but in America, while raffia fiber has been used to a limited extent in the manufacture of hats, its principal use is for tying vines, flowers, asparagus and celery bunches and for grafting. It is soft as silk and not affected by moisture or change in temperature so as to risk cutting or wounding the most delicate tissues, and it does not break or ravel when folded or knotted. These qualities bring it into general use in Europe, especially in the vineyards of France, where it is extensively used, and consequently maintains its price. It is virtually inexhaustible in Madagascar, the supply being limited only by the scarcity of labor. For export, the fiber is collected in large skeins, twisted or plaited, and then packed in compressed bales of about 100 kilograms (220 pounds) each. About 20,000 bales are exported annually.

Chas. W. Jacob & Allison.

RAFFLÈSIA (named for Sir Thomas Stamford Raffles). *Rafflesiàceæ*. Fleshy parasites, with a solitary large sallow fl. with a cadaverous odor rising from a superficial rhizome, leafless; fls. dicœcious; perianth fleshy, the tube hemispherical at the base, solid in the male fls. and adnate to the ovary in the female fls., broad-campanulate above the ovary, limb 5-parted, the segms. imbricated in 1 row; ovary inferior, with numerous ovules. About 5 species, Malaya. *R. Arnoldii*, R. Br. Fls. flesh-colored, 3 ft. across, mottled with a thick fleshy rim or corona lining the upper part of the tube. In the male fls. there is a thick fleshy column within the corona and adherent to the perianth-tube and having at the top a wide flat plate, the overhanging margin of which is revolute and on which is placed a ring of sessile anthers. The female fls. are similar, but lack the anthers and possess an ovary adherent to the base of the perianth-tube and having a single cell. Sumatra. G. 7:547. J.H. III. 54:373.

RAILROAD-GARDENING. That phase or application of landscape gardening (or landscape architecture) which aims to improve the appearance of railway rights-of-way and station grounds; and, as an art of design, which lays out the approaches and makes the subdivisions of the grounds as best to serve convenience and beauty.

In this article, in a cyclopedia of horticulture, it is not intended to discuss the theory of design for railway properties, but rather to consider the plant-growing features; yet the layout must be taken into consideration. The subdivision of the property and the general theory of arrangement are necessarily controlled by the nature of the property itself, the extent of trackage, the need for passenger and freight access, the size of settlement to be served. Probably nowhere are the main elements more rigidly fixed by the necessities of the case, for the engineering requirements must be met; and yet there are large civic relations that should receive careful consideration.

In a small suburban railway station property, the planting feature may well be very prominent or even, to the general observer, dominant. Large trees are in place, and flanking lines of shrubbery and many good

XCV. Radish, in several varieties

gardening features. In small cities, of say 10,000 inhabitants more or less, the station buildings become relatively more dominant and the planting falls into a subordinate place, and the gardening may take on the features of ornament; the approaches and the general layout begin to assume a civic character. In large cities, the architecture, arrangement, and formal approaches necessarily dominate, the plant materials are reduced to a very minor feature or disappear altogether, and the landscape architect approaches the work as a problem in city-planning and design. There remains the small country station in the farming country, which usually has been wholly neglected in respect to its landscape features and which has little expanse beyond the mere right-of-way; this is a problem quite by itself and which has not yet been studied to any extent. This application of the landscape art to real rural conditions will develop when the whole subject of country-planning begins to appeal to the public mind.

3334. A good rural station, with well-directed approaches, sward, trees, shrub-planting, and vines on the building.

Historical sketch.

The railroad-gardening movement is best understood by a consideration of its historical development, and this is here attempted, although the treatment is not complete nor does it pretend to bring the subject down to date.

The movement in England.—Planting has been practised on the station grounds of some English railways for many years, but it is almost exclusively limited to purely ornamental gardening. The corporations do little beyond offering prizes to station-masters and their assistants. This system was put in operation about forty years ago on the Great Eastern, in about 1885 on the Midland, and at a more recent time on the Great Western Railway. The prizes range from 5s. to £5, and in 1900 aggregated £300 on the Midland Railway. The little planting that is done by the railway companies themselves is confined to a few trees of low growth near stations, to a background of shrubs for some of the so-called "platform gardens," and to sowing broom and gorse on certain slopes of the permanent way between stations. The "allotment gardens" that attract attention on English roads are small tracts near stations rented to employees of the roads, who use them as vegetable-, fruit-, and, to some extent, as flower-gardens. The Railway Banks Floral Association was an interesting factor in the improvement of English railway rights of way. Earl Grey was the originator of the novel and excellent scheme. The society was an organization for interesting owners of adjacent property, and for collecting money and materials for sowing and planting railway "banks" (downward slopes) and "cuttings" (upward slopes) of the permanent way, to the end of making them more attractive. The results have been eminently satisfactory.

Denmark.—In Denmark the railways belong almost without exception to the government, and improvements are begun when the roads are constructed. These consist of five classes of work: (1) planting of station grounds; (2) hedges as a substitute for fences; (3) snow-shelters; (4) vegetation on embankments as a protection against erosion; (5) allotment gardens near block signal stations. Planting on station grounds is purely for esthetic purposes; the other features, while possessing some attractions, are maintained chiefly for their economic advantages. The materials for planting are obtained from nurseries ("planteskoler") owned by the roads and consist for the most part of shrubs, largely coniferous. These nurseries, as well as the entire planting, are under the supervision of a "plantoer," i. e., a chief botanical instructor. The allotment gardens, like their English namesakes, are tracts near the block signal stations where railway employees conduct vegetable- and fruit-gardens for their own use, and sometimes care for a few flowering plants.

Sweden.—Ornamental planting has been universal on government railways, as well as on most private railways in Sweden, since 1862. According to the Royal Administration of the Swedish State Railways, the following distinctions are made: (1) decorative and fire protective plantings on station grounds; (2) mixed plantings (decorative and economic) on "habitation grounds;" (3) plantings along the railway lines as hedges or for protection against snow. Station planting consists of trees selected to suit the climate of various parts of the country, of shrubs, and of perennials and annuals (flowering as well as bedding plants). At the largest stations (only about seventy-five) annuals are exclusively used for "modern or elegant combinations." The planting at habitation grounds consists of fruit-trees, small-fruits, a few ornamental shrubs, some flowering plants, and a small kitchen-garden. The state railways yearly plant out about 40,000 hard-wooded plants (trees and shrubs), and 400,000 soft-wooded plants (perennials and annuals), which are nearly all grown at five greenhouses, hotbeds, and nurseries situated in different parts of the country. On private railways the same plan is followed on a smaller scale.

In various other countries there are scattered examples of ornamental, economic, and protective planting on railways, including the cultivation of fruits along the rights of way of certain railways of Germany and of France.

The Canadian Pacific Railway Company has planted a considerable part of its right of way to tamarack and other suitable trees to supply the tie material of the future.

The director of the association called Het National Belang, at Utrecht, says that the association has contracts with the State Railway Company and the Holland Railway to plant the dykes of their roads. Different kinds of willows, low apple and pear trees (halfstam appel en peeren-bloomen) and wild prune trees are used, the fruit of the last being "used for jams."

The common quince is used to a limited extent in Uruguay for binding earth on embankments, and the paradise tree for shading station platforms. "The Ombu is the national tree of Uruguay,—useless as fuel or as timber, useless as food, but as welcome as Jonah's gourd at midday at certain seasons."

The Royal Railway Department of Siam reports through M. Kloke, acting Director General of Railways, that efforts have formerly been made to establish protective tamarind hedges along embankments in the Korat section, which were destroyed by cattle; Eucalyptus trees grown from seed received from Australia have developed quickly into "stately trees;" and good success has also resulted from the introduction of a tree from Manila which is said strongly to resemble the cherry tree, and is well suited for making "shady alleys;" and that India-rubber trees are used at smaller stations.

Remarkable work has been accomplished in Algiers. The director of the P. L. M. Railroad Company wrote some years ago that about 525,000 trees had been planted between 1869 and 1875, of which 495,000 were forest trees and 30,000 fruit-trees. The prevailing forest trees are eucalypts and locusts; others are mulberry, plane, pine, cypress, willow, poplar, oak, sycamore, and mimosa. About one-fifth of the forest trees were planted about stations and watch-towers for ornament, and the remaining four-fifths were used in protective plantings. The fruit-trees include mandarin, orange, lemon, medlars from Japan, pomegranate, apricot, and almond.

In Mexico some companies, notably the Mexican Central, maintain flower-gardens and parks at larger stations.

United States.—The first traceable indications of the movement in this country are about 1870. It was not until several years later that infrequent allusions to the work crept into print. From the year 1880, however, the movement gained in favor so rapidly that the late W. A. Stiles said of it in "Garden and Forest," March 13, 1889: "Railroad-gardening has come to be considered a necessary part of constructions and maintenance among prosperous and progressive companies seeking to develop local passenger business."

As nearly as can be determined with certainty, the first railroad-garden made in this country occupied the triangular plot of ground formed by the main line and the "Y" of the Baltimore & Ohio Railway, at Relay Station, where the through line from Washington joins the main line from Baltimore to the West. Frank Bramhall, of the passenger department of the Michigan Central Railroad, says of this plot: "I first saw it just before the Civil War." "Harper's Magazine" for April, 1857, gives a wood-cut of this station and its surroundings, but makes no mention of the planting.

The first example of gardening known to have been made by official order, as far as can be learned, was to be seen in 1869, on the line of the Central Railroad of New Jersey, on the stretch between Elizabeth and Bound Brook. The credit for this was directly due to the president of the railroad, J. T. Johnston. That gentleman was therefore one of the pioneers, if not actually the first American railway official to recognize the advantages, and to encourage the development of such improvement of station grounds.

Another early example, also on the Baltimore & Ohio road, is a little flower-garden which has been maintained at Buckhorn Point, on a narrow strip of ground between the tracks and the edge of a precipitous height overlooking the valley of the Cheat River.

In 1880, the Boston & Albany Company built a new station at Newtonville, Massachusetts, and a baggage-master (E. A. Richardson?) who took charge at that point in 1881 evinced an interest in the care of the grounds that attracted the favorable attention of the assistant engineer, who sent him men and material for grading and sodding. This so encouraged the baggage-master that he solicited the townspeople for money to buy seeds and plants, and with such success that he maintained for three years a flower-garden that favorably impressed the higher officials of the road, and led to the establishment of similar gardens at other points, and eventually to the adoption of a system of planting which, under intelligent artistic supervision, has been radically changed in style till it now stands as the nearest approach to a comprehensive and consistent example of railroad-gardening. (Fig. 3334.) In 1882 and 1884 several new and exceptionally artistic stations had been built for the Boston & Albany Railway Company after designs by the late eminent architect, H. H. Richardson, and the latter date marks the adoption of a consistent scheme of permanent planting, aiming at nature-like effects instead of the purely ornamental, i. e., formal gardening, previously used. This happy result was due to the influence of Charles S. Sargent, of

3335. One method of treating a railway ground,—temporary formal ornament and no durable flank-planting.

the Arnold Arboretum, a director of the road, and to Wm. Bliss, its president. Designs for the improvement of the grounds around these stations were made by F. L. Olmsted, the veteran landscape architect, and since 1884 the development of these plans, as well as all of the horticultural interests of the road, have been in charge of a competent landscape gardener, E. A. Richardson, who says: "The plan followed is to conform the treatment and development of the station grounds to the adjacent ground: a natural style being followed amid natural surroundings, and a more cultivated style in highly cultivated regions; to utilize all natural advantages of ground surface, rocks, water, and native growths; to make large use of trees, shrubs, vines, and plants indigenous to the locality where improvements are being made; to supply beds for shrubs with from eighteen to twenty-four inches of good loam; and to plant so closely in the beginning that as the plants grow they can be thinned to supply other grounds as needed." It goes without saying that these methods are not only the most practical but that they insure the most artistic results.

Among the first railway companies to improve their station grounds by planting were the Central of New Jersey (1869), the Baltimore & Ohio (date uncertain), the Boston & Albany (1880), the New York Central & Hudson River (1880), the Erie (1881), the Southern Pacific (1885), the Pennsylvania (1886), and the Austin & Northwestern of Texas (1887). Other roads appreciate the value of the work and encourage it; and railroad-gardening has now become a recognized form of landscape improvement, although yet at its merest beginnings.

The methods.

In the public mind, railroad-gardening usually means the formal use of flower-beds about stations. Such work is ornamental gardening, not landscape gardening. Most of the so-called landscape gardening at railroad

stations is really merely decorative. Carpet-beds are relatively costly as compared with hardy shrubbery. They last but a few months and then leave bareness, while the best hardy trees and shrubs skilfully arranged are interesting all the year round. (Figs. 3335, 3336.) This making of nature-like pictures with relatively simple, inexpensive, and permanent materials is a much higher art than that involved in creating and maintaining flower-beds and a few summer-blooming plants. However, both have their places. Many a tired traveler is cheered by the bright colors of a neatly kept railroad station. Such displays are suitable at the stations if anywhere along the line. They are always preferable to dirt, ugliness, and a general air of indifference. But railroad-gardening never becomes worthy our best attention until it rises to the plane and importance of planning. (Fig. 3337.)

Some of the underlying considerations in the landscape improvement were stated in an editorial in

3336. A better method of treating the area.

"Garden and Forest," 1889, by the late W. A. Stiles, from which we quote: "Up to the present time, with few exceptions, railroad-gardening has failed to accomplish what the public has a right to expect of it from an artistic point of view. Instead of using their opportunities for increasing the taste and knowledge of the communities they serve, railroad managers have generally been satisfied to reproduce all that was glaringly bad in the prevailing horticultural fashion of the time. Perhaps this is inevitable, and it will continue so as long as they feel that they need not call for the advice of an expert of a higher class than the ordinary jobbing gardener. It is the old story—a man employs an architect to build his house, but thinks he needs no advice in laying out the park that surrounds it.

"The principles that underlie good railroad-gardening are simple. They relate,—so far as such gardening has been attempted,—to the immediate surroundings of country stations and to the shaping and turfing of the slopes rising and falling from the permanent way.

"The essential features are: convenient and abundant approaches, and some treatment of the ground not needed for approaches. This treatment should be at once economical and permanent, and of a character simple enough to be successfully maintained by the station-master and his assistants, under the inspection and with the occasional advice of a higher official charged with the management of the horticultural affairs of the corporation.

"The selection of a system of general treatment is the only difficult thing, and it is here that railroad managers have usually failed. Most railroad-gardens,—and this is as true of Europe as of America,—consist of a badly laid out and constructed approach, bordered with turf in which are cut as many large and often grotesquely shaped beds as can be crowded in and filled during four months of the year with the most showy and ill-assorted plants, and quite bare of all covering during the remaining eight months; of a few shrubs, mutilated almost past recognition by bad pruning, and by a clump of pampas grass to complete the decoration; also often the name of the station in stones (mere 'toys'). As Bacon wrote three centuries ago, 'You may see as good sights many times in tarts.' Such grounds are not artistic, and are therefore bad from the point of view of the public. They are enormously expensive and difficult to maintain, therefore bad from the point of view of the railroad.

"If railroad-gardening is ever to become a potent and permanent means of public education, it must be organized upon a more economical basis, and with more regard to the laws of good taste and good business. This subject has already occupied the attention of a few thoughtful men, and we are confident that some progress has at last been made." Mr. Stiles commends the plans of the then new station grounds of the Boston & Albany Railway for "convenience, neatness, and simplicity. No beds, no brilliant flowers, no startling effects. They rely for attractiveness on convenient, well-kept roads, neat turf, a few good trees, and masses of well-selected and well-planted shrubs, among which herbaceous and bulbous plants are allowed to grow. The plan is simple, and when thoroughly carried out in the beginning it is easy to maintain."

On the treatment of the right-of-way between stations, Mr. Stiles says: "What is needed is a ground-covering that will be more permanent than turf and will not need its constant cutting and attention, and which can be secured without the enormous first expenditure for accurate grading and the deep soil that makes a grass slope presentable," and adds: "Such low plants as wild roses, dwarf willows and sumacs, sweet fern, bayberry, etc., when once established will prevent surface soil from washing, will not grow tall enough to interfere with operating the road, and if destroyed by fire would soon grow again from the root and re-cover the ground."

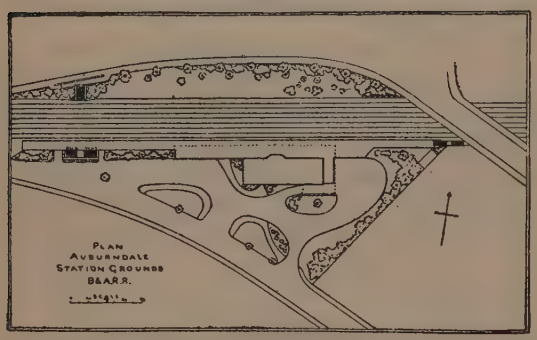
The proof of these deductions is seen yearly on many roads, where thousands of miles of railroad rights-of-way which, in the spring and early summer, are like ribbons of flowered brocade linking the towns together but later in the season become blackened wastes from accidental or intentional fires. Year by year this mournful program is repeated.

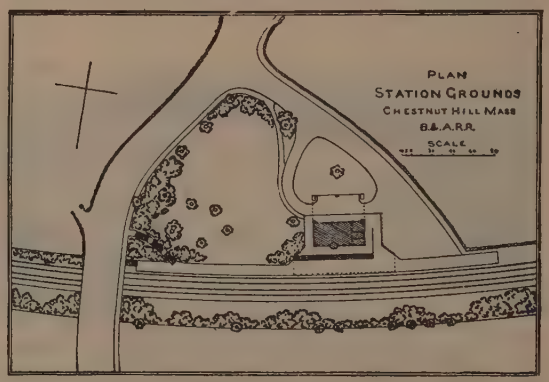
Railway officials offer no practical objections to the use of small trees and of shrubs between stations which apply when the work is done with discretion; viz., on the outer boundaries of rights of way that are 100 or more feet wide, on straight stretches, or on long tangents, and not on short curves or near grade crossings. The tracks should never be menaced by the danger of trees falling across them in wind-storms, nor should the telegraph wires and poles be interfered with, nor the view of the line obstructed. The danger to planting from fire can never be entirely eliminated until some non-spark-producing fuel is substituted for coal.

Planting for protection, as practised so far, includes: (1) covering banks with vegetation to prevent erosion, and (2) planting for protection from wind and snow, and from landslides. All this has been successfully done in various parts of the world. Snow-hedges are comparatively common at home and abroad. A notable example of confidence in the advantage of belts of trees for this purpose is seen in the groves planted some years ago by the Northern Pacific Railway Company. About 600,000 trees were set out in 1900, and the chief engineer of the road says: "This experiment has been undertaken to determine the possibility of substituting groves for snow-fences. It is necessary to protect all railway cuts in these prairie regions in some manner, as the strong winds across the treeless prairies cause the snow to drift badly. A strip 100 feet wide is cultivated to keep down weeds and overcome danger from fire, and through the middle of it runs a grove 60 feet wide, the inner edge being 125 feet from the center line and parallel with the tracks through cuts. The trees are

planted in parallel rows spaced 6 feet apart at right angles with and 3 feet apart parallel with the track. The two outer rows on each side are golden Russian and laurel-leaved willows; the third row from the outer margins, box-elder and ash; and the five central rows, cottonwood. This arrangement is expected to produce a dense grove, increasing in height from both sides to the center, which will furnish an effective windbreak." The feasibility of planting for protection against the encroachment of shifting sand on the seacoast, along rivers, and on so-called desert lands, has been demonstrated by the researches and experiments of the United States Department of Agriculture. The advantages of such plantings are sure to be eventually recognized and utilized by railway companies whose lines are exposed to this danger.

The disagreeable features and their suppression constitute an important phase of landscape improvement about railway properties. There are two important classes of disfigurement: defacement by signs, and defacement by abused and neglected grounds adjoining





3337. Plans of railroad-gardening.—On the left, Auburndale Station, Boston & Albany Railroad. The plan provides for a porte-cochère, driveways, steps to an overhead bridge and to an underground passage. On the right, Chestnut Hill Station, Massachusetts. Both reproduced from "Garden and Forest."

railway rights-of-way. The more noticeable of these is the display of hideous sign-boards that disfigure railway rights of way and, indeed, seem to have the right of way on highways of every description. These amount to a public nuisance that should be legally controlled, but as they are placed on adjacent land or buildings instead of on railway property, their direct suppression by railway officials is out of the question. These eyesores, however, furnish an added and cogent reason for massing plantations of small trees, shrubs, and vines at certain points along rights-of-way where the topography of adjacent land invites such disfigurement. These gaudy signs not only blot out or mar most fine landscape views (being adroitly placed to that direct end), but are allowed to distort otherwise unobjectionable farm buildings, while the approach to villages and towns is announced in screaming colors by the crowding together of these frightful adjuncts of civilization. While railway companies are not strictly responsible for these conditions, it is certain that they might sway public opinion and effect a much-needed reform by continuous, systematic work in the way of "planting out" the disfigurements, and by establishing attractive plantations wherever possible. This policy is likely to result in a reformation in the direction of the second source of unpleasant views from trains; viz., the unkempt, sordid, and often wretchedly squalid appearance of grounds adjoining rights-of-way through villages, towns, and small cities. If a park is maintained on the station grounds, nearby residents are likely to catch the good spirit and improve the looks of neighboring back yards. To this end, a rule against dumping on railway ground should be strictly enforced. The objectionable features that obtain in large cities must probably be endured until mitigated by the efforts of municipal art and social-service leagues.

Protection of natural scenery is a prime consideration. Notwithstanding the prominence given in railway advertising to fine natural scenery, little credit seems due to railway companies in general for protecting such scenery. That they might wield a mighty influence for their own and the public good is proved by a few examples. It is learned that the unofficial work of representatives of the New York Central and the Michigan Central roads did much to create the public sentiment that led to the formation of government parks on each side of Niagara Falls, and that the same roads should be credited with comprehensive and extended efforts to secure legislation looking to the prevention of further defacement of the palisades of the Hudson. Many of the movements for protecting natural views and worthy objects have close relation with the improvement of railway properties.

Planting for economic purposes is among the possibilities along rights of way, for the purpose of producing timber for furnishing cross-ties, poles, and posts. It is asserted that, under competent supervision, this branch can be made not only to pay the entire expenses of the department but to become a source of revenue. This branch of the work appeals to practical railway men as perhaps no other phase can be expected to, and to what extent the fortunes of various groves of locust, catalpa, and tamarack influence the point of view of chief engineers it would be difficult to learn, but that numbers of them are turning otherwise unoccupied railways lands to this use is certain. In Indiana, for example, some railway companies have planted a part of their holdings with trees for the double purpose of growing timber for economic uses and to secure the resulting reduction in taxes, which is a feature of the state forestry law.

It is often asked whether the planting or horticultural department of a railroad can be made partly self-supporting. There seems little doubt that by one means or another this department might be made at least partly self-sustaining, but the consensus of opinion among railroad men is distinctly against the advisability of making it so, except indirectly. It is conceivable that railroad nurseries and greenhouses might supply planting stock to individuals to their advantage; and possibly railway rights-of-way aggregating immense areas might be planted to crops, perhaps to fruit-trees as is done to some extent in European countries (a project which has also been recently suggested for the roads of India), but the opinion is general that legitimate railroad business is limited to the transportation of people and of freight. Even if this is true, it is still certain that

the department may legitimately be made to yield substantial financial returns. This feature of the department work is as yet in a preliminary stage that makes definite conclusions as to the extent of its benefits impossible, but enough has already been accomplished to demonstrate the usefulness of a well-conceived and correctly developed policy of protective and economic planting.

The attainable ideals are many. Railway companies can do no more effective advertising than by demonstrating the possibilities of the country traversed for home-making. Instead of dreary wastes of dust and cinders, their way-station grounds should present refreshing scenes of shade and verdure. Their grounds should be treated according to the rules of landscape art that hold good in all planting. When adjacent land drops away, giving good vistas, these should be preserved; objectionable features should, as far as possible, be "planted out;" sky-lines should be varied, banks clothed, and variety and views supplied, particularly in flat and uninteresting regions. Railroad-gardens should be in the hands of those who will adorn instead of deface them; who will look to the formation of features that will take care of themselves after planting is established—features that require considerable expenditure, a good knowledge of trees and of shrubs, and a large amount of taste in the designer at the outset, but after being established, like the island gardens of Paris, "the hand of man might be withheld for half a century without their suffering in the least." This conception of railroad improvement is therefore much larger and more inclusive than the mere adornment of station grounds; eventually it will modify the development of the entire property over which passengers ride.

FRANCES COPLEY SEAVEY.

RAISIN: *Grape*, page 1386.

RAJÀNIA (named in honor of John Ray, 1628–1705). *Dioscoreàceæ*. Sts. from tubers, twining, and the habit of Dioscorea: lvs. alternate, undivided, hastate, cordate-oblong or linear: fls. dicœcious, small, racemose, the male along the rachis often fascicled or in very short racemes, the female and sometimes both sexes simple and on short slender pedicels; perianth-segms. 6; stamens 6 in the male fls.; ovary ovoid or oblong: fr. reduced to one carpel through abortion, key-like, indehiscent.—About 10 species, W. Indies.

pleioneùra, Griseb. Fig. 3338. Tubers very irregular cocks-combed: plant subshrubby, 5–6 ft. high: lvs. cordate-roundish or cordate-ovate, 2–5 in. diam., deltoid-pointed or cuspidate, 9-nerved; petiole about as long as or shorter than the lf., the aërial tubers produced at the base of the petiole: fls. dicœcious, in racemes which are often fascicled, the male racemes compound, 3–8-fld., flexuose, the female simple: samara semi-obôvate-oblong, bluntish, wing twice as long as the seed. Cuba and other islands of the W. Indies.

F. TRACY HUBBARD.

RAMIE: *Boehmeria nivea*, a fiber plant. See Cyclopedia of American Agriculture, Vol. II.

RAMÓNDA: *Ramondia.*

RAMÓNDIA (named for L. F. E. von Ramond de Carbonnières, French botanist and traveler, 1753–1827). Usually spelled *Ramondia*, but first written *Ramonda*. *Gesneriàceæ*. Subacaulescent herbs with reddish lanate-villous hairs, suitable for rockwork.

Leaves basal, softly rugose: scapes leafless, 1- to few-fld.: fls. violet or pale purple; calyx free, 4–5- rarely 6-parted, the segms. ovate or oblong; corolla with scarcely any tube, rotate or broad-campanulate, 4–5- rarely 6-cleft, the lobes broad; perfect stamens as many as the corolla-lobes, affixed at the base of the corolla; ovary superior, conical: caps. oblong, rather acute.—About 10 species, mountains of Eu.

Ramondia pyrenaica is one of the choicest and most interesting alpine plants. Few, if any, inhabitants of rock-gardens have been so often pictured. It is a small tufted, hardy perennial herb, like most alpine plants, and its scapes bear one or few flowers in spring. These are an inch or so across, and normally purple or violet, but there is a pure white variety which is in much favor. The ramondias vary in the number of their petals, or rather corolla-lobes. For example, *P. Nathaliæ* often has four-lobed and five-lobed flowers on the same plant. The floral parts in the genus are in fours, fives, or sixes. These plants are rare and local in Europe and are interesting as being among the few alpine survivors of a family that is now essentially tropical. Although several ramondias are in the trade, only one is well known. This is *R. pyrenaica*, which is hardy in the eastern states. It is a beautiful dwarf alpine plant well adapted for the rock-garden. It is rather hard to establish but can be easily grown from seed. If seeds

3338. Rajania pleioneura, showing aërial tuber. (×¼)

are sown in the spring, and the small plants grown along in pots for the first summer and kept in a cool shady position, they will make neat little plants by the end of autumn. They should be kept in a coldframe for the winter. These one-year-old plants grown in pots are much easier to establish than younger plants. They may be planted in small pockets in the rockery in a slightly shaded and elevated position, and given good deep peaty soil. When the plants become established they will blossom freely, and if allowed to ripen their seed they will sow themselves freely amongst the rocks. Old plants can also be increased by division. They ought to be covered in winter with hay or dry leaves so that they will not be heaved out of the ground by the alternate thawing and freezing. The plants require perfect drainage.

A. *Color of fls. purple or white.*

B. *Corolla 5-parted, rotate.*

pyrenàica, Rich. Sometimes called ROSETTE MULLEIN. Fig. 3339. About 3 in. high: lvs. ovate, deeply toothed, hirsute with long rufous hairs: scapes many, several-fld., rarely 1-fld.; fls. purple; calyx and corolla 5-parted, the latter with subobovate lobes. May. Pyrenees. B.M. 236 (as *Verbascum Myconi*). G.C. III. 12:vii. Gn. 26, p. 129; 27, p. 197; 29, p. 343; 37:30

and p. 31; 44, p. 555; 51, p. 205; 56, p. 228; 65, p. 113; 67, p. 71; 73, p. 374; 74, p. 327. G. 7:134; 33:139; 35:123. G.W. 1, pp. 16, 17; 15, p. 541. G.Z. 10:160. F.W. 1877:161. J.H. III. 34:187. R.H. 1866:330; 1906, p. 230; 1907, p. 447. Var. **álba,** Hort., is a white-fld. form. G. 23:485. Many inferior forms have been sent out under this name. *R. leucopétala,* Hort., *R. peregrìna,* Hort., and *R. quercifòlia,* Hort., are apparently only forms of *R. pyrenaica.* Well-grown specimens may have 6–12 scapes, each bearing 3–4 fls. 1½ in. across.

BB. *Corolla mostly 4-parted, more concave, short bell-shaped to funnelform.*

Héldreichi, Janka (*Jancèa* or *Jankèa Héldreichi,* Boiss.). Lvs. ovate, entire, obtuse, silky white above,

3339. Ramondia pyrenaica. (×½)

rusty-woolly below: scapes 1–2-fld.; fls. violet. According to Boissier it normally has a 5-parted calyx, 4-lobed corolla and 4 stamens. Thessaly. Gn. 55, p. 394. G. 35:197.

AA. *Color of fls. yellow.*

sérbica, Panc. This is said to be distinguished by its blue anthers; also the fls. are said to be normally 5-lobed. Servia. G.L. 24:146. Var. **Nathâliæ,** Hort. (*R. Nathâliæ,* Panc. & Petrov.), is more commonly 4-lobed than the type. Gn. 76, p. 203. G.W. 13, p. 553. S.H. 1:161.

F. Tracy Hubbard.†

RAMPION (*Campanula Rapunculus*) is a vegetable sometimes cultivated for winter salads. The roots are chiefly used, generally in a raw state, but the leaves may also be used as a salad. The roots are white, a foot or so long, and spindle-shaped, like a long radish. They are ready for use in October or November and may be used all through the winter. According to Vilmorin's "Vegetable Garden," the seeds of rampion are the smallest of all kitchen-garden seeds, and their germinating power lasts five years. The seed may be sown in the open ground, either broadcast or in drills. The precautions usually taken with minute seeds must be observed. In order not to sow the seed too thickly, it is well to mix it with sand. The seed should not be covered, merely firmed into the soil. Frequent and careful waterings are necessary until the plants become established. Thinning is an important operation. Every plant allowed to remain should have at least 4 inches each way for development. The plants like a light rich soil, partial shade and water during the hot season. Although rampion is usually biennial, it sometimes runs to seed the first year, especially if the seed is sown early. It is, therefore, sometimes advisable to postpone seed-sowing until June. For botanical description, see *Campanula.*

RÁNDIA (named in honor of Isaac Rand). *Rubiàceæ.* Trees or shrubs, erect or climbing, unarmed or spiny, grown in the warmhouse for their bloom or hardy outdoors in the extreme southern United States.

Leaves opposite, obovate-oblong or lanceolate, often leathery; stipules short: fls. small or large, solitary, corymbose or axillary, fascicled, rarely terminal, white, yellowish or rarely rose; calyx-tube ovoid, obovoid or turbinate, limb rarely dentate or lobed; corolla funnel-shaped or salver-shaped, tube short or elongated; limb 5-lobed (rarely more), short or elongated; stamens 5; ovary 2- very rarely 3–4-celled: berry globose or ovoid.—About 100 species in the tropical regions, especially in Asia and Afr. Closely allied to Mitriostigma and Gardenia.

A. *Shrubs having spines.*

dumetòrum, Lam. (*R. floribúnda,* DC.). A small tree or rigid shrub with stout straight often long spines: lvs. 1–2 in. long, short-petioled: fls. white or greenish yellow, fragrant, not large, solitary or rarely 2–3 on a peduncle; corolla ½–¾in. across: berry globose or ovoid, ¾–1½ in. long, yellow. Trop. Asia.—Cult. in S. Fla.

Thúrberi, Wats. Papachi. An upright shrub, 6–8 ft. high, armed with slender spines, young branches canescent: lvs. obovate, attenuate to the short, winged petiole, obtuse or retuse: fr. globose or ellipsoidal, axillary, sessile or nearly so; seeds about 20, in black pulp. Lower Calif. and Sonora, Mex.—Intro. into Calif. The fr. is eaten by the Indians.

AA. *Shrubs or trees without spines.*

B. *Corolla-tube ½in. long.*

Fitzálanii, F. Muell. A glabrous tree: lvs. often over 6 in. long, shining, obovate-oblong or elliptical, obtuse; petiole rather long: fls. about 1 in. across, in loose, few-fld. cymes or the fertile fls. solitary: fr. globular, 1½ in. thick or ovoid and longer, hard. Austral.—Cult. in Fla.

BB. *Corolla-tube 4–10 in. long.*

C. *Lobes of corolla obtuse.*

maculàta, DC. (*Gardènia Stanleyàna,* Hook.). A much-branched shrub 10–15 ft. high: lvs. elliptical or obovate-oblong, 1½–5 in. long, ⅔–2½ in. wide, chartaceous, acuminate, narrowed at base; petiole usually with glands near its union with the midrib: fls. usually purple with white lobes, solitary, terminal or at ends of short lateral branches, sessile: fr. oval, oblong or globose, pointed, 1¼–3 in. long. Trop. Afr. R.H. 1894: 60. B.R. 31:47. B.M. 4185. Gn. 38:322. G.C. III. 54:79. R.B. 30, p. 5.

macrántha, DC. (*Gardènia macrántha,* Roem. & Schult.). A climbing shrub, 9–30 ft. high: lvs. oval or obovate-oblong, opposite, cuspidate or caudate at the apex, narrowed at the base; stipules persistent, glumaceous: fls. solitary, fragrant, terminal, 6–10 in. long, whitish; calyx-lobes linear or linear-spatulate, spreading; corolla with a slender green or yellowish tube and oval obtuse lobes: fr. globose or somewhat pear-shaped. Trop. Afr. G.M. 51:221.

CC. *Lobes of corolla acute.*

Ruiziàna, DC. A tender shrub with dark green lanceolate acute lvs., and white or pale yellow fls. terminal, solitary, sessile: corolla-tube somewhat hairy; lobes spreading: fr. cylindrical, yellow, 10-nerved. Brazil, Peru.

F. W. Barclay.
F. Tracy Hubbard.†

RANÈVEA (anagram of *Ravenea*). *Ravènea* of Bouché. *Palmàceæ.* One species of palm perhaps allied to Hyophorbe, from which it differs, among other things, in its dwarfer habit, usually dicœcious fls. and in the fls. being arranged alternately on the short branches of the spadix. The genus Ranevea seems, however, to be of uncertain relationship. Bouché's generic name *Ravenea* dates from 1878. It appears in Bentham & Hooker (3:883) as *Ravenia.* In spelling it is so similar to *Ravenia* of Vellozo, 1825, that the two cannot be distinguished by pronunciation, and there-

fore a new name was given. Cult. as in Hyophorbe. Prop. by seeds in stovehouse, under glass.

Hildebrandtii, Bailey (*Ravènea Hildebrandtii,* Bouché). Becoming 8–12 ft. high, but flowering under cult. when half that height, spineless, erect: lvs. elliptic-oblong or ovate-oblong in outline, long-stalked, pinnate, the pinnæ 20 or more pairs and narrow-lanceolate-acute: spadix long-stalked, the staminate recurved and with short densely fld. spreading branches, the pistillate erect, with filiform strict branches thickened at the base: fls. pale straw-color, the calyx 3-lobed, the petals 3 and joined at the base, the stamens 6: fr. black. Comoro Isls. (east of Afr.). I.H. 27:403. B.M. 6776. G.F. 4:259.—An excellent dwarf palm, described by W. Watson to be "as elegant as *Geonoma gracilis* and as sturdy as a Kentia. It deserves to take a prominent place among garden palms, its small size, free habit, elegance, good constitution, being all in its favor, while in the freedom with which it flowers and produces seed we have an exceptional character among dwarf palms." Perfect fls. are sometimes produced, although the plant is usually dicœcious. Described as one of the most valuable recent palms. L. H. B.

RANÚNCULUS (Latin name for a little frog; applied to the genus by Pliny in allusion to the wet places in which many of the species grow). Including *Batràchium* and *Ficària*. *Ranunculàceæ*. BUTTERCUP. CROWFOOT. Annual and perennial herbs, a number of which are grown in the garden and sometimes in the greenhouse for their showy flowers. Most of the species are hardy perennials, some of them aquatic.

Leaves entire or dissected; cauline lvs. alternate, often few: fls. white, yellow or red, terminal, solitary or panicled, rarely sessile at the branch axils; sepals 3–5, caducous; petals all or most (up to 15) provided with a honey-bearing pit or an enlarged conspicuous or rarely minute scale; stamens shorter than the sepals and petals, frequently numerous, sometimes only few in small-fld. species; carpels numerous, 1-ovuled: achenes compressed or subglobose, smooth or variously striate, costate, rugose, or spiny.—About 300 species dispersed all over the world, mostly in the temperate and colder regions, few in the tropics. The structure and arrangement of the achenes is well shown in Fig. 3340.

3340. Head of buttercup achenes.

Culture of the ranunculuses. (E. J. Canning.)

The culture of ranunculuses in gardens and by florists has been confined chiefly to the Persian and Turban ranunculus, *R. asiaticus*, since the Asiatic species is far more attractive than the European. In England and in other European gardens, *R. asiaticus* has been in cultivation a very long time. Parkinson mentions it in his Paradisus, published in 1629. He termed it "the double-red crowfoot of Asia." Since his time *R. asiaticus* and its varieties have been greatly improved, both in size of flowers and variety of colors. The flowers are very double, almost globular in outline, and often exceed 2 inches in diameter, while the colors now embrace almost every shade except blue, and some are striped and variegated. A well-grown mass of these charming flowers when in full blossom is a sight not soon forgotten. They are not so well known in American gardens as in those of England or at least not in the eastern states, since the writer has rarely met with them or seldom seen any reference to them in the horticultural periodicals. They are not adapted to either spring or summer bedding. Their season of blossoming in this country is about the last week in May and the first week in June, which is too late for spring bedding, while the season of blossoming is too short for summer bedding. Therefore a position should be given them in the herbaceous border where they will receive some shade during the warmer parts of the day, or a level place in a rock-garden with a northern aspect. The roots are tuberous, being like miniature dahlia roots. They are not hardy, at least not in any of the northern states. The tubers should be carefully lifted after the foliage has all "ripened off" (which occurs usually toward the end of August), and stored until the following spring in some cool shed where they will not freeze. They should be planted as soon as the frost is well out of the ground in spring, about 2 inches in depth and about 6 inches apart, making the soil very sandy on top so that the leaves will push through readily without heaving the soil. Like their congeners the European ranunculi, they like plenty of moisture at the roots during the growing season, and if they can be shaded from the sun when in flower their blossoming period will be materially lengthened. They may also be grown for flowering in the greenhouse. The gardener may well have a few pans each year, planting the roots in pans of light soil toward the end of January and placing them in the coolest greenhouse, where they will blossom toward the middle of April. He will probably prefer the Turban varieties, since they are stronger-growing and rather larger than the Persian. The species may be propagated by seeds, but this process is not worth while because the bulbs may be procured so cheaply.—Of the native and European species of ranunculus, those of the Batrachium section, such as *R. aquatilis* and its varieties, are interesting aquatic plants, while *R. repens* var. *flore-pleno*, and *R. amplexicaulis* are useful as subjects for the bog-garden.—For herbaceous borders or moist corners in the rock-garden *R. aconitifolius* var. *flore-pleno*, *R. cortusæfolius*, *R. anemonoides*, *R. parnassifolius*, and *R. Ficaria* are the only species worth growing. These are readily propagated from seeds or by division of the plants in spring. See the supplementary list, p. 2909, for some of these.

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KEY TO THE SPECIES.

A. *Sepals 3*..... 1. **Ficaria**
AA. *Sepals 5.*
B. *Achenes transversely wrinkled, emarginate: petals with a nectar-bearing pit at base.*
C. *Lvs. setaceous-multifid: sts. submersed*..... 2. **fluitans**
CC. *Lvs. subreniform or rounded-cordate: sts. creeping in the mud*..... 3. **hederaceus**
BB. *Achenes smooth or nearly so: petals usually with a nectar-bearing pit and scale, the latter sometimes imperfect or very minute in* C.
C. *Roots fascicled, more or less tuberous-thickened.*
D. *Sepals reflexed.*
E. *Head of achenes cylindrical-spicate; achenes slightly verrucose; beak straight: fls. numerous*..... 4. **psilostachys**
EE. *Head of achenes ovoid; achenes pubescent; beak recurved: fls. few.*

F. *Lf.-blades 3-lobed or 3-parted: beak of achene recurved*..... 5. **monspeliacus**
FF. *Lf.-blade pinnately compound, lfts. or segms. 5–7: beak of achene straight*..... 6. **orthorhyn-**[**chus**
DD. *Sepals spreading.*
E. *Lvs. ternately or biternately cut: head of achenes cylindrical; achenes glabrous*..... 7. **asiaticus**
EE. *Lvs. subcordately reniform, incised, lobes cut and dentate: head of achenes short-ovoid; achenes hairy on the sides*..... 8. **cortusæfolius**
CC. *Roots fibrous, not fascicled or tuberous thickened (bulbous in No. 11.)*
D. *Fls. white, rose or rarely purple (yellow in a double-fld. variety of No. 11).*
E. *The lvs. dissected.*
F. *Sepals pubescent.*
G. *Petals 5*..... 9. **glacialis**
GG. *Petals 12–20*..... 10. **Matthewsii**
FF. *Sepals glabrous.*
G. *Sts. several-fld*..... 11. **aconitifolius**
GG. *Sts. 1–3-fld.*
H. *Blades palmately 3-lobed: petals 5*..... 12. **alpestris**
HH. *Blades pinnately cut, lobes 3-lobed: petals 8–10*..... 13. **rutæfolius**
EE. *The lvs. not dissected.*
F. *Blades sessile and amplexicaul.* 14. **amplexicaulis**
FF. *Blades petioled.*
G. *Sepals glabrous: lvs. linear or lanceolate*..... 15. **pyrenæus**
GG. *Sepals pubescent: lvs. rather cordate or ovate-rounded*.... 16. **parnassifolius**
DD. *Fls. yellow (see also a double variety of No. 11; fls. scarlet in a form of No. 28).*
E. *Lvs. not divided (although sometimes lobed).*
F. *Lf.-blades rounded-cordate or reniform*..... 17. **insignis**
FF. *Lf.-blades linear or lanceolate.*
G. *Plants alpine, 6–12 in. high: lvs. linear or narrow-lanceolate: sepals glabrous*..... 18. **gramineus**
GG. *Plants aquatic, 2–3 ft. high: lvs. lanceolate, sessile and somewhat clasping: sepals villous*..... 19. **lingua**
EE. *Lvs. divided.*
F. *Stolons present*..... 20. **repens**
FF. *Stolons lacking.*
G. *Base of st. bulbous*..... 21. **bulbosus**
GG. *Base of st. not bulbous.*
H. *Rootstocks present.*
I. *Sts. glabrous: lvs. all radical*..... 22. **Enysii**
II. *Sts. pubescent: lvs. both radical and cauline*..... 23. **montanus**
HH. *Rootstocks absent (though a short, erect, thickened caudex is often present).*
I. *Axis of infl. hirsute*..... 24. **polyanthemos**
II. *Axis of infl. glabrous.*
J. *Sepals spreading.*
K. *Sts. lax or weak: petals 6–15: upper cauline lvs. wanting.* 25. **californicus**
KK. *Sts. strictly erect: petals usually 5: upper cauline lvs. present.*
L. *Peduncles terete, not striate*..... 26. **acris**
LL. *Peduncles striate*... 27. **lanuginosus**
JJ. *Sepals reflexed.*
K. *Fls. many on a st.*... 28. **constantino-**[**politanus**
KK. *Fls. 1 or 2 on a st.*.. 29. **anemone-**[**folius**

1. **Ficària,** Linn. (*Ficària Ficària,* Karst.). Perennial: roots fleshy, thickened: sts. short, decumbent, branched at base, often with bulblets in the lf.-axils: lvs. 1–2 in. long, ovate, cordate, crenate (sometimes entire), somewhat fleshy; petioles long, broad: fls. solitary, golden yellow, about 1 in. across; sepals 3, spreading, oval, concave; petals 8–9, scale at base of petal emarginate: achenes 15–20, in a globose head, very convex, truncate, short-puberulent; receptacle glabrous. April, May. Eu., adventive in N. Amer., Mass. to D.C. B.B. (ed. 2), 2:117. Var. **flòre-plèno,** Hort., is a double-fld. form. Var. **grandiflòrus,** Hort., is merely a large-fld. form. J.H. III. 53:371. Var. **ochroleûcus,** Hort., is a form with whitish yellow fls., offered in the trade.

2. **fluìtans,** Lam. Perennial, aquatic: sts. submersed, usually very long: lvs. submersed, petioled, the lower lvs. often long-petioled, about twice 3-parted, divisions very long-linear, 2–3-cleft, segms. nearly parallel: peduncle tapering, bearing a spreading raceme: fls. large, white; petals often more than 5, broadly obovate, many-veined, contiguous, persistent: achenes obovate, inflated, much rounded at the end laterally, apiculate; receptacle conical, naked. June. Rivers, Eu.

3. **hederàceus,** Linn. (*Batràchium hederàceum,* S. F. Gray). Perennial, semi-aquatic: sts. creeping, rooting at the nodes: lvs. subreniform or rounded-cordate, 3–5 shallow rounded lobes widening to their base and usually entire or notched at the apex, usually opposite and with a black half-moon; stipules various: peduncles usually shorter than the lvs.: fls. 1/6–1/3 in. across, white; petals very narrow, 3-nerved, distant, sometimes hardly exceeding the calyx; stamens 5–12; style prolonging the nearly straight inner edge of the ovary: achenes few, glabrous, obovate, laterally compressed at the base, inflated or rounded at the top, muticous; receptacle globose, naked. June. Shallow ponds or mud. W. Eu. and naturalized in N. Amer., Newfoundland to S. Va. B.B. (ed. 2) 2:116.

4. **psilóstachys,** Griseb. (*R. nyssànus,* Petrov.). Perennial, about 18 in. high, appressed silky pubescent: sts. branched: radical lvs. broadly orbicular, subcordate, deeply 3-parted, divisions cuneate, incise-lobed: fls. numerous, large, shining citron-yellow, 2 in. across; sepals reflexed: achenes in a cylindrical spike, ovate, slightly verrucose, beak straight, as long as the body. Servia, Macedonia, and Greece. G.C. III. 46:163.

5. **monspelìacus,** Linn. Perennial, 1½ ft. high, white-woolly or sericeus: sts. erect, few-fld.: lvs. woolly, ovate-rotund, cordate, the radical 3-lobed, lobes cuneate, trifid or 3-toothed; the upper 3-parted, lobes entire, linear: fls. yellow; sepals hirsute, reflexed; petals obovate: achenes numerous, pubescent, compressed, beak recurved and equaling the carpel; receptacle glabrous; head of achenes ovate. April, May. Medit. region.

6. **orthorhýnchus,** Hook. Perennial, 10–18 in. high, hirsute to nearly glabrous: sts. erect from a fascicled root of thick fibers: lvs. mostly oblong, pinnately compound; lfts. or segms. 5–7, lower commonly short-petioluled, usually cleft or incised: fls. yellow, sometimes purple outside; sepals reflexed, soon deciduous; petals 7–16, 1/3–1/2 in. long, obovate, much surpassing the sepals: achenes in an ovoid head, not numerous, ovate, nearly 2 lines long, strongly margined, beak slender, subulate, rigid, straight, nearly as long as the body. May–July. Wet places, Brit. Col. to Ore. and Mont. Var. **platyphýllus,** Gray (*R. máximus,* Greene), is more robust, growing 1–5 ft. high, the lfts. often 3 in. long, laciniately cleft and incised and the petals often larger than the type. N. Utah, Idaho, Wash. to Calif. and reported from Brit. Col.

7. **asiáticus,** Linn. (*R. orientàlis,* Hort., not Linn.). Fig. 3341. Perennial, 6–12 in. high: sts. erect, simple or branched, somewhat appressed hirsute: lowest radical lvs. cuneate-ovate, dentate at the obtuse

apex; the others ternately or biternately cut, segms. ovate or oblong, toothed or deeply trifid, sometimes many-fid: fls. 1–4 to a st., of many various colors; sepals spreading; petals large, obovate, very obtuse, much exceeding the calyx: achenes papery-compressed, oblong, glabrous, attenuate to a much shorter beak which is hooked and black at the tip; head of achenes cylindrical. May, June. S. E. Eu., Asia Minor, Syria and Persia. F.S. 16:1679 (fl.-pl.). G.M. 49:13.—Very variable; the common garden ranunculus of which there are several highly developed strains, many of which are very double. The fleshy roots are sold as

3341. Persian ranunculus.—R. asiaticus. (×½)

bulbs. The cult. forms of *R. asiaticus* are constantly increasing in number. They are of two main types: (1) The florists' section, called Persian Ranunculi, or true *R. asiaticus*. These require more care than the others. They are very variable in form and color, and are the most highly cult. members of the genus. (2) The gardeners' section, called Turban Ranunculi, or var. **africànus,** Hort. (*R. africànus*, Hort.). Compared with the first section, these have larger, broader, 3-parted lvs., not so much cut: fls. larger and broader, with many crisp petals, not flat and spreading but erect and curved inward, forming a spherical fl., as in the double peonies. Var. **superbíssimus,** Hort., is a taller-growing very large semi-double-fld. form. July–Sept. R.B. 16:133.

8. **cortusæfòlius,** Willd. Perennial, 1–3 ft. high, velvety hairy: roots thick, fleshy, fascicled: sts. branched, corymbose above: lower lvs. long-petioled, subcordately reniform, incised lobes cut and dentate; cauline lvs. nearly sessile, 3–5-lobed, lobes narrow; floral lvs. sessile, lanceolate: fls. several to many in a terminal and axillary rather paniculate infl., yellow; sepals 5, ovate to lanceolate, spreading, green with pale margins; petals 5, large, broadly obovate, glossy: achenes compressed, hairy on sides, tapering into recurved beaks, nearly their own length; head of achenes short-ovoid. May. Isl. of Teneriffe, Canary Isls. B.M. 4625. Gn. 45:28. Gn.W. 8:517. J.F. 3:239.—Not very hardy and needs protection in winter and early spring. It is well suited for pot culture. It is increased by division of the roots in autumn.

9. **glaciàlis,** Linn. Perennial, 3–6 in. high: sts. reddish brown, 1–3-fld.: lower lvs. petioled, rather fleshy, palmately 3-parted or 3-cleft, lobes trifid, or again lobed, the lobules rather obtuse; the other lvs. similar but sessile and involucrate: sepals very hirsute; petals obovate to cuneate, obtuse, white or reddish: achenes very numerous, obliquely obovate, slightly compressed, smooth, glabrous, margin above membranaceous-winged; beak straight; receptacle glabrous. May–Aug. Alpine Eu., Arctic regions, Greenland. Gn. 45, p. 28; 48, p. 501. G.C. III. 53:117.—With age the fls. become coppery red.

10. **Mâtthewsii,** Cheesm. Perennial, 15–20 in. high, glabrous or a few weak hairs on the petioles and peduncles: radical lvs. reniform or orbicular ternate-cut, the main divisions petioluled, coarsely toothed or lobed; petioles stout, 3–9 in. long; cauline lvs. sessile, deeply toothed or lobed: fls. 1–4, large, pure white, sweet-scented, 2½–3 in. across; sepals 5, slightly villous, reflexed; petals numerous, 12–20, oblong-cuneate, rounded at apex; gland solitary, large and basilar: achenes forming an oblong-globose head ½in. or more diam., turgid, pilose, beak long, subulate. New Zeal. Gn. 78, p. 2.

11. **aconitifòlius,** Linn. Perennial, 6 in. to 3 ft. high, pubescent: sts. branched: lvs. palmately 3–5-parted; segms. incise-dentate; upper lvs. sessile with linear-lanceolate lobes: fls. white, several to a st.; sepals flat, glabrous; petals oblong, cuneate or orbicular: achenes 6–15, obovate, laterally subcompressed, nerved, glabrous, beak straight, recurved at the top; receptacle villous. May, June. Mountains of Cent. Eu. Gn. 70, p. 135. G.M. 45:196. Var. **flòre-plèno,** Hort. (*R. aconitifòlius* var. *plènus*, Hort.), called White Bachelor's Button and Fair Maids of France, has large double white fls. Gn. 45, p. 29; 48, p. 506; 65, p. 24. G. 4:415; 10:411; 36:226. Var. **lùteo-plènus,** Hort., has double golden yellow fls.—This species and its varieties are well adapted for border planting.

12. **alpéstris,** Linn. Perennial, 3–6 in. high: st. usually 1-fld.: lvs. petioled, orbicular-cordate, 3-lobed, lobes rather obtuse, lobate-crenate at the top, sometimes the lvs. are trifid or hardly so; this is true of the sessile cauline ones: sepals glabrous, spreading; petals 5, white, rounded-obcordate, emarginate: achenes obovate-globose, glossy, glabrous; beak straight, hooked at the summit. Mountains of Eu.

13. **rutæfòlius,** Linn. Perennial, 3–6 in. high: st. usually 1- rarely 2–3-fld.: lvs. pinnately cut, lobes 3-lobed, incisely many-cleft: sepals glabrous; petals 8–10, white, sometimes suffused with yellow toward the base, oblong, claw orange: achenes obliquely ovate, reticulate-rugose, emarginate; beak short and curved. May–Aug. Alpine Eu. and Siberia.

14. **amplexicaùlis,** Linn. Perennial, 3–12 in. high: sts. erect, glabrous, with 2–3 flowering branches: lvs. oval-lanceolate, acuminate, amplexicaul, at first with hairy edges soon becoming glabrous, glaucous: fls.

3–6, terminal or axillary, pure white, with yellow stamens; sepals acute; petals much larger, obtuse: achenes in an ovoid head, obliquely globose, faces raised in prominent nerves, beak recurved; receptacle pubescent at base. April–July. Mountains of Eu. B.M. 266 (poor). L.B.C. 16:1593. J.H. III. 35:345; 71:85. G.C. II. 19:788. G.L. 22:95. G.W. 3, p. 217; 15, p. 429.

15. **pyrenæus,** Linn., also incorrectly offered in the trade as *pyrenaicus,* Hort. Perennial, about 1 ft. high: lvs. linear or lanceolate, entire, all basal, bluish green: scape tomentose at the top, 1–4-fld.; fls. white, rather large; sepals glabrous; petals obovate: achenes obliquely obovate-globose, sides glossy, beak short, hooked; receptacle pubescent. June–Aug. S. Eu.

16. **parnassifòlius,** Linn. Perennial, 3–8 in. high: sts. 1–6-fld., hirsute above: radical lvs. long-petioled, rather cordate or ovate-rounded, upper surface shiny

3342. Ranunculus lingua. (×¼)

green, under surface lanate on the nerves; petioles lanate; cauline lvs. sessile, ovate-lanceolate: fls. snowy white or rarely purplish; sepals pubescent, roseate, very obtuse; petals obovate: achenes in a spherical head, obliquely globose, faces glossy; receptacle pubescent. June, July. Alps and Pyrenees. B.M. 386. L.B.C. 3:245. J.H. III. 30:37. Gn.W. 20:275.

17. **insignis,** Hook. f. Perennial, 1–3 ft. high, usually villous: sts. stout and erect, paniculately branched: radical lvs. numerous, large, rounded-cordate or reniform-crenate, often short-lobed, 4–9 in. diam., thick and leathery; petioles stout, sheathing at base; cauline lvs. smaller, upper cut and lobed: peduncles often very numerous, stout with linear-oblong bracts: fls. golden yellow, 1–2 in. across; sepals 5, woolly outside; petals 5–6, rarely more, obcordate, with 1 or 2 glands at base: achenes forming a rounded head ½in. diam., swollen, villous, beak long and slender; receptacle oblong, pubescent. New Zeal.—A variable plant, both in size and degree of hairiness.

18. **gramíneus,** Linn. (*S. graminifòlius,* Salisb.). Perennial, 6–12 in. high: sts. erect, fibrillose at the neck, otherwise glabrous, 1–7-fld.: lvs. lanceolate or linear, entire: fls. yellow, brilliant; sepals glabrous; petals cuneate, scales of the petals tubular: achenes in a head, obliquely obovate-globular, faces reticulate, nerved, beak short; receptacle glabrous. April–June. Eu. and Morocco. B.M. 164.

19. **lingua,** Linn. Fig. 3342. Perennial, 2–3 ft. or more high: roots densely fibrous: sts. erect, glabrous: lvs. 6–10 in. long, lanceolate, acuminate, sessile, semi-amplexicaul, entire or toothed: fls. showy, yellow, about 1½ in. across, somewhat panicled; sepals oval, villous; petals shining: achenes 60–80, in a globose head, compressed, with a straight border which is larger at the top, beak large, short, sword-shaped; receptacle glabrous. June–Sept. Marshes, ditches and pond borders. Eu. and Temp. Asia south to the Himalayas. Gn. 48:500.—Useful for water-gardens and aquatic planting. Var. **grandiflòrus,** Hort., apparently differs only in the size of fl.

20. **rèpens,** Linn. Perennial, stoloniferous: rootstock short and thick; roots fibrous: sts. decumbent, 8 in. to 2 ft. long, more or less appressed hairy: lvs. 3-divided, the terminal segm. or all three petioluled, all ovate, cuneate or truncate, acute, incised-lobed: peduncles sulcate: fls. yellow, about 1 in. across; sepals spreading, hairy below; petals obovate, much longer than the sepals: achenes in a globose head, plano-compressed, ovate-orbicular, beak slightly curved less than half the length of the body; receptacle slightly villous. May–July. Eu., Siberia, N. Amer., Newfoundland to Va., Ont. and Brit. Col., Bermuda and Jamaica. B.B. (ed. 2) 2:113. Var. **flòre-plèno,** DC., Fig. 3343, is a double form not uncommon in gardens.

21. **bulbòsus,** Linn. (*R. speciòsus,* Hort.). Perennial, about 1 ft. high: root a true bulb: sts. erect, hirsute: lvs. petioled, broad ovate, 3–5-parted, terminal division petioluled, lateral sessile or nearly so, all variously lobed or cleft: peduncles sulcate: fls. bright yellow, about 1 in. across, terminating the branches; sepals often reflexed; petals 5–7, much larger than the sepals, obovate, shining above: achenes in a globose head, ovate, compressed, beak very short, bowed; receptacle slightly villous. Eu., Persia, N. Afr., naturalized in N. Amer., New England to N. C., Tenn., and La. B.B. (ed. 2) 2:112.—One of the common field buttercups. Var. **flòre-plèno,** Hort. (*R. speciòsus flòre-plèno,* Hort. *R. speciòsus plènus,* Hort.), is a double-fld. form.

22. **Enýsii,** T. Kirk. Perennial, 6–15 in. high: rootstock rather stout: sts. slender, glabrous: lvs. all radical, numerous, 1–3 in. diam., 3–5-foliate or biternate; lfts. long-petioluled, toothed, 3–5-lobed or 3–5 narrow cuneate incised, toothed or lobed segms., occasionally pinnately divided: scapes 1–5, longer than the lvs., 1- rarely 2-fld.: fls. yellow, ½–1 in. across; sepals 5, broadly ovate; petals usually 5, rarely more, broadly obovate: achenes in a small rounded head, numerous, turgid, glabrous, beak stout, straight or curved. New Zeal.

23. **montànus,** Willd. Perennial, about 6 in. high: rootstock short, creeping: sts. pubescent, with soft appressed or spreading hairs, especially toward the top, usually 1-fld.: radical lvs. few, petioled, glabrous, orbicular or pentagonal, palmately 3-parted, segms. obovate, trifid, obtuse, sinus sharp; cauline lvs. 3–5-parted, sessile, somewhat clasping, segms. linear-oblong, divergent, obtuse: fls. bright yellow, terminal, about 1 in. or more across; sepals pubescent, concave, acute, yellowish green; petals 5, large, broadly obovate with a very short scale at base: achenes 20–30, turgid, glabrous, beak recurved, much shorter than the body; receptacle pilose. May–July. Mountains of Eu. B.M. 3022. L.B.C. 17:1610. G. 37:341. Var. **dentàtus,** Baumg. (*R. carpáticus,* Herbich). Lvs. much more

toothed than in the type: plant much taller: fls. larger. B.M. 7266. Gn. 52:262.

24. **polyánthemos,** Linn. Perennial: sts. erect, many-fld., spreading, pilose: radical lvs. broadly ovate-orbicular, palmately 3–5-parted, segms. linear, dentate; petioles spreading, pilose: peduncles sulcate: fls. yellow; sepals villous: achenes prolonged into a very short, somewhat hooked beak. N. and Cent. Eu., Caucasus region.—The common form in cult. is var. **plènus,** Hort., which has a branching infl. of small globular orange fls.

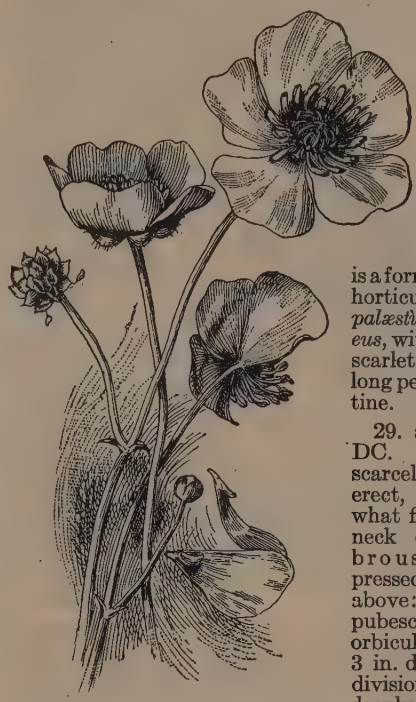
25. **californicus,** Benth. Perennial, 6–25 in. high, pubescent or hirsute: sts. rather weak, branching and naked above: lvs. ternately divided or parted, some pinnately 5-divided, segms. linear or narrow-lanceolate and often 2–3-parted: fls. yellow; sepals closely reflexed; petals 6–15, glossy, oblong or narrowly obovate, ⅛–½in. long: achenes flattened, only slightly margined, beak short, stout, and closely recurved. Dry ground, Calif. and Ore.—The common species of that region.

26. **àcris,** Linn., also spelled *acer* by some recent authors. Fig. 3344. Perennial, 8 in. to 3 ft. high: sts. erect, pubescent, many-fld.: radical lvs. tufted, petioled, palmately 3–7-parted, divisions sessile and cleft; cauline lvs. similar, petioles shorter and sheathing the st.; uppermost only 3-parted, lobes entire, nearly linear: fls. golden yellow, about 1 in. across; sepals spreading, ovate, villous beneath; petals 5, glabrous, glossy, obovoid, obtuse, bearing a prominent scale at the base, much longer than the sepals: achenes in a globose head, coriaceous on the margins, compressed, beak less than half the length of the body. April–Sept. Eu. and naturalized in N. Amer., Newfoundland, Canada and the Atlantic states. B.B. (ed. 2) 2:111. Var. **flòre-plèno,** Hort. (*R. àcer flòre-plèno,* Hort.), is a double form which is more common in cult. The most desirable forms are rich glossy golden yellow and very double; known horticulturally as "yellow bachelor's buttons." B.M. 215.

27. **lanuginòsus,** Linn. Perennial, villous: sts. tall, erect, many-fld., hairs reflex or spreading, fibrillose at the neck: radical lvs. broadly orbicular-pentagonal, silky pubescent, 3-parted, divisions broad-obovate, acutely trifid and dentate; petioles with hairs reflex or spreading: peduncles striate: fls. yellow; sepals spreading, villous: achenes plano-compressed, obovate, marginate, beak one-third as long as the body, hooked; receptacle glabrous. July. Eu. and Caucasus region. Var. **flòre-plèno,** Hort., is a double form, which is the one usually cult.

3343. Ranunculus repens, double-flowered. Tip of a decumbent plant, which roots at the joints. (×½)

28. **constantinopolitànus,** Urv. Perennial: sts. erect, retrorse villous, corymbosely many-fld.: lvs. long-petioled, appressed, silky, broadly triangular-ovate, trifid or 3-parted, divisions ovate, acutely lobed and dentate; petioles retrorse villous: peduncles terete: fls. yellow; sepals reflexed: achenes plano-compressed, suborbicular, marginate, beak one-third to one-fourth as long as the body, coiled to hooked, rising abruptly. Turkey. Var. **palæstìnus,** Boiss. (*R. palæstìnus,* Boiss.). Lvs. 3-parted, divisions divergent from the base, cuneate-oblong, 2–3-cleft. Palestine and Syria. There is a form of this known horticulturally as *R. palæstìnus atrococcíneus,* with large intense scarlet fls., borne on long peduncles. Palestine.



3344. Buttercups.—Ranunculus acris. (Natural size)

29. **anemonefòlius,** DC. Perennial, scarcely 1 ft. high: sts. erect, 1–2-fld., somewhat fibrillose at the neck otherwise glabrous below, appressed-pubescent above: radical lvs. pubescent, broadly orbiculate, sometimes 3 in. diam., 3-parted, divisions cuneate, deeply trifid, segms. acute, dentate; cauline lvs. few, divided into linear segms.: fls. large, yellow; peduncles finally striate: young achenes obovate, compressed, beak hooked, one-sixth the length of the body. Asia Minor.

R. adòneus, Gray, 4–12 in.: shaggy-hairy: sts. more or less decumbent: fls. golden yellow. Colo.—*R. anemonoìdes,* Zahl., 6 in.: fls. white or tinged rose. Austria. Gn. 22:252. J.H. III. 54:345. —*R. aquátilis,* Linn., sometimes called lodewort, ram's foot, etc., is an interesting aquatic plant common in temperate regions, the floating lvs. often broad and 3-lobed, while the submerged lvs. are cut up into numerous thread-like segms.—*R. Aréndsii,* Hort. (R. amplexicaulis × R. gramineus), has fls. of a soft shade of butter-yellow, fading white, and likes partial shade and a moist situation, according to trade-lists.—*R. bullàtus,* Linn., is a yellow-fld. species offered in single and double forms by Dutch bulb-dealers. Medit. region.—*R. cardiophýllus,* Hook., offered in Colo. in 1900, is considered by Gray as R. affinis var. validus. It is an American species pictured in B.M. 2999 with yellow fls. 1¼ in. across.—*R. fasciculàris,* Muhl. Height 1 ft. June. N. Amer. Mn. 2:1.—*R. Lỳallii,* Hook. f., the New Zealand water-lily, grows 2–4 ft. high, has peltate lvs. and waxy white fls. 4 in. across, borne in many-fld. panicles. In Eu. it is considered a cool greenhouse plant. It is a gorgeous species and ought to succeed somewhere in N. Amer. G.C. II. 15:724; 23:371; III. 51:suppl. June 29. Gn. 67, p. 23; 74, p. 379.—*R. pedàtus,* Waldst. & Kit., a native of the Hungarian Alps, has yellow fls. nearly an inch across.—*R. septentrionàlis,* Poir., has been listed; a native plant allied to R. repens.—*R. spectábilis plènus,* Hort., has been offered as a dwarf plant with double shining yellow fls. This species is unknown botanically.—*R. spicàtus,* Desf., is figured in B.M. 4585 with showy 5-petaled yellow fls. fully 2 in. across. It is an Algerian species but is said to be perfectly hardy in England and of easy cult. in any good garden soil. J.F. 2:148.—*R. Sùksdorfii,* Gray. 4–10 in.: st. slender, 1–3-fld.: fls. deep yellow. Mountains Wash., Ore. and Mont.—*R. superbìssimus,* Hort., is used in some catalogues for the double French ranunculi, known also as R. asiaticus var. superbissimus (No. 7).—*R. viridiflòrus,* Hort. Van Tubergen, is a scarlet-and-green-fld. variety of the Turban class of R. asiaticus.

F. Tracy Hubbard.

RAPE (*Brassica Napus*). Fig. 3345. In recent years rape has become an important forage plant. The name rape includes several varieties which are grown for two purposes: (1) for seed from which oil is expressed

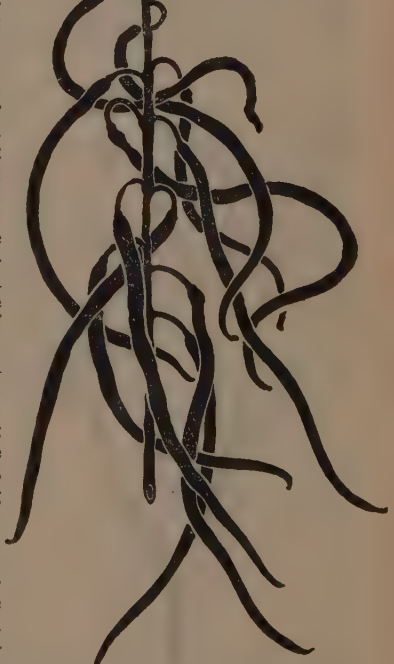
(2) for the purpose of furnishing animals with succulent feed during late summer and autumn, when pastures become bare. Varieties used for the latter purpose usually do not produce seed in this climate the same season, though they are usually classed with annuals. Dwarf Essex is an example of the kind used for soiling (green feeding) purposes. Rape is of considerable importance to the fruit-grower as a cover-crop. The seed germinates readily, will often grow where a clover catch is impossible, and furnishes excellent sheep pasturage late in the season. When grown strictly as a soiling plant, the tops are cut and hauled to the feed-lot or stable. Dwarf Essex rape much resembles a rutabaga turnip at first. It is like a rutabaga with an exaggerated leafy top and without a swollen fleshy root. Rape is a cool-weather plant and may be grown in almost any part of the United States by sowing it at the proper time. As a cover-crop in the orchard in the East it may be sown as late as September 15 with good results. It is an excellent pioneer plant in the work of renewing humus in worn-out lands. In the Middle West, where shade is needed, rape is used as a nurse plant for clover when the latter is sown in orchards in midsummer. Turnips may be used for the same purpose. JOHN CRAIG.

3345. Dwarf Essex rape. ($\times\frac{1}{12}$)

RÁPHANUS (classical name, from the Greek). Sometimes spelled *Rháphanus*. *Crucíferæ*. Annual or biennial branching herbs, one of which, *R. sativus*, is the radish (which see).

Leaves various and variable, the radical and sometimes the cauline lyrate-pinnatifid: fls. small but rather showy, slender-pedicelled, in open terminal racemes, rose-lilac or white, or in some species yellow; sepals erect, the lateral ones somewhat saccate or pouch-like at base; stamens 6, free: pod a long-cylindrical fleshy or soft-corky silique, with spongy tissue between the globose seeds, indehiscent.—About 10 species in Eu. and Temp. Asia. The genus is divided into two natural groups, one (Raphanistrum) with the pod longitudinally grooved and constricted between the seeds, the other (Raphanus proper) with the pod not grooved nor prominently constricted. To the former group belongs **R. Raphanístrum**, Linn., the JOINTED or WHITE CHARLOCK (sometimes, but erroneously, known as RAPE). It is an Old-World annual weed, now naturalized in fields and waste places in the easternmost states. It is an erect sparsely hairy herb, with slender tap-root and radish-like lvs., growing 2–3½ ft. high: fls. rather showy, yellowish, turning white or purplish: silique 1–3 in. long, few-seeded, with a long beak. It is from this species that Carrière produced radishes by means of plant-breeding (see *Radish*). To the second section belongs **R. satívus**, Linn., the RADISH, considered to be native to Eu. and Asia, but imperfectly known in an aboriginal wild state. It is usually annual, although commonly spoken of as biennial because the roots can be kept over winter and planted the following spring. The winter radishes are truly biennial in northern climates. Radish has pink-lilac or nearly white fls., and short thick spongy taper-pointed pods. Sometimes it runs wild in waste places, and then bears a long hard tap-root like that of *R. Raphanistrum*. The radish is extensively cultivated for its thick root, which has been developed into many shapes and colors. There are Chinese types of radish that have hard roots little more than 1 in. diam., and sometimes becoming nearly 1 ft. long. Some forms are scarcely distinguishable from short turnips. The Madras radish (India) is grown for its soft tender pods, which are eaten raw or in pickles. The rat-tailed or serpent radish, var. **caudàtus** (*R. caudàtus*, Linn.), has enormously long pods (see Fig. 3346), which are eaten either pickled, or raw as are radish roots. Frequently the pods are 1 ft. long. The root is slender and hard. This is a cultural variety, coming true from seed. L. H. B.

RÁPHIA (Greek, *needle*, referring to the fact that the fr. ends in a noticeable point). *Palmàceæ*. Monocarpic palms unarmed or with the sheaths only armed: sts. erect, simple or dichotomously branched, densely annulate: lvs. in a terminal crown, equally pinnatisect; lfts. linear-lanceolate, acuminate, rachis not produced at the apex: spadices monœcious, large, pendulous, cylindrical, much-branched; the branches and branchlets thick, compressed, the latter pectinately arranged, densely covered with cup-shaped bracts; common spathe none: fls. solitary in each bract, the male at the base of the ultimate branches of the spadix, the female at the apex; calyx tubular, entire or minutely toothed; corolla curved, the petals 3, linear-lanceolate, valvate; stamens 6–16: fr. large, oblong or ellipsoid, rostrate, 1-seeded.—About 15 species, Trop. Afr. and the Mascarene Isls., 1 in Trop. Amer. *R. Gentiliàna*, Wildem. Lvs. pinnate, furnished with small prickles: infl. dense, pendent, nearly 3 ft. long with flattened branches, the principal rachis of the branches with imbricate bracts: fr. pyriform, apiculate, 2–2½ in. long, with 9–10 rows of fringed scales. Congo. *R. Laurêntii*, Wildem. Trunk up to 6 ft.: lvs. 15–40 ft. long; rachis subcylindrical, about 3 in. thick, grooved; lfts. irregularly disposed, linear, up to 5½ ft. long and 2 in. broad, acute, with short blackish spines: infl. compact, branched, more than 3 ft. long: fr. ovoid, about 2 in. long, short-peduncled, with 12 rows of scales. Congo. R. B. 32, pp. 14–16. *R. Rùffia*, Mart. RAFFIA or ROFFIA PALM. Trunk 6–26 ft. high: lvs. up to 65 ft. long, petiole up to 13 ft. long, nearly 1 in. thick: fr. obovate or pyriform, somewhat depressed and mucronate at the apex, 12–15 rows of very convex scales. Trop. Afr. and Madagascar. *R. tædígera*, Mart. Trunk 6–8 ft. high: lvs. 50 ft. or more long, bending out and often forming a graceful plume 70 ft. high and 40 ft. diam.: fr. oblong, 2½ in. long, reticulated with large scales. Amazon. Probably also produces raffia. *R. vinifera*, Beauv. BAMBOO or WINE PALM. Trunk of medium



3346. Rat-tailed radish.—Raphanus sativus var. caudatus. Grown for its enormous pods. ($\times\frac{1}{6}$)

height: lvs. 6–7 ft. long; lfts. spiny: spadix about 8 ft. long, laxly branched: fr. cylindric-ellipsoid, shortly mucronate, 3 in. long, 8–9 rows of deeply grooved scales. Trop. Afr.—The natives make wine from the sap of the trunk and which they call "bourdon."

F. Tracy Hubbard.

RAPHIÓLEPIS (Greek, *raphis*, needle, and *lepis*, scale; referring to the subulate bracts). Sometimes spelled *Rhaphiolepis*. *Rosàceæ*, subfamily *Pòmeæ*. Ornamental shrubs grown for their handsome foliage and attractive white or pinkish flowers.

Leaves persistent, alternate, short-petioled, serrate, rarely entire: fls. in terminal racemes or panicles; sepals triangular; petals 5, oblong or obovate; stamens 15–20; ovary completely inferior; styles 2–3, connate toward the base: fr. subglobose, purplish black or bluish black with 1 large subglobose or 2 partly compressed seeds.—Two or perhaps 4 species in S. Japan and China.

These are handsome evergreen shrubs with alternate or obscurely whorled leaves, white or slightly pinkish flowers and small pea-sized black fruits. None of the species is hardy North, but *R. umbellata* will stand about 10° of frost or even more with some protection; they are well suited for cultivation in the southern states and California. They will thrive in any good well-drained soil, and if cultivated in pots, a compost of sandy loam and leaf-mold or peat will suit them. Propagation is by seeds or by cuttings of ripened wood under glass late in summer; also by layers, and sometimes grafted on hawthorn.

umbellàta, Schneid. (*R. japónica*, Sieb. & Zucc.). Shrub, to 12 ft., with stout upright branches: lvs. short-petioled, elliptic to broadly oval or obovate, obtuse or acutish, narrowed at the base, crenate-serrate, dark green and lustrous above, pale beneath, floccose-tomentose when young, thick, 1½–3 in. long: fls. white, ¾in. across, fragrant, in dense, tomentose panicles or racemes; petals obovate, obtuse: fr. to ⅓in. across. May, June. S. Japan and adjacent islands. S.Z. 1:85. Gn. 22, p. 43; 32, p. 20; 34, p. 158. G. 7:165; 10:224. Var. **ovàta,** Schneid. (*R. ovàta*, Briot). Lvs. broadly obovate, rounded at the apex. R.H. 1870, p. 348. G.W. 4, p. 129; 14, p. 323. J.H. III. 47:521; 69:81. Var. **integérrima,** Rehd. (*R. japónica* var. *integérrima*, Hook.). Lvs. entire or nearly so, broadly obovate. B.M. 5510.

índica, Lindl. (*R. rùbra*, Lindl. *Cratègus índica*, Linn.). Indian Hawthorn. Shrub, to 5 ft., with slender spreading branches: lvs. obovate to oblong-lanceolate, acute or acuminate, gradually narrowed at the base, serrate, glabrous or slightly pubescent when unfolding, 1½–2½ in. long: fls. white or pinkish, about ½in. across, in glabrous or somewhat tomentose, rather loose panicles; sepals lanceolate, acute, usually red like the filaments; petals acute: fr. ¼–⅓ in. across. May, June. S. China. B.M. 1726. B.R. 1468; 1400 (as *R. rubra*). L.D. 4:247 (as *Cratægus sinensis*). —A very variable species; several forms have been described as distinct species, as *R. Phæostemon*, *R. rubra* and *R. salicifòlia*, Lindl. The last named, which is var. **salicifòlia,** Nichols., is the most ornamental: lvs. oblong-lanceolate, acuminate: panicles rather large and many-fld.; stamens white or purplish, shorter than sepals. B.R. 652. R.H. 1874:270. Gn. 9:596.—A hybrid between *R. indica* and the preceding species is *R. Delacoùrii*, André, forming a compact shrub with rather large panicles of blushed fls. and the foliage intermediate between the two parents. R.H. 1900:698.

Alfred Rehder.

RAPHIONÁCME (Greek, *needle* and *point*, referring to the 5 pointed or awned scales in the throat of the corona). *Asclepiadàceæ*. Herbs, with tuberous rootstock often furnished with an elongated woody neck; juice milky: lvs. opposite: fls. small or moderate-sized, terminal in few- or many-fld. cymes, or in the forks of the st., or subaxillary from one axil, rarely from both; calyx 5-parted; corolla-tube distinct, campanulate, lobes 5, erect, spreading or reflexed; crown of 5 free, entire, 2–3-divided or 3-parted lobes alternating with the corolla-lobes: follicles often solitary by abortion.—About 35 species, Trop. and S. Afr. *R. ùtilis*, N.E. Br. & Stapf. Perennial herb with a turnip-shaped tuber 2–5 in. diam., covered with dark brown flaky bark: sts. annual, 1–4 in. long, erect or decumbent: lvs. in 2–5 pairs, opposite or forming a rosette close to the ground, orbicular, elliptic or oblong-ovate, obtuse and apiculate or subacute at the apex, rounded or subcordate at base, green above, purple beneath: fls. in small terminal and axillary cymes or clusters, bright purple; sepals lanceolate, acute, purplish with green tips; corolla about ½in. diam., deeply 5-lobed. Trop. Afr. B.M. 8221.

F. Tracy Hubbard.

RÀPHIS: *Rhaphis*.

RAPHISTÉMMA (Greek, *needle* and *crown*, referring to the linear scales of the crown). Glabrous twining shrubs: lvs. opposite and membranaceous: infl. long-peduncled, axillary, umbelliform cymes; fls. large, white, and long-pedicelled; calyx 5-glandular inside; corolla campanulate, 5-cleft, lobes spreading, twisted in bud and overlapping to the right; crown with 5 membranaceous scales which are produced into long slender linear ligules: follicles thick, acute, smooth.—About 2 species, Asia. *R. pulchéllum*, Wall. Branches slender, smooth, and herbaceous: lvs. cordate-acuminate, 3–7 in. long: cymes 4–6-fld.; the pedicels very slender: fls. pure white, 1–1½ in. long; sepals broad; corolla thick. Himalaya region and Burma. J.F. 4:353.

RASPBERRY (from *rasp*, a tool resembling a file, and berry), a name applied to certain species of the genus Rubus, particularly to *Rubus idæus*, *R. strigosus*, and *R. occidentalis*, from which have been derived common cultivated forms grown for their excellent edible fruits.

Raspberry plants have perennial roots and erect or nearly erect biennial canes bearing thimble-shaped red, yellow, black, or purple-colored fruit consisting of many cohering drupelets which separate from a partially dried receptacle. The raspberry is distinguished from the blackberries and dewberries, which belong to the same genus, in bearing fruit that separates from its receptacle, while that of the blackberries and dewberries does not separate from their juicy receptacles.

Origin of horticultural varieties.

The first raspberries introduced into cultivation in America were varieties of European origin belonging to the species *Rubus idæus*. These varieties, adapted to a mild humid climate, did not prove sufficiently hardy to merit their continued cultivation after hardy native varieties of good quality began to be propagated. At present but two varieties, the Antwerp and Superlative, representing the European species, *Rubus idæus*, are grown commercially. These two varieties are raised only in the Pacific Coast region and are there being gradually superseded by American varieties.

By far the greater part of the varieties under cultivation at present belong to the American species *Rubus strigosus* and *R. occidentalis*. The American red raspberry, *R. strigosus*, is very similar to the European species, *R. idæus*. Both species have erect canes, but the American species has proved much hardier and adapted to a wider range of environmental conditions. Two of the first varieties of this species to come under cultivation were the Marlboro and Cuthbert, and these are still two of the most widely grown varieties. The black raspberry, *R. occidentalis*, has recurved canes which are longer than those of either of the red-fruited

species, and bears black fruit. The acreage of this class is, at present, much less than that of the red raspberry. The Gregg, one of the first varieties of this species introduced into cultivation, is also one of the leading varieties grown at present.

Yellow-fruited varieties have come from both the American species, the erect-growing sorts from *R. strigosus*, and those with recurved canes rooting at the tips from *R. occidentalis*. Purple-caned varieties, of which the Columbian is the most widely grown, are hybrids between *R. strigosus* and *R. occidentalis*.

Up to the present time, the greater part of the varieties under cultivation have appeared as chance seedlings. Recently, however, many promising new varieties have been originated as a result of systematic effort to produce better sorts. Thus, as the result of definite breeding work, the New York State Experiment Station has originated the June red raspberry, and the South Dakota Experiment Station the Ohta and Sunbeam red raspberries. These, as well as other experiment stations, have many promising varieties under test. L. E. Wardell, a practical grower of Marlboro, New York, has originated the Empire red raspberry, another promising variety. Many others are also trying to originate better varieties, some of whom are using in their work foreign species recently introduced into this country.

Geographical distribution.

The limit of the successful culture of this fruit corresponds closely with the distribution of its wild forms. The southern limit is southern Virginia, along the mountains to northern Georgia, southern Tennessee, westward through the Ozark Mountains and southern Oklahoma. It is chiefly grown in northern regions. The great commercial centers of the industry are, at present, in New York State and Michigan. Smaller centers of its culture, aside from the proximity of the large cities, are found near Hagerstown in western Maryland; in central New Jersey; near Kansas City, Kansas; about Loveland, Colorado, and in the Puyallup Valley of Washington. The culture of the raspberry, however, is not confined to these centers, but is widely distributed throughout the northern districts.

Propagation.

The red varieties are propagated by the use of suckers which spring from the underground parts. Nurserymen secure their stock by digging in the spring suckers sent up during the previous summer. Some growers who wish to increase their own plantation wait until young suckers begin to come up in the spring and transplant these. The black raspberries, as well as the purple varieties now raised, are propagated by encouraging the tips of the young canes to root. As the young canes bend over and the tips approach the ground, soil is thrown over the tips. Plants suitable for setting the following spring will be formed during the remainder of the growing period by these rooted tips. By pinching back the tips in early summer when the canes are about 2 feet high, they will branch and several plants may be secured from each cane.

3347. Raspberries trained to the hill system.

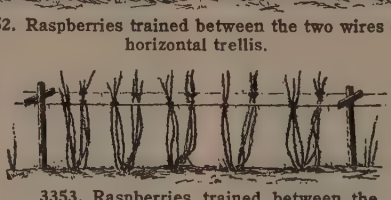
3348. Raspberries trained to the solid-row system. No support used.

3349. Raspberries trained to a single wire trellis.

3350. Raspberries trained to the two-wire trellis.—Canes in erect position.

3351. Raspberries trained to the two-wire trellis. Canes arched over upper wire and tied to lower wire.

3352. Raspberries trained between the two wires of a horizontal trellis.



3353. Raspberries trained between the two wires of a horizontal trellis, one-half of canes tied to the wire on one side and one-half to the wire on the other side.

Culture.

The raspberry thrives best in a deep fertile loam containing plenty of humus. Most varieties grow better on the heavier than on the lighter types of soil, though this is not universally true. The soil must be well drained and a location with good air-drainage should be preferred to lowlands, as certain varieties are peculiarly susceptible to poor air-drainage. Fertilizers are not generally used on raspberry fields, and among growers using them their composition varies widely. The use of fertilizers should depend on the needs of the particular soil, and such needs can be determined only by actual tests of the soil with varying amounts and kinds of plant-foods.

Two methods of culture are commonly used, the hill system and the solid-row system. Under the first system the plants are usually set 5 feet apart each way, while under the second system they are set 3 or 4 feet apart in the row, the rows being from 6 to 8 feet apart. Under the hill system less hand-labor is required for the returns in fruit than under the solid-row system. The plants should be set as early in the spring as possible, as the moisture conditions are usually better in early spring. In setting the plants, the principal requirement is that the soil shall be thoroughly firmed about the roots. Vegetable intercrops may be grown between the rows during the first season and should help pay the cost of cultivation for the first year. Cabbage, cauliflower, beans, peas, and lettuce are often used for this purpose. Cultivation should be thorough and frequent, not only the first year, but after the plantation comes into bearing. Especially when the berries are growing

and ripening do the plants need the large supply of moisture that frequent cultivation conserves.

Training and pruning.

In training the red raspberries when the plants are set by the hill system, a stake is usually placed by each plant before the second year's growth begins and the year-old canes tied to it (Fig. 3347). This allows the new canes to grow up outside the old ones and makes picking easier. When the solid-row system is used, several methods of training are practised. (1) When the plants are vigorous but do not grow very tall, the suckers are allowed to grow up between the plants in the row, while those between the rows are destroyed by frequent cultivation (Fig. 3348). No pruning is required. (2) When the canes grow very long, they are not pruned until spring and then are sometimes cut back to a height of about 3 feet in order that the cane may support its crop of fruit. Weaker canes are removed at this time. (3) Instead of cutting the canes back as described above, they are often trained to trellises in the following ways: (*a*) A trellis is made by stretching a wire on posts set about 30 feet apart in the row. The old canes are tied to this wire to keep them upright when ripening their fruit (Fig. 3349). Two wires, one above the other, are sometimes used in making this kind of trellis and the canes either tied in an erect position to both wires (Fig. 3350), or they are arched over the upper wire and tied to the lower (Fig. 3351). When tied in an erect position, those portions of the canes projecting more than 6 inches above the wire are pruned off. (*b*) The trellis is often made by stretching two wires along the line of posts from the ends of crosspieces about 15 inches in length (Fig. 3352). The old and new canes are kept between the wires and out of the way when the cultivating is done. Sometimes the old canes are tied to the wires, half of them being tied to the wire on one side and half to the wire on the other side (Fig. 3353). The young canes then come up between the old canes and will be out of the way of pickers and cultivators. Many variations of the above systems are in use.

3354. Crate of Cuthbert red raspberries.

The above systems are applicable to the red raspberries. The black and purple varieties do not sucker and are usually trained as follows: The tips of the young canes are pinched back when they are about 2½ feet from the ground. This causes them to branch and form bushes better able to support a heavy crop of fruit. If the side branches grow very long, they are pruned back in the spring to a length of 6 to 18 inches. Sometimes a trellis is made and they are trained on the system described above under (*a*).

The old fruiting canes of all types of raspberries should be cut out and taken from the field immediately after the crop is picked. Some fruit is usually secured the second year after planting, often enough to pay the entire cost of cultivation for that year. The duration of the plantation depends on the varieties, the care, the locality, and the practice of the grower.

Some growers of the black raspberries harvest one crop and then plow the plantation up; most persons keep the fields for two or three crops, and still others gather six to eight crops before destroying the plantation. The red raspberry fields are usually fruited longer than are those of the black raspberry. Growers generally plan to secure eight to ten crops from a field. Yields from fields receiving good treatment will vary from 50 to 150 bushels to the acre, depending upon the locality, the soil, and the variety grown.

3355. Cuthbert raspberry—to show habit of fruit-bearing. (×⅓)

In many northern and western sections, varieties are grown that require winter protection. This is best secured by drawing the soil from one side of the row of plants, using either hoes or a plow, inclining the canes to that side, and covering them entirely with earth about 2 inches deep. The canes are left as late as possible in the spring before uncovering. When the buds begin to start, the canes are forced into an erect position.

Picking and handling.

Raspberries should be harvested as carefully as possible in order to avoid injuring them. The subsequent behavior of the berries on the market depends in a large measure on the care used in picking and handling. Berries injured or bruised in handling, or soft from being over-ripe, or from rainy weather, are quickly attacked by certain mold fungi which cause their decay. To avoid as much injury as possible, three fingers should always be used in picking; very few berries should be held in the hand at one time, to avoid mashing them; the berries should always be placed, not dropped, into the basket or cup; all decaying, over-ripe, and injured berries should be discarded and no later handling of the berries in the baskets allowed. The crates should be hauled on spring wagons to avoid jolting and neither the berries nor the crates containing them should be exposed to the sun. Pint baskets should be used in harvesting red varieties and either pint or quart baskets for the black and purple varieties. (Fig. 3354.) In Pacific Coast regions a basket, or "cup" as it is called there, holding a pound of berries, is commonly employed.

Varieties.

The principal red varieties grown at present are Cuthbert (Fig. 3355). Herbert, King, Marlboro, Ranere (St. Regis), and Perfection (Fig. 3356). Promising new varieties are June, Empire, Sunbeam, and Ohta. Much interest has recently been shown in the fall-bearing type represented by the Ranere. Among the black raspberries, the Cumberland, Farmer, Gregg, and Kansas are the leading varieties. The Golden Queen is the principal yellow sort grown. The Columbian is the principal purple-caned variety at present, although the Shaffer (Fig. 3357) and Cardinal are also grown. The Royal is a very promising new purple-caned sort.

3356. Perfection raspberry trained to stakes 5 by 5 feet apart.

Enemies.

Among the more serious diseases of the raspberry are crown-gall, anthracnose, cane-blight, and orange-rust. When plants free from these diseases are set, very little trouble is likely to be experienced later from them. The means of control commonly employed when these diseases are found are eradication and destruction of plants affected by crown-gall and orange-rust, and the cutting out and removing from the field of all canes affected by anthracnose and cane-blight. Cane-borers are considered the most serious insect enemy of the raspberry. The adults lay their eggs in the tips of the canes. When these tips are seen to be withering and drooping, they should be cut off and burned. If the cut is made well below the point of injury, these tips will contain the eggs or young larvæ of the borer.

GEORGE M. DARROW.

RATHBÙNIA (named for Richard Rathbun, Assistant Secretary in charge of U. S. National Museum). *Cactàceæ.* Plants not large, the st. and branches often weak: spines stout, those of the flowering areoles not differing from the others: fls. diurnal, single, only from the upper areoles, very narrow and elongated, at first straight, but in age more or less curved, oblique at throat, scarlet, persistent; petals very short, spreading or reflexed; stamens attached near the middle of the tube, exserted: fr. spiny, globular, red, breaking open irregularly; pulp red; seeds black, compressed, minutely pitted, with a large basal oblique hilum.—Three species have been described. Native of the west coast of Mex. The species all have rather weak sts., often clambering and resembling somewhat *Cereus serpentinus*, but usually stouter and with different spines and fls. The fls. are very narrow and scarlet, and more enduring.

alamosénsis, Brit. & Rose (*Cèreus alamosénsis*, Coult.). Upright, columnar, about 4 ft. high by 2 in. diam.: ribs 7–9; spines numerous, stout; central spines usually 4: fls. from the upper areoles, funnelform, about 1½ in. long, red. W. Mex.

R. sonorénsis, Brit. & Rose, and *R. Kérberi*, Brit. & Rose, are sometimes confused with the above, and may be handled under this name in the trade.

J. N. ROSE.

RAUWÓLFIA (named for Leonhart Rauwolf, a physician of Augsburg in the sixteenth century). *Apocynàceæ.* Trees or shrubs, mostly glabrous, sparingly grown, suitable for the warmhouse and outdoor planting in the far southern parts of the United States.

Leaves opposite or verticillate, those of a whorl often very unequal: infl. terminal or pseudo-axillary, peduncled, few- or many-fld., compound, umbelliform or corymbose, rarely racemose; fls. small; sepals 5, almost free or united into a flat 5-toothed cup; corolla salver-shaped, lobes 5, twisted and overlapping to the left; disk annular or cup-shaped, entire or slightly lobed; carpels 2, free or more or less coherent: drupes 2, distinct or somewhat united.—About 60 species from the tropics of both hemispheres.

chinénsis, Hemsl. A small evergreen shrub, with dark green lvs., white fls. which are borne in dense terminal trusses, and numerous red berries. China.—Intro. into Orange Co., Fla., as an ornamental, where it is semi-hardy, but always sends up strong new shoots in the spring. Requires a light rich soil and plenty of water, with some protection against the sun. Each spring, it should receive fresh rich compost.

pleiosciádica, K. Schum. A shrub or small tree, up to 20 ft. high: lvs. in whorls of 3 or 4, lanceolate to elliptic, 3–7 in. long: fls. in cymes, arranged in umbels, white; corolla-tube 3–3½ in. long. Trop. Afr.

F. TRACY HUBBARD.

RAVENÀLA (the name of the plant in Madagascar). *Musàceæ.* Musa-like plants becoming 20 to 30 feet high, with a palm-like trunk, cultivated for ornamental uses.

Leaves exceedingly large, crowded in 2 ranks, thus forming a fan-shaped head of foliage; petioles long, with concave bases scarcely sheathed: scapes or peduncles in the upper axils longer or shorter than the lvs.: bracts spathe-like, many, boat-shaped, acuminate: fls. many, large, in a spathe or bract; petals long-exserted; sepals free: fr. a 3-valved caps.—A genus of 2 species, 1 from Madagascar and the other from Brazil and Guiana.

A. *Lvs. shorter than petioles.*

madagascariénsis, J. F. Gmel. TRAVELERS' TREE, so called from the clear watery sap in the large box-like cells of the lf.-stalks or caught in the lf.-sheaths, and which affords a refreshing drink. Fig. 3358. Lvs. often 30 ft. high, very large, fibrous: fls. white, in spathes about 7 in. long. Gng. 5:153. V. 23, p. 136. F.S. 21:2254. A.F. 12:535. R.H. 1890, p. 152. G.C. III. 2:693; 50:460. A.G. 20:870.—Cult. in Fla. and S.

3357. Shaffer raspberry.—Rubus neglectus. (×¼)

Calif.; also rarely under glass in the northern states. It is said that in S. Calif. the traveler's tree was never really successful.

aa. *Lvs. as long as the petioles.*

guyanénsis, Steud. Becoming 15 ft. high: lvs. oval-elongated: fls. white; spathes 1–1½ ft. long.—Offered 1893 in S. Fla. F. W. Barclay.

RAVÈNIA (name not explained). *Rutàceæ.* Tender glabrous shrubs suitable for the warmhouse.

Leaves opposite, 1–3-foliolate; lfts. lanceolate, entire: fls. red or white, borne on rather long axillary peduncles; sepals unequal, the 2 outer being somewhat foliaceous; corolla-tube straight, rather long; the limb nearly regular.—Two species from Cuba and Brazil.

spectábilis, Griseb. (*Lemònia spectábilis,* Lindl.). Tender shrub: lfts. 3: fls. purplish red, about 1 in. across, solitary or in open, few-fld. clusters on axillary peduncles as long as the lvs. Cuba. B.R. 26:59. R.H. 1844:25.—The plant once offered in Fla. as *Lemonia spectabilis* apparently is of some other genus. F. W. Barclay.

REBÙTIA (named for Rebut). *Cactàceæ.* Plants very small, globular, covered with small tubercles, resembling in habit very much a mammillaria: fl. appearing from the side and even the base of plant, large in comparison with the plant, red or orange-colored, with slender, funnelform tube; bracts on ovary small, naked in their axils: fr. a small berry.—Originally described with 1 species, but a study of S. American material indicates that there may be 5 or 6 other species to be transferred here from other genera. The original species has been referred both to Echinopsis and Echinocactus, from both of which it is abundantly distinct.

minúscula, Schum. Plants globose, 1–2 in. diam., covered with low tubercles: spines in clusters of 25–30, 1–1½ lines long: fls. often numerous, arising from near the base of plant, 1–1¼ in. long, bright crimson. N. Argentina. B.M. 8583 (as Echinocactus).

Fiebrigii, Brit. & Rose (*Echinocáctus Fiebrigii,* Gürke). Globose, depressed at apex, 2 in. diam.: spines 30–40 in a cluster, ½in. long, white, or some of the longest ones nearly 1 in. long with brownish tips: fls. nearly 1 in. long. Bolivia. Blühende Kakteen, pl. 109. J. N. Rose.

RED BAY: *Persea Borbonia.* **Red-Bud:** *Cercis.* **Red Campion:** *Lychnis dioica.* **Red Cedar:** *Juniperus virginiana.* **Redhead:** *Asclepias curassavica.* **Red-hot Poker Plant:** *Kniphofia.* **Red Morocco:** *Adonis autumnalis.* **Red Osier:** *Cornus stolonifera.* **Red Pepper:** *Capsicum.* **Red Robin:** *Geranium Robertianum.* **Red-root:** *Ceanothus americanus; Lachnanthes.* **Red-Spider:** See *Diseases and Insects.* **Redtop:** *Agrostis.* **Redwood:** *Sequoia;* also *Ceanothus, Pterocarpus.*

REED: *Arundo* and *Bamboo.* **R. Canary-Grass:** *Phalaris arundinacea.* **R., Indian:** *Canna.* **R. Mace,** or **Cat-tail:** *Typha.*

REEVÈSIA (after John Reeves, an English resident of Canton, China, who introduced many Chinese plants into England). *Sterculiàceæ.* A genus of 3 species in China and Himalayas. Evergreen trees with alternate, simple, entire lvs. 3-nerved at the base and with white or pink fls. in dense terminal corymbs: calyx funnelform-campanulate, 4–5-toothed; petals 5, clawed; stamens adnate to the long gynophore, much exceeding the petals, 15, forming a globose head; ovary 5-lobed; stigma sessile: caps. large, woody, septicidally 5-valved, seeds 2 in each cell, compressed, winged. Little known in cult. and adapted only for warmer temperate regions. Prop. probably by cuttings from half-ripened wood.

R. thyrsoídea, Lindl. Evergreen shrub: lvs. ovate-oblong to oblong-lanceolate, glabrous, 2–5 in. long: fls. creamy white, ½in. across; gynophore ½–¾ in. long. China. B.R. 1236. B.M. 4199. F.S. 3:206. **R. pubéscens,** Mast. Similar to the preceding: lvs. ovate to ovate-oblong, subcordate to broadly cuneate at the base, brownish tomentose beneath, 3–5 in. long: fls. somewhat larger, pink; gynophore 1 in. long. E. Himalaya, S. W. China. Recently intro.

Alfred Rehder.

REHMÁNNIA (Jos. Rehmann, 1779–1831). *Scrophulariàceæ.* Perennial viscous-villous herbs suitable for the cool greenhouse, grown for the showy bloom.

Stems leafy, branched from the base, either low, scapiform and almost leafless, or (especially in cult.) tall and few-lvd.: lvs. alternate, obovate or oblong, coarsely

3358. Traveler's tree.—Ravenala madagascariensis.

dentate: fls. rather large, borne in terminal racemes and short-pedicelled, brownish purple or pale, the throat intensely colored; calyx ovoid-campanulate, 5-cleft at the top; corolla pilose, slightly incurved, tube rather broadly subventricose, limb obliquely 2-lobed, the lobes spread, the rear or inner one deeply 2-cleft, the front one 3-cleft; stamens 4: caps. broad, partly included in the calyx; seeds numerous.—About 5 species, China and Japan.

angulàta, Hemsl. Perennial plant, 1–3 ft. high, glandular-hairy: lvs. pinnately lobed, each side of lf. having either very many marginal teeth, or, if there are a few lobes or large teeth, by these being again toothed; the bracts broadly and abruptly cuneate at the base which is wider than any other part of the blade: corolla smaller than *R. elata,* red with a band of scarlet at the margin of the upper lip and has orange dots inside the lower lip. China. G.C. III. 33:296; 47:104. G. 25:171; 28:211. Gn. 63, p. 317. G.M. 46:290; 51:745. Gn. W. 21:117. Gt. 55:1547. G.W. 9, p. 114; 11, p. 488; 12, p. 362. J.H. III. 46:422; 71:11. R.H. 1905:586. F.S.R. 2:280. F.E. 20:526.—Many of these illustrations are probably of *R. elata.*

Var. **tigrina,** Hort., is said to be a garden hybrid of which *R. angulata* is one of the parents: fls. marked. An interesting form.

Var. **trícolor,** Hort. Fls. at first bright purple, later almost violet-rose, the upper lip shaded with vermilion and the throat whitish, spotted with purple. China.

Bríscœi, Hort. (*R. elàta* × *R. Hénryi*). Intermediate in most characters, dwarfer than the former in having an erect infl. instead of a condensed one: the fls. are intermediate in color and of a soft pink: the lvs. arranged in a rosette are similar in shape to those of *R.*

3359. Rehmannia elata. (×⅓)

Henryi and have the same dark veinings, while they are much more velvety-hairy than those of *R. elata* but less so than those of *R. Henryi*. A garden hybrid. G.C. III. 47:188.

elàta, N. E. Br. (*R. angulàta,* Hort. not Hemsl.). Fig. 3359. Twice as large as *R. angulata:* lvs. 2–6-lobed on each side, lobes acute, entire; bracts or flowering lvs. long-cuneate at base: corolla slightly larger than *R. angulata,* bright rosy purple on the lips and yellow dotted red in the throat. China. B.M. 8177 (as *R. angulata*).

glutinòsa, Libosch. (*R. chinénsis,* Fisch. & Mey.). Plant pubescent-hirsute: st. 6–12 in. high, erect and weak: lvs. alternate, obovate, attenuate to a short petiole, remotely and coarsely serrate: fls. axillary and solitary, large, yellowish buff or purplish, purple at the throat and purple-veined; calyx-tube oval, inflated, 5-parted, segms. recurved, ovate; corolla hairy, limb 2-lipped. China. B.M. 3653. B.R. 1960. F.S. 11:1134. G. 28:210.

Hénryi, N. E. Br. (*R. Piasézkii,* Hemsl., not Maxim.). Perennial herb, 6–18 in. high, glandular-hairy: lowest lvs. 3–7 in. long, elliptic-oblong, obtuse, base narrowed to the petiole, crenately toothed, or more or less pinnately lobed and obtusely dentate: fls. axillary; calyx ascending, never nodding, campanulate, lobes spreading, deltoid or deltoid-ovate, obtuse; corolla-tube 1¾–2 in. long, pubescent outside, dirty yellow spotted red, limb oblique, 2-lipped, white and pubescent, yellow, red-dotted at the throat, upper lip 2-lobed, lower 3-lobed, all the lobes rounded; ovary ovoid, glabrous. China. B.M. 8302. G.C. III. 47:189. G. 31:343. R.H. 1910, p. 571.

kewénsis, Hort. (*R. Hénryi* × *R. glutinòsa*). Sts. leafy, about 2 ft. high: lvs. petioled, ovate, glossy green, irregularly dentate: fls. 2 in. long, 1½ in. across, the corolla-segms. broad, almost square in outline and toothed, creamy yellow with a dark crimson blotch on the upper segms. A garden hybrid. G.C. III. 51:218. Gn. 76, p. 296. G.M. 55:485. J.H. III. 66:469.

F. Tracy Hubbard.

RÈIDIA: *Phyllanthus.*

REINÉCKIA (J. Reinecke, a German gardener). *Liliàceæ.* A tender perennial herb, with attractive foliage in tufts 1–1½ ft. high from a thick, creeping rootstock: lvs. rather long, channeled: scapes leafless: fls. sessile, in a loose spike; perianth-tube cylindrical; lobes recurved, spreading; ovary 3-loculed, with a few seeds to each cell: berry globular, usually with 1 seed to each cell. A single species from China and Japan. The following is procurable from Dutch bulb-growers.

B. cárnea, Kunth. Fls. dull flesh or pink: bracts rather large, tinted red: fr. red, 3–4 lines diam. Var. **variegàta,** Hort., is also offered. I.H. 9:323.

REIN ORCHIS: *Habenaria.*

REINWÁRDTIA (named in honor of Kaspar Georg Karl Reinwardt, 1773–1822, scientist of Leyden). *Linàceæ.* Subshrubs, sometimes nearly shrubs, suitable for the warmhouse.

Leaves alternate, entire or crenate-serrate; stipules minute, subulate, caducous: fls. yellow, in axillary and terminal cymose fascicles, rarely solitary; sepals 5, entire, lanceolate, acuminate; petals 5, contorted, fugacious, much longer than the sepals; stamens 5; ovary 3–5-celled: caps. globose, splitting into 6–8 cocci. —Two species, India. The genus is closely allied to the flax (Linum), and *Reinwardtia trigyna* is known to this day as *Linum trigynum* by the gardeners, who usually accent trigynum on the second syllable instead of the first. Reinwardtia is distinguished from Linum by the yellow fls., 3–4 styles and unequal or deficient glands; Linum has mostly blue, rosy or white fls., 5 styles, and equal glands.

Reinwardtias are showy subshrubs about a foot high with bright yellow flowers. They are useful for the decoration of the conservatory in winter time, at a season when yellow is scarce. To have presentable plants, it is necessary to give them a good deal of attention. It is difficult sometimes to get suitable cuttings; the strong growths which start away from the base when the plants are cut down make the best plants. Top-shoots will grow, but seldom make good plants, as they are liable to go to bloom prematurely. Sandy loam is the best compost. Plants that have been grown in pots for

3360. Reinwardtia trigyna. (×⅓)

a season may be planted out in early summer, and these will make good plants and furnish cuttings. They will have to be topped frequently and carefully lifted. Young stock is better kept in pots, as the plants do not lift well. Sunshine is essential during the winter season to get the best development of reinwardtias. They thrive best in a temperature of 55–60°. (T. D. Hatfield.)

A. *Lvs. entire: styles 3.*

trígyna, Planch. (*R. índica,* Dum. *Lìnum trígynum,* Roxbg.). Fig. 3360. Lvs. elliptic-obovate, entire or minutely toothed, tip rounded or subacute. B. M. 1100. Gn. 29, p. 279. G. 6:611; 10:344; 32:101. G.W. 2, p. 297. H.F. II. 6:136. J.H. III. 54:507.—Grows 2–3 ft. high in the wild.

AA. *Lvs. toothed: styles 4 or 3.*

tetrágyna, Planch. Lvs. elliptic-lanceolate, acuminate, crenate-serrate. B.M. 7136. G.C. III. 16:721. R.H. 1867:292. Gn. 61, p. 108. WILHELM MILLER.
F. TRACY HUBBARD.†

REMUSÀTIA (named for G. P. A. Remusat, 1785–1832). *Aràceæ.* Tuberous herbs, flowering and leafing in alternate years, and bearing long radical bulbiferous shoots; warmhouse foliage plants. Lf. solitary, entire, peltate: spathe coriaceous, tube convolute, ovoid, limb broad or narrow, deciduous; spadix very short, sessile, male and female infl. separated by neuters, appendage none; male infl. clavate, female short and cylindric; ovaries ovoid, 1-celled: berries small.—Three or 4 species, natives of the mountains of India and Java.

vivípara, Schott. Tuber the size of a hazel or walnut; bulbiferous shoots very stout, suberect or ascending, simple or very shortly branched: lf. 5 x 3½–18 x 12 in., membranous, orbicular, ovate or cordate, acute or acuminate; petiole 1 ft. or less long: spathe 4–5 in. long, tube green, limb broadly orbicular-obovate, cuspidate, 2–3 in. broad, golden yellow; spadix 1–1½ in. long. India and Java.

RENANTHÈRA (named from the reniform anther). *Orchidàceæ.* Tall climbing epiphytes.

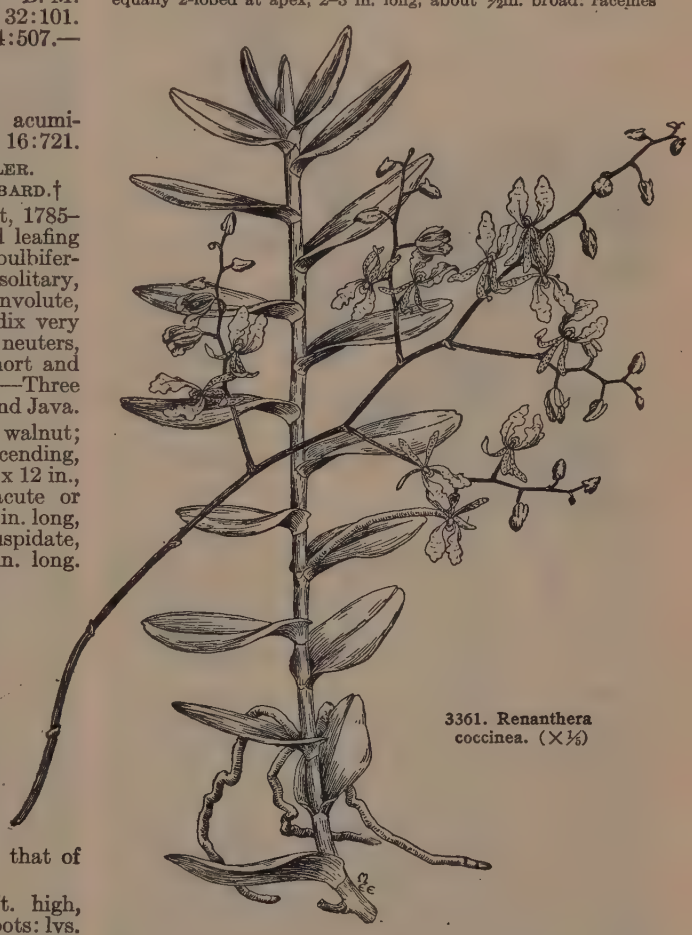
Stems branched, sometimes 12–14 ft. high: lvs. distichous on the st.: fls. in large, drooping racemes or panicles; sepals and petals spreading, similar or the lateral sepals often larger and of a different color; labellum small, movably joined to the column, spurred or spurless, often with small, erect, lateral lobes. —About 15 or more species, in Malay Archipelago and Cochin-China. Cult. is similar to that of Aërides and Vanda.

coccínea, Lour. Fig. 3361. Sts. 8–10 ft. high, branched, climbing by means of white fleshy roots: lvs. in 2 rows, oblong, notched at the end, 4–5 in. long: fls. open, 2–3 in. across, in loose, branching racemes 2–3 ft. long, very brilliant; petals and dorsal sepal linear-spatulate, deep red, blotched with orange; lateral sepals larger, oblong, broader toward the apex, undulate, deep crimson, with palertrans verse lines; labellum small. Autumn. Cochin-China. B.M. 2997, 2998. B.R. 1131. P.M. 4:49. F.S. 7, p. 163. G.C. 1845:491. —Does not flower readily in cult., but is very showy.

Stòriei, Reichb. f. St. slender, climbing, 10–12 ft. high: lvs. alternate, oblong to linear-oblong: panicle about 1 ft. long and nearly as broad; fls. 2½–3 in. long; petals and dorsal sepal erect, linear-spatulate, orange-red, mottled with crimson; lateral sepals pendulous, obovate-spatulate, undulate, crimson with large blood-red blotches; labellum very small. Philippines. B.M. 7537. Gn. 53, p. 119. G.M. 39:659.

Lòwei, Reichb. f. (*Vánda Lòwei,* Lindl.). Fig. 3362. Sts. very long, climbing, somewhat branched: lvs. rather crowded, strap-shaped, 2–3 ft. long: racemes from the upper axils, 6–12 ft. long, bearing 40–50 fls.; fls. of two kinds, the lowest pair tawny yellow with crimson spots, the others larger, pale yellowish green, irregularly blotched with reddish brown; sepals and petals lanceolate, acute, undulate, on the lowest pair shorter, blunter, and more fleshy. Borneo. B.M. 5475. I.H. 11:417. R.H. 1868:110; 1884, p. 343. F.S. 21:2256. Gt. 37, pp. 108, 109. Gn. 11, p. 524; 16, pp. 354, 355; 32, p. 197. G.C. II. 20:657; III. 27:3.—A very remarkable orchid.

R. annaménsis, Rolfe. Dwarf, erect, up to 1 ft. tall: lvs. unequally 2-lobed at apex, 2–3 in. long, about ½in. broad: racemes



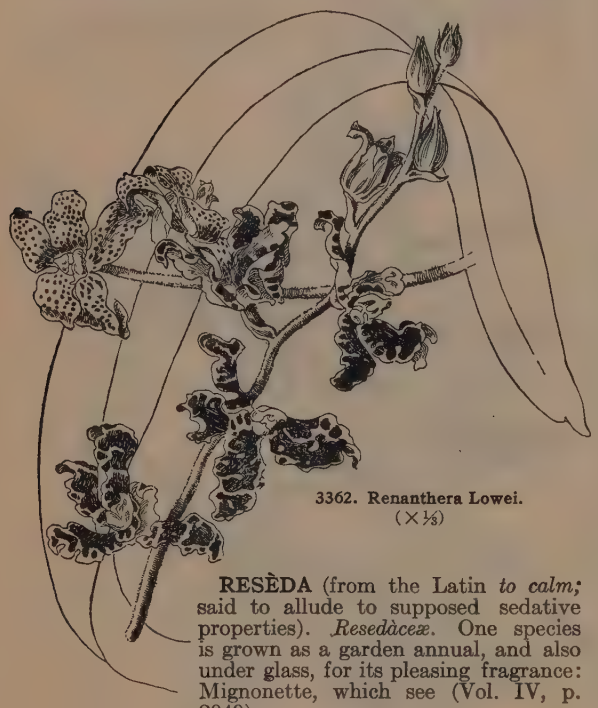
3361. Renanthera coccinea. (×⅛)

many-fld.; fls. yellow, crimson-spotted on the sepals, spur and base of petals, the last also with an apical deep crimson spot; dorsal sepal oblong, obtuse, ½in. long, the lateral spatulate, ¾in. long; petals obtuse, ¼in. long; lip 3-lobed, ¼in. long, the lobes crimson. Annam. B.M. 8116.—*R. Imschootiàna,* Rolfe. Sts. 1 ft. long: lvs. linear-oblong, 2–4 in. long, 1 in. wide: infl. a raceme or panicle, up to 1 ft. long, the rachis, branches and pedicels bright red; dorsal sepal linear-oblong, obtuse, dull yellow, ¾in. long, lateral 1½ in. long, clawed, oval, cinnabar-red above, ochre beneath; petals a little shorter than dorsal sepal, narrowly spatulate, yellow, spotted blood-red; lip minute, 3-lobed. Assam. B.M. 7711. Gn.W. 11:809. O. 1910, p. 24.—*R. matutìna,* Lindl. St. 2–3 ft.: lvs. linear-oblong, 4–6 in. long: fls. numerous, reddish crimson, toned yellow, and becoming orange-yellow when old; sepals and petals similar, linear, acute; lip saccate, subcylindric. Java. R.B. 31:252.—*R. pulchélla,* Rolfe. Resembling R. Imschootiana, but fls. only about half the size, yellow, with side lobes of lip and upper half of petals crimson. Burma.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

RENEÁLMIA (in honor of Paul Reneaulme, a French botanist). *Zingiberàceæ.* Perennial aromatic herbs, suitable for cult. in the warmhouse or outdoors in the extreme S.: rootstock fleshy: sts. leafy: lvs. more or less long-petioled or sessile, lanceolate or oblong: infl.

terminal or scapose and either paniculate or racemose; fls. white, yellow or red; calyx short, 3-lobed; corolla short-tubed, the lobes erect or finally spreading, subequal or the posterior broader and concave; ovary 3-celled: caps. globose. About 60 species, Trop. Amer. and a few in Trop. Afr. *R. exaltàta*, Linn. f., is recently intro. as a dye-plant; also ornamental, with reddish peduncles and bracts, and yellow fls.: lvs. like a canna: the fleshy hulls of fr. yield dye and ink. W. Indies.



3362. Renanthera Lowei. (×⅛)

RESÈDA (from the Latin *to calm;* said to allude to supposed sedative properties). *Resedàceæ*. One species is grown as a garden annual, and also under glass, for its pleasing fragrance: Mignonette, which see (Vol. IV, p. 2049).

Herbs (sometimes partially woody at the base) with alternate, simple or compound lvs., and terminal spikes of inconspicuous perfect fls., which have 4–7 small greenish toothed or cleft unequal petals and 8–40 small stamens attached on one side of the fl.: pistil 1, ripening into a 3–6-horned or -angled cap. that opens at the top at maturity (Fig. 3363), and contains several to many seeds. Only one species, the common mignonette (*R. odorata*), is generally known, but two or three other species are sometimes grown. Two other species are occasional weeds in the East,—*R. Luteola*, Linn., the dyer's weed (formerly used as yellow dye), 1–2 ft. tall, with entire lvs., 4 or 5 greenish petals of which the lowest one is entire; and *R. lutea*, Linn., with pinnatifid lvs. and petals usually 6; and two or three of the perennial species are more or less recommended as border plants. This genus contains 50–60 species, most of which are native to the Medit. basin, Arabia and Persia.

A. *Lvs. entire or only notched.*

odoràta, Linn. Common Mignonette. Fig. 3363; also 2372, p. 2049. Branching annual herb, at first upright but becoming wide-spreading and more or less decumbent: lvs. spatulate or oblanceolate, mostly obtuse, usually entire but sometimes notched: fls. yellowish white, in spicate racemes that become loose and open with age, very fragrant. N. Afr. B.M. 29. Gn. 55, p. 409.—Much grown for its strong and agreeable fragrance. It has been greatly modified under domestication. The following garden names seem to belong to this species: *arborea, ameliorata, compacta, eximia, gigantea, grandiflora, pyramidalis, multiflora, pumila;* they represent stature-forms and habit-forms of the horticulturists. Var. **suffruticòsa,** Edw., is woody at the base. B.R. 227. Many named varieties of *R. odorata* are in the trade. See *Mignonette.*

glaùca, Linn. Glabrous and somewhat glaucous perennial, less than 1 ft. tall, with many spreading sts.: lvs. narrow-linear, entire, or 2-toothed near the base: petals 5 or 6, the upper ones 3-lobed; stamens about 14. Pyrenees.—Recommended for dry places, as a border plant. See p. 1467.

AA. *Lvs. usually prominently lobed or pinnatifid.*

álba, Linn. White Upright Mignonette. Straight-growing erect glabrous annual or biennial, 1–3 ft., weedy: lvs. numerous, long-stalked, deeply and irregularly pinnatifid, the segms. usually linear and sometimes toothed: fls. greenish white, in a very long slender spike; stamens about a dozen, and petals 5–6. S. Eu. G.C. III. 20:45. G.W. 8, p. 255.—A commendable plant for growing as an ornamental subject in the fl.-border with other plants. It bears many spikes on tall branches, making it a conspicuous plant; treated as a half-hardy annual; odor not pleasing. It occurs somewhat in this country as an adventive plant.

crystállina, Webb. Glabrous, sparingly branched, somewhat glaucous annual: lvs. usually 3-parted, or the lowest ones entire: fls. deep yellow, in racemes. Canary Isls.—Has been offered as a garden annual.

L. H. B.

RÉSTIO (Latin, *rope,* alluding to the use made of the plants in S. Afr.). *Restiàceæ*. Perennial herbs with a tufted or creeping rootstock, of little horticultural significance: sts. terete, compressed or 4-sided, with remote sheathing lf.-sheaths, usually more or less mucronate, sometimes prolonged into a linear blunt lf.: male and female infl. similar or dissimilar, spicate, spikes solitary or spikelets numerous in spicate or panicled cymes; fls. dicœcious, 1-bracteate; perianth usually of 6, sometimes 4 segms. in 2 rows, rarely none; ovary 2- or 3-celled: caps. 2- or 3-celled, or by abortion 1-celled, 1 seed in each cell. About 170 species, half of them from S. W. Afr. the remainder from S. W. Austral. *R. subverticillàtus*, Mast. Sts. erect, 3–4 ft. high. with verticillate branches: sheaths about 1 in. long, coriaceous, striate above, membranous, spreading, acuminate, smaller sheaths foliaceous from beneath a 2-lobed hyaline apex: perianth-segms., male, broadly oblong, the lateral villous-keeled, female broader: caps. obliquely ovate, 1-celled, 1-seeded. S. Afr. G.M. 43:76.

REST-PERIOD IN PLANTS. The rest-period of plants is that period or stage when the part or parts at inaction are incapable of responding to favorable growing conditions. A rest-period of some length, either short or long, appears to be universal with all perennial plant forms. So far as known, none has a continuous growth. Trees and shrubs growing in the open, both in cold and warm climates of the temperate zone, may begin to enter the rest-period in some of their branches as early as midsummer. This is indicated by cessation of length growth and formation of terminal buds. Some may be ready to grow again in a few weeks, while others are unable to grow for five or six months. Herbaceous perennials begin their rest after dying down in summer or fall. The death of the aërial parts is accompanied by the formation of strong crown-buds. They are usually ready to resume growth within a few days or weeks, although there are notable

3363. Pod of Reseda odorata. (×2)

exceptions. Bulbs begin their rest when the tops die down after flowering. Many will not grow again for several months. Many seeds germinate poorly, or not at all, if planted immediately or shortly after ripening. Failure to grow is usually due to the influence of a rest-period. However, aside from the effects of a rest-period, seeds may fail to germinate promptly or at all on account of a hard or tough seed-coat which is more or less impervious to water. In garden practice, seeds are stored for a few weeks or months before planting in order that they may pass through a period of "after-ripening." Those with hard or tough seed-coats are stored by stratifying in moist sand.

Investigation has shown that practically all woody plants native to the temperate zone have a rest-period. Many of these are unable to grow in late fall or early winter, even when transferred to a warm moist greenhouse. In trees and shrubs the rest-period begins to set in as early as midsummer. The length of the rest varies greatly. In some cases it may last only a few days or weeks, while in others it may persist from three to six months. Red raspberries, mountain-ash, and spireas are almost free from a rest-period, while white oak, tulip tree, and American beech commonly rest for six or seven months. Among herbaceous perennials, the lily-of-the-valley is conspicuous for its rather long rest-period which usually lasts for two or three months. Asparagus, rhubarb, hardy chrysanthemum, golden marguerite, calliopsis, and a host of others are ready to grow again in a week or two after the old plants die down. All spring-flowering bulbs appear to have a distinct rest-period lasting from three to five months. From 50 to 75 per cent of the seeds of herbaceous plants, annual and perennial, have a rest-period, while the resting phase is noticeable and generally very distinct in fully 90 per cent of the seeds of trees and shrubs.

The rest-period is commonly looked upon as the period of dormancy in plants and seeds, but this view is incorrect. The rest-period of trees, for example, begins and ends entirely independent of the winter season. While cold weather may prevent growth from taking place, it does not necessarily prevent the rest-period from coming to an end and thus leaving the trees ready to grow as soon as surrounding conditions are favorable. In mild climates the rest begins and ends with great regularity. The same is true in cold climates, but in the case of trees, at least, the true condition of affairs is not apparent on account of the interference of the cold which prevents growth. In trees the rest sets in gradually twig by twig and is not complete until all the growing points have ceased elongating and formed terminal buds. In like manner the trees pass out of their resting state gradually, some twigs often being ready to grow much earlier than others. These phenomena are very noticeable when trees are grown under glass.

The rest-period of many trees and shrubs may be broken or greatly shortened by special treatments. Those with a long rest-period are very difficult to arouse during the early stages of their rest. The greater part can be forced with comparative ease during the middle period of their rest and to some extent during the latter phases, although at this time the treatments must be less severe or the plants may be killed. The agents most generally used for forcing growth are ether, drying, and freezing. Submerging in warm water will sometimes start growth, particularly in dormant twigs. Twigs of flowering shrubs, such as lilac, deutzia, spirea, and golden-bell, may be caused to burst into bloom in early or midwinter by placing them in a tight vessel and pouring in ether at the rate of one teaspoonful to each two gallons of space. Allow the plants to remain in the ether vapor for twenty-four hours, when they should be taken out and stood in vessels of water in a warm moist room. It is very necessary to have the air moist to keep the buds from drying out before they begin to grow. Potted plants of all kinds, both woody and herbaceous, may be similarly treated, provided the surface of the soil in the pots is dry, as moist or wet soil will absorb too much of the ether. Many herbaceous plants do not respond to the ether treatment and some are killed. The best treatment for forcing hardy herbaceous perennials is to lift them in the fall, subject them to a temperature a few degrees below freezing for twelve to twenty-four hours, and then place them in a mild hotbed. By mid- or late winter most plants may be forced with heat alone. There are perhaps thirty or forty different agents that have been successfully used for forcing plants.

Of just what value the rest-period is to the different plants and plant parts is not known. It is highly probable, however, that the period of inactivity is utilized for the conservation of energy through the special work the enzymes are able to perform while the growing parts are dormant, that they could not do in the presence of active growth.

The cause of the rest-period and the specific effects of the rest-period-breaking agents on the plant organism have been carefully studied only in connection with woody plants. It has been thought that the rest-period in trees sets in on account of the inhibition of enzyme activity due to an over-accumulation of the products of their work. The early phases of the rest-period occur and are passed through while the plants are in full leaf and often while some of the parts are still making active growth. The parts to enter the resting state first, in fruit-trees particularly, are the so-called spurs which are short lateral outgrowths usually arising from wood that grew the previous year. These cease growing early in the season, probably because of imperfect sap circulation. The crude sap from the roots rises most rapidly in those branches and twigs that are nearest in a straight line upward from the ground. It would appear then that the spurs, on account of their position, are deprived of water very early in the growing season. Assimilation goes forward rapidly in those parts that first approach a state of maturity. With a decreased water-supply and a greatly increased deposition or accumulation of carbohydrates, enzyme activity is soon checked if not entirely inhibited. As the season advances, the approach of cool weather may hasten the period of dormancy, but the trees would go dormant just the same, although later, in a mild climate or under glass. It is thus seen that the rest-period of trees is gradual, beginning in the spurs and gradually involving all of the branches.

Briefly, the rest-period perhaps begins to set in on account of the inhibition of the enzymes by the over-accumulation of the products of their work. This is the early rest of mid- or late summer. In the fall, excess supplies of carbohydrates continue to be accumulated and, with trees growing in the open, the further inhibition of the enzymes is actively aided by the approach of cool weather. These factors acting together bring about the main or middle state of rest. However, since dormant trees are never completely at rest, respiration continuing all the time, and doubtless enzyme activity too, the over-accumulation of carbohydrates is gradually reduced. Toward the last of this period occurs the after-rest, which, as the enzymes become more and more active, gives place to the beginning of growth.

Research has shown that diastatic, proteolytic, fat-splitting, and oxidizing enzymes all play a prominent part in bringing about, as well as ending, the rest-period in woody plants. Any forces or agents that will reduce the activity of these ferments will be the means of causing the rest-period to set in and, similarly, any agent that will stimulate the enzymes into activity will be the means of bringing the rest-period to an end. (See Research Bulletins Nos. 1, 15, 16, 17, 21, Missouri Agricultural Experiment Station.) W. L. Howard.

RESTRÈPIA (Joseph Emanuel Restrep, a student of natural history in the tropics). *Orchidàceæ*. Very interesting little plants, allied to Masdevallia and not unlike that genus in habit and appearance.

Stems tufted on creeping rhizomes, each bearing a single lf. and clothed below with scales; fl.-sts. appear from the axil of the lvs.: perennial, producing fls. for several years in succession: dorsal sepal free, ending in a filiform, clavate tail; lateral sepals united into a broad blade, bifid only at the apex; petals like the dorsal sepal, but smaller; labellum oblong or ovate, often with 2 small teeth near the base.—About 40 species, from Brazil to Mex., few of which are cult. for their curious fls. They are easily grown at a temperature suited for cool odontoglossums (40–55°). They thrive well planted in a mixture of peat and sphagnum in baskets, which are usually suspended near the glass. They have no definite resting period, but do not require so large a quantity of water in winter as during their most active growth. Pot moderately firm, and rest in a coolhouse.

antennífera, HBK. Sts. slender, clustered, 4–6 in. high, clothed with imbricated scales, and bearing one (rarely more) ovate-cordate petioled lf.: peduncle from the axil of the lf., slender, 1-fld.: dorsal sepal 1½ in. long, lanceolate, tapering into a slender clavate tail, yellow, with purple lines and a purple tip; lateral sepals united into an oblong blade 2-lobed at the tip, yellow, marked with red-purple dots; petals small, antenna-like, purple at the tip. Nov.–Feb. Colombia, Venezuela. B.M. 6288; 7930. I.H. 16:601. A.F. 6:631.

Dayàna, Reichb. f. A small plant growing in dense tufts: lvs. roundish, acute, cordate: dorsal sepal and petals filiform, clavate, shining, violet-brown; lower sepals united into a broad, bifid blade, yellow and brown. Costa Rica.

élegans, Karst. Tufted, epiphytic, 2–3 in. high: lvs. 1–1½ in. long, elliptic: peduncles usually in pairs: fls. 1½–2 in. long; dorsal sepal erect, lanceolate, white, streaked purple, with a tail as long as itself, which is clubbed at the tip and yellow; lateral sepals connate into an oblong, emarginate, concave blade, yellow, spotted purple; petals like the dorsal sepal, but spreading and only half the size; lip half the size of the connate lateral sepals and of the same color but edged with red. Venezuela. B.M. 5966. F.S. 7:743.

R. aspasicénsium, Reichb. f. Only 2–3 in. high: fls. small, deep yellow, densely spotted with crimson or chocolate-brown. Venezuela.

HEINRICH HASSELBRING.

RESURRECTION PLANTS are such plants as "come to life" after being apparently dead. They are kept in a dried state as curiosities, to be "resurrected" on occasion, and sometimes they are grown for a similar purpose but they are scarcely horticultural subjects.

3364. Rose of Jericho in the dry state.

The commonest resurrection plants are members of the mustard family and the club moss family. Others are Asteriscus, a composite, and Mesembryanthemum, of the fig-marigold family. Many plants can be similarly revived from the dried state, particularly those of desert regions.

1. The rose of Jericho is properly *Anastatica hierochuntica,* Linn., which name means "resurrection plant from Jericho." The plant is a native of the sandy deserts from Arabia and Syria to Algeria. It is an annual and grows about 6 inches high. Soon after flowering the leaves fall and the branches become woody and roll up into a ball, reminding one of wickerwork or lattice. (Fig. 3364.) Inside the ball are the seeds, or, in botanical language, the fruits, which are borne in a protected position near the tips or on the sides of the inrolled branches. (Fig. 3365.) The plants are up-rooted by the winds and are blown about on the deserts. These balls were thought by many to be "the rolling thing before the whirlwind" mentioned in Isaiah, and were brought to Europe by the crusaders. The shape of these balls might be fancifully compared to that of an unopened rose. When the winter rains descend or when the balls are blown into the Mediterranean the branches at once open back and stretch out straight, the fruits open, and the seeds germinate very quickly, "often in the fruit," according to Warming. The dead plants do not, of course, "come to life," but they retain their hygroscopic properties for many years.

3365. Rose of Jericho as it opens after being moistened.

Botanically, Anastatica is distinct by reason of its short and broad fruit or silicle, which has two ear-like appendages at the top. The silicle is divided by a transverse partition into two cells, each of which contains a seed. There is only one species. The genus belongs to the Arabis tribe of the Cruciferæ, but is exceptional in not having a long slender silicle. The growing plant has obovate leaves, the lower ones entire, upper ones toothed, and the flowers are small, white, and borne in spikes in midsummer. Excellent pictures of resurrection plants may be found in Kerner & Oliver's "Natural History of Plants," together with accounts of the behavior of the various kinds. See also B.M. 4400, G.C. 1872:1068, Gn. 4, p. 111. These plants have much folk-lore.

2. The bird's-nest moss, *Selaginella lepidophylla,* is a native of Mexico and reaches into western Texas. Many selaginellas curl up if allowed to dry, and several of the Mexican species do so in their native places in the dry season, but this species is said to make a tighter mass than any other. When placed in lukewarm water the fronds loosen and roll back into a flat or saucer-like position. The plant may become green and grow, and it is also said that it may be dried and revived an indefinite number of times. The specimen shown in Figs. 3366, 3367 was "resurrected" four times after it came into the hands of the Editor, and showed no indications of a limit to its reviving possibilities. Selaginellas are beautiful moss-like plants. What appear to be the leaves are really the branches, and the true leaves are scale-like. See Gn. 17, p. 400; F. 1871, p. 144; also *Selaginella.*

3. A member of the composite family (*Odontospermum pygmæum,* or *Asteriscus pygmæus*) is also called rose of Jericho, has the same range as No. 1, and was also brought to Europe by the crusaders. (Fig. 3368.) The branches do not roll up, but the involucre closes over the head of fruit in the dry season, and is loosened by moisture when the seeds escape.

3366. Selaginella lepidophylla, one of the resurrection plants. (×½)

4. Several species of Mesembryanthemum are known to be hygroscopic. According to Kerner & Oliver, "the capsular fruits of these plants remain closed in dry weather; but the moment they are moistened the valves covering the ventral sutures of the fruit-loculi open back, dehiscence takes place along the ventral

3367. The plant shown in Fig. 3366 when "resurrected."

sutures, and the seeds, hitherto retained in a double shroud, are washed out of the loculi by the rain." It is doubtful whether these capsules are offered in the trade.

WILHELM MILLER.

The cultivation of resurrection plants.

Anastatica is sometimes grown for curiosity or for botanical purposes, but the plant is anything but ornamental. It has often been grown for classes in botany, sowing the seed in February in pots and keeping the plants in pots all summer. Bottom heat is not necessary at any stage, at least in America. The plant could be grown in a window-garden. The seeds may be sown in February in 4-inch pots, using a light, sandy soil, in a house with a temperature of 60° F. As soon as the seedlings are large enough they are transplanted into other 4-inch pots, three plants to a pot.

The *Selaginella lepidophylla* is perennial. It is rarely cultivated in greenhouses for ornament, like the evergreen kinds of selaginella. It is grown chiefly in botanic gardens or by fanciers of ferns and selaginellas, as it is by no means the most beautiful member of the genus. The writer grew a plant of it for four years, and once saw at one of the botanical gardens a plant which through long cultivation had developed a stem almost a foot high. It looked like a miniature tree-fern, except of course that the fronds were arranged in a dense rosette, which gave the fronds a flat rather than a pendulous appearance. Whether the plants received directly from Texas have a crop of spores on them is a question. The spores do not discharge when the plants are wetted. Many extravagant statements are made about the bird's-nest moss. The dried plants offered by the trade will turn green and grow unless they are too old or have been kept dry too long. They would probably not grow if kept over more than one season. They cannot be dried again and again indefinitely and still remain alive.

3368. Another "rose of Jericho," Odontospermum, or Asteriscus. The bracts roll out and make a flat star-shaped figure.

If a plant has been grown in a pot three or four years and is then dried off it will die. Most persons who grow these plants as curiosities place them in a bowl of water with perhaps a little sand and a few pebbles. The water causes them to turn green and they will grow for a time. Then if taken out of the water they may be kept dry for a time and the process repeated, but each time the plant loses its lower or outer circles of fronds much faster than new ones are made and at about the third time the plant is commonly used up.

There is a fern (*Polypodium polypodioides*, page 2744) which could just as truly be called a resurrection plant. It is a native of the southern states, where it grows up the trunks of trees and over rocks and stones. At certain times it is dried up and parched, but as soon as moisture conditions are restored it looks as fresh as ever. In warm dry countries there are ferns of various genera that dry up and then are resurrected quickly when wet weather comes; some of these are very interesting.

EDWARD J. CANNING.

RETARDING is the opposite of forcing, and consists in keeping plants in cold storage, thereby preventing them from growing during their natural season. Its object is to supplement natural methods and forcing in order to produce the same thing the year round. The lily-of-the-valley is one of the plants of the first importance which may be retarded in commercial establishments. There is sufficient demand for these flowers all the year round to justify the expense of cold storage. Lily-of-the-valley "pips" may be taken from cold storage and forced into bloom in three weeks. Plants that have been retarded need very little heat when they are allowed to grow; they are eager to start, and a temperature of 45° to 50° is sufficient. *Lilium speciosum*, *L. longiflorum*, and *L. auratum* will bloom in ten to twelve weeks from cold storage; *Azalea mollis* in three to four weeks; spireas in about five weeks. Sea-kale and lilacs have also been retarded with profit. Goldenrod has been kept in an icehouse all summer and flowered for Christmas with good results. The art of retarding plants is making progress at present, and with the growth of popular taste for flowers the list of retarded plants may be greatly extended in the future. See A. F. 16:654, 655 (1900).

RETINÍSPORA. Often but not originally spelled *Retinospora*. A genus of conifers founded originally by Siebold and Zuccarini on the two Japanese species of Chamæcyparis, chiefly distinguished from the American species by the resinous canals of the seeds (from Greek, *retine*, resin, and *spora*, seed). Afterward the genus was united with Chamæcyparis, but in horticultural nomenclature the name is applied to a number of juvenile forms of Thuja and Chamæcyparis, chiefly those introduced from Japan. As these juvenile forms all resemble each other very much, indeed much more than do the typical forms to which they belong, it is not strange that they should have been considered to be distinct species and even to belong to a separate genus. Even botanists failed to recognize the true relation of these forms and went so far as to place one of them in the genus Juniperus. With the exception of *Retinispora ericoides*, which C. Koch recognized as the juvenile form of *Thuja occidentalis*, the origin of these juvenile forms remained doubtful until L. Beissner, after having carefully studied the subject for years, disclosed the relationship of the various forms. He showed by experiment that it is possible to raise the same form by making cuttings from seedlings which have still retained their primordial foliage, and he also published cases in which larger plants of these doubtful forms have been observed accidentally to develop branches with the foliage of the typical form. See, also, Gt. 1879, pp. 109 and 172; 1881, pp. 210 and 299, and 1882, p. 152.

There are four of these juvenile forms generally in

cultivation, each of them with an intermediate form showing either a kind of foliage approaching that of the type or two different kinds of foliage on the same plant. There seems to be no doubt that all these forms have been secured by propagating branches of young seedling plants. All seedlings of Chamæcyparis, Thuja, and other genera of the Cupressineæ produce in their juvenile state a kind of primordial foliage very different in appearance from that of the adult plants. The first leaves are always linear and spreading, passing gradually into acicular and at last scale-like leaves. In some plants, especially if they have not sufficient nourishment, the primordial foliage is retained longer than usual and these have probably been selected for perpetuating the juvenile state, by means of cuttings. By continuing through many generations the propagation of those branches which show the juvenile state most distinctly, these forms have become well-fixed varieties and even sometimes bear seeds without changing the foliage on the fruiting branches. These seeds, however, produce plants of the typical form and only a few of them retain the primordial foliage somewhat longer than usual.

The juvenile forms very much resemble some species of Juniperus in habit and foliage. They bear linear spreading leaves in pairs, changing in winter to a

3369. Retinisporas. The specimen on the left is Thuya orientalis var. decussata; middle, Chamæcyparis thyoides var. ericoides; right, C. thyoides var. andelyensis. (×⅔)

brown, reddish, violet or steel color, and do not show the regular frond-like branching of the typical forms. The leaves, however, are much softer and not sharply and acutely pointed as in Juniperus; they are mostly marked with whitish or grayish green lines beneath, which is never the case in Juniperus. Only *Thuya orientalis* var. *decussata* and some intermediate forms, with acicular suberect leaves, show whitish marks on the upper side of the leaves like Juniperus.

Though these Retinispora forms are described under the genera and species to which they belong, where also references to illustrations are cited, descriptions are given here to afford a closer comparison of these similar and much confounded forms. The two forms of foliage in the common red cedar are well shown in Fig. 2025, Vol. III. For other pictures of Retinispora forms see *Chamæcyparis* and *Thuja*.

Chamæcýparis obtûsa var. **ericoìdes,** Boehmer (*Retinìspora Sánderi*, Sander. *Juníperus Sánderi*, Hort.). Dense round-headed bush with upright branches and bluish gray foliage: lvs. acicular, decussate, spreading, about ⅕in. long, thickish, concave above and with a green line in the middle, the lower lvs. often acutish, the upper ones obtuse.

Chamæcýparis pisífera var. **squarròsa,** Beissn. & Hochst. (*Retinìspora squarròsa*, Sieb. & Zucc.). Fig. 893. A dense, pyramidal or round-headed bush or sometimes small tree, with light bluish green foliage almost silvery white when young, usually coloring violet in winter: tips of branchlets nodding: lvs. crowded, spreading, very soft, bluish green above, silvery white below. The most ornamental and graceful and the best known of these juvenile forms. The intermediate form, var. **plumòsa,** Beissn. & Hochst. (*Retinìspora plumòsa*), has smaller, subulate and suberect lvs., and is much planted, especially in its golden variegated form. See Fig. 892, Vol. II.

Chamæcýparis thyoìdes var. **ericoìdes,** Sudw. (*Retinìspora ericoìdes*, Zucc.). Fig. 3369. Dense shrub, of stiff, pyramidal or almost columnar habit, with upright branches and bright green foliage, changing to violet-red or brownish red in winter: lvs. bright green above, with 2 bluish lines below. This form is very distinct with its stiff, columnar habit, but is less common in cult. The intermediate form, var. **andelyénsis,** Schneid. (*Retinìspora leptóclada*, Hort.), shows also a stiff, pyramidal habit and bears chiefly small, suberect or almost scale-like lvs., and occasionally branchlets with spreading linear lvs. Fig. 3369.

Thûja occidentàlis var. **ericoìdes,** Beissn. & Hochst. (*Retinìspora ericoìdes*, Hort. *R. dùbia*, Carr.). Dense broadly pyramidal or round-headed bush, with upright branches and dull green foliage, changing to brownish green in winter: lvs. linear, soft grayish green beneath. The intermediate form, var. **Ellwangeriàna,** Beissn. (*Retinìspora Ellwangeriàna*, Hort.), has usually two kinds of lvs., but the linear lvs. are smaller than those of the preceding form.

Thûja orientàlis var. **decussàta,** Beissn. & Hochst. (*Retinìspora juniperoìdes*, Carr. *R. decussàta*, Hort. *R. squarròsa*, Hort.). Fig. 3369. Dense, round-headed bush, with bluish green foliage changing to violet or steel-color in winter: lvs. rather rigid, bluish green, spreading, concave and with a whitish line above. But rarely cult. and not quite hardy N. The intermediate form, var. **meldénsis,** Laws. (*Retinìspora meldénsis*, Hort.), has mostly acicular suberect lvs. of the same color as in the preceding var. *andelyensis*.

These juvenile forms are valuable for formal gardening, for rockeries, small gardens and wherever slow-growing and dwarf conifers are desired. They are short-lived and usually becomes unsightly when older. They are all readily prop. by cuttings. See also *Chamæcyparis* and *Thuya*.

R. decussàta, Hort.=Thuja orientalis var. decussata.—*R. dùbia*, Carr.=Thuja occidentalis var. ericoides.—*R. Ellwangeriàna*, Hort.=Thuja occidentalis var. Ellwangeriana.—*R. ericoìdes*, Zucc.=Chamæcyparis thyoides var. ericoides.—*R. ericoìdes*, Hort.=Thuja occidentalis var. ericoides.—*R. filicoìdes*, Hort.=Chamæcyparis obtusa var. filicoides.—*R. filífera*, Stand.=Chamæcyparis pisifera var filifera.—*R. juniperoìdes*, Carr.=Thuja orientalis var. decussata.—*R. leptóclada*, Zucc.=Chamæcyparis pisifera var. squarrosa.—*R. leptóclada*, Hort.=Chamæcyparis thyoides var. andelyensis.—*R. lycopodioìdes*, Gord.=Chamæcyparis obtusa var. lycopodioides.—*R. meldénsis*, Hort.=Thuja orientalis var. meldensis.—*R. obtùsa*, Sieb. & Zucc.=Chamæcyparis obtusa.—*R. pisífera*, Sieb. & Zucc.=Chamæcyparis pisifera.—*R. rígida*, Carr.=Thuja orientalis var. decussata.—*R. Siéboldii*, Hort.=Thuja orientalis var. decussata.—*R. squarròsa*, Sieb. & Zucc.=Chamæcyparis pisifera var. squarrosa.—*R. squarròsa*, Hort.=Thuja orientalis var. decussata.

ALFRED REHDER.

REYNÒSIA (named for Dr. Alvaro Reynoso, 1830–1888, a Cuban agricultural chemist). *Rhamnàceæ*. Unarmed evergreen shrubs or trees, with rigid branches, sparingly cultivated, possibly for its edible fruit.

Leaves opposite, leathery, entire and emarginate; stipules small and caducous: fls. small, perfect, yellowish green, in sessile, axillary, umbel-like clusters; sepals 5, valvate spreading; petals wanting; stamens 5, inserted on the margin of the fleshy disk; ovary almost superior, 2–3-celled: drupe with a thin fleshy pulp and a crustaceous stone.—About 10 species, 1 in S. Fla.

latifòlia, Griseb. RED IRONWOOD. DARLING PLUM. Slender tree, 20–25 ft. high: lvs. oval, oblong, or subrotund, usually emarginate, 1–1½ in. long, leathery; mar-

gins revolute: fls. in axillary umbels, borne in May: fr. ripens in Nov. or the following spring. S.S. 2:56.

F. Tracy Hubbard.†

RHABDOTHÁMNUS (Greek, *rod* and *bush*, a shrub with many rod-like branches). *Gesneriàceæ*. Divaricately branched shrub, with slender branches: lvs. small, opposite, petioled, rotundate, coarsely dentate, often dissimilar: pedicels solitary in the axils, filiform and without bracts: fls. red-striped; calyx free, deeply 5-cleft, the lobes membranaceous, acuminate; corolla tubular-campanulate; the limb slightly oblique, somewhat 2-lipped, the lobes 5, rotundate, spreading and subequal; stamens 4, perfect: caps. ovate, acuminate, coriaceous, finally 4-valved.—One species, New Zeal. *R. Solándri*, A. Cunn. A much-branched, hispid shrub 1–3 ft. high: branches very slender, spreading at right angles: lvs. opposite, often in unequal pairs, oval or orbicular, coarsely toothed: fls. axillary, solitary, about 1 in. long; calyx hispid, 5-lobed, lobes lanceolate, acute; corolla glabrous, orange, striped red, limb 2-lipped, upper lip smaller, lower lip deeply 3-lobed, the lobes rounded: caps. ovoid acute. New Zeal. B.M. 8019. G.C. III. 37:146.

RHAMNÉLLA (referring to its close affinity to Rhamnus). *Rhamnàceæ*. About 6 species in E. Asia. Deciduous shrubs or small trees: lvs. alternate, stipulate, serrulate: fls. small, green, in axillary clusters; sepals, petals, and stamens 5; ovary incompletely 2-celled: fr. a black drupe with a 1-seeded stone. In habit resembling Rhamnus, but in fls. and frs. more like Berchemia. Only the following species is in cult.; it seems somewhat tender and has no particular ornamental qualities; cult. and prop. like rhamnus. **R. franguloìdes**, Weberbauer (*R. japónica*, Miq. *Microrhámnus franguloìdes*, Maxim.). Small tree, to 30 ft.: lvs. ovate-oblong, acuminate, finely serrulate, with 5–10 pairs of veins, glabrous except on the veins beneath, 2–5 in. long: fls. in 5–15-fld. clusters: fr. cylindric-oblong, black, ⅓in. long. Japan, Korea, E. China. S.I.F. 2:48.

Alfred Rehder.

RHÁMNUS (its ancient Greek name). Including *Frángula*. *Rhamnàceæ*. Buckthorn. Ornamental woody plants grown chiefly for their handsome foliage and some also for their attractive fruit.

Deciduous or evergreen shrubs or small trees, sometimes spiny: lvs. alternate or opposite, short-petioled, with small deciduous stipules, penninerved, serrulate or entire: fls. small, in axillary clusters, umbels or racemes, perfect, polygamous or dicœcious; sepals, petals and stamens 4–5, petals sometimes wanting; style usually undivided; ovary 2–4-loculed: fr. a globular or oblong 2–4-seeded drupe; nutlets with a leathery usually dehiscent wall.—About 100 species native chiefly to the temperate regions of the northern hemisphere. A few species are found in the tropics and as far south as Brazil and S. Afr. Several species yield yellow or green dyes and the frs. and bark of some are used medicinally. The wood of *R. Frangula* is made into charcoal valued for the manufacture of gunpowder.

The buckthorns are handsome shrubs with generally bright green often rather large leaves and with inconspicuous greenish flowers usually in axillary clusters followed by berry-like, usually black, rarely red, fruits. Many of the species as *R. cathartica*, *R. dahurica*, *R. fallax*, *R. Frangula*, and *R. alnifolia* can be depended upon as hardy, while *R. Purshiana* and *R. lanceolata* are hardy at least as far north as Massachusetts. *R. imeretina* and *R. caroliniana* are somewhat more tender. The handsomest in foliage are *R. fallax* and *R. imeretina* and the evergreen *R. ilicifolia* and *R. crocea*. *R. Purshiana*, *R. caroliniana*, *R. alnifolia*, *R. dahurica*, and *R. Frangula* are also noteworthy on account of pretty foliage. Of the evergreen species which are not hardy North, *R. crocea* and *R. ilicifolia* are to be recommended for their ornamental bright red fruits. Buckthorns are useful for planting in shrubberies; they like a rather moist soil, especially *R. lanceolata*, *R. alnifolia*, *R. caroliniana*, and *R. Frangula*, and grow well in shaded or partly shaded situations, but *R. cathartica* and its allies prefer dry soil. *R. cathartica* is a valuable hedge plant, though it is now not used so extensively as in the past. The species are propagated by seeds stratified or sown in fall, and by layers. Some, as *R. lanceolata*, *R. fallax*, and *R. alnifolia*, are propagated by cuttings; *R. Purshiana*, has been successfully raised in England from softwood cuttings put in mild bottom heat under glass about the middle of July. The evergreen species are propagated by cuttings of ripened wood under glass. Rarer kinds are sometimes grafted, those of the Frangula group usually on *R. Frangula* and the true buckthorns on *R. cathartica* or allied species.

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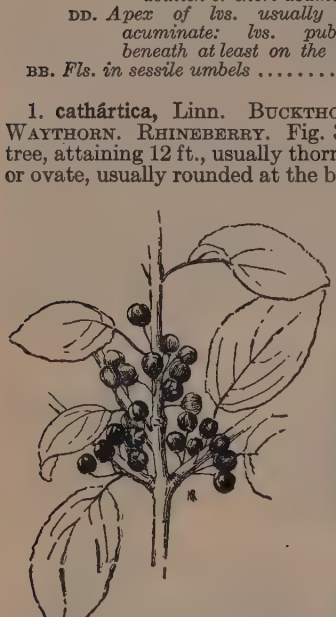
KEY TO THE SPECIES.

A. *Winter buds scaly: petals usually 4, sometimes 5 or wanting: seeds (not the outer coating of the nutlet) sulcate or concave on the back, with thin cotyledons recurved at the margins: fls. imperfectly diœcious. (Eurhamnus.)*
- B. *Lvs. opposite: spiny shrubs.*
  - C. *Shape of lvs. ovate to oblong.*
    - D. *Length of lvs. 1½–3 in.; lvs. broadly ovate to elliptic, thin.* 1. **cathartica**
    - DD. *Length of lvs. 2½–4 in.; lvs. oblong-elliptic to oblong, leathery.* 2. **dahurica**
  - CC. *Shape of lvs. obovate, cuneate at the base.* 3. **japonica**
- BB. *Lvs. alternate: unarmed shrubs.*
  - C. *Foliage deciduous.*
    - D. *Pairs of veins 12–25.*
      - E. *Branchlets and lvs. beneath glabrous.* 4. **fallax**
      - EE. *Branchlets and lvs. beneath pubescent.* 5. **imeretina**
    - DD. *Pairs of veins 4–9.*
      - E. *Fls. 5-merous, apetalous: lvs. oval.* 6. **alnifolia**
      - EE. *Fls. 4-merous, with petals: lvs. oblong-lanceolate.* 7. **lanceolata**
  - CC. *Foliage evergreen.*
    - D. *Veins 5–9 on each side: lvs. ¾–1 ⅓ in. long: fls. apetalous.*
      - E. *Lvs. glandular denticulate: fls. 4-merous.* 8. **crocea**
      - EE. *Lvs. spinulose-dentate: fls. often 5-merous.* 9. **ilicifolia**
    - DD. *Veins 3–5 on each side: lvs. ¾–2 in. long: fls. 5-merous, with petals.* 10. **Alaternus**

AA. *Winter buds naked: petals 5: seeds convex at the back, not grooved, with flat and fleshy cotyledons: unarmed shrubs with alternate lvs. (Frangula.)*
- B. *Fls. in peduncled umbels.*
  - C. *Foliage evergreen.* 11. **californica**
  - CC. *Foliage deciduous.*
    - D. *Apex of lvs. obtuse or short-acuminate.*
      - E. *Peduncles usually longer than the petiole: lvs. with 6–15 pairs of veins, usually obtuse.* 12. **Purshiana**

EE. *Peduncles usually shorter than the petiole: lvs. with 5–10 pairs of veins, usually acutish or short-acuminate.* 13. **caroliniana**
DD. *Apex of lvs. usually long-acuminate: lvs. pubescent beneath at least on the veins.* 14. **crenata**
BB. *Fls. in sessile umbels* ..... 15. **Frangula**

1. **cathártica,** Linn. Buckthorn. Hart's-thorn. Waythorn. Rhineberry. Fig. 3370. Shrub or small tree, attaining 12 ft., usually thorny: lvs. oval to elliptic or ovate, usually rounded at the base or cordate, obtuse or acute, crenulate-serrate, beneath green, glabrous or pubescent, 1¾–3 in. long: fls. in 2–5-fld. clusters, with 4 petals: fr. black, about ¼in. across; seed with a furrow usually open only at the base. Eu., W. and N. Asia; often escaped from cult. and naturalized in the E. U. S. B.B. (ed. 2) 2:502. Gng. 9:2. H.W. 3, p. 56.



3370. Rhamnus cathartica. (×½)

2. **dahùrica,** Pall. (*R. cathártica* var. *dahùrica,* Maxim.). Fig. 3371. Large, spreading shrub, with stout thorny branches, sometimes a tree, to 30 ft.: branchlets glabrous: lvs. oblong or sometimes elliptic, narrowed at the base, acuminate, crenulate-serrate, glabrous, grayish green beneath, somewhat coriaceous at maturity, 2–4 in. long: fls. and fr. similar to those of the preceding species, but fr. somewhat larger. Dahuria to Amurland and N. China. G.F. 9:425 (as *R. crenata;* adapted in Fig. 3371).—Sometimes cult. under the name of *R. crenata.* Var. **nippónica,** Makino. Lvs. narrow-oblong, light green beneath, 2–6 in. long and 1–2 in. broad. Japan.

3. **japónica,** Maxim. Spreading shrub with thorny branches, to 10 ft.: branchlets yellowish or grayish brown, lustrous: lvs. slender-stalked, obovate to oblong-obovate, short-acuminate, cuneate at the base, serrulate, sparingly pubescent or glabrous beneath, with 4–5 pairs of veins, 2–3 in. long: fls. in axillary clusters: fr. black, ¼–⅓in. across; seed usually with closed furrow. Japan. S.I.F. 2:48.

4. **fállax,** Boiss. (*R. alpìna,* Auth., not Linn.). Shrub, to 10 ft., with stout, upright, glabrous and reddish brown branches: lvs. elliptic-oblong to oblong or obovate-oblong, cordate or rounded at the base, abruptly acuminate, crenulate-serrate, with 12–20 pairs of veins, dark green above, pale green and glabrous or nearly so beneath, 3–5½ in. long: fls. in 3–7-fld. clusters; petals 4: fr. globose, black, ¼in. across or less. Mountains of S. and Cent. Eu.—This and the following species are the handsomest of the deciduous-lvd. buckthorns because of the large size of their lvs.

5. **imeretìna,** Koehne (*R. cólchica,* Somm. & Lev. *R. alpìna* var. *cólchica,* Kusn. *R. alpìna* var. *grandifòlia,* Dipp. *R. libanòtica,* Hook. f., not Boiss. *R. grandifòlia,* Hort., not Fisch. & Mey. *R. castaneæfòlia,* Hort.). Allied to the preceding, but larger in every part: shrub, attaining 10 ft.: branchlets and petioles pubescent: lvs. larger and longer, to 8 in. long, pubescent beneath and often bronze-colored at maturity, with 15–25 pairs of veins. Caucasus, W. Asia. B.M. 6721. M.D.G. 1906:405.

6. **alnifòlia,** L'Her. Low, wide-spreading shrub, attaining 4 ft., with puberulous branchlets: lvs. ovate to oval, obtuse or acuminate, usually narrowed at the base, crenately serrate, glabrous, 1½–4 in. long: fls. in few-fld. clusters, 5-merous, without petals: fr. globose, black, with 3 nutlets. New Bruns. and N. J. to Brit. Col. and Calif. B.B. (ed. 2) 2:503.

7. **lanceolàta,** Pursh. Tall, upright shrub, with puberulous branchlets: lvs. ovate-lanceolate to oblong-lanceolate, acuminate or obtusish, finely serrulate, glabrous or somewhat pubescent beneath, 1–3½ in. long: fls. in few-fld. clusters, with 4 petals: fr. with 2 nutlets. Pa. to Ala., Texas, and Neb. B.B. (ed. 2) 2:503.

8. **cròcea,** Nutt. Red-berry. Evergreen shrub to 3 ft., with rigid often spinescent branches: lvs. orbicular to oblong-obovate, glandular-denticulate or serrulate, dark green and lustrous above, bronze- or copper-colored and glabrous or slightly pubescent beneath, ⅛–¾ in. long: fls. in few-fld. clusters, 4-merous, apetalous: fr. bright red, about ⅛–¼in. across, edible. Calif.

9. **ilicifòlia,** Kellogg (*R. cròcea* var. *ilicifòlia,* Greene). Evergreen shrub or small tree, to 12, or sometimes to 20 ft., with rather stout scarcely spinescent branches: lvs. oval to orbicular, spinulose-dentate, dark green and lustrous above, often golden beneath, ¾–1½ in. long: fls. often 5-merous, apetalous: fr. bright red, ovoid, ¼in. long. Calif. S.S. 2:59 (as *R. crocea*).—This is superior to the preceding species on account of the more plentiful and somewhat larger bright red berries, also the lvs. are larger and resemble those of *Prunus ilicifolia.*

10. **Alatérnus,** Linn. Evergreen shrub or small tree, attaining 20 ft., with glabrous branches: lvs. oval or ovate to ovate-lanceolate, acute, serrate or almost entire, glossy and dark green above, pale or yellowish green beneath, glabrous, ¾–2 in. long: fls. in short racemes, with 5 petals: fr. bluish black. S. Eu. H.W. 3, p. 59. Var. **angustifòlia,** DC. (*R. angustifòlia,* Hort.), has narrower, oblong-lanceolate lvs. There are also varieties with variegated foliage.

11. **califórnica,** Esch. (*R. oleifòlia,* Hook. *R. Purshiàna* var. *califórnica,* Rehd.). Coffee-Berry. Evergreen shrub, to 15 ft.: lvs. oblong to oblong-lanceolate, acute or short-acuminate, serrulate or entire, glabrous and yellowish green beneath, 1–4 in. long: peduncles longer than petioles: fr. depressed-globose, changing from red to purplish black, about ⅓in. across. S. Ore. and Calif. to Ariz. and New Mex. R.H. 1874, p. 354. S.S. 2:63, fig. 3. Var. **tomentélla,** Brew. & Wats. (*R. Purshiàna* var. *tomentélla,* Brandeg. *R. tomentélla,* Benth. *R. incàna,* Carr. *Frángula califórnica* var. *tomentélla,* Gray). Allied to the preceding variety, but lvs. densely white-tomentose beneath. R.H. 1858, p. 658; 1872, p. 194. S.S. 2:63, fig. 2.

12. **Purshiàna,** DC. Cascara Sagrada. Tall shrub to medium-sized tree, occasionally attaining 40 ft.: young branchlets pubescent or tomentose: lvs. elliptic to ovate-oblong, acute or obtuse, usually denticulate, with often wavy margin, dark green above, glabrous or pubescent beneath, 1–7 in. long: peduncles longer than petioles: fr. globose, changing from red to black, about ⅓in. across, with 2–3 nutlets. Brit. Col. to Mont., Idaho, and N. Calif. S.S. 2:62, 63.—Cascara Sagrada bark is extensively collected in Ore. and Wash. for use in drug manufacture.

13. **caroliniàna,** Walt. Indian Cherry. Shrub or small tree, attaining 30 ft.: young branches puberulous: lvs. elliptic to oblong, acute or acuminate, obscurely serrulate or almost entire, lustrous and dark green above, glabrous or nearly so, somewhat leathery at length, 2–6 in. long: peduncles shorter than petioles: fr. globose, about ⅓in. across, red changing to black, sweet, with 3 nutlets. N. Y. to Fla., west to Neb. and Texas. S.S. 2:61. B.B. (ed. 2) 2:503.

14. **crenàta,** Sieb. & Zucc. Shrub, to 10 ft.: young branchlets and young lvs. rusty pubescent: lvs. oblong-ovate to oblong-lanceolate or obovate-oblong, acuminate or long-acuminate, finely crenate-serrulate, pubescent beneath, at least on the veins, with 7–12 pairs of veins, 2–4 in. long: peduncles usually shorter than petioles: fr. subglobose, ⅓in. across, changing from red to purplish black. Japan to Cent. China. S.I.F. 2:47.

15. **Frángula,** Linn. (*Frángula Álnus,* Mill.). Shrub or small tree, attaining 12 ft.: lvs. broadly obovate to obovate-oblong, acute, entire, dark green above, glabrous, 1–2½ in. long: fr. red, changing to black, with 2 nutlets. Eu., N. Afr., W. Asia and Siberia, escaped from cult. in some localities in the eastern states. Gng. 8:3. B.B. (ed. 2) 2:504. H.W. 3:48. Var. **asplenifòlia,** Dipp. (*R. asplenifòlia,* Simonkai, not Carr.). Lvs. linear, undulate; an interesting form of very distinct appearance with its feathery foliage. Var. **latifòlia,** Dipp. (*R. latifòlia,* Kirchn., not L'Her.). Lvs. to 5 in. long and to 2½ in. broad: fr. larger. Var. **heterophýlla,** Mouillef. (var. *angustifòlia,* Bean). Lvs. oblong to lanceolate, uneven, erose or irregularly lobed at the margin.—*R. Frangula* is a handsome shrub with shining foliage and attractive berries.

R. alpìna, Linn. Closely allied to R. fallax. Young branchlets dull brownish gray, often pubescent: lvs. elliptic or oval, with 10–12 pairs of veins, 1½–3, rarely to 4 in. long: fr. smaller. Mountains of S. Eu. L.B.C. 11:1077.—*R. argùta,* Maxim. Unarmed glabrous shrub, allied to R. cathartica: lvs. opposite, orbicular-ovate, acuminate, sharply serrate, with bristly pointed teeth. Amurland. Probably hardy.—*R. Billárdii,* Hort.=R. hybrida var.—*R. chloróphora,* Koehne (R. chinensis, Hort.). Shrub: branchlets glabrous or nearly so; lvs. obovate, abruptly acuminate, pubescent on the veins beneath, with 4–6 pairs of veins, 1½–3 in. long. China. Doubtful species.—*R. chloróphora,* Decne.=R. globosus.—*R. costàta,* Maxim. Allied to R. fallax. Shrub, to 15 ft.: branchlets glabrous: lvs. elliptic- or ovate-oblong, crenately serrulate, with about 20 pairs of veins, pubescent beneath, 3–6 in. long; petiole very short: fr. black, ⅓in. across. Japan. S.I.F. 2:48.—*R. crenulàta,* Ait. Evergreen shrub: lvs. oblong, obtusish, narrowly cuneate at the base, crenulate, glabrous, ¾–1¾ in. long: fls. in dense clusters in the axils of last year's lvs. Canary Isls. Tender.—*R. dumetòrum,* Schneid. Spiny shrub, to 6 ft.: lvs. usually opposite, rhombic-lanceolate, acute at the ends, or elliptic, crenate-denticulate, pubescent at least on the veins beneath, ⅓–1⅓ in. long: fr. ¼in. thick. W. China. Var. *crenoserràta,* Rehd. & Wilson. Lvs. 1½–2½ in. long, more coarsely crenate-serrate. W. China.—*R. Erythróxylon,* Pall. Unarmed shrub, allied to R. cathartica: lvs. alternate, oblong-lanceolate to linear. Caucasus to Mongolia and Siberia. Hardy.—*R. globòsa,* Bunge (R. chlorophora, Decne. R. dahurica var. aprica, Maxim.). Low rigid shrub: branchlets pubescent: lvs. opposite, obovate or broadly obovate, cuneate, pubescent, ¾–2 in. long: fr. ⅓in. thick. N. and E. China.—*R. heterophýlla,* Oliver. Shrub, to 5 ft. with often decumbent branches: branchlets pubescent; stipules persistent: lvs. alternate, ovate-lanceolate, ¾–1½ in. long or broadly ovate, ¼–⅓in. long, puberulous on the veins beneath: fls. 5-merous. Cent. China. H.I. 18:1759.—*R. hýbrida,* L'Her. (R. Alaternus × R. alpinus). Half-evergreen shrub, with alternate, oval-oblong, glossy lvs. Var. *Billárdii,* Lav. Lvs. narrower, more remotely serrate. Half-hardy shrub, with handsome glossy foliage.—*R. infectòria,* Linn. Spiny spreading shrub, to 6 ft.: lvs. subopposite, oval or ovate to obovate, finely toothed, glabrous or pubescent on the veins beneath, ½–1½ in. long: fr. black. S.W. Eu.—*R. latifòlia,* L'Her. Allied to R. Frangula: lvs. larger, elliptic-oblong, with 12–15 pairs of veins, 4–7 in. long: fr. ⅛–½in. thick, changing from red to black. Azores. B.M. 2663. I.T. 3:106. G.W. 12, p. 342. Not hardy.—*R. leptophýlla,* Schneid. Shrub, to 6 ft.: branchlets glabrous: lvs. opposite, obovate, short-acuminate, remotely denticulate, light green, glabrous beneath, 1½–3 in. long: fr. ¼in. thick. Cent. and W. China.—*R. libanótica,* Boiss. Allied to R. imeretina; more spreading: lvs. oblong-obovate, crenate-dentate, pubescent beneath, with 10–15 pairs of veins: fr. ⅓in. across. Asia Minor.—*R. pùmila,* Linn. Low, sometimes procumbent shrub, allied to R. alpinus, with smaller and shorter lvs., usually narrowed at the base. Eu., Alps. Hardy.—*R. Rósthórnii,* Pritz. Shrub, to 5 ft.: branchlets glabrous: lvs. opposite, oblong-lanceolate, cuneate, crenate, pubescent beneath, ½–1 in. long: fr. ⅓in. across, with usually 2 seeds. W. China.—*R. rupéstris,* Scop. Low, often procumbent shrub, about 3 ft. high, allied to R. caroliniana: lvs. ovate to oblong-obovate, thin, 1–3 in. long: umbels 1–3-fld. Alps of E. Eu.—*R. Sargentiàna,* Schneid. Shrub, to 15 ft.: branchlets glabrous: lvs. alternate, oblong-elliptic, cuneate, acute or short-acuminate, crenate-serrate, sparingly hairy beneath, with 12–18 pairs of veins, 1¾–5 in. long: fr. purplish black, ⅓in. across. W. China.—*R. saxátilis,* Linn. Low and dense, very spiny shrub, about 3 ft. high, allied to R. cathartica: lvs. opposite or alternate, oval or obovate, glabrous, about 1 in. long. Mountains of Cent. and S. Eu., W. Asia. Hardy. H. W. 3, p. 57.—*R. spathulæfòlia,* Fisch. Spiny shrub, to 6 ft.: lvs. alternate, elliptic-oblong to lanceolate, narrowed at both ends, finely toothed, glabrous or finely pubescent, ¾–2 in. long: fr. black, slender-stalked. S. E. Eu., W. Asia.—*R. tinctòria,* Waldst. & Kit. Closely allied to the preceding, but lvs. pubescent. Mountains of Cent. and S. Eu., W. Asia.—*R. útilis,* Decne. Shrub to 10 ft.: branchlets glabrous: lvs. opposite, elliptic-oblong, serrulate, light green, glabrous, with 5–8 pairs of veins, 2–5 in. long. Cent. and E. China.

ALFRED REHDER.

3371. Rhamnus dahurica. (×⅓)

RHAPHIDÓPHORA (Greek for *needle-bearing;* alluding to needle-like hairs). *Aràceæ.* Climbing aroids, to be treated like Philodendron and Pothos. Species 60 in Engler, Pflanzenreich, hft. 37 (IV. 23B. 1908), of the East Indies, allied to Pothos, but distinguished by the presence of odd hairs in the intercellular spaces and by the two-loculed rather than three-loculed ovary. The garden plant *Pothos aureus,* sometimes provisionally referred here, is to be sought in Scindapsus. The generic name is sometimes spelled *Raphidophora.*

It is not known that any species of Rhaphidophora are in the American trade. *R. pertùsa,* Schott (*Pòthos pertùsus,* Roxbg. *Scindápsus pertùsus,* Schott), has large monstera-like lvs., with long and narrow side lobes and numerous holes in the blade. R.H. 1883, p. 561. *R. decursìva,* Schott, is a gigantic climber, with large pinnate lvs., the segms. or lfts. oblong-lanceolate-acuminate and strongly nerved: spathe yellowish. B.M. 7282. *R. Peèpla,* Schott, has entire oblong or elliptic-oblong lvs., with roundish or subcordate base: spathe yellowish.

RHAPHITHÁMNUS (Greek, *rhaphis,* needle, and *thamnos,* shrub; referring to the needle-like spines). *Verbenàceæ.* Two evergreen small trees from Chile, with slender axillary spines, opposite, rather small, entire short-petioled lvs. and tubular lilac fls. axillary, solitary or in pairs on the spines, followed by bright blue globose berries: calyx tubular-campanulate, 5-toothed, persistent, becoming fleshy and inclosing the frs.; corolla tubular-funnelform, with short spreading unequally 5-lobed limb; stamens 4, didynamous, inclosed; ovary superior, 4-celled; style slender with 2-lobed stigma: fr. a fleshy drupe with two 2-celled and 2-seeded stones. The following species has recently been recommended as a hedge-plant for the warmer parts of the United States.

R. cyanocárpus, Miers (*Citharéxylon cyanocárpum,* Hook. & Arn. *R. parvifòlius,* Miers). Tree, to 20 ft.: young branchlets pubescent; spines slender, ½–1 in. long: lvs. sometimes in 3's, ovate, acute, rounded at the base, entire, glabrous above and glabrous beneath except bristly hairs on the midrib, ¼–¾in. long: fls. lilac, slender, about ½in. long: fr. globose, bright blue, ⅓–½in. across. Chile. B.M. 6849.—A handsome densely leafy shrub, particularly ornamental when studded with its bright blue frs. ALFRED REHDER.

RHAPIDOPHÝLLUM (Greek, probably means *Rhapis-leaved*). *Palmàceæ.* BLUE PALMETTO. NEEDLE PALM. One species ranging from S. C. to Fla. It is a dwarf fan palm with erect or creeping trunk 2–3 ft. long, and long-stalked nearly round deeply and unequally cleft lvs. with about 15 segms.: spadices short-peduncled: spathes 2–5, entire, tubular, compressed, bifid, woolly: fls. minute, orange: fr. small, ovoid or obovate, woolly. The genus is closely allied to Chamærops and is distinguished by having the albumen not ruminate and by the bracts at the base of the branches of the spadix being few or none. The plant is said to produce suckers freely, like Rhapis. Cult. as in Rhapis.

3372. Young leaf of blue palmetto, not yet unfolded. (×¼)

Rhapidophyllum hystrix, the blue palmetto or needle palmetto, is the most beautiful and elegant of our native dwarf palms. It is very local in its distribution, being found in rich low soil both in Georgia and Florida, but it is everywhere rather rare. Its most striking characteristics are the long sharp black spines projecting in every direction from the dark fibers which cover the trunk. These spines, which are often a foot long, seem to protect the inflorescence, which before opening resembles a large white egg and which is imbedded among the spines. This palm bears staminate and pistillate flowers on separate plants. The woolly clusters of fruit or seeds are borne on short stems also surrounded by the sharp spines. This palmetto is easily transplanted. The leaves are dark shiny green, relieved by a pale silvery gray on the under surface. It is a very beautiful plant, and groups of it are striking. The stem is 2 to 3 feet high and the leaves rise to a height of 3 to 4 feet. (H. Nehrling.)

hýstrix, H. Wendl. & Drude (*Chamærops hýstrix,* Fraser). Fig. 3372. St. 2–3 ft., erect or creeping, proliferous, clothed with the fibrous remains of lf.-sheaths intermingled with long, erect spines: lvs. 3–4 ft., somewhat glaucous especially beneath, circular in outline, with numerous 2–4-toothed segms.; petiole triangular, rough on the margins; sheaths of oblique fibers interwoven with numerous strong, erect spines: spadix 6–12 in. long, short-peduncled: petals ovate, drupe ¾–1 in. long. S. C. to Fla. I.H. 30:486.

JARED G. SMITH.

RHÀPIS (Greek, *needle:* alluding to the shape of the leaves or perhaps the awns of the corolla). *Palmàceæ,* tribe *Sàbaleæ.* Fan palms of very distinct habit, being among the few palms that produce suckers at the base, thereby forming bushy clumps.

Low palms, with leafy densely cespitose reedy sts. clothed with remains of the reticulate lf.-sheaths: lvs. alternate and terminal, submembranaceous, connate or semi-orbicular, irregularly and digitately 3- to many-parted; segms. linear, cuneate, or elliptical truncate, entire, dentate or lobed; nerves 3 to many; transverse veins conspicuous; rachis none; ligule very short, semi-circular; petiole slender, biconvex, smooth or serrulate on the margins; sheath long, loosely fringed on the margin: spadices shorter than the lvs., slender-peduncled: rachis sheathed by deciduous bracts: branches spreading: spathes 2–3, incomplete, membranous: fls. yellow.—About 5 species; natives of China and Japan. This genus is distinguished from its near allies (for a list of which see *Licuala*) by the fls. being dicœcious; corolla 3-toothed; anthers dehiscing extrorsely. The name Rhapis is commonly spelled and pronounced Raphis, but this is incorrect. They can be grown in temperate house with a night temperature of 55–60°. The soil should be good loam 3 parts, leaf-mold 1 part and sand 1 part. Prop. by imported seeds or by the freely produced suckers. Hardy in S. Calif. and S. Fla., and, in fact, the hardiest of all the palms with the exception of certain species of Sabal and Chamærops.

3373. Rhapis humilis.

A. *Sts. 1½–4 ft. high.*

B. *Lvs. with 5–7 segms.*

flabellifórmis, L'Her. (*R. Kwaniwórtsik,* Wendl.). Fig. 2739. Sts. 1½–4 ft. high: lvs. 5–7-parted; segms. linear, subplicate, ciliate-spinulose along the margins and midveins, truncate, erose at the apex; petioles serrulate along the margins. China, Japan. B.M. 1371. R.H. 1872, p. 230. A.G. 13:261. I.H. 34:13. G. 1:478; 23:614. Gn.M. 6:288. Var. **intermèdia,** Hort., according to Siebrecht, has lvs. horizontal instead of somewhat erect. Var. **variegàta,** Hort., has been offered.

BB. *Lvs. with 7–10 or more segms.*

hùmilis, Blume. Fig. 3373. Almost stemless, but producing a few short reed-like sts.: lvs. semi-circular; basal lobes directed backward; segms. rarely more than 10, spreading; petioles unarmed. China. A.F. 7:405; 22:475.

aa. *Sts. becoming 8 ft. high.*

cochinchinénsis, Mart. (*Chamærops cochinchinénsis,* Lour.). Sts. often 6–8 ft.: lf.-segms. much plaited, oblong, obtuse; petioles short, straight and prickly. Cochin-China. Intro. by Franceschi, 1900.

N. Taylor.†

RHAPÓNTICUM (old Greek name for rhubarb, the same as occurs in *Rheum Rhaponticum*). *Compósitæ.* Under this generic name at least one species is still catalogued, although the genus is now included as a section of Centaurea. Nine species are recognized in the group, extending from Morocco and Algiers to China. They are more or less thistle-like stout herbs, mostly or entirely perennial, with large solitary yellow, pink or purplish heads, the lvs. usually white-tomentose beneath: florets all equal and perfect: fr. 4-angled; pappus rough or feathery. Two species may be described here, under the genus Centaurea. *C. Rhapónticum,* Linn. (*Rhapónticum scarìosum,* Lam.). Perennial, 2–2½ ft., with purplish fl.-heads: lvs. tomentose beneath, glabrous above, the lower ones ovate or cordate and finely toothed, petiolate, the upper ones sessile and oblong: outer scales of involucre scarious (dry). Alps, Switzerland. B.M. 1752. Appears not to be offered. *C. cynaroìdes,* Link (*R. cynaroìdes,* Less.). Perennial, from the Pyrenees region: heads few and erect, purplish-fld.: lvs. large, oblong to ovate, attenuate at base, acuminate, the lower ones pinnately parted, the upper scarcely pinnatifid, all the lobes acutely toothed, more or less tomentose beneath: scales of involucre ciliate-serrate.—Listed abroad for outdoor planting.

L. H. B.

RHEÈDIA (named after H. van Rheede 1635–1691). *Guttíferæ.* Trees, full of yellow sap, some of them with edible fruit.

Leaves rigid, leathery, lightly feather-veined: peduncles axillary or lateral, the male fascicled, the female fewer: fls. often small, polygamous-dicœcious; sepals 2, often connate at the base; petals 4, decussately imbricated; ovary 3- (rarely 4–5-) celled: berry corticose and indehiscent.—About 30 species, Trop. Amer.

brasiliénsis, Planch. & Triana. Lvs. coriaceous, ovate or oblong-ovate, obtuse and narrowed at the base to a short petiole, apex obtuse or rather acute: fls. numerous, in axillary clusters, polygamous: berry obovate, short-beaked. Brazil and Paraguay.—Intro. into Calif.

edùlis, Planch & Triana. Very smooth tree: lvs. lanceolate-oblong or oblong, acuminate, base acute or attenuate: fls., the fertile ones, axillary, the pedicels shorter than the fr.: drupe oblong, yellow. Cent. Amer.—Intro. into Calif.

macrophýlla, Planch. & Triana. Lvs. broad-lanceolate or lanceolate-oblong, acute at both ends, leathery: fls. axillary, fascicled, 4–8; the pedicels twice the length of the fls.: berry ovate. S. Amer.

F. Tracy Hubbard.

RHÈUM (*Rha* was the old Greek name for rhubarb). *Polygonàceæ.* Rhubarb. Perennial (sometimes monocarpic) herbs grown for the large bold foliage and often interesting inflorescence; and one for the edible leaf-stalks.

Leaves mostly radical, large for the size of the plant, entire or divided, on stout thick petioles: sts. mostly strict and rising above the heavy foliage, often tall, making plants of striking habit: fls. perfect, small, greenish or whitish, pedicellate, in numerous panicled fascicles or racemes, the infl. elevated on stout mostly hollow scape-like sts., which are provided with sheathing stipules or ochreæ (Fig. 3374); perianth 6-parted and spreading; stamens 9 or 6; ovary 3-angled and bearing 3 styles, ripening into a winged or sometimes nearly succulent achene.—Species about 25, Syria and Siberia to China, through the Himalayan region.

Aside from the common rhubarb, *Rheum Rhaponticum,* which is grown for the edible leaf-stalks, the species are little known in general cultivation. Few plants are more useful, however, for bold and striking foliage effects; and these effects are heightened by the towering flower-panicles. Most of the species are hardy and easy to grow, but they profit by a liberal winter mulch. Rheums are usually seen to best advantage against a heavy background of foliage or of rock (Fig. 1817, p. 1463). Even the common rhubarb is a useful ornamental subject when well placed. In order to secure large and fine foliage, the soil should be rich and moist. The species are propagated by dividing the root-masses, preferably in spring, leaving as much root as possible with each strong eye or bud.

3374. Ochrea or stipular sheath of rhubarb.—Rheum Rhaponticum. (×⅓)

The dried rhizomes of rhubarb are used medicinally. Several species afford the officinal product. The larger part of the dried rhubarb imported from the Orient is probably made from the crown or short stem (not the flower-stem) of *R. officinale. R. Rhaponticum* is sometimes grown for its medicinal roots.

a. *St. or scape with large imbricating lvs. or bracts.*

Alexándræ, Veitch. Tall, the fl.-sts. reaching 3–4 ft., bearing great pale yellow overlapping leaf-like rather obtuse bracts well above the dark glossy green and relatively small elliptic-ovate crown-lvs. Thibet, W. China. R.B. 35, p. 297. J.H. III. 61:297.—A striking plant of recent intro.

aa. *St. or scape without prominent imbricating foliage.*

b. *Foliage undivided, the margins of the lvs. nearly or quite entire.*

c. *Lvs. (at least on the fl.-stalks) acute or acuminate.*

Rhapónticum, Linn. (i. e., *Pontic Rha,* "Rhubarb of Pontus," a province of Asia Minor). Rhubarb. Pie-Plant (in the U. S.). Wine-Plant. Fig. 3374. Strong perennial, with thick clustered roots: petioles semi-cylindric, plane above: lf.-blades suborbicular, deeply cordate at base, undulate, about 5-ribbed, glabrous and shining above, pubescent on the veins beneath: panicles tall and narrow, somewhat leafy, densely flowered, the pedicels jointed below the middle, the fls. whitish: achene oblong-oval. In deserts and subalpine parts of S. Siberia.—Nearly everywhere grown in this country for the succulent acid petioles or leaf-stalks, which are used in early spring for pies and sauces. Wine is sometimes made from the juice. In France, known usually as an ornamental plant. There are several garden varieties. See *Rhubarb.*

undulàtum, Linn. St. 4–5 ft., smooth: petioles semiterete, lightly channeled above, the lf.-blades ovate-cordate and strongly undulate (basal sinus not so deep as in *P. Rhaponticum*), 5–7-ribbed, glabrous above and puberulent beneath, the upper ones long: panicle narrow and leafy below, the pedicels jointed near the base: achene ovate or oval. Siberia.—Earlier and usually smaller than *R. Rhaponticum.*

cc. *Lvs. obtuse or essentially so.*

emòdi, Wall. St. tall and leafy, 5–10 ft.: petioles semi-terete, somewhat concave above, the margins obtuse: lf.-blades large, ovate, cordate, obtuse, somewhat undulate, 5–7-ribbed, the under surface and the margin pubescent: panicles fastigiately branched, the fls. dark purple, pedicels jointed below the middle: achene large, ovate or oblong-oval. Himalaya, in alpine and subalpine regions.—Foliage has a coppery hue.

inopinàtum, Prain. Small perennial of recent introduction: plant seldom more than 2 ft. high, the foliage clustered at the crown, the st. red and nearly leafless: lvs. orbicular-oval, gray-green, blades 6–9 in. long and nearly as broad, more or less blistered, not lobed but somewhat irregular-margined, obtuse, the petiole about 6 in. long and red-purple: infl. paniculate, bright red or crimson, produced in succession: fr. highly colored; the nutlets orbicular and 3-winged, nearly ½in. across.

3375. Rheum officinale, showing the foliage crown before flowering.

Thibet. B.M. 8190. G.C. III. 48:391.—A handsome small species, in condition nearly all summer, with attractive red-stalked and red-nerved foliage.

BB. *Foliage more or less lobed, the margins of the lvs. or segms. usually toothed or notched.*

C. *Lvs. shallowly or obscurely lobed.*

compáctum, Linn. St. tall: petioles sulcate, plane above: lf.-blades thickish, broad-ovate, cordate, undulate and obscurely lobed, very obtuse, glabrous and shining above, the margin strongly toothed, the veins very prominent: panicle with drooping branches: achene large, dark-colored. Siberia to China.

CC. *Lvs. deeply lobed or evenly divided.*

palmàtum, Linn. (*R. sanguíneum,* Hort.). St. tall (5–6 ft.) and leafy: petioles subcylindrical, the margin rounded: lf.-blades broad, suborbicular and cordate, 3–5-ribbed, scabrous, deeply palmately lobed; the lobes ovate-oblong or lanceolate, acute, entire, dentate or pinnatifid: panicle leafy, with pubescent branches, the pedicels scarcely longer than the fls.: achene oblong-oval and subcordate. N. E. Asia. Var. **tangùticum,** Regel (*R. tangùticum,* Hort.). Lvs. more elongated and not so deeply lobed. G.Z. 20, p. 17. Var. **atrosanguíneum,** Hort. (var. *floribus rubris,* Hort.), has a showy dark red panicle. Gn. 60, p. 10.

hýbridum, Murr. Petiole long, canaliculate above and sulcate beneath: lf.-blades ovate, 3–5-ribbed, the base cuneate or scarcely cordate, incise-dentate, puberulent beneath: panicle lax, leafy: achene large, ovate.—Seems to be unknown wild. Perhaps a hybrid series between *R. palmatum* and *R. Rhaponticum* or *R. officinale.*

Colliniànum, Baill. Probably one of the *R. hybridum* series, with much-cut broad lobes that extend half the depth of the lf.-blade: fls. red. China.

officinàle, Baill. Fig. 3375. Robust, with a short, branching st. or crown 4–10 in. high: lvs. very large, 1–3 ft. across, round-oval, more or less pointed or acuminate, hairy, 3–7-lobed, the lobes extending one-third or one-half the depth of the blade and sharply angled-notched: fl.-sts. 3–10 ft., much branched, bearing numerous greenish fls. that give a feathery effect to the panicle: achenes red, winged. Thibet and W. China, on high tablelands. B.M. 6135. R.H. 1874, p. 95. Gn. 36, p. 243; 48, pp. 199, 208; 59, p. 282. G.C. III. 55:328. G. 9:341; 18:428; 23, 452, 453.—Probably the best species of the genus for general cultivation for ornament, making a striking foliage plant. It is from the short thick branching st. or caudex of this plant that most of the true officinal rhubarb is derived. Although known to the Chinese for centuries and the product long imported into Europe, the plant was not described botanically until 1872.

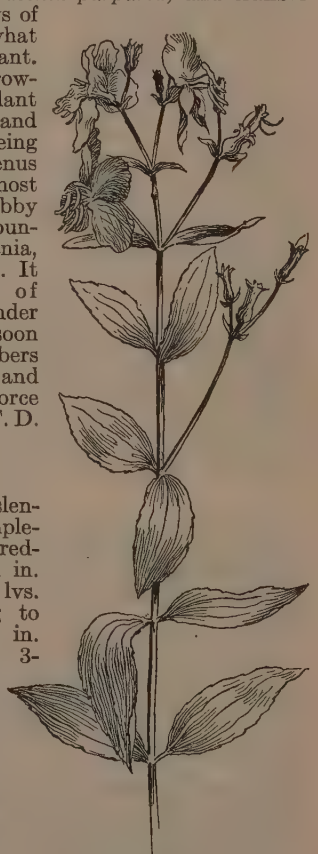
R. acuminàtum, Hook f. & Thom. Dwarf plant (seldom exceeding 3 ft.), like a small form of R. emodi, with acuminate lvs., but fls. considerably larger: said to be an attractive plant in cult. but to die after flowering: sts. and infl. deep red-purple. B.M. 4877. G. 36:659.—*R. gunneroides,* Hort., is a garden hybrid, of German origin, between R. emodi and R. palmatum. Himalayas.—*R. nóbile,* Hook. f. & Thom. St. simple, 3–4 ft., densely clothed with imbricated downward-pointing bracts that conceal the short axillary peduncles: lvs. ovate-oblong or rounded, entire. When the fruit is ripe, the shingled bracts are torn away by the winds, leaving the long panicle exposed, and this may stand while another panicle grows from the crown and perhaps at some distance separated. Himalayas. R.H. 1876, p. 266. I.H. 22:209. G.C. II. 13:793. G.Z. 20, p. 104. A remarkable plant.—*R. Ribes,* Linn. 3–5 ft.: lvs. 1 ft. across, cordate to reniform, the margins crisped or undulate, the blade puckered or blistered: fls. green, drooping: frs. about 1 in. long, oblong-cordate, narrow-winged, blood-red, showy. Asia Minor to Persia. B.M. 7591. "Rivas" or "Ribes" is its Arabic name.—*R. spiciforme,* Royle. Dwarf: lvs. thick, orbicular or broadly ovate: fls. white, in a dense spike rising about 2 ft. W. Himalaya.

L. H. B.

RHÉXIA (Greek, *rupture,* referring to its supposed properties of healing). *Melastomàceæ.* Meadow Beauty. Low perennial often bristly herbs suitable for border and wild-garden planting.

Leaves opposite, sessile or short-petioled: fls. terminal, solitary or cymose; calyx-tube urn-shaped, adherent to the ovary below, and continued above it, persistent, 4-cleft at the apex; petals 4, oblique, falling early; stamens 8: caps. 4-celled, with 4- to many-seeded placentæ.—About 12 species, N. Amer.

Rhexia virginica is found wild in company with side-saddle plants (*Sarracenia purpurea*) and cranberries in the low meadows of Massachusetts. It is what would be called a bog-plant. It is a pretty, low-growing, tuberous-rooted plant blooming in summer and chiefly interesting as being one of few species of a genus belonging to a family almost wholly composed of shrubby plants from tropical countries, such as Centradenia, Pleroma, and Medinella. It increases by means of tubers and seeds, and under suitable conditions soon makes large clumps. Tubers potted in the autumn and kept in a coldframe force nicely in springtime. (T. D. Hatfield.)



3376. Rhexia virginica. (×½)

A. *St. cylindrical.*

mariàna, Linn. A slender erect usually simple-stemmed plant with reddish purple fls. about 1 in. across, in loose cymes: lvs. short-petioled, oblong to linear-oblong, 1–1½ in. long, 2–5 lines wide, 3-nerved; anthers minutely spurred at the back. June–Sept. Pine barrens, N. J. to Fla., west to Ky. B.B. 2: 474.—Grows in drier places than *R. virginica.* It sometimes has white fls. and there is also a linear-lvd. form.

AA. *St. angled.*

B. *Petals yellow.*

lùtea, Walt. St. becoming much branched, 1 ft. high: lvs. smooth, serrulate, the lower obovate and obtuse, the upper lanceolate and acute: fls. small, in numerous cymes. July, Aug. Pine-barren swamps, N. C. to Fla. and west.

BB. *Petals not yellow.*

C. *Lvs. 6–10 lines long.*

ciliòsa, Michx. St. nearly simple, 1–2 ft. high: lvs. ovate, sessile or very short-petioled, 3-nerved: fls. violet-purple, 1–1½ in. across, short-pedicelled, in few-fld. cymes; anthers not curved and not spurred at the back. June–Aug. Swamps, Ind. to Fla., west to La.

CC. *Lvs. 1–2 in. long.*

virgínica, Linn. Fig. 3376. Roots tuber-bearing: sts. about 1 ft. high, branched above and usually clustered, forming a compact, bushy plant: lvs. sessile, ovate, acute, rounded or rarely narrowed at the base, 1–2 in. by ½–1 in., usually 5-nerved: fls. rosy, 1–1½ in. across, in cymes; petals rounded or slightly retuse; anthers minutely spurred on the back. July–Sept. Sunny swamps, Maine to Fla., west to Mo. B.B. 2:474. B.M. 968.—This is one of the prettiest of the small wild fls. When transplanted, it seems to thrive as well in good clay loam as in peaty soils, although it sometimes grows in the latter.

F. W. Barclay.
F. Tracy Hubbard.†

RHIPIDODÊNDRON: *Aloe.*

RHIPIDÓPTERIS (from Greek for *division* and *Pteris* for *fern*). *Polypodiàceæ.* A tropical American genus of small ferns formerly classed under Acrostichum which it resembles in having the fertile lf.-blades entirely covered with sporangia. It differs in having the sterile lvs. dichotomously divided into linear lobes unlike any other fern.

peltàta, Schott (*Acróstichum peltàtum,* Swartz). Rootstocks long-creeping: sterile lf.-blades 1–2 in. each way on slender stalks 2–4 in., repeatedly forked into very narrow divisions; fertile lf.-blades ¼–½in. wide, circular, or somewhat 2-lobed. Mex. and W. Indies to Brazil.—A delicate and distinct plant, needing moisture all the year round especially in the air. Avoid unnecessary disturbances of roots. Use some partly decayed leaf-mold.

R. C. Benedict.

RHÍPSALIS (Greek, *rhips,* wicker-work). Includes *Lepísmium. Cactàceæ.* Epiphytic plants of rather diverse form, sometimes grown in glasshouse collections of succulents and cacti.

Flowers very small, usually without tube; stamens and style very short: fr. small naked berries.—A genus of about 50 species, mostly confined to S. Amer. Excludes Hariota and Pfeiffera of Cyclo. Amer. Hort. Cult. similar to epiphyllum and zygocactus. They are mostly fancier's plants and grown by collectors, for the interesting habit and characteristic kinds of branching.

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A. *Bracts on ovary with hairs and bristles in their axils.*

1. **pilocárpa,** Löfgren. Branches terete, the axils bearing 10–15 white bristles: fls. wheel-shaped, 1 in. broad. Brazil.

AA. *Bracts on ovary naked.*

B. *Ovary imbedded in the branch.*

C. *Edges of joints winged.*

2. **squamulòsa,** Schum. (*Lepísmium commùne,* Pfeiff.). Somewhat branched, reaching a length of 2 ft.: branches very unequal in length, ⅓–1 in. thick, triangular, the angles winged: fls. 1–2, from the deep areoles, 5 lines long, greenish without, yellowish within. Brazil, Argentina. B.M. 3763.

CC. *Edges of joints not winged.*

3. **myosùrus,** Schum. (*Lepísmium myosùrus,* Pfeiff.). Somewhat branched, a yard long: branches 3–6 lines thick, 3–4-angled, the angles not winged, the terminal branchlets generally acuminate, often tipped by a pencil of bristles: fls. solitary in the deep areoles, 4–5 lines long, rosy white: fr. red. Brazil. B.M. 3755.

BB. *Ovary not imbedded in the branch.*

C. *Branches terete, slender.*

D. *The branches of 2 kinds.*

4. **Sagliònis,** Otto (*R. brachiàta,* Hook. *Hariòta Sagliònis,* Lem.). Fig. 3377. Reaching a height of 2 ft., richly branched: long or cereiform branches ⅓–1 ft. long; secondary or fruiting branches oblong-elliptic or short-cylindric, rounded at the ends, spirally or rarely verticillately arranged, sometimes weakly grooved, not more than ½in. long: areoles with very scanty wool and

3377. Rhipsalis Saglionis. (×¼)

2–4 short bristles, which on the end branches project as a little brush: fls. near the tops of the short branches, flat, ⅔in. diam., with 12 white lvs. with yellowish midstripe: berry white. Uruguay and Argentina. B.M. 4039.

5. **mesembrianthemoìdes,** Haw. (*Hariòta mesembrianthemoìdes,* Lem.). Upright, the ends drooping, richly branched: long branches 4–8 in. long, 1 line diam.; fruiting branches 3–5 lines long, not more than 2 lines diam., spirally attached, thickly crowded: areoles sparsely woolly, with 1–2 bristles which project from the ends of the branches: fls. near the top of the joint, about 5 lines diam., formed of 10 white with yellow midstriped lvs.: berry white. Brazil. B.M. 3078.—Probably hardly more than a slender variety of the preceding species.

6. **grâcilis,** N. E. Br. Branches terete, slender: fls. either terminal or lateral, minute. Passing in collections under the name of *R. penduliflora.*

DD. *The branches all alike.*

7. **grandiflòra,** Haw. (*R. funàlis,* Salm-Dyck). Branching, cylindrical, rather stout, the branches reaching a height of 3 ft., with a diam. of more than ⅓in.; ultimate branchlets short, often verticillate: areoles depressed, bordered by a red line, sometimes in old branches bearing a bristle: fls. wheel-shaped, lateral on the branches, nearly 1 in. diam. Brazil. B.M. 2740.

8. **Cassỳtha,** Gaertn. Richly branching, pendulous, sometimes 10 ft. long; branches rarely 2 ft. long, 1–1½ lines diam., pale green; ultimate branchlets spirally attached: areoles with sparse woolly hairs and frequently 1–2 minute bristles: fls. lateral on the terminal joints, 2–3 lines diam.: berry like that of the mistletoe, 1–2 lines diam. Widely dispersed in Cent. and S. Amer., W. Indies, Mex., Mauritius, Ceylon, and Afr. B.M. 3080.

9. **virgàta,** Web. Richly branching, pendulous, becoming a yard long; terminal branchlets hardly more than a line thick, spirally attached: areoles bearing sparse woolly hairs, with an occasional bristle: fls. lateral, 3–4 lines diam.: berry only 1½ lines diam. Brazil. —Very much like the preceding.

CC. *Branches not terete.*

D. *The branches narrow, angled.*

10. **trigòna,** Pfeiff. Richly branched, becoming a yard long: branches ½ to nearly 1 in. diam., 3-angled: areoles sparsely woolly and bristly, the blooming areoles much more copiously so: fls. greenish outside, white within, 4 or 5 lines long. Brazil.

11. **paradóxa,** Salm-Dyck. Sparingly branched, 1–2 ft. long; branchlets 1–2 in. long and ½–1 in. diam., twisted at the joints, so that the angles alternate with the sides: fls. ⅔in. long, white. Brazil.

12. **pentáptera,** Pfeiff. Richly branched, 1–2 ft. long, 4–5 lines diam.: branchlets 2–5 in. long, 5–6-angled or almost winged: areoles in crenatures of the angles with scanty wool and an occasional bristle: fls. greenish white, 3–4 lines long: fr. white, bright rose-red above, crowned by the withered fl. S. Brazil, Uruguay, Argentina.

13. **ròsea,** Lagerheim. Shrubby, more or less erect, usually 10 in. high: branches clustered, often hanging, 3–4-angled: fls. rare, large, 1½ in. broad, rose-colored, fragrant. Brazil.

DD. *The branches usually flat or 3-angled, always broad.*

14. **rhómbea,** Pfeiff. (*R. Swartziàna?,* Pfeiff.). Branching, reaching a yard in length: joints green, lf.-like, crenate-oblong or rhombic, 1–5 in. long, ½–2 in. broad: fls. yellow, about 5 lines long. Brazil.

15. **pachýptera,** Pfeiff. (*R. alàta,* Steud.). Erect, branching, reaching a height of nearly 3 ft.: joints flat, rarely 3-winged, rather thick, usually somewhat concavo-convex, 3–8 in. long, blunt, 2–5 in. broad, often purple-red: fls. about 8 lines long, yellow with reddish tips. Brazil. B.M. 2820 (as *Cactus alatus*).

16. **Houlletiàna,** Lem. (*R. Houllétii,* Lem.). St. richly branched, becoming 3 ft. or more long, 1–1½ in. broad, often tapering to the round midrib for a considerable distance, then becoming again broad and lf.-like: fls. 8–9 lines long, yellowish white to yellow: berry red. Brazil. B.M. 6089.

R. angustissima, Web., *R. chlorόptera,* Web., *R. Novàesii,* Löfgren, *R. Simmleri,* Beauverd, and *R. Wércklei,* Berger, are recent species occasionally seen in European collections, but not offered in American trade.

J. N. Rose.

RHIZÓPHORA (Greek, *root* and *bearing,* referring to the fact that the seeds germinate even while attached to the plant if they touch the ground). *Rhizophoràceæ.* Trees, with thick terete scarred branches, sometimes planted to hold seashores: lvs. opposite, petioled, thick, leathery, ovate or elliptic, entire, glabrous: peduncles axillary, di- or trichotomously branched, few-fld.: fls. rather large, leathery, sessile or pedicelled; calyx-limb 4-parted; petals 4; stamens 8–12; ovary semi-inferior, 2-celled: fr. leathery, ovoid or obconical, 1-celled, 1-seeded.—About 3 species, seashores of the tropics. *R. Mángle,* Linn. Shrub or tree reaching a height of 30 ft.: lvs. 2–6 in. long, leathery, elliptic or elliptic-obovate, obtuse: peduncles 2–3-fld.; fls. pale yellow; sepals lanceolate; petals linear, or nearly so, leathery, cleft at tip. Coast of Fla. and the tropics. It forms impenetrable thickets.

RHODÁNTHE: *Helipterum.*

RHODAZÀLEA: a name given in France to a hybrid (**R. Croûxii,** Hort.) between a garden rhododendron and *Azalea mollis* (*Rhododendron sinense*). Another name for this hybrid is *Azaleodendron Crouxii,* Hort.

RHÒDEA: *Rohdea.*

RHODOCHÎTON (Greek, *red cloak;* alluding to the large rosy red calyx). *Scrophulariàceæ.* A free-flowering graceful vine with lvs. cordate, acuminate, sparsely and acutely dentate: fls. solitary, pendulous, axillary, long-peduncled; calyx conspicuous, large, membranous, broad bell-shaped, 5-cleft; corolla-tube cylindrical, the throat not personate, 5-lobed; lobes oblong, nearly equal: caps. dehiscent by irregular perforations.—One species, Mex.

volûbile, Zucc. Purple Bells. A vine with habit of maurandia, to which it is allied, but more vigorous and having curious, distinct purplish red fls. over 2 in. long on red peduncles: lvs. about 3 in. long. B.M. 3367. B.R. 1755. G.C. III. 53:310. G.M. 58:376. Gn.W. 12:449. I.H. 42:31. J.H. III. 43:563. R.H. 1910, p. 79.—Blooms the first season from seed and may be treated as a tender annual.

F. W. Barclay.

RHODODÉNDRON (Greek, *rhodon* and *dendron,* rose-tree; the Rhododendron of the ancient writers is Nerium). *Ericàceæ.* Including *Azalea* which most botanists consider inseparable from Rhododendron, but horticulturists may be inclined to retain Azalea for the deciduous species and to use the Azalea names given in parentheses. Highly ornamental woody plants, chiefly grown for their beautiful flowers and many species also for their handsome foliage.

Evergreen or deciduous shrubs, rarely trees: lvs. alternate, short-petioled, entire: fls. pedicelled, in terminal umbel-like racemes, rarely lateral, in 1- to few-fld. clusters; calyx 5-parted, often very small; corolla rotate, campanulate or funnel-shaped, sometimes tubular, with 5-, sometimes 6–10-lobed limb; stamens 5–10, sometimes more; anthers opening with pores at the apex; ovary 5–10-loculed; style slender with capitate stigma: caps. separating into 5–10 valves containing numerous

minute seeds.—About 350 species are known, distributed through the colder and temperate regions of the northern hemisphere; in Trop. Asia they occur in the mountains and extend as far south as New Guinea and Austral., the greatest segregation being in Cent. and W. China and the Himalayas; several species closely allied to those of the Malayan Archipelago are found in the Philippine Isls. but are not yet intro.; 16 species occur in N. Amer. The rhododendrons possess but few economic properties. The hardy close-grained

3378. A common hybrid form of garden rhododendron. (×⅛)

wood of the arborescent species is used for fuel; also for construction and for turnery work; the lvs. of some species are used medicinally; those of *R. arboreum* and other species are believed to be poisonous to cattle. In India the fls. of various species are sometimes made into a subacid jelly. The honey obtained from the fls. is believed to be poisonous.

The rhododendrons belong to our most ornamental and most beautiful flowering shrubs and are often completely covered with their showy trusses of brilliantly and variously colored flowers and the evergreen species are attractive throughout the whole year with their handsome usually large foliage. They grow best in a peaty or porous loamy soil, which does not contain lime and always retains a sufficient amount of moisture; they like as a rule half-shaded positions. In regard to their culture and particular ornamental qualities, they may be divided into three horticultural groups: Evergreen rhododendrons, hardy deciduous azaleas, and Indian azaleas.

Evergreen rhododendrons.

Here belong the largest number of species comprising the two sections Lepidorhodium and Leiorhodium. Although most of the species are hardy only in warm temperate regions, there are many which are hardy at least as far north as Massachusetts. They are *R. maximum, R. catawbiense, R. caucasicum, R. brachycarpum, R. Metternichii, R. Smirnovii, R. mucronulatum, R. dahuricum, R. micranthum, R. lapponicum, R. ferrugineum, R. hirsutum, R. Kotschyi, R. carolinianum, R. minus,* and probably also *R. chrysanthum, R. Przewalskii, R. campanulatum, R. californicum, R. Ungernii,* and most of the small-leaved Chinese species. Somewhat more tender are *R. ponticum, R. niveum, R. Hodgsonii, R. Thomsonii, R. Anthopogon* and many of the recently introduced Chinese species, as *R. discolor, R. oreodoxa, R. decorum.* South of Philadelphia such species as *R. cinnabarinum, R. glaucum, R. ciliatum, R. Fortunei, R. lepidotum, R. Collettianum,* and the Yunnan species, as *R. yunnanense, R. irroratum,* and *R. racemosum,* are probably hardy; also *R. arboreum, R. barbatum, R. Falconeri, R. Keysii, R. triflorum,* and *R. Wrightii* in very sheltered positions. Species like *R. Dalhousiæ, R. Edgeworthii, R. Griffithianum, R. formosum, R. Maddenii, R. Nuttallii,* and *R. pendulum* stand only a few degrees of frost. The Javanese species, as *R. javanicum, R. jasminiflorum, R. Brookeanum* and *R. Lobbii* grow and bloom continually and stand no frost at all.

Variation in height.—Most of the species are shrubby; a few only, and these mostly Himalayan species, grow into small or medium-sized trees, attaining 60 feet in the case of *R. barbatum,* 40 feet in *R. grande* and *R. arboreum,* 30 feet in *R. Falconeri* and *R. maximum.* A number of northern and alpine species always remain dwarf, as *R. ferrugineum, R. hirsutum, R. lapponicum, R. virgatum, R. lepidotum, R. racemosum,* and others. A few Himalayan and Chinese species and most of the Malayan species are often epiphytal and grow on branches of large trees like orchids; e. g., *R. Dalhousiæ, R. pendulum, R. Nuttallii, R. moupinense.*

Hybrid rhododendrons.—Many hybrids have been raised and they are now more extensively cultivated than the original species. The first hybrid was probably the one raised from *R. ponticum,* fertilized by a hardy azalea, probably *A. nudiflorum;* it originated about 1800, in the nursery of Thompson, at Mileend, near London, and was first described and figured as *R. ponticum* var. *deciduum* (Andrews, Bot. Rep. 6:379). Many hybrids of similar origin were afterward raised for which the name Azaleodendron has been proposed by Rodigas. The first hybrid between true rhododendrons was probably a cross between *R. catawbiense* and *R. ponticum,* but it seems not to have attracted much attention. It was by hybridizing the product of this cross with the Himalayan *R. arboreum* introduced about 1820 that the first plant was raised which became the forerunner of a countless number of beautiful hybrids. From the appearance of this cross, obtained about 1826, at Highclere, in England, and therefore called *R. altaclarense,* the era of rhododendron hybrids is to be dated. Figs. 3378 and 3379 are common hybrid forms. A second era in the history of the rhododendron may be dated from the introduction of a large number of the beautiful Sikkim rhododendrons about 1850, among them species like *R. Griffithianum* which entered into the parentage of many of the most striking tender hybrids, and from the introduction of the Javanese species shortly afterward. A third era will perhaps be traced from the recent introduction of the Chinese rhododendrons.

Their place in ornamental planting.—Rhododendrons are equally effective and desirable as single specimens on the lawn as when massed in large groups, and are especially showy when backed by the dark green foliage of conifers, which at the same time afford a most advantageous shelter. The dwarf species, which are mostly small-leaved and flower at a different time, should not be grouped with the large-leaved ones, as they do not harmonize with them; however, they are exceedingly charming plants for rockeries or in groups with other smaller evergreens. It is certainly true that the rhododendrons have not yet received the attention they deserve. They are still far from being as popular as they are in England. The beautiful Himalayan species and their numerous hybrids are still almost unknown in this country, although without doubt they could be grown as well outdoors in the Middle and South Atlantic states as they are in England, if the right situation were chosen. Formerly it was considered impossible to grow the beautiful hardy hybrids in the New England

states, and it was first shown by the splendid collections of H. H. Hunnewell at Wellesley, Massachusetts (see A.F. 13:24–31 and Gng. 5:375–7), that, even in a trying climate, they can be grown to perfection if the proper situations are found and the right way of cultivation is followed.

Outdoor cultivation.—The selection of a suitable situation is of foremost importance. If possible the beds should be sheltered against drying winds and the burning sun by tall conifers, but the shelter should be always light and natural, as too much shelter by dense hedges or walls close to the plants is worse than no shelter at all. Any open well-drained soil which does not contain lime or heavy clay and has a moist and fresh subsoil will prove satisfactory. Where limestone or heavy clay prevails, beds must be specially prepared and filled with suitable soil. They should be at least 2 to 3 feet deep, or deeper when the subsoil is not porous, and in this case the bottom should be filled in about 1 to 2 feet high with gravel or broken stones for drainage. A mixture of leaf-mold or peat and sandy loam will make a suitable soil. In dry spells during the summer, watering is necessary if the subsoil is not very moist; it is most essential that the soil never becomes really dry. In autumn the ground should be covered with leaves, pine needles, hay, or other material to protect from frost. This mulch should be allowed to remain during the summer, especially when the plants are not large enough to shade the ground. An occasional top-dressing of well-decayed stable- or cow-manure will prove of much advantage. The ground should never be disturbed, as the roots are very near the surface. After flowering, the young seed-vessels should be removed. The rhododendrons are easily transplanted either in spring or in fall, especially if they grow in peat or turfy loam, and if a good ball of earth can be preserved in moving. They should be planted firmly, especially in porous, peaty soil, and thoroughly watered after planting. If they are carefully handled they are not much affected by transplanting, and tender kinds may be dug in fall, heeled-in in a frost-proof pit, and planted out

3379. A good plant of garden rhododendron in bloom.

again in spring. Potted and well-budded plants transferred in January into a temperature not exceeding 60° will develop in about six to eight weeks into very attractive and showy specimens for decoration.

Hardy varieties.—The following varieties have proved hardy in the vicinity of Boston and may be recommended for planting in similar climates and for experimental trial farther north. They are mostly hybrids of *R. catawbiense* with *R. maximum, R. ponticum, R. caucasicum* and with some infusion of *R. arboreum* and perhaps a few other species. As in most of them the parentage of *R. catawbiense* is the most predominant, they are all usually called "catawbiense hybrids." Choice kinds are (those marked with an asterisk have proved the hardiest): *Album elegans*, blush, changing to white; *Album grandiflorum*, blush, changing to white, flowers larger, less spotted; *Alexander Dancer*, bright rose, paler in center; *Atrosanguineum*, rich blood-red; *August Van Geert*, bright carmine, spotted dark purple; *Bacchus*, crimson, large flowers; *Bicolor*, purplish pink, spotted; *Blandianum*, rosy crimson (H.F. 1859:153); **Bluebell*, blush, with light purplish margin; **Boule de Neige*, white, early; **Caractacus*, deep crimson; *Charles Bagley*, cherry-red; **Charles Dickens*, dark red, spotted brown, one of the most striking red ones; *Cærulescens*, pale lilac; **Coriaceum*, white, spotted yellow, dwarf and free-blooming; *Crown Prince*, carmine, spotted greenish yellow; **Delicatissimum*, blush, edged pink, changing to almost white, late (Gn. 63, p. 415); *Edward S. Rand*, rich scarlet; **Everestianum*, rosy lilac with crisped edges, excellent habit and very free-flowering (G. 26:103); **F. L. Ames*, white center, edged pink; **F. L. Olmsted*, pink; **Giganteum*, bright rose, large clusters; **Glennyanum*, white, suffused with pink (G.M. 44:355; 48:565); **Gomer Waterer*, blush-pink; *Grandiflorum*, clear rose; *Guido*, deep crimson; *Hannibal*, rosy carmine; **Henrietta Sargent*, pink; *Henry W. Sargent*, crimson, large clusters; *H. H. Hunnewell*, rich crimson; *John Waterer*, dark crimson; *J. D. Godman*, carmine, distinctly spotted; **Kettledrum*, rich crimson; **King of Purples*, purple, spotted dark brown; *Lady Armstrong*, rose-red, paler in center, distinctly spotted; **Lady Clermont*, rosy scarlet; **Lady Frances Crossley*, salmon-pink; *Lady Gray Egerton*, delicate lilac, spotted greenish brown; **Lee's Purple*, purple; *Madam Carvalho*, blush, changing to pure white; **Melton*, rich purple; **Mrs. C. S. Sargent*, similar to Everestianum, but pink; *Mrs. Milner*, rich crimson; **Norma*, pink; **Old Port*, plum-color; *Princess Mary of Cambridge*, white with purple margin; **Purpureum crispum*, lilac-purple, spotted greenish; **Purpureum grandiflorum*, purple, large clusters; *R. S. Field*, scarlet; *Ralph Sanders*, rich purplish crimson; *Rosa mundi*, white slightly flushed with yellow spots, dwarf (Gn. 63, p. 369); *Roseum elegans*, rosy lilac, dwarf; *Scipio*, rose with deep spot; **Sefton*, deep maroon, large clusters; *Wellsianum*, blush, changing to white.

For greenhouse culture, the most successful way, especially with the taller-growing species, like *R. arboreum, R. Griffithianum, R. barbatum*, and *R. Falconeri*, is to plant them out in a porous peaty soil provided with good drainage. If grown in pots, a sandy compost of leaf-soil and peat, with an addition of some fibrous loam, will suit them. The pots, which should never be too large, must be well drained and the plants freely watered during the summer, while during the winter water must be carefully applied. The Himalayan species and their hybrids will do well in a cool greenhouse, where the temperature is kept a few degrees above freezing-point during the winter. The Javanese species and hybrids, however, on account of their continual growing and blooming, require a warmer greenhouse and must have a minimum temperature of 50° during the winter. They like a moist atmosphere and should be freely syringed in warm weather. In potting them, their epiphytal habit must be borne in mind, and the soil should consist mainly of good fibrous peat broken into pieces, with a liberal addition of sand and broken charcoal. The soil should never be allowed to become dry. They are readily propagated by cuttings with bottom heat in the warm propagating-house. The Javanese rhododendrons are especially valuable for their continual blooming during the winter and the brilliant color of their flowers. A large number of beautiful hybrids have been raised; the following are a

small selection of them: *Balsaminæflorum*, with double pink flowers (Gt. 37, p. 265. G.C. II. 18:230; III. 12:769. J.H. III. 43:151. G.Z. 27:241); *Balsaminæflorum album*, with double white flowers (Gn.W. 5:373); *Balsaminæflorum aureum*, with double yellow flowers; *Brilliant*, brilliant scarlet; *Ceres*, tawny yellow (Gn. 41:845); *Diadem*, orange-scarlet; *Duchess of Connaught*, vermilion-red; *Duchess of Edinburgh*, scarlet with orange-crimson (F.M. 1874:115); *Eos*, scarlet-carmine (G.C. III. 19:327); *Exquisite*, large light fawn-yellow flowers (Gn. 56:62); *Favorite*, satiny rose; *Jasminiflorum carminatum*, deep carmine (Gn. 41:328); *Little Beauty*, flowers small, but bright carmine-scarlet (Gn. 56:242); *Lord Wolseley*, bright orange-yellow, tinted with rose at the margins; *Luteo-roseum*, flowers satiny rose, suffused with white, center light yellow (G. 33: 313); *Maiden's Blush*, blush, with yellowish eye (Gn. 16:394); *Princess Alexandra*, white, faintly blushed; *Princess Frederica*, yellow, faintly edged rose; *Princess Royal*, pink; *Rosy Morn*, bright pink (Gn. 42:164); *Taylori*, bright pink, with white tube (F. M. 1877:242); *Triumphans*, crimson-scarlet.

Propagation.—All rhododendrons are easily propagated by seeds, which are very small and are sown in spring in pans or boxes well drained and filled with sandy peat. Pots should be well watered previous to sowing. The seeds should be covered only a very little with fine sand or finely cut sphagnum, or merely pressed in and not covered at all. To prevent drying, a glass plate may be placed over the pan or some moss spread over the surface; this, however, must be taken off as soon as the seeds begin to germinate. The seeds also germinate very readily if sown on fresh sphagnum, but in this case they must be pricked off as soon as they can be handled. In any case, it is of advantage to prick off the young seedlings as soon as possible, but if they are not sown too thickly they may remain in the seed-boxes until the following spring. The seedlings of hardy rhododendrons should be placed in coolframes and gradually hardened off; those of greenhouse species remain under glass. Rhododendrons are also sometimes increased under glass by cuttings of half-ripe wood taken with a heel, and if gentle bottom heat can be given after callusing it will be of advantage. They root, however, but slowly, except those of the Javanese kinds, which are mostly propagated in this way, since they grow very readily from cuttings. Layering is sometimes practised, especially with the dwarf and small-leaved species, but the layers usually cannot be separated until the second year. For the propagation of the numerous varieties and hybrids of hardy and half-hardy rhododendrons grafting is most extensively employed. *R. catawbiense* or seedlings of any of its hardy hybrids may be used as stock; *R. maximum* is also probably as good. In English and Belgian nurseries *R. ponticum*, which is inferior in hardiness, is mostly employed as a stock, but this often proves fatal if the grafted plants are transferred to colder climates. *R. arboreum* may be used for strong-growing varieties intended for cultivation in the greenhouse or South. Veneer- or side-grafting is mostly practised, and sometimes cleft- and saddle-grafting (see G.C. III. 24:425 and Figs. 3380, 3381). The leaves should be removed only partly and the stock not headed back until the following year. The grafting is usually done late in summer or early in spring in the greenhouse on potted stock without using grafting-wax, and the grafted plants kept close and shaded until the union has been completed. If large quantities are to be handled the plants are sometimes not potted, but taken with a sufficient ball of earth, packed close together and covered with moss. Covering with moss to keep the atmosphere moist is also of much advantage if the plants are potted.

Other experience with the evergreen rhododendrons. (B. M. Watson.)—Rhododendrons, in this article, mean more particularly *R. maximum* and the hybrid varieties of *R. catawbiense;* in the main, however, the directions for the various operations apply to the azalea group and to many other members of the heath family.

Rhododendrons as a class are increased by seeds, layers and grafts, and occasionally by cuttings. Seeds should be sown under glass, between January 1 and March 15, in soil one-half peat and one-half pure fine sand, with good drainage. The seeds are small and require no covering, the usual watering after sowing being quite sufficient. A thin layer of sphagnum over the surface of the seed-pan is good protection from the sun and keeps the soil evenly moist; it should be removed when germination begins. Seeds may also be sown on growing sphagnum, a thin layer being compactly spread above the seed-soil and drainage, and an even surface being secured by clipping. Seed-pans or flats of convenient size are used and they should be plunged in sphagnum still further to insure even moisture; the temperature of the house should be 45° to 50° F. Seedlings are prone to damp-off and should be pricked off into fresh soil as soon as they are big enough to handle; wooden pincers, made from a barrel hoop, are handy for this work. They are slow growers, and must be tended carefully. Keep under glass, well shaded until the weather is settled. Frames with lath screens make good summer quarters. Winter in pits and plant out in frames in peaty soil when large enough. Never let them suffer from dryness. It has been suggested that the seed of *R. maximum* might be planted on living moss under high-branched trees in swamps where the water does not collect in winter. (See Jackson Dawson, on the "Propagation of Trees and Shrubs from Seeds," in Transactions of the Massachusetts Horticultural Society, 1885, part I, page 145.) Layers probably make the best plants, and in the best English nurseries layering is the common method of propagation. In the United States layering in spring is preferable, but abroad it is practised in both spring and autumn. It is a slow process, but desirable for the hardy hybrids of *R. catawbiense*. Roots form on wood of almost any age; when removed the layers should be treated as rooted cuttings and carefully grown in well-prepared soil where water and shade are easily furnished. See *Layering*. See, also, G.F. 6:63 (1893) for an interesting account of layering large plants by burying them to the top.—Grafting is the common method of propagation, and is employed almost universally in continental nurseries. *R. ponticum* is the usual stock, a free grower and readily obtained from seeds. Attempts have been made to use *R. maximum* in American nurseries, because of the tenderness of *R. ponticum*, but no great progress has been made. It is asserted that the rate of growth is somewhat slower than that of the hybrids; this seems hardly possible, and it is to be hoped that further experiments will be made. *R. ponticum* should

3380. Grafting of rhododendron. Saddle-graft at A; veneer-graft at B.

be established in pots in spring and grafted under glass in autumn and early winter, using the veneer-graft (see *Grafting*, page 1362, Vol. III). Graft as near the root as possible and plant the worked parts below the surface when planting in the nursery or permanently. With these precautions, and an extra covering of leaves until the plant is established on its own roots, the defect of tenderness in this stock can be overcome. Nurse carefully the young grafted plants in frames until of sufficient size to be planted in the nursery rows. Figs. 3380 and 3381 illustrate two common methods of grafting rhododendrons and other woody plants. The details of the unions are shown in Fig. 3380, and the completed work in Fig. 3381. Statements are made that cuttings of half-ripened wood will strike, but it is not likely that this will ever prove a practical method of propagating *R. maximum* or the *R. catawbiense* hybrids; it might be worth while to experiment with wood grown under glass,

3381. Saddle-graft at A; veneer-graft at B. (For comparison with Fig. 3380.)

particularly with some of the smaller-leaved evergreen kinds.

As to cultivation, the point on which successful American growers of rhododendrons now insist is that the water-supply shall be sufficient. (See H. H. Hunnewell, in G.F. 3:201, 1890.) To effect this: (1) make the soil deep and fine, using materials like peat, leafmold, well-rotted manure and yellow loam, all of which are retentive of moisture; (2) plant in masses, at any rate while young, so that they may protect each other and prevent evaporation; (3) give the bed a northern exposure or a situation where the force of the midday sun is broken; (4) do not plant under or near trees like elm, oak, or maple, which make undue inroads on the natural water-supply, nor so near buildings that the border is sheltered from rain or overdrained by cellar walls; (5) mulch with leaves summer and winter, protect from wind and sun with evergreen boughs in winter and in summer give heavy watering whenever the weather is excessively hot or dry.

The planting-bed should be prepared by excavating to the desired dimensions and at least 3 feet deep. The poor material should be discarded, but the good soil can be replaced, adding enough peat and the like (see above) to make good that which was rejected; all should be thoroughly and carefully mixed. Peat, although excellent, is not necessary. Yellow loam or hazel loam, if not too sandy, is equally good and is improved by additions of humus. To nearly pure peat an admixture of sand is beneficial; the essential point is that all soils for these plants must be fine. The beds should be prepared in autumn and left to settle all winter, due allowance being made for shrinking. In spring level off to the grade of the adjacent land and do not leave "rounded up." A bed higher at the center than at the sides perhaps makes a better display of the plants, but is more likely to dry up and does not catch all the water possible from occasional showers. It is generally conceded that lime soils and manures containing lime, e.g., woodashes and bone-meal, are injurious to rhododendrons; in limestone regions it is undoubtedly advisable to substitute, for the natural soil, others which are free from this objectionable element.

Plant rhododendrons in spring when weather is settled and the March winds have passed. If the ball of roots is dry, soak well before setting. Plant closely, so that the tops are only 10 to 12 inches apart and pay particular attention to "facing" them, i. e., see that the best side is facing the most important point of view, and that all are faced alike. Grafted plants should, if possible, have the worked portion below the surface. Do not plant in autumn. Plants grown on the premises may be transplanted in favorable weather in summer if great care is taken to prevent the roots suffering from dryness. In planning the original border it is well to leave room for extension: when planted, as described above, the beds can be enlarged at intervals of four or five years, or new beds made from the old stock. Place the beds so that the glare of the midday sun is screened both summer and winter, and avoid situations where there is any interference, owing to trees or buildings, with a naturally good condition of the soil in respect to moisture. If permanent protection is desired, use conifers, particularly the hemlock, in preference to deciduous trees. Good positions for beds may be found along the edges of ponds and streams, and in reclaimed meadows, with their cool moist soil, but keep aloof from any ground where the water collects in summer or winter. Beds, or even single plants, if sizable, may be introduced into open spaces in woodlands if the precautions noted above are observed and plenty of air and light are obtainable. It is somewhat difficult to combine rhododendrons and many deciduous shrubs, among which are the azaleas, their near relatives. A background of dark green conifers seems most appropriate. Mountain laurels, *Pieris floribunda*, *Leucothoë Catesbæi*, and *Daphne Cneorum* are proper companions, but at times these seem better apart. Our native lilies, *L. superbum* and *L. canadense*, are good associates and thrive under the same conditions. In hot, dry weather water should be given, not daily in driblets, as lawns are sprinkled, but in quantity, enough at one time to soak the border to the depth of the soil, but at comparatively infrequent intervals, once a week or so. The bed should also be mulched with leaves, or other material, to prevent evaporation; grass clippings are serviceable, but should not be used in large quantities at any one time or else they will heat. Leaves make good winter protection, which should be given just before cold weather,—in eastern Massachusetts, between Thanksgiving and Christmas. Let the bed be covered to the depth of 10 to 12 inches, well worked in beneath the foliage but not over it. In spring dig as much as pos-

XCVI. Rhododendron well placed.—One of the Rhododendron catawbiense varieties.

sible of this material into the ground, reserving a part for the summer mulch. Shelter the tops with evergreen boughs, the butts driven into the earth a foot or more; in windy positions a temporary board fence is useful.

Experience at Rochester, New York (John Dunbar).—About fourteen years ago, rhododendrons were planted in the Rochester City Parks in beds excavated to a depth of 2 to 2½ feet (sandy soil containing lime removed), and filled with humus or soil of a peaty nature from an adjacent swamp. Cow-manure was mixed liberally in the surface. Rhododendrons planted in this preparation began to root immediately, grew with vigor, and flowered splendidly. About 20,000 square feet have been planted to rhododendrons in this way with unfailing success. A ¾-inch-pipe water-system is connected with all of the beds, with faucets at convenient points, and the plants are thoroughly watered in the growing season, and are never permitted to enter the winter with dry roots. The natural drainage is perfect. Rhododendrons will not tolerate stagnant moisture at their roots. They are thoroughly protected by the lay of the land from the west, northwest, and north winds, but are completely exposed to the south, summer and winter, and with the exception of a heavy mulching of leaves, spread over the beds in the autumn, they receive no other protection. The lace-fly became a very serious pest some years ago. The colonies of nymphs feed on the under side of the leaves and the foliage presents a sickly yellow appearance, as if attacked by red-spider. This is promptly destroyed and kept under control by two sprayings of Ivory soap during the growing season, using it in the proportion of five bars of soap to one hundred gallons of water.

The following are hardy at Rochester in a normal winter: *Catawbiense, Catawbiense album, Anna Parsons, Album elegans, Album grandiflorum, Alexander Dancer, Amarantinora, Atrosanguinea, Bertha Parsons, Boule de Neige, Caractacus, Charles Dickens, Cærulescens, Daisy Rand, Delicatissimum, Dr. Torrey, Edward S. Rand, Everestianum, F. D. Godman, F. L. Ames, Flushing, General Grant, Glennyanum, Guido, Henrietta Sargent, Henry Probasco, H. W. Sargent, Ignatius Sargent, J. R. Trumpy, Kissena, Kettledrum, Lady Armstrong, Macranthum, Maximum, Maximum superbum, Maximum Wellsianum, Mrs. C. S. Sargent, Mrs. Harry Ingersoll, Mrs. Henry S. Hunnewell, Mrs. Milner, Old Port, President Lincoln, President Roosevelt, Roseum pictum, Roseum elegans, Samuel B. Parsons, Scipio, Senator Charles Sumner, Sherwoodianum.*

The following are liable to severe injury in a very cold winter: *Blandyanum, Beauty of Surrey, Charles S. Sargent, Charles Bagelay, Giganteum, Hannibal, H. H. Hunnewell, James Bateman, James MacIntosh, J. Marshall Brooks, John Waterer, Lady Clermont, Lady Gray Egerton, Madame Carvalho, Meteor, Marchioness of Lansdowne, Mrs. John Clutton, Ralph Saunders, Rosabel, Stella, The Queen.*

The following species and hybrids are hardy: *R. arbutifolium, campanulatum, caucasicum pictum, carolinianum, dahuricum, ferrugineum, hirsutum, Metternichii, mucronulatum, myrtifolium, Smirnovii.*

Hardy deciduous azaleas.

These include the species of the sections Pentathera and Rhodora and some of the section Tsutsutsi, and the hybrids known as Ghent azaleas. Most of them are hardy, but in the North and in exposed situations a protection with brush, hay, or mats should be given in winter, to protect the flower buds from sudden changes of temperature.

In the open, the flowering period of hardy azaleas extends from April to July. First comes *R. canadense, R. rhombicum,* and *R. Vaseyi;* then *R. nudiflorum* and *R. japonicum,* followed by *R. luteum* and *R. calendulaceum* and nearly at the same time, *R. Schlippenbachii* and *R. Albrechtii;* somewhat later, *R. occidentale,* and last, *R. arborescens* and *R. viscosum.* One of the most beautiful is the American *R. calendulaceum,* which is hardly surpassed in the brilliancy and abundance of its flowers by any of the Ghent hybrids. There may also be mentioned the few species of true rhododendrons with deciduous foliage, as *R. mucronulatum* and *R. dahuricum,* which are the very earliest to bloom, and the hardy deciduous Indian azaleas, as *R. poukhanense* and *R. Kaempferi,* which flower with *R. Vaseyi* and *R. nudiflorum.* Azaleas are easy to transplant, either in early spring or in early autumn, when the year's growth has ripened. If desired, they may be planted for decorative purposes in early spring, in beds, without injuring the abundance or brilliancy of the flower, and afterward removed to give space for other decorative plants, and planted carefully in nursery beds, where they remain till next spring; and so on every year. Especially the hybrids and varieties of *R. japonicum* (*Azalea mollis*) are often and easily forced for winter-flowering. If intended for early forcing, they should be grown in pots, and care taken to allow them to finish their growth as early as possible; for later forcing, after Christmas, they may be potted in fall, or even just before bringing them into the forcing-house. With a temperature of 50° to 55° at night, they will bloom in about six weeks. The Ghent azaleas are grown in great quantities in the Low Countries and in Germany for export to America; it is usually more profitable to buy this stock each fall than to attempt to raise it in this country, where labor is high-priced and the climate dry and hot.

Propagation is usually by seeds sown in early spring in frames or pans, in sandy peat, without covering, and kept moist and shady. When the seedlings appear they should have air and a daily syringing. In autumn they are transplanted into boxes or frames, in sandy, peaty soil. The seeds germinate very readily sown in cut sphagnum, but ought to be pricked into boxes as soon as they can be handled. The second year the seedlings should be planted out in beds, sufficiently wide apart to allow a growth of two years. Long upright branches should be shortened, to secure well-branched plants. The named varieties are grafted on any of the common species, usually by veneer-grafting in autumn in the greenhouse, on potted stock. They may also be increased by cuttings of mature wood 2 to 3 inches long, taken with a heel late in summer, and placed in sand under glass. Layers usually require two years to root sufficiently; they are made in spring, and the buried part inclosed in moss.

Many hybrids, known as Ghent azaleas or Mollis hybrids (*R. Morteri,* Sweet, *Azalea Mortieriana,* Spae, *A. gandavensis*), are in cultivation. They have originated chiefly from crosses of *R. sinense,* and later *R. japonicum,* with *R. luteum, R. calendulaceum* and *R. nudiflorum,* also in some cases with *R. occidentale* and *R. viscosum.* Some good varieties are the following:

Single-flowered varieties: *Albicans, Admiral de Ruyter, Altaclarense* (B.R. 28:27); *Anthony Koster, Comte de Gomer* (R.B. 1:9. F.M. 1879:367); *Daviesi* (Gt. 42:1307); *Directeur Charles Baumann, Fragrans* (J.H. III:49:489); *Géant des Batailles, Hilda, Louis Hellebuyck* (F.S. 19:2019); *Marie Verschaffelt, Morteri, Princesse d'Orange, Sanguinea, Tsarine* (R.B. 20:277); *Van Dyck, Viscosa floribunda.*

Double-flowered varieties: *Arethusa, Bijou de Gandbrugge* (F.S. 19:2024); *Louis Aimé Van Houtte* (F.S. 19:2022); *Madame Mina Van Houtte* (F.S. 19:2021); *Murillo* (R.B. 19:232); *Phebe* (R.B. 19:232); *Raphael de Smet, Virgile* (R.B. 19:232. G.W. 15, p. 493).

Indian azaleas.

This group contains *R. indicum* and other species of the section Tsutsutsi and the hybrids of them. They are well-known evergreen shrubs, in the North requiring cultivation in the greenhouse during the winter, but some, as *R. Kaempferi* and *R. poukhanense,* have proved perfectly hardy in the neighborhood of Boston; also *R. ledifolium* and *R. linearifolium* will stand many degrees of frost in somewhat sheltered positions. Indian azaleas are rarely increased by seeds, which may be sown in the greenhouse in the same way as with the former group. Usually they are propagated by cuttings or grafting. The cuttings root best when made in August from half-ripened wood, and placed in sand under a frame, with gentle bottom heat. Choicer varie-

ties are usually increased by veneer- or tongue-grafting, either in winter or in July and August on vigorous-growing varieties raised mostly from cuttings. Grafting on rhododendron is now used in some German nurseries with very good results. The best soil for azaleas, if grown in pots, is a sandy compost of half peat and half leaf-soil, with an addition of good fibrous loam. It is essential to plant them firmly, and to give very good drainage. The base of the stem should be just above the surface. The best time for repotting is after flowering, when the new growth commences. During the summer, they should be kept in a coldframe or in the open in a sheltered spot, with the pots plunged in the soil, or planted out in prepared beds, where they make a very vigorous and healthy growth. In September they should be repotted and transferred to the greenhouse. They must have plenty of water and free syringing during the hot months. The natural flowering time is from April to June, but in the greenhouse, azaleas may be had in flower from November till June. Against the red-spider and thrips, from which the azaleas are liable to suffer if the air is too dry, free syringing with water is the best remedy. Most of the plants used for forcing in this country are imported from Holland, Belgium, and Germany. Formerly azaleas were kept in summer in shade or partial shade, but now it is the custom of the best growers to give them full exposure to the sun, either planted out or in the pots plunged to the rim in ashes or other good drainage material; in the latter case a top-dressing of 2 or 3 inches of old cow-manure is very beneficial. The only American treatise is Halliday's "Treatise on the Propagation and Cultivation of Azalea Indica," Baltimore, 1880.

Some of the best varieties of Indian azaleas are the following (for a completer account, see August Van Geert, "Iconographie des Azalées," abbreviated here as Ic. Az. 20):

Single-flowered: *Antigone*, white, striped and spotted violet (R.B. 7:241. Ic. Az. 3); *Apollo*, vermilion (Ic. Az. 20); *Charmer*, rich amaranth, very large (F.M. 5:303, 304, 1); *Comtesse de Beaufort*, rich rose, blotched deep crimson; *Criterion*, rich salmon-pink, bordered white and blotched crimson (F.S. 8:796. F. 1849:137); *Diamond*, white, blotched dark crimson (F.S. 21:2233, 2234); *Duc de Nassau*, rich rosy purple, very free and large; *Easter Greetings*, small, flower often semi-double, crimson, very free-flowering; *Eclatante*, deep crimson, shaded rose; *Emil Liebig*, pink; *Fanny Ivery*, deep salmon-scarlet, blotched magenta (F.M. 10:542); *Fielder's White*, pure white, early (A.F. 13:1169); *Flambeau*, rich, glowing crimson (Gn. 16:242, 4); *Fuerstin Bariatinsky*, white, striped red (Gn. 16: 242. Ic. Az. 13); *Haerens' Lorraine*, small bright pink flowers, very floriferous; *Hexe* (Firefly), deep crimson, "hose in hose," small fl. very free-flowering (R.B. 31:49); *Jean Vervæne*, salmon, striped, bordered white (R.B. 2:145. Ic. Az. 11); *John Gould Veitch*, lilac-rose, bordered and netted white, striped crimson (F.S. 20:2071, 2072); *La Victoire*, reddish, white toward the edges, spotted maroon-crimson; *Louise von Baden*, pure white, sometimes speckled pink (F.S. 17:1796. F.M. 3:158); *Madame Charles Van Eeckhaute*, pure white, with crisped edges; *Madame L. Van Houtte*, scarlet-rose, bordered white (F.S. 23:2383. Ic. Az. 5); *Marquis of Lorne*, brilliant scarlet, very fine; *Miss E. Jarret*, pure white, with crisped edges (R.B. 14:213); *Mrs. Turner*, bright pink, bordered white, spotted crimson (F.S. 8:451. Gn. 56, p. 306); *Mons. Thibaut*, orange-red; *Perle de la Belgique*, large, pure white; *President Victor Van den Hecke*, white, striped and speckled crimson, with yellow center (F.S. 15:1567, 1568); *Princess Alice*, pure white, one of the best; *Princesse Clementine*, white, spotted greenish yellow; *Professor Wolters*, pink, with amaranth blotch; *Reine des Pays-Bas*, rich violet-pink, bordered white (I.H. 13:479); *Roi de Hollande*, dark blood-red, spotted black; *Sigismund Rucker*, rich rose, bordered white, blotched crimson, very showy (F.S. 19:2010, 2011. Ic. Az. 31); *Stella*, orange-scarlet, tinged violet; *Wilson Saunders*, pure white, striped and blotched vivid red.

Double-flowered: *Alice*, deep rose, blotched vermilion (I.H. 23:244); *Baron N. de Rothschild*, rich purple-violet, large (F.S. 23:2477, 2478); *Bernard André*, dark violet-purple, large; *Bernard André alba*, white (I.H. 17:15. Ic. Az. 19); *Borsig*, pure white; *Charles Leirens*, dark salmon, blotched dark purple, good form and substance (F.S. 19:1971, 1972); *Charles Pynaert*, salmon, bordered white (R.B. 10:25); *Chicago*, deep carmine, bordered white, large; *Comtesse Eugenie de Kerchove*, white, flaked red-carmine; *Deutsche Perle*, pure white, early) R.B. 21:85. R.H. 1886:516. Gn. 33:460. Ic. Az. 25); *Dominique Vervæne*, bright orange;

3382. Rhododendron mucronulatum. (×½)

Dr. Moore, deep rose, shaded white and violet, very fine (R. B. 11:61); *Eggebrechtii*, bright crimson; *Empereur du Brésil* (Emperor of Brazil), rich rose, banded white, upper petals marked red (Ic. Az. 15); *Ernest Eeckhaute*, deep carmine, very double; *Francois de Vos*, deep crimson (I.H. 14:512. Ic. Az. 14. F.M. 8:443); *Frau Herm. Seidel*, white, striped red; *Helene Thelemann*, rosy pink, free-flowering; *Imbricata*, white, sometimes flaked rose (I.H. 24:281. F.S. 22:2284, 2285. F. 1876, p. 201); *Impératrice des Indes* (Empress of India), salmon-rose, bordered white and spotted dark carmine (F.M. 18:357. Ic. Az. 21. F. 1879:97); *Johanna Gottschalk*, white; *John Lieweleyn*, soft pink; *Louise Pynaert*, white (R.B. 4:209); *Madame Camille van Langenhove*, white, striped with rose, very double; *Madame Iris Lefebvre*, dark orange-carmine, shaded bright violet and blotched brownish red (F.S. 18:1862, 1863); *Madame Jos. Vervæne*, large, pink and white, similar to Vervæneana; *Madame Petrick*, bright rose, very early; *Madame Van der Cruyssen*, pink, fine form (A.F. 12:1003); *Madeleine*, white, large, semi-double; *Niobe*, white, fine form; *Pharailde Mathilde*, white, spotted cherry-red (R.B. 13:145); *President Ghellinck de Walle*, bright rose, upper petals spotted yellow and striped crimson; *President Oswald de Kerchove*, pink, bordered white, blotched carmine; *Raphael*, white; *Sakuntala*, white, very free-flowering; *Simon Mardner*,

large, rose, very double and very early; *Souv. du Prince Albert*, rich rose-peach, broadly margined white, very free-flowering (F.M. 4:201. Ic. Az. 24); *Theodore Reimers*, lilac, large; *Vervæneana*, rose, bordered white, sometimes striped salmon (Gn. 52, p. 137. C.L.A. 5:146; 7:179. J.H. 31:423); *Vervæneana alba*, white (R.H. 1908:424); *Vuylstekeana*, deep crimson, "hose-in-hose."

The varieties now chiefly imported and considered the best for forcing are the following (those marked with an asterisk are adapted for early forcing):

Single-flowered: *Emil Liebig, Haerens' Lorraine, *Hexe, Professor Wolters.

Double-flowered: *Eggebrechtii, Empereur du Brésil, Ernest Eeckhaute, *Frau Herm. Seidel, *Helene Thelemann, *Imperatrice des Indes, John Liewelyn, *Madame Camille Van Langenhove, Madame Jos. Vervæne, *Madame Petrick, Madame Van der Cruyssen, Niobe, Pharailde Mathilde, *Pres. Oswald de Kerchhove, *Simon Mardner, *Vervæneana.

Plants grown in Germany are preferred for early forcing, because they are grown in pots over summer before shipping, while the Belgian plants are grown in the open field. Generally the Belgian plants are grown more compact, while the German-grown plants are of looser, more naturally graceful habit. Some varieties, though much approved abroad, are rarely imported, because they do not travel well.

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KEY TO THE GROUPS.

A. *Foliage evergreen, glabrous, lepidote or tomentose, rarely deciduous and lepidote, not ciliate or ciliate and lepidote: stamens 5–20; ovary glabrous, lepidote or tomentose, not setose, sometimes more than 5-celled.* Subgenus I. EURHODODENDRON
  B. *Lvs. lepidote: ovary lepidote; stamens 5–10.*
    Section 1. LEPIDORHODIUM. Species Nos. 1–16
  BB. *Lvs. glabrous or tomentose beneath, never lepidote, always persistent: ovary glabrous, glandular or tomentose; stamens 10–20.*
    Section 2. LEIORHODIUM. Species Nos. 17–28

AA. *Foliage deciduous, rarely evergreen, pubescent, often strigose and ciliate, rarely glabrous, never lepidote: stamens 5–10; ovary setose, rarely glabrous, 5-celled.* Subgenus II. AZALEA
  B. *Fls. from axillary buds, usually solitary; corolla rotate.*
    Section 3. AZALEASTRUM. Species No. 29
  BB. *Fls. from terminal buds, 1 to many.*
    C. *Terminal bud producing only fls., usually many-fld.: lvs. deciduous.*
      D. *Stamens 5; corolla funnelform-campanulate or funnelform.*
        Section 4. PENTANTHERA. Species Nos. 30–38
      DD. *Stamens 7–10; corolla rotate-campanulate, deeply divided.*
        Section 5. RHODORA. Species Nos. 39, 40
    CC. *Terminal bud producing fls. and leafy shoots, 1–3-fld.; stamens 5–10: lvs. persistent or deciduous.*
      Section 6. TSUTSUTSI. Species Nos. 41–48

Subgenus I. EURHODODENDRON.

Section 1. LEPIDORHODIUM.

A. *Corolla funnelform or campanulate; tube shorter or not much longer than lobes.*
  B. *Fls. from a terminal bud, usually many.*
    C. *Diam. of fls. ½–¾in.*
      D. *Stamens and style longer than corolla, filaments glabrous; fls. white, small, in a many-fld. dense head* ..... 1. **micranthum**
      DD. *Stamens and style shorter than corolla, filaments hairy below the middle; fls. usually pink; tube pubescent inside.*
        E. *Style scarcely twice as long as ovary: lvs. ½–2 in. long.*
          F. *Lvs. without hairs* ..... 2. **ferrugineum**
          FF. *Lvs. ciliate* ..... 3. **hirsutum**
        EE. *Style at least 3 times as long as ovary: lvs. 1–3 in. long.*
          F. *Shape of lvs. lanceolate-elliptic* ..... 4. **arbutifolium**
          FF. *Shape of lvs. elliptic* ..... 5. **myrtifolium**
    CC. *Diam. of fls. 1–2 in.; tube glabrous inside.*
      D. *Style and stamens shorter than corolla-lobes: petioles about ½in. long.*
        E. *Tube of corolla longer than lobes, corolla lepidote outside, spotted* ..... 6. **minus**
        EE. *Tube of corolla shorter or as long as lobes; corolla glabrous outside, usually not spotted* ..... 7. **carolinianum**
      DD. *Style exceeding the corolla-lobes: petioles about ½in. long.*
        E. *Color of fls. yellow: lvs. glabrous* ..... 8. **Keiskei**
        EE. *Color of fls. pink, rarely white.*
          F. *Lvs. ciliate or hairy on the midrib beneath: stamens longer than the corolla-lobes.*
            G. *Midrib of lvs. pilose beneath; lvs. glabrous above: fls. rose-pink to purple* ..... 9. **Augustini**
            GG. *Midrib of lvs. glabrous; lvs. setose above and ciliate, sometimes nearly glabrous: corolla white, spotted red* ..... 10. **yunnanense**
          FF. *Lvs. never hairy: stamens somewhat shorter than corolla-lobes* ..... 11. **yanthinum**
  BB. *Fls. from lateral buds usually crowded at the end of the branches, one or few from each bud.*
    C. *Under side of lvs. glaucous and lepidote: fls. about ¾in. across* .. 12. **racemosum**
    CC. *Under side of lvs. green and lepidote: fls. 1–1½ in. across.*

D. *Margin of lvs. usually ciliate: lvs. persistent*.....13. **præcox**
DD. *Margin of lvs. glabrous.*
E. *Lvs. obtuse or obtusish at the ends, sometimes partly persistent*.....14. **dahuricum**
EE. *Lvs. acute at the ends, deciduous: fls. larger*.....15. **mucronulatum**
AA. *Corolla with a cylindric tube thrice as long as the lobes*.....16. **jasminiflorum**

1. **micrânthum,** Turcz. Shrub, to 8 ft.: lvs. lanceolate or oblanceolate, obtuse or acutish, glabrous above, densely ferrugineous-lepidote beneath, ¾–1½ in. long: fls. in dense many-fld. clusters, white, campanulate, ⅓–½in. across, lobes oblong or oval, longer than tube; stamens longer than corolla, glabrous; style shorter than stamens; sepals lanceolate, ciliate, ⅛in. long. June, July. Manchuria to W. and Cent. China. B.M. 8198.—Very distinct species, resembling Ledum with its dense clusters of small white fls. and exserted stamens and with its small lvs. It has proved perfectly hardy at the Arnold Arboretum and is very floriferous even as a small plant.

2. **ferrugíneum,** Linn. Shrub, 2 ft. high, glabrous: lvs. elliptic to oblong-lanceolate, acute, densely lepidote beneath, 1–2 in. long: clusters many-fld.; calyx-lobes short, obtuse; corolla funnelform-campanulate, with the tube about twice as long as limb, pink or carmine, about ½in. across. June–Aug. Mountains of Cent. Eu. L.B.C. 1:65. Gn. 29, p. 358. G. 8:610.—Dwarf, hardy shrub, handsome for rockeries. Var. **álbum,** Sweet, has white fls.

3. **hirsûtum,** Linn. Shrub, 3 ft. high, with hirsute branches: lvs. oval to oblong, ciliate, light green and glandular-lepidote beneath, ½–1 in. long: clusters many-fld.; calyx-lobes lanceolate, as long as ovary; corolla similar to that of the preceding, lobes shorter. June, July. Alps. L.B.C. 5:479. B.M. 1853. L.D. 6:425.—Much like the preceding, but usually thrives better in cult. and does not dislike limestone soil.

4. **arbutifòlium,** Hort. (*R. daphnoìdes, R. Hámmondii,* and *R. oleæfòlium,* Hort. *R. Wílsonii,* Hort., not Nutt.). A hybrid of *R. ferrugineum* and *R. minus.* Dense shrub, 4 ft. high: lvs. elliptic to elliptic-lanceolate, acute at both ends, 1½–3 in. long: fls. similar to those of *R. ferrugineum,* but larger. June, July.—Of garden origin. Handsome hardy shrub, perhaps best known under the name of *R. Wilsonii;* this name, however, had been given previously to another hybrid between two Himalayan species and should not be used for this plant.

5. **myrtifòlium,** Lodd. (*R. ovalifòlium,* Hort. *R. ovàtum,* Hort., not Hook.). Hybrid between *R. minus* and *R. hirsutum,* much like the preceding, but lvs. generally smaller and broader, less densely lepidote beneath, 1–2½ in. long, sometimes sparingly ciliate when young: fls. longer-pedicelled and calyx-lobes narrower and longer. June, July. L.B.C. 10:908.—Originated in the nursery of Loddiges.

6. **mìnus,** Michx. (*R. punctàtum,* Andr. *R. Cúthbertii,* Small). Straggling shrub, to 10 ft.: lvs. elliptic to elliptic-lanceolate, acute at both ends, sometimes acuminate, glabrous above, glandular-lepidote beneath, 1½–4 in. long: heads about 6–8-fld.; calyx short; corolla funnelform-campanulate, about 1 in. across, rosy pink, the upper lobe spotted greenish, lepidote outside; tube nearly cylindric, longer than the ovate crisped lobes. June, July. N. C. to Ga. and Ala. B.M. 2285.—Fls. appear with or after the new lvs. Var. **Hárbisonii,** Rehd. Fls. larger, 1½ in. across, in dense, about 10-fld. heads. Ga. Handsomer than the type.

7. **caroliniànum,** Rehd. (*R. punctàtum,* Small, not Andr.). Shrub, to 6 ft., usually low and compact: lvs. oval to narrow-elliptic, acutish or shortly and abruptly acuminate, broadly cuneate at the base, glabrous above, ferrugineous-lepidote beneath, often very densely so, 2–3 in. long: fls. in dense 5–10-fld. heads, broadly funnelform-campanulate, about 1½ in. across, pale rosy purple or rarely whitish, not or only slightly spotted; tube gradually widened, as long or shorter than the ovate lobes, glabrous or nearly so outside. May, June. N. C. B.R. 37. G. 31:619 (as *R. punctatum*).—On account of its compact habit and larger fls. superior as an ornamental plant to the preceding.

8. **Keìskei,** Miq. Low, sometimes procumbent shrub: lvs. elliptic to lanceolate, acute, dull green above, lepidote beneath, 1½–3 in. long: clusters 2–5-fld.; calyx minute; corolla broadly funnelform, divided to the middle into rounded lobes, pale yellow, 1½ in. across; stamens much exserted. May. Japan. B.M. 8300.

9. **Augustíni,** Hemsl. Shrub, to 20 ft.: branchlets pubescent while young: lvs. elliptic-ovate to oblong-lanceolate or lanceolate, acute or acuminate, broadly cuneate at the base, pale green beneath and lepidote and hirsute on the midrib and petiole, 1½–2½ in. long: fls. 3–6; calyx-lobes short, ciliate; corolla broadly campanulate, 1½–2 in. across, pale purple or rosy pink, rarely nearly white; lobes much longer than tube; stamens as long or slightly shorter than corolla, style longer. Cent. and W. China. B.M. 8497. G.C. III. 52:4. F.S.R. 3:162. R.H. 1909, p. 18.

10. **yunnanénse,** Franch. Shrub, to 6 ft.: lvs. elliptic-lanceolate, acute, cuneate at the base, with scattered stiff hairs above and on the margin, or sometimes nearly glabrous, pale green below and sparsely lepidote, 2½–3 in. long: fls. 3–8; calyx minute; corolla broadly funnelform, 2 in. across, white, the upper lobes spotted blood-red, lobes longer than tube; stamens about as long as lobes, style longer. May. S. W. China. B.M. 7614. G.C. III. 39:399; 46:68; 54:396. G. 32:69; 36:305. Gn. 78, p. 317. M.D.G. 1903:173. F.S.R. 2:360.

11. **yánthinum,** Franch. (*R. concínnum,* Hemsl. & Wilson and Hort., not Hemsl. *R. Benthamiànum,* Hemsl. *R. atroviride,* Dunn). Shrub, to 10 ft.: lvs. ovate-elliptic, acute, rounded or sometimes broadly cuneate at the base, glaucescent and rather densely lepidote beneath, 1¼–2½ in. long: fls. 3–6; calyx minute; corolla funnelform-campanulate, 1¼ in. long and as broad, purple or rosy purple, sometimes white, glabrous outside, tube about as long as lobes; stamens somewhat shorter than lobes, style longer. June. W. China. Var. **lepidánthum,** Rehd. & Wilson. Corolla lepidote and pubescent outside, dark purple: lvs. broader.

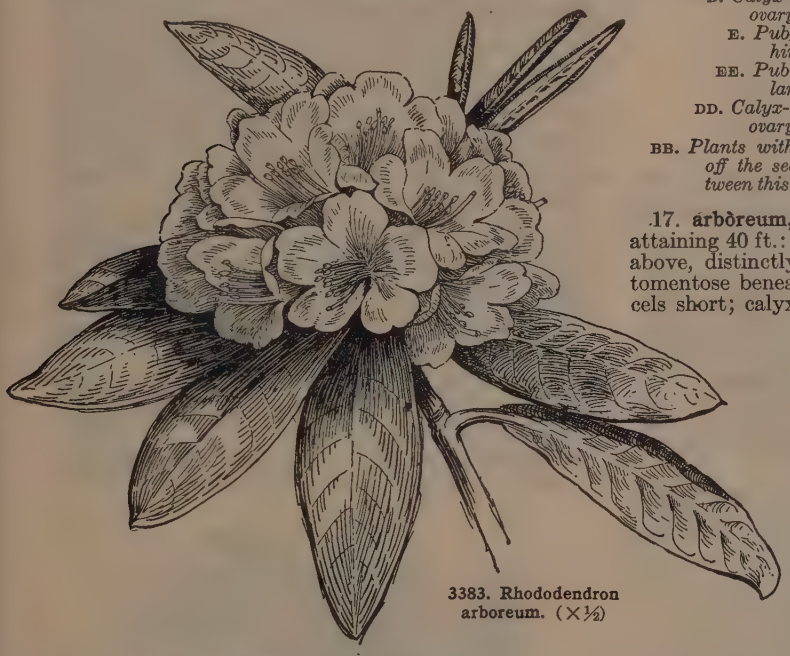
12. **racemòsum,** Franch. Shrub, to 6 ft.: lvs. elliptic to oval or obovate, obtuse or acutish, rounded or broadly cuneate at the base, glabrous above, glaucous below and lepidote, ¾–1¼ in. long: fls. 1–3, from axillary buds usually crowded at the end of the branches, sometimes along the branches; corolla funnelform-campanulate, ¾in. across, rose-pink, lobes oblong, about as long as tube; stamens and style exserted. B.M. 7301. G.C. III. 12:63; 47:343. Gn. 42:320. G. 28:224. Gt. 57:1577, pp. 562, 563. G.W. 6, p. 43 (as *R. rigidum*); 14, p. 271. R.H. 1912, p. 134.—It flowers profusely when still very small.

13. **præcox,** Carr. Hybrid between *R. ciliatum* and *R. dahuricum.* Low shrub with persistent, elliptic or oval lvs., sparingly ciliate or glabrous, ferrugineous-lepidote beneath, 1–2 in. long: clusters few-fld.; calyx-lobes ovate, ciliate; corolla broadly funnelform, pale purple or lilac, 1½ in. across. March, April. Of garden origin. R.H. 1868:210. Gn. 38:32; 59, p. 277; 61, p. 428; 71, p. 151. G.C. II. 17:295; III. 12:771. Gt. 50, p. 135; 56:1567. G.W. 5, p. 267. G. 35:109.—Less hardy than the following species, but handsomer. Here belongs also Early Gem, with larger pale lilac fls. and the lvs. somewhat more ciliate. G.C. II. 9:336.

14. **dahùricum,** Linn. (*Azàleà dahùrica,* Koch). Shrub, to 10 ft.: lvs. deciduous or sometimes partly

persistent, very short-petioled, oval to oval-oblong, obtuse at both ends, revolute at the margin, ferrugineous-lepidote beneath, ¾–1⅓ in. long: fls. 1–3 at the end of the branchlets; corolla rotate-funnelform, rose-colored, 1 in. across; stamens about as long as lobes, style longer. March, April. Siberia, N. China, Kamchatka. B.M. 636. L.B.C. 7:605. G.C. II. 17:295; III. 12:701; 53:51. Gn. 77, p. 18. G.W. 7, p. 415. Var. **sempérvirens,** Sims (var. *atróvirens,* Edw.). Lvs. dark green, almost persistent: fls. violet-purple. B.M. 1888. B.R. 194. L.B.C. 16:1584. Gt. 53, pp. 267, 268. R.H. 1908, p. 198.

15. **mucronulàtum,** Turcz. (*R. dahùricum* var. *mucronulàtum,* Maxim.). Fig. 3382. Upright shrub, attaining 6 ft.: lvs. elliptic to oblong, acute at both ends, slightly crenulate, sparingly lepidote on both sides, bright green above, pale beneath, 2–3 in. long: fls. 3–6, short-pedicelled; corolla rotate-funnelform, divided to the middle into oval rounded lobes, rose-colored, 1½ in. across. March, April. Manchuria, N. China, Korea, Japan. G.F. 9:65 (adapted in Fig. 3382). M.D. 1898:1.



3383. Rhododendron arboreum. (×½)

B.M. 8304.—Hardy shrub valuable for its very early fls. (it is the earliest of all hardy rhododendrons) and for its handsome scarlet fall coloring.

16. **jasminiflòrum,** Hook. Small shrub: lvs. subverticillate, obovate to oblong, acute, glabrous, lepidote beneath, 1½–3 in. long: clusters many-fld.; pedicels short; calyx minute; corolla almost salver-shaped, with the tube 2 in. long and with spreading limb, fragrant, white, blushed outside below the limb, the anthers forming a red eye; style shorter than stamens, included. Winter. Java, Malacca. B.M. 4524. I.H. 6:203. J.F. 1:41. G. 32:145.—A distinct species, very unlike other rhododendrons; it requires a warm greenhouse.

Section 2. Leiorhodium.

- A. *Under side of lvs. tomentose or pubescent.*
  - B. *Ovary tomentose: branchlets tomentose or nearly glabrous.*
    - C. *Corolla distinctly campanulate; lobes much shorter than tube; pedicels about ½in. long: tall shrub or tree, tender* ..... 17. **arboreum**
    - CC. *Corolla funnelform-campanulate; pedicels ¾–2 in. long.*
      - D. *Lvs. acute at both ends.*
        - E. *Tomentum of lvs. beneath and of branchlets whitish or pale brown* ..... 18. **Smirnovii**
        - EE. *Tomentum of lvs. beneath and of branchlets deep brown.*
          - F. *Corolla 5-lobed, spotted greenish* ..... 19. **caucasicum**
          - FF. *Corolla 5–7-lobed, spotted purple* ..... 20. **Metternichii**
      - DD. *Lvs. obtuse or obtusish at both ends* ..... 21. **brachycarpum**
  - BB. *Ovary and branchlets glabrous* ..... 22. **campanulatum**
- AA. *Under side of lvs. glabrous or pubescent only when young.*
  - B. *Plants with coriaceous persistent lvs.*
    - C. *Ovary glabrous or glandular only.*
      - D. *Pedicels puberulous; ovary glandular; stamens 10* ..... 23. **ponticum**
      - DD. *Pedicels glabrous; ovary glabrous; stamens 13–15* ..... 24. **sutchuenense**
    - CC. *Ovary tomentose or pubescent.*
      - D. *Calyx-lobes much shorter than ovary.*
        - E. *Pubescence of ovary rusty hirsute: pedicels glabrous* ... 25. **californicum**
        - EE. *Pubescence of ovary glandular; pedicels pubescent* ..... 26. **catawbiense**
      - DD. *Calyx-lobes nearly as long as ovary: lvs. acute at both ends..* 27. **maximum**
  - BB. *Plants with rather thin lvs. falling off the second spring: hybrids between this and the following section* 28. **azaleoides**

17. **arbòreum,** Smith. Fig. 3383. Large shrub or tree, attaining 40 ft.: lvs. oblong to lanceolate, acute, rugose above, distinctly veined and whitish or ferrugineous-tomentose beneath, 4–6 in. long: clusters dense; pedicels short; calyx minute; corolla campanulate, blood-red, pink, or white, usually spotted, 1–1½ in. across; ovary ferrugineous-woolly or mealy, usually 7–9-celled. March–May. Himalayas. B.R. 890. P.M. 1:101. Gn. 64, p. 415. G.W. 6, p. 595. Var. **álbum,** DC. (*R. álbum,* Sweet, not Blume). Fls. white, spotted purple: lvs. ferrugineous beneath. G. C. III. 29:246. Var. **cinnamòmeum,** Lindl. Fls. white, slightly blushed, darker spotted than the preceding: lvs. cinnamon-brown beneath. B.R. 1982. Var. **limbàtum,** Hook. Fls. with rosy limb and white throat, blotched purple at base: lvs. white beneath. B.M. 5311. Var. **Kingiànum,** Hook. (*R. Kingiànum,* Watt). Shrub: lvs. broader, strongly bullate, very dark: fls. deep scarlet; filaments rose-colored; calyx larger. G.C. III. 26:306. B.M. 7696. Var. **nilagíricum,** Clarke. Fls. rose-colored to deep crimson, spotted: lvs. ferrugineous beneath. B.M. 4381. Gn. 36:54. Var. **puníceum,** DC. Fls. purple or scarlet: lvs. white beneath. Var. **Windsorii,** Voss (*R. Windsorii,* Nutt.). Fls. deep crimson-scarlet; calyx with elongated lobes: lvs. white beneath. B.M. 5008.—This species is tender and suited only for warmer temperate regions, but has been crossed with hardy varieties and its blood is recognizable in many of our most beautiful hardy hybrids.

18. **Smirnòvii,** Trautv. Shrub or small tree, to 20 ft.: young branchlets whitish or grayish woolly: lvs. elliptic-oblong, acutish, narrowed at the base into a short petiole, revolute at the margin, dark green with yellow midrib above, densely felted grayish white or pale brown beneath, 3–5 in. long: fls. many, in a compact head; calyx small, tomentose; corolla campanulate-funnelform, rosy red, 3 in. across; lobes oval, longer than tube, with crisped darker rose-colored margin, upper lip spotted brownish; stamens 10, curved; ovary

tomentose. May. Caucasus. B.M. 7495. R.H. 1899: 500. G.C. III. 20:15; 49:417. Gt. 35:1226. G.W. 16, p. 147. M.D.G. 1909:356.

19. **caucásicum,** Pall. Dense low shrub, 2 ft. high, often with procumbent branches: lvs. oval-oblong or narrow-elliptic, acute, dark green above, ferrugineous-tomentose beneath, 2–4 in. long: clusters 7–10-fld.;

3384. Rhododendron brachycarpum. (×⅓)

pedicels short; calyx minute; corolla funnelform-campanulate, with emarginate rounded lobes, pink to yellowish white, spotted greenish within, 1½ in. across. June, July. Caucasus. B.M. 1145.—A dwarf, quite hardy species; late-flowering. Var. **flávidum,** Regel. Fls. straw-colored, spotted greenish within. Gt. 16: 560. Var. **stramíneum,** Hook., is similar, but with fulvous spots. B.M. 3422. Var. **róseo-álbum,** Briot., with blush fls., changing to white, and var. **spléndens,** Briot, with deep pink fls., are said to bloom very early and may be hybrids. R.H. 1868:311. Also "Coriaceum" and "Rosa mundi" (see p. 2932) are apparently forms of this species.

20. **Métternichii,** Sieb. & Zucc. (*R. Hymenánthes,* Makino. *R. japónicum,* Schneid., not Suring.). Shrub, 4 ft. high: lvs. oblong or oblong-lanceolate, narrowed at both ends, acute or obtuse, ferrugineous-tomentose beneath, 3–6 in. long: clusters 8–15-fld.; calyx minute; corolla campanulate, usually 7-lobed, rose-colored, spotted purple within, 1½–2 in. across; stamens usually 14. May, June. Japan. S.Z. 1:9. G. 32:91.—Like the preceding hardy, but rare in cult. Var. **pentámerum,** Maxim. Corolla 5-lobed; stamens 10 or 11. B.M. 8403. S.I.F. 2:60. Var. **angustifòlium,** Bean. Lvs. narrower, to 7 in. long: fls. pale lilac-rose: of stiffly erect habit.

21. **brachycárpum,** Don. Fig. 3384. Shrub, 4 ft. high, sometimes 10 ft.: lvs. oval to oblong, rounded at both ends, mucronulate at the apex, bright green above, whitish or ferrugineous-tomentulose beneath, 2½–6 in. long: fls. in dense clusters, short-pedicelled; calyx-lobes short; corolla funnelform-campanulate, creamy white, spotted greenish within, 1½–2 in. across. June. Japan. G.F. 1:293 (adapted in Fig. 3384). B.M. 7881. G. 28:345.—Has proved quite hardy, but is still rare in cult.

22. **campanulàtum,** Don. Shrub, attaining 16 ft.: lvs. elliptic to elliptic-oblong, usually rounded at both ends, ferrugineous-tomentose beneath, 3–6 in. long: clusters many-fld.; pedicels short; calyx-lobes short; corolla funnelform-campanulate, pale purple or pale lilac or almost white, with few purple spots, 2 in. across. June. Himalaya. B.M. 3759. L.B.C. 20:1944. Gn. 48, p. 108; 59, p. 294. G. 28:463. H.U. 1, p. 255.—This is one of the hardiest of the Himalayan species. Var. **æruginòsum,** Nichols. (*R. æruginòsum,* Hook. f.). Lvs. with verdigris-colored tomentum beneath. Var. **Bàtemanii,** Nichols. (*R. Bàtemanii,* Hook.). Of more robust habit and with larger fls. B.M. 5387. Var. **Wállichii,** Hook. Lvs. with lax, often caducous tomentum, and with densely woolly petioles: corolla more highly colored. B.M. 4928.

23. **pónticum,** Linn. Shrub, 10 ft. high: lvs. elliptic to oblong, acute, pale green beneath, 3–5 in. long: clusters many-fld.; pedicels longer than fls., puberulous; calyx-lobes as long as ovary, the lower ones half as long; corolla funnelform-campanulate with oval lobes, purple, spotted brownish within, about 2 in. across; ovary glandular. May, June. Spain, Portugal, Asia Minor. B.M. 650.—This species is less hardy than the two preceding and now rarely found in cult. in its typical form. Var. **álbum,** Hort., has white fls. There are also varieties with variegated and one with purplish lvs.

24. **sutchuenénse,** Franch. Shrub, to 15 ft.: lvs. oblong-oblanceolate, usually obtuse, narrowed at the base, dark green above, paler and glabrous beneath, 4–10 in. long; petioles stout, ¾–1½ in. long: fls. many, in a dense head; pedicels glabrous; corolla funnelform-campanulate, 2–2½ in. across, rose-colored, spotted below the base of the upper lobes, lobes broad, rounded, shorter than tube; stamens 13–15, shorter than the corolla, anthers purple-black; style glabrous, as long as the stamens; ovary glabrous. W. China. B.M. 8362. —Blooms freely as a small plant 2 ft. high.

25. **califórnicum,** Hook. Shrub, 8 ft. high, sometimes to 20 ft., glabrous: lvs. oblong, shortly acuminate, pale green beneath, 3–6 in. long, sometimes crowded beneath the fls.: clusters many-fld.; calyx minute; corolla broadly campanulate, with oval crisped lobes, rosy purple or pink, paler toward the center, spotted yellow within, about 2 in. across, rich carmine in bud; stamens 10, with purple anthers; ovary with appressed silky hairs. May, June. Calif. to Brit. Col. B.M. 4863. —*R. macrophýllum,* Don, and *R. washingtoniànum,* Hort., are probably not different.

26. **catawbiénse,** Pursh. Figs. 3385, 3386. Shrub, 6 ft. high, rarely 20 ft.: lvs. rounded at base, oval to

3385. Rhododendron catawbiense. (×⅓)

oblong, usually obtuse and mucronulate, glaucous beneath, 3–5 in. long: clusters many-fld.; pedicels rusty pubescent; corolla broadly campanulate, with broad roundish lobes, lilac-purple, about 1½ in. across; ovary rusty tomentose. June. Va. to Ga., in the mountains. B.M. 1671. L.B.C. 12:1176. Gn.M. 2:18. F.E. 17:312 (pl. 71). M.D.G. 1902:381. G.W. 4, p. 97. G. 37:391. —One of the most beautiful of native shrubs, covering extensive tracts of land on the higher mountains of the

southern Alleghanies. Hardy as far north as New England.

27. **máximum,** Linn. GREAT LAUREL. Fig. 3387. Shrub, or small tree, attaining 35 ft.: lvs. mostly acute at base, narrow-oblong or lanceolate-oblong, acute or shortly acuminate, whitish beneath, 4–10 in. long: clusters many-fld.; pedicels viscid; calyx-lobes oval, as long as ovary; corolla campanulate, deeply 5-lobed with oval lobes, usually rose-colored, spotted greenish within, about 1½ in. across; ovary glandular. June, July. Nova Scotia and Ont. to Ga. B.M. 951. Em. 2:435. Mn. 1:1 and 3, p. 22. C.L.A. 3:32; 4:105. G.W. 15, p. 623.—This is one of the hardiest species, being hardy as far north as Que. and Ont. Three varieties have been distinguished: var. **álbum,** Pursh (*R. Púrshii,* Don), with white fls.; var. **purpùreum,** Pursh (*R. purpùreum,* Don), with purple fls., and var. **rôseum,** Pursh, with pink fls. This species and the following are now often extensively used in park-planting and taken by the carloads from the woods. If properly handled and taken from a turfy soil with a sufficient ball of earth around the roots, they are usually successfully transplanted.

28. **azaleoìdes,** Desf. (*R. fràgrans,* Lodd. *R. odoràtum,* Paxt.). Hybrid between *R. minus* and *R. nudiflorum.* Shrub, a few feet high: lvs. leathery but thin, elliptic to oblong, acute at both ends, dark green above, paler beneath, sometimes pubescent when young: fls. funnel-form-campanulate, pinkish or whitish, fragrant, 1½–2 in. across; calyx with ciliate lobes. May, June. P.M. 10:147. J.H. III. 49:489.—Of garden origin. There are many allied forms of similar origin described under different names. The name Azaleodendron has been proposed as a generic name for the hybrids between Azalea and Rhododendron by Rodigas. To this group of hybrids also belong *R. Smithii aùreum,* Hort., with yellow fls. F.S.R. 2:152, and *R. Broùghtonii aùreum,* Hort., similar, but with deeper yellow fls. and with the under side of the lvs. green, not glaucescent as in the preceding form (G.C. III. 51:53); also *R. Cartoniànum,* DC., *R. gemmíferum,* Bean, and *R. Goweniànum,* Sweet (see suppl. list).

3387. Rhododendron maximum. (×¼)

Subgenus II. AZALEA.

Section 3. AZALEASTRUM.

29. **albiflòrum,** Hook. (*Azàlea albiflòra,* Kuntze. *Azaleástrum albiflòrum,* Rydb.). About 2–3 ft.: branches strigose and glandular when young: lvs. oblong, pale green, appressed-strigose above and at the midrib beneath, slightly ciliate: fls. nodding, on short pedicels; corolla white, 5-cleft, about 1 in. broad; calyx glandular; stamens 10. Rocky Mts. B.M. 3670. Var. **plènum,** Rehd. A very handsome double form found wild, but not yet in cult.—The species is hardy, but difficult to cult.; will probably succeed best on a rockery in a cool and shady place.

3386. Flower-bud of Rhododendron catawbiense. These buds are full-formed in the fall. Unless these large terminal buds are produced, the bush will not bloom the following spring. (×⅜)

Section 4. PENTANTHERA.

A. *Stamens longer than the limb; corolla-tube long and narrow, usually glandular outside.*
  B. *Color of fls. white or pink.*
    C. *Fls. with or after the lvs., white.*
      D. *Corolla soft-pubescent outside, with yellow stripes on the upper lobe: branchlets glabrous or finely pubescent.....* 30. **occidentale**
      DD. *Corolla hirsute, with stalked glands.*
        E. *Lvs. beneath and branchlets glabrous.....* 31. **arborescens**
        EE. *Lvs. strigose beneath on the midrib and branchlets strigose.....* 32. **viscosum**
    CC. *Fls. before the lvs., pink, rarely whitish.*
      D. *Lvs. strigose beneath: corolla usually not glandular.....* 33. **nudiflorum**
      DD. *Lvs. grayish soft-pubescent beneath: corolla glandular outside.....* 34. **canescens**
  BB. *Color of fls. yellow to flame-red.*
    C. *Ovary not glandular; stamens much longer than corolla: lvs. generally obovate.....* 35. **calendula-**
    CC. *Ovary glandular; stamens little longer than corolla: lvs. generally oblong.....* [**ceum**
    36. **luteum**
AA. *Stamens shorter than the limb; corolla-tube short, funnelform, finely pubescent outside, not glandular.*
  B. *Under side of lvs. soft-pubescent: corolla yellow.....* 37. **sinense**
  BB. *Under side of lvs. only strigose on the veins: corolla brick-red to carmine..* 38. **japonicum**

30. **occidentàle,** Gray (*Azàlea occidentàlis,* Torr. & Gray. *A. califórnica,* Durand). Shrub, 2–6 ft.: branchlets glabrous or pubescent: lvs. obovate-oblong, finely ciliate, slightly pubescent beneath when young, 1–2 in. long: corolla 2–2½ in. long, white or slightly tinged rose, with yellow on the upper lobe, fragrant. May, June. Calif. B.M. 5005. F.S. 14:1432. Gn. 34:416. G.W. 11, p. 8; 15, p. 650.

31. **arboréscens,** Torr. (*Azàlea arboréscens,* Pursh). SMOOTH AZALEA. Fig. 3388. From 8–20 ft.: branchlets glabrous: lvs. obovate or obovate-oblong, acute, ciliate, glabrous, green or glaucescent beneath, 2–4 in. long: fls. white or tinged rose, 2 in. long, fragrant; style and stamens red. June, July. Alleghany Mts. G.F. 1:401 (adapted in Fig. 3388). C.L.A. 11:496. Gn.M. 5:219. L.B.C. 17:1632 (as *A. verticillata*).

32. **viscòsum,** Torr. (*Azàlea viscòsa,* Linn.). WHITE SWAMP HONEYSUCKLE. From 4–8 ft.: winter buds glabrous: branchlets with stiff hairs: lvs. obovate-oblong, obtuse or mucronulate, ciliate, bristly hairy on the veins beneath, 2–4 in. long: fls. white or tinged rose, 1½–2 in. long, viscid outside, fragrant; style red. June, July. E. N. Amer. Em. 2:438. Mn. 10:81. C.L.A. 11:496. Var. **nítidum,** Gray. From 1–3 ft.: lvs.

3388. Rhododendron arborescens. (×⅛)

oblanceolate, bright green on both sides: corolla tinged red. B.R. 414. Var. **glaùcum,** Gray. Lvs. whitish-glaucous beneath, dull and glaucous above. L.B.C. 16:1518. Var. **híspidum,** Schneid. (*Azàlea híspida,* Pursh). Pedicels bristly hispid: fls. usually pink: lvs. glaucescent beneath. L.B.C. 5:441.

33. **nudiflòrum,** Torr. (*Azàlea lùtea,* Linn., partly. *A. nudiflòra,* Linn.). PINXTER FLOWER. Figs. 3389, 3390. Height 2–6 ft.: winter buds more or less pubescent: branchlets pubescent and often with stiff hairs: lvs. oblong or obovate, strigose on the midrib beneath, 2–4 in. long: fls. pink to nearly white, before the lvs., about 1½ in. broad, strigose or slightly glandular outside, faintly fragrant; pedicels strigose-hairy. April, May. Mass. to Fla. and Texas. B.R. 120. L.B.C. 1:51. Mn. 2:17. Gn. 29, p. 550.

34. **canéscens,** Don (*Azàlea canéscens,* Michx.). Shrub, 1–3 ft.: similar to the preceding: lvs. oval to elliptic or obovate, soft-pubescent beneath, at least when young, 1½–3 in. long: pedicels glandular: fls. pink to nearly white, 1½–2 in. broad, glandular outside, very fragrant; stamens slightly exserted. April, May. N.H. to Fla. and La.

35. **calendulàceum,** Torr. (*R. lùteum,* Schneid., not Sweet. *Azàlea calendulàcea,* Michx. *A. lùtea,* Linn., partly. *A. aurantìaca,* Dietr. *A. speciòsa,* Willd.). FLAME-COLORED AZALEA. From 4–10 ft.: branchlets glabrous or with stiff hairs: lvs. obovate or ovate, usually pubescent beneath, serrulate-ciliate: fls. orange-yellow to orange-red or flame-red, often 2 in. broad, with the lvs., nearly scentless; tube usually shorter than the limb; stamens thickened at the middle. May, June. E. N. Amer. C.L.A. 11:496. Gn. 29, p. 550. B.R. 145. L.B.C. 7:624. B.M. 180. Var. **cròceum,** Rehd. Fls. yellow or orange-yellow. B.M. 1721. L.B.C. 14:1324.—One of the most showy species.

36. **lûteum,** Sweet (*R. flàvum,* Don. *Azàlea póntica,* Linn.). Shrub, 2–6 ft.: branchlets hairy: pedicels and petioles glandular: lvs. cuneate, oblong, usually hairy on both sides when young, 2–4 in. long: fls. yellow, 2–2½ in. broad, very fragrant; stamens as long as the limb. May. Orient, Caucasus. B.M. 433; 2383 (var. *albiflora*). C.L.A. 11:495. G. 27:15. Gn. 29, p. 550. G.M. 36: 500.—A very fragrant and free-flowering species, not common in cult. Nearly all varieties referred to this species in nursery catalogues are hybrids and belong to the so-called Ghent azaleas, *R. Morteri,* Sweet (*Azalea Mortieriana,* Spae. *A. gandavensis,* Hort.); see p. 2935.

3389. Rhododendron nudiflorum. (×⅛)

37. **sinénse,** Sweet (*R. mólle,* Don. *Azàlea sinénsis,* Lodd. *A. móllis,* Blume). Shrub, to 5 ft.: young branchlets pubescent and often setose: winter buds grayish pubescent: lvs. oblong to oblong-oblanceolate, obtuse and mucronate, cuneate at the base, ciliate and often revolute at the margins, soft-pubescent beneath, 2½–3½ in. long: fls. in many-fld. heads; pedicels puberulous; calyx-lobes short, rounded, ciliate; corolla campanulate-funnelform, yellow, upper lobe spotted greenish, 2 in. across; stamens shorter than limb. April, May. China. B.R. 1253. L.B.C. 9:885.—Tenderer than the following species with which it has been confused. It has entered largely into the parentage of the so-called Ghent azaleas, and some of them, particularly Anthony Koster, are little different from true *R. sinense.*

38. **japónicum,** Suring. (*R. mólle,* Miq., not Don. *Azàlea japónica,* Gray. *A. móllis,* Hort., not Blume). Fig. 3392. Shrub, to 6 ft.: young branchlets glabrous, sometimes setose: winter buds glabrous: lvs. obovate to obovate-oblong, obtuse and mucronate, cuneate at the base, ciliate, glabrous or sparingly setose above, glabrous below except setose on the midrib, 1½–3 in. long: fls. in dense heads; pedicels setose; calyx-lobes ovate, setose; corolla campanulate-funnelform, 2 in. across, salmon-red, brick-red, or carmine; stamens shorter than limb. April, May. Japan. F.S. 19:2032–6. Gn. 29, p. 551; 33, p. 324; 42, p. 369; 46, p. 546; 59:403. Gn.M. 4:24. C.L.A. 4:210; 5:147; 11:495. Gt. 16:556; 57:1575. M.D.G. 1906:556. G. 2:503; 5:219. Gng. 4:279. S.I.F. 2:62.—This and the preceding species have been hybridized extensively with *R. luteum* and the American azaleas and almost all the varieties now in trade under the names of these two species are hybrids. The type of *R. japonicum* has been reintro. from Japan by C. S. Sargent and that of *R. sinense* from China by E. H. Wilson, and they have been distributed by the Arnold Arboretum. *R. japonicum* is hardy at the Arnold Arboretum; *R. sinense* is tenderer, but stands ordinary winters in favorable positions.

3390. Capsule of Rhododendron nudiflorum.

Section 5. RHODORA.

A. *Stamens 10; corolla rosy purple, not spotted* ..... 39. **canadense**
AA. *Stamens 7 or 5; corolla pale rose-colored, spotted* ..... 40. **Vaseyi**

39. **canadénse,** Zabel (*R. Rhodòra,* Don. *Rhodòra Azàlea canadénsis,* Kuntze). Shrub, 1–3 ft.: lvs. oval to oblong, obtuse and mucronulate, glaucous and slightly pubescent beneath, 1–2½ in. long: fls. 5–7, on very short pedicels, before the lvs.; corolla 2-lipped, the two lower segms. narrow, divided nearly to the base, rose-purple, not spotted, 1–1½ in. broad; stamens 10. April, May. Newfoundland to Que., south to Pa. and N. J. Em. 2:441. B. M. 474. C.L.A. 11:496. Gn.M. 5:221. G.W. 9, p. 474; 14, p. 85. M.D.G. 1902:286: 1906:73.

3391. Rhododendron Vaseyi. (×⅔)

40. **Vàseyi,** Gray (*Azàlea Vàseyi,* Rehd. *Bíltia Vàseyi,* Small). Fig. 3391. From 5–15 ft. high: branchlets without bristles: lvs. oblong or oblong-lanceolate, acute, sparsely hirsute, 2–5 in. long: fls. before the lvs.; corolla rotate-campanulate, slightly 2-lipped, divided to below the middle, pale rose-colored, 1½ in. across, upper lobes spotted, lower lobes widely spreading, divided nearly to the base; stamens 7, rarely 5. April, May. N. C. G.F. 1:377 (adapted in Fig. 3391). G.C. III. 20:71; 51:313. B.M. 8081. Gn. 76, p. 332; 79, p. 302. Mn. 7:121. C.L.A. 11:499. Gn.M. 5:219. M.D.G. 1899:332, 333. G.W. 16, p. 231.—A very handsome, hardy species. There is also a form with white fls., var. **álbum,** Rehd., but this is not quite so beautiful as the type.

Section 6. TSUTSUTSI (Tsusia).

A. *Corolla rotate-campanulate, divided to below the middle: lvs. deciduous.*
B. *Lvs. rhombic-ovate, acute: corolla not spotted* ..... 41. **rhombicum**
BB. *Lvs. obovate, obtuse: upper lobes of corolla spotted* ..... 42. **Schlippenbachii**
AA. *Corolla funnelform-campanulate: lvs. deciduous or persistent.*
B. *Inner bud-scales viscid when unfolding.*
C. *Sepals obtuse, ciliate, not glandular* ..... 43. **poukhanense**
CC. *Sepals acute, lanceolate, glandular-ciliate* ..... 44. **ledifolium**
BB. *Inner bud-scales not viscid.*
C. *Fls. solitary, 2–3 in. across; anthers purple; sepals small, ovate: lvs. persistent, lustrous above* ..... 45. **indicum**
CC. *Fls. 2–3, smaller: lvs. subpersistent or deciduous, dull.*
D. *Stamens 7–10, anthers purple; sepals ovate to lanceolate: lvs. elliptic, acute, subpersistent, 1–2 in. long* ..... 46. **Simsii**
DD. *Stamens 5; anthers usually yellow.*
E. *Lvs. deciduous, elliptic, acute. 1–2½ in. long: fls. 1½–2 in. across, anthers yellow* ..47. **Kaempferi**
EE. *Lvs. subpersistent, obovate to elliptic, obtuse or acutish, ½–1½ in. long: fls. ½–1½ in. across; anthers sometimes purple* ..... 48. **obtusum**

41. **rhómbicum,** Miq. (*Azàlea rhómbica,* Kuntze). Shrub, 3–8 ft.: lvs. rhombic-ovate to rhombic-elliptic, acute at both ends and sparsely hairy above, yellowish pubescent at the nerves beneath, 1½–2½ in. long: fls. 2–3; corolla 1½–2 in. broad, rotate-campanulate, bright rose-colored, segms. oblong, not spotted; stamens 10. April, May. Japan. B.M. 6872. Gt. 17:586. G.C. III. 20:38. Gn. 72, p. 267. R.H. 1909, p. 79. Var. **albiflòrum,** Makino. Fls. white.

42. **Schlippenbáchii,** Maxim. (*Azàlea Schlippenbáchii,* Kuntze). Three to 5 ft.: branchlets glandular-pilose: lvs. cuneate, broadly obovate, 2–5 in. long, rounded and mucronate at the apex, hirsute on both sides or glabrous at length: fls. with the lvs., 2–3 in. broad, pale rose-colored, upper lobes spotted reddish brown; stamens 10. May. Japan. B.M. 7373. Gn. 46:80; 77, p. 136. G.C. III. 19:561; 55, suppl. Jan. 3.

43. **poukhanénse,** Léveillé (*R. coreànum,* Rehd.). Spreading shrub, 1–3 ft.: lvs. chartaceous, subpersistent, narrow-elliptic to elliptic-lanceolate, or lanceolate at the end of the branchlets, dark green above and usually sparingly strigose, paler beneath and strigose on the veins, 1¼–2½ in. long: fls. 1–3; the inner scales of the bud viscid; sepals ¼–⅓in. long, ovate-oblong, obtuse, strigose and long-ciliate; corolla funnelform-campanulate, pale lilac-purple, spotted purplish brown on the upper lobes, about 2 in. across; stamens 10, anthers purple. May. Korea.—Has proved perfectly hardy at the Arnold Arboretum and flowers freely as a small plant; the purple-lilac color of the fls. is unique among hardy azaleas. Var. **yodogàwa,** Rehd. (*Azàlea yodogàwa,* Hort.). Fls. double, rosy lilac, spotted dark purple: lvs. elliptic-lanceolate. G.W. 16:163. R.H. 1908:425.

44. **ledifòlium,** Don (*R. rosmarinifòlium,* Dipp., not Vidal. *Azàlea rosmarinifòlia,* Burm. *A. álba,* Sweet. *A. ledifòlia,* Hook. *A. liliiflòra,* Poit.). Much-branched low shrub, 1–3 ft.: branches, lvs. and pedicels densely rufously appressed-strigose: lvs. elliptic or elliptic-lanceolate, persistent, 1–3 in. long: fls. 1–3; sepals lanceolate, serrate-glandular; corolla pure white or rosy purple, 2–3 in. broad, fragrant; stamens usually 10. May. China. B.R. 811. B.M. 2901. L. B. C. 13:1253. G. 28: 323. Gn. 33, p. 321. G.W. 15, p. 650.—Some remarkable varie-

3392. Rhododendron japonicum (×⅔)

ties of this species are the following: Var. **álbum,** Rehd. (*R. ledifòlium* var. *leucánthum,* DC. *A. índica* var. *álba,* Lindl. *R. leucánthum,* Bunge). Fls. white, sometimes striped pink. G.C. III. 33:373. Gn. 54, p. 487. G. 6:607. Var. **Noordtiànum,** Rehd. (*Azàlea ledifòlia Noordtiàna,* Wittm. *A. japónica álba grandiflòra Van Noordt,* Hort.). Fls. white, larger: lvs. elliptic. R.B. 30:133. M.D.G. 1905:73, 74. Gt. 59, p. 310. G.W. 15, p. 45. Said to be the hardiest variety of this species. Var. **purpùreum,** Maxim. Fls. rosy purple. Var. **narcissiflòrum,** Maxim. (*A. narcissiflòra,* Fort.). Fls. double, white, rarely purple. F. 1880:89. Var. **phœníceum,** DC. (*A. punícea,* Sweet. *A. ledifòlia* var. *phœnícea,* Hook. *A. índica* var. *calycìna,* Paxt.). Fls. single, purple; calyx with linear, not serrate and less glandular lobes. B.M. 3239. L.B.C. 18:1735. J.F. 3:257. Possibly a hybrid of this species and *R. sublanceolatum.*—*R. ledifolium* has produced, with *A. índica,* a large number of beautiful hybrids, of which one of the first was figured in 1833 as *R. pulchrum.*

45. **índicum,** Sweet (*R. macránthum,* Don. *R. Danielsiànum,* Planch. *Azàlea índica,* Linn. *A. macrántha,* Bunge. *A. Danielsiàna,* Paxt.). Low, much-branched shrub: lvs. evergreen, elliptic to lanceolate-oblong, obtuse or acute, dark green and lustrous above, paler and slightly strigose below, 1–2 in. long: fls. usually solitary; sepals small, ovate, ciliate; corolla funnelform, 2–3 in. across, rosy purple to pink; stamens 5–10, anthers purple. June, July. Japan. P.M. 1:129. Var. **crispiflòrum,** Schneid. (*Azàlea crispiflòra,* Hook.). Fls. large, rose-colored, with distinctly crisped segms. B.M. 4726. F.S. 9:887. Var. **laterítium,** Rehd. (*Azàlea índica* var. *laterítia,* Lindl.). Fls. salmon- or brick-red: lvs. oblong-lanceolate. B.R. 1700. Var. **rosiflòrum,** Rehd. (*Azàlea rosiflòra,* Flor. Mag. *A. balsaminæflòra,* Carr. *A. Róllissonii,* Hort.). Lvs. oblong-lanceolate: fls. salmon-red, very double, with imbricated oblong segms., resembling the fl. of a camellia-fld. balsam. F.M. 19:418. Gn. 18:254. R.H. 1882:432. F. 1878, p. 35. G.Z. 29, p. 265.—This species is the origin of most of the beautiful garden forms of Indian azaleas raised by hybridizing with the allied species, particularly *R. Simsii* and *R. ledifolium;* many of the forms were intro. from Chinese and Japanese gardens. Gn. 33, p. 139; 50, p. 192; 54, p. 487; 73, p. 202. G.C. III. 24:101. R.B. 20:121; 23:37; 25:73. A.G. 14:473. Gng. 4:359. F.E. 9:431. F.R. 2:579. C.L.A. 7:479. Gn.M. 5:220.

3393. Rhododendron Kaempferi. (×½)

46. **Símsii,** Planch. (*R. índicum* var. *Símsii,* Maxim. *R. índicum* var. *ignéscens,* Sweet. *Azàlea índica,* Sims, not Linn.). Half-evergreen or evergreen shrub, to 10 ft.: lvs. elliptic-ovate to elliptic-lanceolate, rarely lanceolate, acute, cuneate at base, sparingly strigose and dull above, more densely so beneath, at least on the veins, ¾–2 in. long: fls. 2–3, sepals ovate to lanceolate, densely strigose and ciliate; corolla funnelform, 1½–2 in. across, carmine or rose-colored; stamens 7–10; anthers purple. May, June. W. China. B.M. 1480. L.B.C. 3:275.—The typical form has been recently re-intro. by E. H. Wilson.

47. **Kaémpferi,** Planch. (*R. índicum* var. *Kaémpferi,* Maxim.). Fig. 3393. Shrub, to 12 ft.: lvs. membranous, deciduous, broadly elliptic to elliptic-ovate or nearly rhombic, acute at the ends, bright green above, paler beneath, strigose on both sides, with rufous hairs on midrib and petiole, 1¼–2½ in. long: fls. 2–4 with or before the lvs.; sepals oval to oblong-ovate, obtuse, long-ciliate, strigose outside; corolla broadly funnelform, 1½–2 in. across, bright orange-red to pink; stamens 5; anthers yellow. April, May. Japan. S.I.F. 2:61. C.L.A. 11:496. M.D.G. 1902:417. S.T.S. 2:113.—Very handsome; hardy in New England.

48. **obtùsum,** Planch. (*R. índicum* var. *obtùsum,* Maxim. *Azàlea obtùsa,* Lindl.). Low, much-branched shrub: lvs. persistent, obovate, rounded and mucronulate at the apex, dark green and lustrous above, strigose on the midrib beneath, ½–1½ in. long: fls. 2–3; sepals ovate, small, ciliate; corolla funnelform, orange-red or pink, 1–1½ in. across; stamens 5; anthers yellow. May. Japan. B.R. 32:37. G.C. II. 25:585. R.H. 1876:370. Gn. 67, p. 190. Var. **álbum,** Schneid., (*Azàlea obtùsa álba,* Hort.). Fls. white. G.F. 9:395. Var. **calyciflòrum,** Schneid. (*Azàlea calyciflòra,* Hort.). Fls. brick-red, corolla double (hose-in-hose). Var. **amœnum,** Rehd. (*R. amœnum,* Planch. *Azàlea amœna,* Lindl.). Lvs. elliptic or elliptic-obovate, acute or obtusish, ½–1 in. long, dark green: corolla usually double (hose-in-hose), purple, ½–1 in. broad; stamens 5; anthers often purple. April, May. B.M. 4728. F.S. 9:885. G.C. III. 23: fig. 125. A.G. 15:373; 18:568. Gng. 2:385; 11:289. A.F. 12:33; 20:751. F.E. 9:573. J.F. 4:329. This variety, of which the wild parent plant is unknown, seems to have some relations to *R. Simsii* and may be of hybrid origin. It flowers early and very abundantly; hardy north to N. Y. There are some forms and crosses of this variety of which the following may be named: *álbum,* with white fls. M.D.G. 1903:476; *Caldwellii,* with larger purple fls. (Geert, Ic. Az. 18); G. 32:21; *Marvel,* lilac-carmine, double (F.M. 11; 14); *Princess Maud,* rosy magenta (R.H. 1886:516); *Mrs. Carmichael,* crimson-magenta; *Princess Beatrice,* bright mauve; *Prime Minister,* soft pink; *Miss Buist,* pure white; *Hexe* (Firefly), deep crimson. In Japanese gardens a large number of named varieties of *R. obtusum,* varying in shades from white to deep crimson, are grown; one of the best known of them is *Hinodigiri,* with brilliant crimson fls.

Great numbers of names of rhododendrons are to be found in current literature, but the plants may be unknown in the American trade. The following list will explain most of these names. The number in parenthesis after the name refers to the section to which the species belongs. *R. adenópodum,* Franch. (2). Shrub, to 10 ft.: lvs. oblong-lanceolate, with white crustaceous tomentum beneath, 3–6 in. long: fls. 4–6, campanulate, pale rose, 2½–3 in. across; pedicels glandular. Cent. China. G.C. III. 45:291.—*R. afghánicum,* Hort., not Aitch.=R. Collettianum.—*R. Álbrechtii,* Maxim. (Azalea Albrechtii, Kuntze) (5). Deciduous shrub, to 5 ft.: lvs. obovate or elliptic, pubescent, 3–5 in. long: fls. purple; stamens 10. Japan.—*R. álbum,* Blume (1). Small shrub: lvs. oblong-lanceolate, ferrugineous-lepidote beneath, 3–4 in. long: fls. rather small, campanulate, yellowish white. Java. B.M. 4972. Tender.—*R. altaclarénse,* Lindl. Hybrid of R. arboreum with R. catawbiense × R. ponticum. Fls. bright crimson, in dense heads. B.R. 1414. B.M. 3423. Not to be confounded with Azalea altaclarensis, Lindl. (R. sinense × R. viscosum. B.R. 28:27).—*R. ambíguum,* Hemsl. (1). Shrub, to 10 ft.: lvs. lanceolate, glabrous above, sparingly lepidote beneath, 2–3 in. long: fls. 5–7, broadly campanulate, yellow, 2 in. across. W. China. B.M. 8400.—*R. Amesiæ,* Rehd. & Wilson (1). Allied to R. yanthinum. Shrub, to 10 ft.: lvs. elliptic to elliptic-oblong, rounded at base, lepidote, villous on the midrib above, 2–3 in. long; petioles setose: fls. 2–3, funnelform, 1¾–2 in. across, purple. W. China.—*R. Annæ,* Franch. Lvs. lanceolate, coriaceous: fls. white, medium-sized; corolla flat and disk-like. W. China.—*R. Anthopógon,* D. Don. Low shrub: lvs. elliptic-oblong, ferrugineous-

lepidote beneath, 1½ in. long: fls. small, funnelform, yellowish white, ½in. long; stamens 5, included. Himalayas. B.M. 3947. Almost hardy.—*R. argênteum*, Hook. f.=R. grande.—*R. argyrophýllum*, Franch. (2). Shrub, to 15 ft.: lvs. oblong-lanceolate or oblanceolate, with white crustaceous tomentum beneath, 3–6 in. long: fls. 7–10, slender-stalked, funnelform-campanulate, 1¼ in. across, pale rosy-purple; stamens 14, included. W. China. Very variable.—*R. Aúcklandii*, Hook. f.=R. Griffithianum var. Aucklandii.—*R. auriculàtum*, Hemsl. (2). Shrub, to 15 ft.: lvs. oblong, obtuse and mucronate, auriculate at the base, rusty-tomentose beneath, 4–8 in. long: fls. 6–8, white to rosy red, funnelform, about 3 in. across; pedicels hairy; bud-scales lanceolate. Cent. China. J.H.S. 28, p. 64.—*R. balsaminæflòrum*, Hort. Hybrid of the Javanese group, with double pink fls. G.C. II. 18:230; III. 12:769. Gt. 37, p. 265. G.Z. 27:241. J.H. III. 43:151. Var. *álbum*, Hort. Fls. double, white. Gn.W. 5:373. G.Z. 27:241. Var. *aùreum*, Hort. Fls. double, yellow. G.Z. 27:241. The name has also been used for a double form of R. indicum, see R. indicum var. rosiflorum.—*R. barbàtum*, Wall. (2). Tree, attaining 60 ft.: lvs. with setose petioles, elliptic-oblanceolate, glabrous and pale beneath, 5–7 in. long: fls. deep red, campanulate, 1½ in. across, in dense clusters. Himalayas. F.S. 5:469–72. G.M. 53:261. Var. *Smíthii*, Clarke. Lvs. ferrugineously subtomentose beneath. B.M. 5120.—*R. blandfordiæflòrum*, Hook. (1). Slender shrub, 8 ft. high, allied to R. cinnabarinum: lvs. oblong-lanceolate, ferrugineous-lepidote beneath, 2–3 in. long: fls. funnelform, with cylindric tube, brick- or orange-red, yellow within, 2½ in. long. Himalayas. B.M. 4930. F.S. 11:1173. I.H. 3:112. B.H. 7, p. 47. G.C. 1856:548; 1871:236. Gn. 15:182 (as R. cinnabarinum).—*R. Boóthii*, Nutt. (1). Shrub, 6 ft. high, often epiphytal: lvs. ovate-oblong, or oblong-lanceolate, hirsute above when young, minutely lepidote beneath, 4–5 in. long: fls. in dense clusters, campanulate, yellow, 1¼ in. across. Himalayas. B.M. 7149. I.H. 5:174.—*R. bracteàtum*, Rehd. & Wilson (1). Allied to R. yanthinum. Shrub, to 6 ft.: lvs. oblong, obtuse, lepidote beneath, 1–2 in. long, toward the base of the branchlets reduced to persistent bracts: fls. 3–6, white, spotted red, broadly campanulate, 1¼ in. across. W. China.—*R. Bréttii*, Hemsl. & Wilson=R. longesquamatum.—*R. Brookeànum*, Low (1). Shrub, often epiphytal, with glabrous purple branches: lvs. oblong-lanceolate, pale beneath, 6–9 in. long: fls. funnelform-campanulate, orange- or golden-yellow, 2½ in. across. Borneo. B.M. 4935. F.S. 5, p. 477; 12:1238, 1239. G.C. III. 9:621. Var. *flàvum*, Hort. Fls. paler yellow. G.Z. 23, p. 145.—*R. Broùghtonii*, Hort. One of the hybrid evergreen rhododendrons of unknown parentage with bright rosy red fls.—*R. Broùghtonii aùreum*, Hort. See under No. 28, R. azaleoides.—*R. bullàtum*, Franch. (2). Shrub, to 5 ft.: branchlets woolly: lvs. elliptic-oblong or oblong-ovate, dull green and wrinkled above, with brownish tomentum beneath, 2–3 in. long: fls. 3–6, white with yellow blotch, broadly campanulate, 2 in. across, fragrant; calyx large. G.C. III. 46:378. S.W. China.—*R. burmánicum*, Hutchins. (1). Lvs. oblanceolate, densely scaly on both sides, 2½–3½ in. long: fls. greenish white, very sweet-scented. Burma.—*R. calophýllum*, Nutt. (1). Shrub, 3 ft. high: lvs. oblong-ovate or elliptic, glossy above, lepidote beneath, 3–5 in. long: fls. 4–5, tubular-campanulate, white, slightly tinged yellowish green, 3 in. across. Himalayas. B.M. 5002. F.S. 22:2340.—*R. calophýtum*, Franch. (2). Shrub or small tree, to 45 ft.: lvs. oblong-obovate, glabrous, 8–12 in. long: fls. 15–20, long-stalked, purple, rose-colored or white, broadly campanulate, 2 in. across; stamens about 20; ovary glabrous. W. China.—*R. camelliæflòrum*, Hook. f. (1). Shrub, 6 ft. high, often epiphytal: lvs. elliptic-lanceolate, ferrugineous-lepidote beneath, 2–3 in. long: fls. 1–2, short-pedicelled, broadly campanulate, white or slightly tinged rose, 1½ in. across; stamens 16. Himalayas. B.M. 4932.—*R. campylocárpum*, Hook. f. (2). Shrub, 6 ft. high: lvs. elliptic, obtuse, mucronulate, glabrous and glaucous beneath, 2–3½ in. long: fls. several, campanulate, yellow, fragrant, to 2½ in. across. Himalayas. B.M. 4968. Gn. 54:182; 78, p. 573. G.C. II. 21:833; III. 11:501 and 12:699. G. 25:195; 28:379; 36:379; 37:19. G.M. 57:851.—*R. cándidum*, Rehd. (Azalea candida, Small) (4). Allied to R. viscosum. Shrub, to 6 ft.: lvs. oblong or obovate-oblong, thinly tomentose above, densely white-tomentose and reticulate beneath, ½–2 in. long: fls. white or pinkish, 1 in. across, after the lvs. Ga.—*R. cárneum*, Hutchins. (1). Allied to R. Veitchianum. Shrub, to 3 ft.: lvs. elliptic-obovate, glabrous, glaucous and scaly beneath, 2¼–4½ in. long: fls. campanulate-funnelform, flesh-colored, 3½ in. across; stamens usually 12. Burma. B.M. 8634.—*R. Cartoniànum*, DC. (R. Cartoni, Hort.). Allied to R. azaleoides and said to be of the same parentage as R. Gowenianum, but lvs. glabrous and fls. more violet, whitish toward the base. B.R. 1449.—*R. Cavrònii*, André. Hybrid of R. formosum and R. Veitchii. Lvs. elliptic: fls. white, usually slightly tinged rose, fragrant, 3½ in. across. R.H. 1885:60.—*R. Championæ*, Hook. f. (Azalea Championæ, Kuntze) (6). Shrub, to 6 ft.: lvs. oblong-lanceolate, acuminate, dark green and glabrous above, rusty colored and pilose beneath, ciliate, 2½–6 in. long: fls. 4–6, wide campanulate-funnelform, with oblong lobes, 3 in. across, rose-colored; stamens 10. Hong-Kong. B.M. 4609. J.F. 2:208.—*R. chartophýllum*, Franch. (1). Allied to R. racemosum. Shrub, to 3 ft.: lvs. elliptic, acuminate, lepidote beneath, 2½–3½ in. long: fls. 6–12, light pink, spotted, funnelform-campanulate, 2 in. across. S.W. China. G.C. III. 51:291. Gn. 78, p. 304. R.H. 1912, p. 135.—*R. chrysánthum*, Pall. Low shrub, 2 ft. high: lvs. elliptic-oblong, acute, 1–2 in. long, ferrugineous beneath: fls. few, slender-pedicelled, broadly campanulate, yellow, 1½ in. across. Siberia, Kamchatka. Hardy.—*R. ciliàtum*, Hook. f. (1). Small shrub, 2–4 ft.: lvs. elliptic, acuminate, pilose above, ciliate, pale and lepidote beneath, 2 in. long: fls. several, campanulate, pale purple, 1½ in. across. Himalayas. G.C. III. 29:247. Gn. 59, p. 351; 67, p. 266; 75:202. G. 36:658. Var. *róseo-álbum*, Hook. Fls. larger, white, tinged rose. B.M. 4648. F.S. 8:766. Gt. 16:563. J.F. 3:312.—*R. ciliicàlyx*, Franch. (1). Small shrub: lvs. elliptic-obovate, shortly acuminate, ciliate, pale and lepidote beneath: fls. 7–10, campanulate, white, 2 in. across. Yunnan. R.H. 1899:36. B.M. 7782. G.W. 8, p. 245.—*R. cinnabarinum*, Hook. f. (1). Slender-branched shrub: lvs. elliptic to elliptic-lanceolate, lepidote beneath, 2–3 in. long: fls. many, nodding, tubular-campanulate, rose-orange or brick-red, 1¼ in. long. Himalayas. G. 34:111. Var. *pállidum*, Hook. Lvs. glaucous beneath: fls. pale rose, spotted red within. B.M. 4788. Var. *Ròylei*, Hook. Lvs. ferrugineous beneath: fls. larger, of brighter color. Gn. 44:558. G.C. II. 21:765; III. 12:709.—*R. citrinum*, Hassk. Small shrub: lvs. elliptic-oblong, obtuse, lepidote and pale beneath, 1½–2 in. long: fls. several, nodding, campanulate, pale yellow, ¾in. long, fragrant. Java. B.M. 4797. Tender.—*R. cliviànum*, Hook. Hybrid of R. arboreum album and R. catawbiense. Fls. white, blushed and spotted carmine. B.M. 4478.—*R. Collettiànum*, Aitch. & Hemsl. Shrub, 10 ft. high: lvs. elliptic-lanceolate, brownish lepidote beneath, 1½–3 in. long: fls. short-pedicelled, funnelform, white, 1 in. long. Afghanistan. B.M. 7019. G.C. III. 4:297. J.H. III. 51:502.—*R. concínnum*, Hemsl. (R. coombense, Hemsl.) (1). Shrub, to 10 ft.: lvs. oval, lepidote beneath, 1–2 in. long: fls. 3–5, purple, campanulate, 1½ in. across. W. China. B.M. 8280, 8620. G.C. III. 53:341.—*R. coombénse*, Hemsl.=R. concinnum.—*R. crássum*, Franch. Closely allied to R. Maddenii, differing in its larger calyx-lobes. S. W. China.—*R. Cúnninghamii*, Moore. Hybrid of R. arboreum var. cinnamomeum and R. maximum var. album. Fls. white, spotted purple. Moore, Gard. Mag. Bot. 1851:121. Not to be confounded with R. Cunningham's White, a variety or hybrid of R. caucasicum, which is a dwarf and hardy shrub, much used in Germany as a stock for grafting hardy varieties.—*R. Cúrtisii*, Moore=R. multicolor var. Curtisii.—*R. Dálhousiæ*, Hook. f. (1). Straggling shrub, attaining 8 ft., often epiphytal: lvs. elliptic, rusty-lepidote beneath, 4–5 in. long: fls. 3–5, campanulate, yellow, changing to white, fragrant, 4½ in. across. Himalayas. B.M. 4718. F.S. 5:466–8. Gn. 28:318; 48, p. 108. G.C. III. 33:338. F.S.R. 3:40. G. 33:579. Remarkable for the large, lily-like fragrant fls. A double-fld. variety is figured in Gn. 13, p. 517. R. Dalhousiæ hybridum (B.M. 5322) is a hybrid with R. formosum, and R. Dalhousiæ Victorianum is a hybrid with R. Nuttallii, see R. Victorianum.—*R. Dàvidii*, Franch. (2). Shrub, to 12 ft.: lvs. oblong-lanceolate, pale green or brownish beneath, glabrous, 4–6 in. long: fls. many, racemose, short-stalked, lilac, spotted purple, broadly campanulate, 7-lobed, 1½–2 in. across. W. China.—*R. Davidsoniànum*, Rehd. & Wilson (1). Shrub, to 10 ft.: lvs. thinly coriaceous, elliptic to oblong-lanceolate, sparingly lepidote above, densely so beneath and glaucescent, 1–2½ in. long: fls. 1–3, axillary, rosy pink, campanulate-funnelform, 1 in. across. W. China. R.H. 1914, pp. 323, 324. B.M. 8605. Gn. 78, p. 316 (as R. siderophyllum).—*R. Dàviesii*, Hort. Hybrid of R. javanicum and R. retusum, with tubular orange-red fls. F.M. 20:474. G.Z. 26:145. Not to be confounded with Azalea Daviesii, Hort., which is a Ghent azalea with white fls.; see p. 2935.—*R. decòrum*, Franch. (R. lucidum, Franch. R. Spooneri, Hemsl. & Wilson. R. erubescens, Hutchins.) (2). Shrub: lvs. oblong, glabrous, glaucous beneath, 4–8 in. long: fls. broadly campanulate, white or pink, to 2 in. across; stamens 16. W. China. G.C. III. 47:120. G. 36:569. R.H. 1914, p. 305. B.M. 8643.—*R. Delavàyi*, Franch. (2). Tree: lvs. oblong-lanceolate, rufous-tomentulose beneath: fls. in large, dense heads, deep red, broadly campanulate, 1 in. across. Yunnan. B.M. 8137.—*R. dilatàtum*, Miq. (Azalea dilatata, Kuntze) (6). Allied to R. rhombicum. Lvs. rhombic-obovate, soon glabrous, 1–2½ in. long: fls. 1–2, lilac-purple, rotate-campanulate, 1½–2 in. broad. Japan. S.I.F. 2:61. G.W. 14, p. 270.—*R. díscolor*, Franch. (2). Shrub, to 15 ft.: lvs. oblong or oblong-lanceolate, acute at both ends or auriculate at the base, whitish beneath, 6–8 in. long: fls. many, white to rosy pink, funnelform-campanulate, 6-lobed, 3 in. across. Cent. China.—*R. Edgariànum*, Rehd. & Wilson (1). Shrub, to 3 ft., intricately branched: lvs. broadly ovate or oval, obtuse, densely lepidote on both sides, rusty beneath, ½–¾in. long: fls. solitary, funnelform, purple, ¾in. across. W. China.—*R. Édgeworthii*, Hook. f. Straggling shrub, often epiphytic: lvs. ovate-lanceolate, blackish green and reticulate above, ferrugineous-tomentose below, 3–4 in. long: fls. few, broadly campanulate, white, tinged rose, with broad, waved lobes, 4½ in. across. Himalayas. B.M. 4936. F.S. 8:797, 798. Gt. 5:228. H.F. 4:264. R.H. 1913, p. 393.—*R. Eeckhaútei*, Hort. (Azalea Eeckhautei, Hort.). Hybrid between R. indicum and R. linearifolium. Lvs. linear-lanceolate: corolla light pink, semi-double, deeply divided into linear-oblong lobes. Very distinct; as hardy as R. linearifolium. R.B. 37:117.—*R. erubéscens*, Hutchins.=R. decorum.—*R. eximium*, Nutt.=R. Falconeri var. eximium.—*R. exoniénse*, Veitch. Hybrid between R. ciliatum and R. Veitchianum. Fls. white, faintly tinged rose outside, 3 in. across, very fragrant. G. 6:537; 16:663.—*R. Fàberi*, Hemsl. (2). Shrub, to 18 ft.: lvs. elliptic-oblong, acute, rusty tomentose beneath like the branchlets, 3–6 in. long: fls. white to pale pink, spotted red, broadly campanulate, 1½ in. across; calyx ¾in. long. W. China.—*R. Fálconeri*, Hook. f. (2). Shrub or tree, attaining 30 ft.: lvs. elliptic or obovate, rusty-tomentose beneath, 8–10 in. long: fls. many, campanulate, 8–10-lobed, white, with a dark purple blotch within, 1–2 in. across. Himalayas. B.M. 4924. F.S. 5:477–80; 11:1166, 1167. Gt. 19:658. Gn. 48, p. 103; 49, p. 441; 64, p. 377. G.C. III. 20:749. F.S.R. 3, p. 33. G.M. 51:203. G. 19:236; 25:22; 35:65. G.W. 14, p. 270. Remarkable for its very large lvs., sometimes to 1½ ft. long. Var. *eximium*, Hook. Fls. rose-colored and not spotted.—*R. Fárgesii*, Franch. (2). Shrub, to 15 ft.: lvs. elliptic, obtuse, subcordate at the base, glabrous, 2–3 in. long: fls. many, white to rosy pink, spotted, broadly campanulate, 6–7-lobed, 1½–2 in. across; stamens 12–14. Cent. China. G.C. III, 52:4. J.H. F. IV. 1:217.—*R. Fárreræ*, Tate (Azalea Farreræ, Koch. A. squamata, Lindl.) (5). Low shrub: lvs. rhombic-ovate, subcoriaceous, 1–2 in. long: fls. pale pink or pale lilac, spotted, 1¾ in. across.

Hong-Kong. B.R. 33:3.—*R. fastigiàtum*, Franch. (1). Very dwarf, flowering when only 4 in. high: lvs. closely crowded, ovate, ⅛–½in. long, covered with rusty dots: fls. bright lilac-rose, ½–1 in. across. W. China.—*R. fastuòsum* var. *flòre-plèno*, Van Houtte. Hybrid of R. catawbiense and R. ponticum. Fls. lilac-purple, semi-double. F.S. 2:143. Almost hardy.—*R. flávidum*, Franch. (R. primulinum, Hemsl.) (1). Shrub, to 6 ft.: lvs. ovate-oblong, densely lepidote on both surfaces, ½–¾in. long: fls. 3–5, yellow, rotate-campanulate, 1¼ in. across; stamens 10. W. China. B.M. 8326. G.C. III. 47:229. J.H.S. 36, p. 55, fig. 78.—*R. floribúndum*, Franch. (2). Shrub, to 15 ft. or small tree: lvs. lanceolate, acute at both ends, slightly bullate, white or grayish tomentose beneath, 3–5 in. long: fls. 8–12, rose-colored, 1½ in. across. W. China.—*R. Fórdii*, Hemsl. (2). Shrub: lvs. obovate-lanceolate, glabrous, 2–3 in. long: fls. few, white, flushed pinkish outside, 1½ in. across. S. China. B.M. 8111.—*R. formòsum*, Wall. (R. Gibsonii, Paxt.). (1). Slender shrub, 8 ft. high: lvs. oblong-obovate, ciliate, pilose above, glaucous and lepidote beneath, 1–2½ in. long: fls. few, funnelform-campanulate, white, tinged pink, 1½–2 in. across. Himalaya Mts. B.M. 4457. P.M. 8:217. G.C. III. 17:711. G. 35:157.—*R. Forsteriànum*, Hort. Hybrid of R. Edgeworthii and R. Veitchianum. Fls. large, white. Gn. 76, p. 272. G.W. 3, p. 605. G. 27:251.—*R. Fórtunei*, Lindl. Shrub, 12 ft. high, with stout branches, glabrous: lvs. oblong, acute, glaucous beneath, 5–7 in. long: fls. many, broadly campanulate, 7-lobed, rosy lilac; stamens 14. Cent. China. B.M. 5596. Almost hardy. Var. *Houlstonii*, Rehd. & Wilson. Lvs. narrower, smaller: pedicels more glandular.—*R. fràgrans*, Maxim. (1). Low shrub: lvs. ovate-elliptic, ferrugineous-lepidote beneath, ½–1 in. long: fls. 10–15, yellowish white, funnelform, ½in. across; stamens 5. E. Siberia.—*R. fràgrans*, Lodd., see No. 28, R. azaleoides.—*R. fragrantissimum*, Burb. Supposed hybrid between R. ciliatum and R. Edgeworthii. Fls. large, white, faintly tinged rose, fragrant. J.H. III. 57:619; 62:581.—*R. fúlgens*, Hook. f. (2). Allied to R. campanulatum, but smaller: fls. deep blood-red, in a dense head. Himalayas. B.M. 5317. F.S. 8:789. Gn. 67:376.—*R. Gauntléttii*, Hort. Hybrid between R. Griffithianum and probably R. ponticum. Fls. pale flesh-color, changing to white, 4 in. across. G. 32:131; 34:701.—*R. gemmíferum*, Bean. Hybrid between a true rhododendron and an azalea. Dwarf shrub: lvs. deciduous or half-evergreen, oval to elliptic, obtuse or acutish, mucronulate, loosely villous on both sides, 1½–2 in. long: fls. light carmine, funnelform-campanulate, tube somewhat longer than the lobes, 1½ in. across; stamens 5–10; style exserted, glabrous; ovary villous. Origin unknown. Hardy at the Arnold Arboretum.—*R. Gibsonii*, Paxt.=R. formosum.—*R. glaùcum*, Hook. f. (1). Small shrub, 3 ft. high: lvs. elliptic-oblong, lepidote, glaucous beneath, 2–4 in. long: fls. 5–8; campanulate, rose-colored, 1½ in. across. Himalayas. B.M. 4721. F.S. 7:672. H.F. 1859:241.—*R. Goweniànum*, Sweet. Allied to R. azaleoides and supposed to be a cross between a hybrid evergreen rhododendron and R. nudiflorum or R. viscosum: lvs. oblong-lanceolate, pubescent on both sides while young: fls. purplish pink; calyx-lobes linear.—*R. gránde*, Wight (R. argenteum, Hook. f.). (2). Tree, to 40 ft.: lvs. oblong-obovate, acute, glabrous, white beneath, 8–12 in. long: fls. in a dense head, campanulate, 5–8-lobed, rosy at first, changing to white, 2–3 in. across. Himalayas. B.M. 5054. Gn. 48:102; 59, p. 342. F.S. 5:473–6. G.C. II. 17: suppl. June 10; III. 4:158 (suppl.); 27:105; 45:290. R.H. 1888, p. 197. F.S.R. 3, p. 37. Gt. 60:1588. Var. *ròseum*, Hook. Fls. rose-colored. B.M. 6948.—*R. Griffithiànum*, Wight. Shrub, 8 ft. high, glabrous: lvs. oblong, pale beneath, 6–12 in. long: fls. 4–6, broadly campanulate, white, fragrant, 3 in. across or more. Himalayas. Gt. 15:517; 51, p. 282. G.C. III. 39:243. Var. *Aùcklandii*, Hook. Fls. 7 in. across. B.M. 5065. Gn. 20:328. R.H. 1855:81. G.C. II. 22:657; III. 12:697. J.H. III. 57:157. Remarkable for its very large fls.—*R. hæmatochílum*, Craib=R. oreodoxa.—*R. Halopeànum*, André. Hybrid of R. arboreum and R. Griffithianum. Fls. large, blush. R.H. 1896:428.—*R. Hanceànum*, Hemsl. (1). Shrub, to 3 ft.: lvs. obovate to elliptic-lanceolate, acute, lustrous above, fulvous beneath, minutely scaly, 1–3 in. long: fls. many, in dense heads, yellow, campanulate-funnelform, ¾in. across; stamens 10. W. China.—*R. Hárrisii*, Hort. Hybrid of R. arboreum and R. Thomsonii. Fls. deep crimson, spotted within.—*R. Harrovièanum*, Hemsl.=R. polylepis.—*R. Hódgsonii*, Hook. f. Shrub or small tree, attaining 20 ft.: lvs. narrowly obovate-oblong, whitish or brownish tomentose beneath, 8–18 in. long: fls. in a dense head, broadly campanulate, pale purple, 2 in. across. Himalayas. B.M. 5552. R.H. 1855:421; 1866:191. Gn. 73, p. 588. —*R. Hòokeri*, Nutt. (2). Shrub, 14 ft. high: lvs. oblong-oval, glabrous, glaucous below and sparingly chaffy on the veins: fls. campanulate, deep crimson, 1–1¾ in. across; calyx cup-shaped. Himalayas. B.M. 4926.—*R. Houlstonii*, Hemsl. & Wilson=R. Fortunei var. Houlstonii.—*R. Hunnewellièanum*, Rehd. & Wilson (2). Shrub, to 15 ft.: lvs. oblanceolate or oblong-lanceolate, acuminate, glabrous above, white-tomentose beneath, 3–4½ in. long: fls. many, white, spotted, broadly campanulate, 2 in. across. W. China.—*R. hypoglaùcum*, Hemsl. (2). Lvs. elliptic, acute, 2–3 in. long: corolla snow-white; segms. notched. Cent. China. B.M. 8649.—*R. imbricàtum*, Hort. Apparently a hybrid of R. ponticum with a hardy species of the same group. Dwarf, very compact shrub: lvs. crowded, oblong, obtuse, glabrous, lustrous, convex and somewhat bullate above, 1½–2½ in. long: pedicels puberulous: fls. pale lilac-purple, 2 in. across; style and the sometimes petaloid stamens short; ovary glabrous. Origin unknown. Hardy at the Arnold Arboretum.—*R. insígne*, Hemsl. & Wilson (2). Shrub, to 18 ft.: lvs. lanceolate-oblong, acute at both ends, lustrous above, grayish tomentose beneath, 3½–5 in. long: fls. many, pink to white, broadly campanulate, 1½–2 in. across; stamens 14 or more. W. China.—*R. intermèdium*, Tausch. Hybrid between R. ferrugineum and R. hirsutum and intermediate between the two. Has been found occasionally with the parents.—*R. intricàtum*, Franch. (1). Shrub, to 3 ft.: lvs. elliptic or ovate, obtuse, densely lepidote on both sides, silvery beneath, ¼–¾in. long: fls. 3–5, rosy purple, funnelform, ½in. across. W. China. B.M. 8163. G.C. III. 41:262. Gn. 78:190, 294. R.B. 35, p. 108. J.H.S. 33, p. 49, fig. 21. J.H. III. 54:343. M.D.G. 1909:145.—*R. irroràtum*, Franch. Shrub, several feet high, glabrous: lvs. oblong to oblong-lanceolate, pale beneath, 3–4 in. long: fls. many, funnelform-campanulate, 1½ in. long, white, tinged pink. Yunnan. B.M. 7361. G.C. III. 49:350.—*R. Jácksonii*, Hort. (G. 28:183) is said to be the same as R. venustum.—*R. javánicum*, Blume (1). Large shrub, glabrous: lvs. elliptic to oblong, acute, minutely lepidote beneath, 3–6 in. long: fls. many, funnelform, orange-yellow to brick-red, 2 in. across. Winter. Malayan Archipelago and Penin. B.M. 4336. F.S. 3:293, 294; 6:576. P.M. 15:217. Var. *tubiflòrum*, Hook. Lvs. smaller: fls. smaller and with longer tube, salmon-pink. B.M. 6850.—*R. Jénkinsii*, Nutt.=R. Maddenii.—*R. kamtschàticum*, Pall. (Azalea kamtschatica, Kuntze). Belongs to the section Therorodion, characterized by the fls. being borne at the end of the young branchlets. Prostrate undershrub: lvs. deciduous, obovate or spatulate, obtuse, ciliate, 1¼–2½ in. long: fls. 2–3, in terminal racemes, rotate-campanulate, 1½ in. across, carmine-purple, spotted; stamens 10; ovary pilose. E. Siberia, N. Japan and Alaska. B.M. 8210. Gt. 36:1260. G.C. III. 44:128. G.W. 13, p. 554. Hardy, but difficult to cult.—*R. Kéndrickii*, Nutt. (2). Large shrub: lvs. lanceolate, acuminate, glabrous, pale beneath, 4–7 in. long: fls. many, campanulate, bright scarlet, 2 in. across. Himalayas. Var. *latifòlium*, Hook. Lvs. broader, oblong-lanceolate, glandular pubescent beneath when young. B.M. 5129.—*R. Kesselringii*, Wolf. Hybrid between R. ponticum and R. Smirnovii. Low shrub: lvs. soon glabrous beneath: fls. rosy purple with darker margin.—*R. kewénse*, W. Wats. Hybrid of R. Griffithianum and R. Hookeri. Fls. large, in loose heads, crimson, pink or almost white. Gn. 42:474; 52:284; 76, p. 319. G.C. III. 23:291. G.M. 44:356; 50:211.—*R. Kèysii*, Nutt. Belongs to the section Keysia characterized by the tubular corolla with short erect lobes. Shrub, 2–6 ft. high, with ferrugineous branches: lvs. elliptic-lanceolate, glabrous, pale and sparingly scaly beneath, 3–4 in. long: fls. many, tubular, with short erect lobes, brick-red, 1 in. long. July. Himalayas. B.M. 4875. F.S. 11:1110. Gt. 12:415. Gn. 48, p. 106.—*R. Kótschyi*, Simonkai (R. myrtifolium, Schott & Kotschy, not Lodd.) (1). Low shrub: lvs. oblong-obovate, obtuse, mucronulate, shining above, ferrugineous-lepidote beneath, ½–1 in. long: fls. few, tubular-funnelform, with the tube outside pubescent, inside villous, carmine, ¾in. long; style shorter than ovary. July. Carpathian Mts. Gn. 56, p. 159. R.F.G. 17:1157, figs. 2, 3.—*R. lácteum*, Franch. (2). Tree, to 30 ft.: lvs. cordate, elliptic-ovate, brownish tomentulose beneath, 5–10 in. long: fls. in dense heads, broadly campanulate, 6-lobed, white, 1 in. across. Yunnan. B.M. 8372. R.H. 1912, pp. 375, 376.—*R. lanàtum*, Hook. f. (2). Shrub or small tree: lvs. obovate to obovate-oblong, with tawny woolly tomentum beneath, and also above when young, 3–5 in. long: fls. 6–10, broadly campanulate, yellow, spotted red within, 2–2½ in. across. Himalayas. F.S. 7:684. R.H. 1855:161. Almost hardy.—*R. lancifòlium*, Moench=R. ponticum.—*R. lancifòlium*, Hook. f.=R. barbatum.—*R. lappónicum*, Wahl. (1). Depressed shrub; lvs. oval or oblong, obtuse, ¼–½ in. long: fls. 3–6, broadly campanulate, purple, ½in. across; stamens 5–8. July. Mountains of N. Amer., N. Eu., N. Asia. B.M. 3106. M.D.G. 1910:136. Hardy.—*R. lepidòtum*, Wall. (R. elæagnoides, Hook. f.) (1). Slender shrub, 4 ft. high: lvs. obovate to lanceolate, glaucous-green, lepidote beneath, ½–1½ in. long: fls. 1–3, sometimes many, slender-pedicelled, broadly campanulate, yellow or dull purple, spotted within, ½in. across; stamens usually 8. Himalayas. B.M. 4657. Gn. 15:182. G.C. II. 22:297. J.F. 4:343. Var. *chlorànthum*, Hook. (R. salignum, Hook. f.). Fls. greenish or pale yellow, spotted greenish: lvs. narrow. Var. *obovàtum*, Hook. Fls. dark purple, larger: lvs. obovate.—*R. linearifòlium*, Sieb. & Zucc. (Azalea linearifolia, Hook.) (6). Allied to R. ledifolium. Lvs. linear-lanceolate: corolla pink, deeply divided into 5 linear-lanceolate segms. Japan. B.M. 5769. G.M. 36:104.—*R. Lóbbii*, Veitch (1). Slender shrub, allied to R. malayanum: lvs. elliptic-oblong: fls. almost salver-shaped, with slender, curved tube, bright crimson. Winter. Borneo. The R. Lobbianum, Moore (F.M. 1:10), belongs to R. Brookeanum.—*R. Lòderi*, Hort. Hybrid between R. Fortunei and R. Griffithianum. Fls. white to soft rose, 6-lobed, 5–6 in. across, fragrant. G.C. III. 50:30; 51:360. Not to be confused with Loder's hybrid which is a cross of unknown origin, apparently also of R. Griffithianum.—*R. longesquamàtum*, Schneid. (R. Brettii, Hemsl.) (2). Shrub, to 15 ft.: scales of lf.-buds persistent, elongated: lvs. obovate-oblong, acute, rounded at the base, glabrous beneath except the villous midrib and petiole, 2½–5 in. long: fls. 6–15, rosy pink, campanulate, 2 in. across. W. China.—*R. longístylum*, Rehd. & Wilson (1). Allied to R. micranthum. Shrub, to 6 ft.: lvs. oblanceolate or oblong-lanceolate, sparingly lepidote beneath, 1-2½ in. long: fls. 10 or more, white, funnelform-campanulate, ½in. across; style exserted, 1 in. long. W. China. R.H. 1914, pp. 232, 233.—*R. lúcidum*, Franch.=R. decorum.—*R. Luscómbei*, W. Wats. Hybrid of R. Fortunei and R. Thomsonii. Fls. large, rose-red to crimson. Gn. 66, p. 392. G. 26:528.—*R. lutéscens*, Franch. (1). Allied to R. racemosum. Lvs. lanceolate or ovate-lanceolate, long-acuminate, sparingly lepidote, light green beneath: fls. 1–3, from axillary heads, 1 in. across, yellow; stamens 10, exserted. W. China. R.H. 1914:324.—*R. macrocárpos*, Griff.=R. Dalhousiæ.—*R. macrosépalum*, Maxim. (Azalea macrosepala, Kuntze) (6). Shrub, to 2 ft.: branchlets villous: lvs. deciduous or subpersistent, elliptic, 1–2 in. long: fls. umbellate, rose-lilac, spotted, 2 in. across; sepals lanceolate, long, glandular-pubescent. Japan. Gt. 19:662. Azalea dianthiflora, Carr. (R.H. 1891:60) is possibly a double-fld. form of this species.—*R. macrostèmon*, Maxim. (6). Low half-evergreen shrub: lvs. oblong-elliptic, pubescent, about ½in. long: fls. pinkish, ¾–1 in. across; stamens twice as long as corolla. Japan. —*R. Máddenii*, Hook. f. (1). Shrub, to 8 ft.: lvs. short-stalked, elliptic-lanceolate, ferrugineous-lepidote beneath, 4–7 in. long: fls.

3, funnel-shaped, white, faintly blushed, to 4 in. across; stamens 18–20. Himalayas. B.M. 4805. F.S. 9:912. R.H. 1855:301. I.H. 4:140. Gt. 9:277 (as R. Jenkinsi). H.F. 7:296. Var. *obtusifòlium*, Hutchins. Lvs. rounded at both ends: calyx-lobes longer. Manipur. B.M. 8212.—*R. malayànum*, Jack. (1). Small shrub or small tree: lvs. elliptic-lanceolate, red-brown-lepidote beneath, 3–4 in. long: fls. few, salver-shaped, dull scarlet, ¾in. long. Winter. Malacca, Java. B.M. 6045.—*R. Mánglesii*, Hort. Hybrid of R. Griffithianum and R. hybridum album elegans. Fls. large, white, spotted. G.C. II. 24:49; III. 12:767. Gn. 66, p. 393; 69, p. 329. F.S.R. 3, p. 39. G. 13:101.—*R. Máriesii*, Hemsl. & Wilson (6). Allied to R. rhombicum. Shrub, to 8 ft.: lvs. oval, acute, silky-pubescent on the midrib beneath, 2–3 in. long: fls. 1–3, rose-pink, broadly campanulate, 1½ in. across; stamens 10. Cent. China. B.M. 8206.—*R. modèstum*, Hook. f. (1). Small shrub, glabrous: lvs. elliptic-oblong, greenish yellow and lepidote beneath, 2–3 in. long: fls. 6–10, broadly funnelform, pale pink, spotted red within, 1½ in. across. Himalayas. B.M. 7686.—*R. Moòrei*, Wats. Hybrid between R. arboreum and R. campanulatum. Fls. large, white spotted purplish: lvs. with buff-colored tomentum beneath.—*R. Morelìanum*, Lem. Hybrid between R. catawbiense and probably R. ponticum. Fls. lilac-violet, with a whitish blotch spotted with yellow. H.U. 4:1.—*R. moulmainénse*, Hook. (2). Shrub: lvs. elliptic-lanceolate, glabrous, 4–5 in. long: fls. many, white, funnel-form-campanulate, 1½–2 in. across. Himalayas. B.M. 4904.—*R. moupinénse*, Franch. (1). Shrub, to 4 ft., sometimes epiphytic: lvs. ovate to ovate-oblong, obtuse, rusty lepidote beneath, 1–1½ in. long: fls. solitary, white, spotted purple, 1½ in. across. W. China. B.M. 8598. G.C. III. 55:133. R.H. 1914, p. 155. Gn. 78, p. 96.—*R. multicolor*, Miq. Small, slender shrub: lvs. whorled, narrowly elliptic-lanceolate, 2–3 in. long: fls. few, funnelform-campanulate, 1 in. long, yellow or dark red. Winter. Sumatra. B.M. 6769. Tender. The red-fld. form is distinguished as var. *Curtisii*, Hort. Gn. 56, p. 62. F. 1884:113. G.Z. 30:73.—*R. myrtifòlium*, Schott & Kotschy, not Lodd.=R. Kotschyi.—*R. nigro-punctàtum*, Hort., not Franch.=R. nitidulum var. nubigenum.—*R. nipponicum*, Matsum. (5). Shrub: lvs. deciduous, elliptic-obovate, obtuse, strigose on the veins beneath and sparingly strigose above, 2½–7 in. long: fls. in dense heads, white, sub-campanulate, ⅜in. long; stamens 10, about as long as the corolla; style glabrous; ovary villous. Japan.—*R. nitidulum*, Rehd. & Wilson (1). Shrub, 2–4 ft.: lvs. oval or ovate, densely lepidote on both sides, ⅛–½in. long: fls. 1–2, violet-purple, funnelform-rotate, 1 in. across. W. China. Var. *nubigenum*, Rehd. & Wilson (R. nigro-punctatum, Hort., not Bur. & Franch.). One-half to 1 ft., densely branched: lvs. ⅛–½in. long, brown beneath: fls. rosy lilac, ¾in. across; calyx large, usually colored. W. China. B.M. 8529.—*R. niveum*, Hook. f. (2). Small shrub, allied to R. campanulatum: lvs. obovate-oblong, whitish tomentose all over at first, later glabrous above, 3–6 in. long: fls. broadly campanulate, light rose-lilac at the base, within with 5 purple spots, 2 in. across. Himalayas. B.M. 4730. J.F. 4:421. Var. *fulvum*, Hook. Lvs. light brownish tomentose: fls. deep purple-lilac. B.M. 6827.—*R. Nobleànum*, Lindl. Hybrid of R. arboreum and R. caucasicum. Fls. rosy crimson. B.R. 1820. Gn. 77, p. 30.—*R. Núttallii*, Booth (1). Shrub, sometimes epiphytic or tree 30 ft. high: lvs. elliptic-oblong, reticulate, pale and lepidote beneath, 6–12 in. long: fls. 4–12, broad funnel-form, white, tinged yellow within, fragrant, to 6 in. across; calyx large. Himalayas. B.M. 5146. F.S. 13:1326, 1327. Gn. 54, p. 106; 79, p. 290. G.C. II. 20:49; III. 12:436 (suppl.) R.B. 31:145. G.Z. 2:96. R.H. 1913:452.—*R. obovàtum*, Hook. f.=R. lepidotum var. obovatum.—*R. orbiculàre*, Decne. (R. rotundifolium, David) (2). Lvs. nearly orbicular, 2–4 in. long, usually not so broad as long: fls. 8–10; corolla 2 in. across, rosy red. W. China.—*R. oreodòxa*, Franch. (R. hæmatochilum, Craib). (2). Shrub, to 10 ft.: branchlets soon glabrous: lvs. elliptic-lanceolate, glabrous, yellowish green beneath, 2½–3½ in. long: fls. 10–12, rose-pink, campanulate, 7–8-lobed, 1¾in. across. W. China. B.M. 8518.—*R. ovàtum*, Planch. (Azalea ovata, Lindl. A. myrtifolia, Champ.) (3). Lvs. ovate or elliptic-ovate, glabrous, 1–2 in. long: fls. rotate, pink or nearly white, 1½ in. across; stamens 5. Cent. China. B.M. 5064. J.H.S. 1847:126.—*R. pachytrichum*, Franch. (2). Shrub, to 18 ft.: lvs. narrow, oblong-lanceolate, acuminate, rounded at base, rufously hairy on the midrib beneath and on the petiole, 2½–5 in. long: fls. 10–15, campanulate, 1½ in. across, pale pink to white; stamens 10. W. China.—*R. parvifòlium*, Adams (1). Shrub allied to R. lapponicum, but larger: 3 ft. high: lvs. not revolute at the margin, larger: fls. larger, purple or white; style much longer than stamens. Siberia, Kamchatka, Japan. Gt. 26:904. G.C. III. 39:164, 165.—*R. pèndulum*, Hook. f. (2). Slender shrub, 4 ft. high: lvs. elliptic to oblong, acute, ferrugineous-tomentose beneath, 1½–2 in. long: fls. few, broadly campanulate, white, about 1 in. across. Himalayas. F.S. 7:662. G.C. II. 17:429.—*R. pentaphýllum*, Maxim.=R. quinquefolium.—*R. pittosporifòlium*, Hemsl.=R. stamineum.—*R. polylepis*, Franch. (R. Harrovianum, Hemsl.) (1). Shrub, to 10 ft.: lvs. lanceolate, acute at both ends, glabrous above, densely lepidote beneath, 1½–3 in. long: fls. 3–5, purple or lilac-purple, 1½ in. across; stamens 10, exserted. W. China. B.M. 8309. R.H. 1914:324.—*R. primulinum*, Hemsl.=R. flavidum.—*R. Przewálskii*, Maxim. (2). Allied to R. brachycarpum, but lvs. glabrous and pale green beneath: fls. white, spotted purple within. China. Hardy.—*R. pulchérrimum*, Lindl. Hybrid of R. arboreum and R. caucasicum. Fls. pink, paler in center, spotted. B.R. 1820.—*R. quinquefòlium*, Bisset & Moore (6). Deciduous shrub: lvs. 4–5, subverticillate at the end of the branchlets, short-petioled, rhombic, acutish or obtuse, ciliate and sparingly strigose-pubescent, 1–1¾ in. long: fls. 1–2, campanulate, 3 in. across; stamens 10. Japan. Var. *ròseum*, Rehd. Fls. pink; possibly identical with R. pentaphyllum, Maxim.—*R. retùsum*, Bennett (1). Shrub, 2 ft. high: lvs. obovate to obovate-oblong, glabrous, lepidote beneath, 2–2½ in. long: fls. 6–9, tubular-funnel-shaped, bright scarlet, to 1½ in. long. Java. B.M. 4859. F.S. 10:1044. I.H. 2:70. Tender.—*R. Ririei*, Hemsl. & Wilson (2). Shrub, to 18 ft.: lvs. lanceolate or oblong-lanceolate, acute at both ends, glabrous and grayish below, 4–6 in. long: fls. about 10, white, 2 in. across. W. China.—*R. robustíssimum*, Lindl.=R. fastuosum.—*R. Róllissonii*, Paxt. (2). Small tree, 30 ft. high, allied to R. arboreum and probably variety: lvs. oblong, wrinkled above, tawny-tomentose beneath: fls. in a dense head, campanulate, deep blood-red. Ceylon. B.R. 29:25.—*R. rotundifòlium*, David=R. orbiculare.—*R. Rovéllii*, Leroy. Hybrid of R. arboreum and R. dahuricum. Fls. rich crimson. R.H. 1868: 190.—*R. Roylei*, Hook.=R. cinnabarinum var. Roylei.—*R. rubiginòsum*, Franch. (1). Rigid shrub, 3 ft. high: lvs. oval to oblong-lanceolate, densely ferrugineous-lepidote beneath, 2–3 in. long: fls. few, broadly funnelform, bright rose-red, 1½ in. across. Yunnan. B.M. 7621.—*R. ruféscens*, Franch. (1). Shrub, to 4 ft.: lvs. oval, brown-tomentose beneath, ½–1 in. long: fls. white, about ½in. across. W. China.—*R. Russellianum*, Sweet. Hybrid of R. arboreum and R. catawbiense. Lvs. tomentose beneath: fls. rosy crimson.—*R. salignum*, Hook.=R. lepidotum var. chloranthum.—*R. Sargentiànum*, Rehd. & Wilson. (1). Alpine shrub, 1–2 ft.: lvs. oval, obtuse, and mucronulate, rusty-tomentose beneath, ⅛–½in. long: fls. 6–12, funnelform, whitish or pale yellow, ½in. across; stamens 5; calyx large. W. China.—*R. scabrifòlium*, Franch. (1). Small rigid shrub, hispid: lvs. oblong-lanceolate, ciliate, hispid above, pale and lepidote beneath, 2½–3½ in. long: several few-fld. clusters at the end of branches: fls. broadly campanulate, blush, 1½ in. across. Yunnan. B.M. 7159.—*R. Searsiæ*, Rehd. & Wilson, (1). Shrub, to 15 ft.: lvs. oblanceolate to oblong-lanceolate, acuminate, glaucescent and lepidote beneath, 1½–3 in. long: fls. 4–8, funnelform-campanulate, 1½ in. across, white or pale purple. W. China. G.C. III. 55:334.—*R. semibarbàtum*, Maxim. (Azalea semibarbata, Kuntze) (3). Allied to R. albiflorum. Lvs. elliptic, crenately ciliate, setose beneath: fls. greenish yellow, spotted purple, ½–¾in. broad. Japan. Gt. 19:666.—*A. serpyllifòlium*, Miq. (Azalea serpyllifolia, Gray) (6). Low, rigid shrub: lvs. deciduous, obovate, ¼–½in. long: fls. single, rosy red, ½–¾in. broad. Japan. B.M. 7503.—*R. Sesterianum*, Hort. Hybrid of R. Edgeworthii and R. formosum. Fls. large, white. G. 17:383; 20:701. R.H. 1906, p. 488.—*R. setòsum*, D. Don (1). Shrub, about 1 ft.; branchlets setose: lvs. elliptic-obovate or oblong, lepidote on both sides, setosely ciliate, ⅛–½ in. long: fl. rosy purple, nearly rotate, deeply divided, about 1 in. across. E. Himalayas. B.M. 8523.—*R. Shéltonæ*, Hemsl. & Wilson (2). Evergreen shrub, 4–6 ft. high: lvs. oval or ovate, 2½–4 in. long, quite glabrous; petiole ½–1 in. long: corolla broadly campanulate, 7-lobed, 1¾ in. across, pink. W. China.—*R. Shépherdii*, Nutt. (2). Shrub: lvs. oblong-lanceolate, glabrous, pale beneath, 3–4 in. long: fls. in a dense head, campanulate, deep scarlet, 2 in. across. Himalayas. B.M. 5125.—*R. Shilsonii*, Hort. Hybrid of R. barbatum and R. Thomsonii. Fls. dull red. Gn. 57, p. 261.—*R. sideróphýllum*, Hort., not Franch.=R. Davidsonianum.—*R. Smithii*, Sweet. Hybrid of R. arboreum and R. ponticum. Fls. rose-purple. Var. *álbum*, Hort. Fls. white, early.—*R. Smíthii*, Nutt.=R. barbatum var. Smithii.—*R. Smithii aúreum*, Hort. See under No. 28, R. azaleoides.—*R. Soùliei*, Franch. (2). Shrub, to 10 ft.: lvs. broadly ovate, cordate, mucronulate, glabrous, whitish beneath, 1½–2½ in. long: fls. 5–7, rose-pink, broadly campanulate, with short rounded lobes. W. China. B.M. 8622. G.C. III. 45:380. Gn. 73, p. 278. G.M. 52:416. J.H.S. 35, p. 137, fig. 89.—*R. spinulíferum*, Franch. (1). Shrub, to 8 ft.: branchlets finely gray, pilose and hispid: lvs. lanceolate, acute at both ends, wrinkled above, lepidote and slightly pilose beneath, 1–1¾ in. long: fls. usually 4, red, tubular, with upright lobes, 1 in. long; stamens exserted. S. W. China. B.M. 8408. R.H. 1910:404.—*R. Spoòneri*, Hemsl. & Wilson=R. decorum.—*R. staminéum*, Franch. (R. pittosporifolium, Hemsl.) (3). Shrub, to 20 ft.: lvs. obovate-oblong to elliptic-oblong, acuminate, glabrous, 2½–4 in. long: fls. many, white to pink, spotted yellow, funnelform with long narrow tube, 1–1½ in. long, fragrant. Cent. and W. China. B.M. 8601.—*R. strigillòsum*, Franch. (2). Shrub, to 15 ft.: branchlets and petioles setose; lvs. oblong-lanceolate, subcordate at the base, with crustaceous white tomentum and setose hairs beneath, 4–6 in. long: fls. many, white to purple, funnelform-campanulate, 1½ in. across. W. China.—*R. sublanceolàtum*, Miq. (Azalea sublanceolata, Kuntze) (6). Allied to R. poukhanense. Lvs. narrow-elliptic to oblanceolate, acute at both ends, with 5–9 pairs of veins, strigose on the veins on both sides, 1¼-2 in. long: fls. 1–3; sepals oblong obtuse, strigose and glandular-ciliate; corolla funnelform, rosy red to crimson, 3 in. across; stamens 10. S. Japan. B.M. 8478. G.C. III. 49:342. J.H.S. 37, p. 131, fig. 115.—*R. taliénse*, Franch. (2). Shrub, to 10 ft.: lvs. ovate-oblong, subcordate, short-acuminate, fulvous-tomentose beneath, 2½–5 in. long: fls. 3–12, white to pink, funnel-form-campanulate, 1 in. across; ovary glabrous. W. China.—*R. Téysmannii*, Miq. (1). Closely allied to R. javanicum: lvs. more shining, not lepidote beneath: fls. somewhat smaller, pale lemon-yellow. Sumatra, Java.—*R. Thómsonii*, Hook. f. (2). Shrub, 15 ft. high: lvs. obovate-oval, glabrous, glaucescent beneath, 2–3 in. long: fls. 6–8, campanulate, deep blood-red, 2 in. across; calyx large. Himalayas. B.M. 4997. R.H. 1855:121. F.S. 7:688–90. G. 28:247; 36:535.—*R. trichóstomum*, Franch. (1). Shrub, to 6 ft.: lvs. ovate-oblong to elliptic-lanceolate, rusty-tomentose beneath, ⅛–¾in. long: fls. 10–15, rose-pink, tubular-funnelform, ½in. across, mouth hairy; stamens included. W. China.—*R. triflòrum*, Hook. f. (1). Shrub, 6 ft. high: lvs. ovate-lanceolate, glaucous beneath and with ferrugineous scales, 2–3 in. long: fls. mostly 3, slender-pedicelled, broadly campanulate, greenish yellow, 2 in. across. Himalayas. F.S. 7:673. G.C. II. 18:45. J.H. III. 30:193. G. 26: 282.—*R. Tschonóskii*, Maxim. (Azalea Tschonoskii, Kuntze) (6) Low shrub: lvs. elliptic, ¼–½in. long: fls. 2–4, white, ¼in. broad. Japan.—*R. tubiflòrum*, DC.=R. malayanum.—*R. Úngernii*, Trautv. (2). Closely allied to R. Smirnovii, but fls. white: calyx

with longer, narrower lobes. July. Caucasus. Gt. 35:1226. B.M. 8332.—*R. Veitchiànum*, Hook. (1). Shrub, 6 ft. high: lvs. obovate, glaucous beneath and with scattered ferrugineous scales, 3–4 in. long: fls. 3–5, broadly funnelform, with crisped lobes, pure white, 5 in. across. Himalayas. B.M. 4992. F.S. 14:1416. A.F. 11:145. Gn. 51, p. 178. G.M. 45:476. G. 19:664, 26:71. Var. *lævigàtum*, Hort. Lobes of corolla only slightly crisped.—*R. venústum*, Sweet. Hybrid of R. arboreum and R. caucasicum. Fls. rich pink.—*R. Victoriànum*, Hort. (R. Dalhousiæ var. Victorianum, Guilmot). Hybrid between R. Dalhousiæ and R. Nuttallii. Fls. very large, to 5 in. long and to 3½ in. wide, white, with yellow center: lvs. glaucous beneath. F.S. 23:2466. R.B. 13:49. G.C. III. 51:406. G. 35:311.—*R. villòsum*, Hemsl. & Wilson. (1). Evergreen shrub, to 18 ft., bristly: lvs. ovate or oblong, pointed, 2–3½ in. long: fls. in clusters of 3 or more; corolla with funnel-shaped tube and a 5-lobed limb, purple. W. China.—*R. violàceum*, Rehd. & Wilson (1). To 4 ft., but sometimes dwarf: lvs. similar to those of R. intricatum, but narrower, yellowish or brownish lepidote beneath with scattered dark scales, revolute at margin: fls. 1–3, terminal, subsessile; corolla violet-purple, over 1 in. across. W. China.—*R. virgàtum*, Hook. f. (1). Slender shrub: lvs. oblong-lanceolate, glaucous and scaly beneath: fls. 1–2, from axillary buds at the end of branches, funnelform, rose-colored, 1¼ in. across. Himalayas. B.M. 5060. F.S. 14:1408. Var. *álbum*, Hort. Fls. white. R.H. 1866:251.—*R. Wásonii*, Hemsl. & Wilson (2). Shrub, to 6 ft.: lvs. ovate to ovate-lanceolate, acute, brown-tomentose beneath, 2–3 in. long: fls. about 6, rose-pink to white, campanulate, 1½–2 in. across. W. China.—*R. Wàtsonii*, Hemsl. & Wilson (2). Shrub or small tree, to 30 ft.: lvs. ovate to ovate-lanceolate, slightly wrinkled above, brownish tomentose beneath, 2–3 in. long: fls. 6, funnelform-campanulate, 2 in. across, pink or creamy white. W. China.—*R. Websteriànum*, Rehd. & Wilson (1). Shrub, to 3 ft.: lvs. ovate or elliptic, obtuse, lepidote above, densely whitish lepidote beneath, ¼–½in. long: fls. 1–3, funnelform, rosy purple, 1 in. across. W. China.—*R. Wightii*, Hook. f. (2). Shrub, attaining 14 ft.: lvs. obovate-oblong, cinnamomeous-tomentose beneath, 6–8 in. long: fls. many, campanulate, yellow, spotted red within, 2½ in. across. Himalayas. F.S. 8:792, 793. B.M. 8492. G.C. III. 50:269.—*R. Williamsiànum*, Rehd. & Wilson (2). Branchlets slender, almost twiggy, diffusely branching: lvs. ovate or roundish-ovate, usually subcordate, glabrous, ¾–1⅔ in. long: fls. 3–5 in a terminal cluster; corolla pale rose. W. China.—*R. Willmottiæ*, Hort.= R. Hanceanum.—*R. Wilsonæ*, Hemsl. & Wilson. (3). An evergreen shrub, to 6 or 7 ft.: lvs. narrowly oval or oval-lanceolate, 2½–4½ in. long: fls. solitary, axillary, slightly fragrant; corolla pale purple, about 2 in. across. Cent. China.—*R. Wiltonii*, Hemsl. & Wilson. (2). Evergreen shrub, to 8 ft. high: young shoots, underside of lvs. and ovary densely clothed with pale brown wool: lvs. deeply wrinkled, obovate, 2–3½ in. long: fls. in clusters of 6 or more; corolla pink. W. China.

ALFRED REHDER.

RHODOLEÌA (Greek, *rose* and *smooth;* alluding to rose-like fls. and smooth st.). *Hamamelidàceæ*. Small tender trees: lvs. evergreen, glabrous, long-stalked: fls. about 5 together in a compact head, having the appearance of a single fl. surrounded by bracts, hermaphrodite; petals of each fl. turned toward the circum. of the head; stamens 7–10; ovary of 2 carpels united at base: caps. several-seeded.—Two species, one from China and the other from Java and Sumatra.

Châmpionii, Hook. A tender tree: lvs. shining, coriaceous, usually ovate, 4–5 in. long; petioles 1½–2 in. long: fl.-heads resembling a semi-double camellia, 1½ in. across, bright pink, each head surrounded by several rows of imbricate bracts; petals 15–20 to each fl.-head. China. B.M. 4509. J.F. 1:4.—Formerly in cult. in S. Calif.

F. W. BARCLAY.

RHODOMÝRTUS (Greek, *rose-myrtle*, from the rose-colored flowers). *Myrtàceæ*. Tender trees and shrubs, one of which, *R. tomentosa*, is of slight economic importance in southern Asia, where it is native, and which is grown to a limited extent in California and Florida.

Leaves opposite, 5- or 3-nerved: fls. rather large, axillary; calyx-tube turbinate, the lobes persistent; petals 5 or 4; stamens numerous, free, in many series; berry globose or ovoid, with few to many seeds.—Species about 5. The genus differs from Myrtus in having 1–3 locules in the ovary with 2 rows of ovules in each, the locules frequently with spurious partitions or divided into numerous 1-ovulate superposed cells; while the lvs., in place of being pinnately veined, have 3–5 nerves. *R. tomentosa* is indigenous to India, Ceylon, Malaya, and S. China. The other species are Australian and not cult.

tomentòsa, Wight (*Mýrtus tomentòsa*, Ait.). DOWNY MYRTLE. HILL-GOOSEBERRY. Small shrub, up to 5 ft., the young branchlets tomentose: lvs. elliptic or obovate, obtuse, 1–2½ in. long, hoary below; petioles short: fls. 1–3 on slender peduncles about half the length of the lvs., rose-pink, ½–¾in. broad; calyx tomentose, 5-cleft, the lobes unequal; petals downy outside, shortly clawed: berry globose, ½in. broad, dull purple, 3-celled, with numerous small compressed seeds in each cell. B.M. 250.—This plant seems to be best known in S. India, where it occurs commonly in the mountains. It is said by Macmillan to succeed in Ceylon only at high elevations. In S. China the fr. is sometimes offered in the markets. While intro. to Fla. some years ago, it is not generally grown in that state, although it is an excellent garden plant of ornamental as well as economic value. According to Reasoner it grows as far north as Putnam County; it succeeds remarkably at Bradentown, where it has almost become naturalized in one or two spots, and it is successfully grown at Miami. In Calif. it has fruited in a few gardens. It does not stand very much frost, although it is hardier than some of the strictly tropical frs. The guava-like fr. is about the size of a gooseberry, of a dull purple color, with numerous small seeds embedded in soft pulp of sweet pleasant flavor, somewhat suggesting the raspberry but rather lacking in character. According to Simpson, it makes excellent pies, if picked before fully ripe. The season in Fla. is early summer, at which time the plants are laden with fr. The fls., which appear in spring, resemble small single roses, and are of unusually attractive appearance, making the plant highly ornamental while in bloom. Frequently the frs. ripen over a period of several weeks. In India, according to Hooker, they are made into a jam called thaonti, and are also eaten while fresh. The plant does not seem to be particular regarding soil, thriving upon heavy loam or light sand. It is readily prop. by seeds, which should be sown in flats of light soil soon after they are removed from the fr., covering them to the depth of ⅛in. and pricking off the young plants when 2 in. high. When set out in the open ground the plants do not grow very rapidly, but are of simple cult. In dry climates they require plenty of water.

F. W. POPENOE.

RHODÒRA: *Rhododendron canadense.*

RHODORHÌZA (Greek, *rose root;* the root and wood furnish the fragrant powder known as *bois de rose*). *Convolvulàceæ*. Rhodorhiza is a group of about 7 species, all from the Canary Isls., which Bentham & Hooker and some other authors regard as a section of the genus Convolvulus. The Rhodorhizas differ from typical Convolvulus in having the caps. by abortion usually 1-seeded, and rupturing irregularly at the base instead of dehiscing by 4 valves. They are prostrate or climbing herbs or erect subshrubs, sometimes spinescent: lvs. entire, dentate, undulate or lobed: corolla broadly or narrowly bell-shaped; limb 5-angled or 5-lobed; ovary 2-loculed, 4-ovuled.

flórida, Webb. (more properly *Convólvulus flóridus*, Linn. f.). Erect subshrub: lvs. persistent, alternate, lanceolate, stalked, entire: fls. long-peduncled, funnel-shaped, white, sometimes pinkish white. Isl. of Teneriffe. R.H. 1892:156.—*R. florida* is a tender subshrub, 6–9 ft. high, which bears white fls. something like a morning-glory. The blossoms are about an inch across and last only a day, but a succession is maintained (in S. France) from early June till Aug. A striking feature of the plant is its terminal, panicled infl. These panicles are often a foot high, 10 in. wide at the base and contain at one time as many as 20 full-blown fls. and 100 buds. Intro into S. Calif.

scopària, Webb. (more properly *Convólvulus scopàrius*,, Linn. f.). Shrubby: sts. terete and glabrous: lvs. linear and rather pilose: fls. white, generally 3 to a peduncle, hairy outside; calyx silky, the sepals ovate, acute. Aug. and Sept. Isl. of Teneriffe. B.R. 27:43.

—The wood of this species is hard and white, with radiating stripes. Intro. into S. Calif.

WILHELM MILLER.
F. TRACY HUBBARD.†

RHODÓSPATHA (Greek, *rose* and *spathe*, referring to the color of the spathe in some species). *Aràceæ*. Climbing shrubs suitable for the warmhouse: branches often rooting: lvs. distichous, elliptic-oblong, acuminate: spathe cymbiform, beaked and deciduous; spadix shorter than the spathe, cylindrical, densely fld., the fls. all perfect or the lower pistillate; perianth none, stamens 4: berries small, oblong, truncate, 2-celled, many-seeded.—About a score species, Trop. Amer. See Engler, Pflanzenreich, IV. 23B.

Forgétii, N. E. Br. St. climbing: lvs. spreading; blade oblong-lanceolate, 16–20 in. long; the petiole about 12 in. long: peduncle 6 in. long; the spathe broadly elliptic, 6 in. long, a dirty pale rose-white outside and dirty rose inside. Costa Rica.

pictum, Nichols. (*Spathiphýllum pictum*, Hort. Lind.). Lvs. somewhat fleshy, broadly ovate-elliptic, 1½ ft. or more long, glossy dark green, mottled along the transverse veins with blotches of golden green. S. Amer.

RHODOSPHÆRA (Greek, *red* and *globe;* referring to the reddish globose fr.). *Anacardiàceæ*. A tree from Austral., closely related to Rhus but differing chiefly in the 10 stamens and in the very short free radicle of the embryo: lvs. odd-pinnate, subcoriaceous: fls. polygamo-diœcious, in terminal and axillary panicles, red; stamens 10; styles 3, free: fr. a globose drupe. In its native country the wood is esteemed for cabinet-work and used as a yellow dye and therefore called "yellow-wood." It is also a handsome foliage tree and is cult. in Calif. The only species is **R. rhodánthema,** Engl. (*Rhùs rhodánthema*, F. Muell.). Evergreen tree to 60 or 70 ft., glabrous: lfts. 7–9, short-stalked, oblong-ovate, obtusely short-acuminate, dark green and lustrous above, lighter beneath, with tufts of hairs in the axils of the veins, 2–2½ in. long: panicles to 4 in. long; fls. small, ⅙in. across, crimson or pink: fr. globose, reddish brown, ½in. across. Queensland and New S. Wales. Maiden, Forest Fl. New S. Wales. 1:32.

ALFRED REHDER.

RHODÓSTACHYS (Greek, *rose* and *flower-spike*, alluding to the rose-colored fls. of some species). *Bromeliàceæ*. Herbs suitable for the warmhouse: lvs. rosulate, long, linear, rather stiff and spinulose-serrate: heads terminal, sessile within an involucre of numerous floral lvs.; fls. subsessile on a hemispherical or short-conical receptacle; sepals erect and strongly imbricated; petals free, imbricated; stamens free; ovary inferior. About 6 or 7 species, S. Amer. *R. andìna*, Phil., is a low subacaulescent plant: lvs. linear, about 1 ft. long and 1 in. broad, aculeate-margined, glabrous: spike almost globose with scarious bracts about equaling the fls.; fls. rose; calyx-lobe lanceolate, strongly acuminate; petals nearly 1 in. long, linear-lanceolate, strongly acuminate. Chile. B.M. 7148. G.W. 3, p. 286. *R. pitcairniifòlia*, Benth. & Hook. f. (*Fasciculària pitcairniifòlia*, Mez). Sts. short, with some short branches at the top: lvs. many, crowded, ensiform from an ovate triangular base, about 1 ft. long and 1 in. wide, margins with short antrorse spines; the innermost lvs. bright red at their base: fls. in a dense central, sessile head, about 2 in. diam.; sepals narrowly lanceolate-acuminate; petals blue, oblong, obtuse, erect; ovary oblong, plano-convex. Chile. B.M. 8087.

F. TRACY HUBBARD.

RHODÓSTOMA (Greek, *rose* and *mouth*). *Rubiàceæ*. Closely allied to Psychotria. *R. gardenioìdes*, Scheidw., a plant 2 ft. high, with opposite obovate-lanceolate dark green lvs. and white fls. in terminal cymes, from S. Amer., has previously been sparingly in cult. H.U. 6, p. 225.—A warmhouse plant. The genus Rhodostoma is now referred to Palicourea and this species becomes *P. gardenioides*, Benth. & Hook.

RHODOTHÁMNUS (Greek, *rhodon*, rose, and *thamnos*, shrub; alluding to the rose-colored fls.). *Ericàceæ*. Dwarf evergreen shrub, with alternate small entire lvs. and rather large pink fls., usually solitary at the ends of the branchlets. Related to Kalmia, but anthers not in pouches: lvs. alternate: sepals 5, half as long as corolla; corolla rotate, deeply 5-lobed; stamens 10, slightly longer than corolla: fr. a 5-celled, many-seeded dehiscent caps. Charming little alpine shrub, hardy N., but somewhat difficult to cult. It thrives best in peaty porous soil of constant, moderate moisture in a partly shaded situation, and is best suited for rockeries. Prop. by seeds or layers, also by cuttings of ripened wood under glass. The only species is **R. Chamæcístus,** Reichb. (*Rhododéndron Chamæcístus*, Linn. *Adodéndron Chamæcistus*, Kuntze). Diffusely branched shrub, to 1 ft.: lvs. cuneate-oblong, acute, setosely ciliate, ¼–½in. long: fls. on slender, glandular-hirsute pedicels, solitary, rarely 2 or 3 at the end of the branchlets, light purplish pink, to 1 in. across. May. Alps of E. Eu. B.M. 488. L.B.C. 15:1491. P.M. 3:169. F.S. 19:1962. F.W. 1873:321. G.C. III. 33:293.

ALFRED REHDER.

RHODOTÝPOS (Greek, *rhodon*, rose, and *typos*, type; alluding to the resemblance of the flowers to those of a single rose). *Rosàceæ*. Ornamental shrub, grown chiefly for its large white flowers and for the handsome bright green foliage.

3394. Rhodotypos kerrioides. (×⅓)

Leaves deciduous, opposite, stipulate, short-petioled, serrate: fls. solitary, short-pedicelled; sepals large, half as long as petals, outside with 4 small alternate bracts; petals 4, orbicular; stamens numerous; carpels usually 4, developing into black dry 1-seeded drupes, surrounded by the large persistent calyx.—One species in Japan. A handsome and distinct shrub, hardy as far north as Mass., with bright green foliage, conspicuous by its white fls. in spring and by its shining black fr. in autumn and winter. It thrives well in any good soil. Prop. by seeds and by greenwood cuttings under glass early in summer; also by hardwood cuttings.

kerrioìdes, Sieb. & Zucc. (*R. tetrapétala*, Makino). Fig. 3394. Much-branched, spreading shrub, usually 3–6 ft. high (in Japan 15 ft.): lvs. ovate to ovate-oblong, acuminate, sharply and doubly serrate, silky-pubescent beneath when young, 1½-3 in. long: fls. pure white, 1½ in. across. May, June. S.Z. 1:99. B.M. 5805. L.I. 14. Gt. 15:505. R.H. 1866, p. 430. Gn. 6, p. 229; 34, p. 159; 43, p. 138. G. 7:18; 10:615.

ALFRED REHDER.

RHŒO (name unexplained). *Commelinàceæ*. One species, from Mex. and the W. Indies, **R. díscolor,** Hance, known also as *Tradescantia discolor*, L'Her.,

T. spathacea, Swartz, and *Ephemerum bicolor*, Moench. B.M. 1192. G.W. 15, p. 230. From Tradescantia the genus is distinguished by having 1 ovule (rather than 2) in each locule of the ovary. *R. discolor* is a short-stemmed erect-growing long-lvd. plant, not unlike a broad-lvd. small pandanus in habit. Fls. white, small, and many in a boat-shaped spathe-like structure arising from the axil of the lf. and which is sessile or nearly so; sepals 3, free, more or less petal-like; petals 3, soon withering; stamens 6. Var. **vittàta**, Hook. (*Tradescántia discolor* var. *vittàta*, Miq. *T. discolor* var. *variegàta*, Hook. *T. variegàta*, Hort.), is the common form in cult. The lvs. are 8–12 in. long, dark purple beneath and longitudinally striped above with pale yellow. A striking plant for the warmhouse, or for the open in the S. B.M. 5079. F.S. 11:1169, 1170. Cult. as for warmhouse tradescantias. L. H. B.

RHOPÀLA: *Roupala.*

RHOPALOBLASTE (Greek, *club* or *pestle*, and *embryo*). *Palmàceæ*, tribe *Arèceæ*. A small group of Old World tropical palms of little horticultural significance: sts. simple, unarmed, crowned at the top by a large cluster of equally pinnatisect lvs.: lf.-segms. acuminate, 1-nerved: spadix appearing from among the lvs., much branched; stamens 6: fr. ellipsoid, red. Cult. as in chrysalidocarpus.

hexándra, Scheff. St. about 4 ft., crowned by numerous lvs. which are much divided into lanceolate lfts.: spadix about 1½ ft. long, or in wild specimens longer, crowded with very small fls. Molucca and neighboring islands.—A little-known palm offered in Eu. but doubtfully cult. in Amer. outside of botanic gardens. N. Taylor.

RHOPALÓSTYLIS (name refers to the club-shaped spadix). *Palmàceæ*, tribe *Arèceæ*. Two species of pinnate palms, both of which are useful conservatory plants and nearly always sold as species of Areca or Kentia.

Spineless palms with medium ringed caudices: lvs. terminal, equally pinnatisect; segms. equidistant, numerous, narrowly sword-shaped, acuminate, the margins not thickened, recurved at the base, the midveins prominent, with 1–3-nerves on each side; rachis concave above, scurfy; petiole very short; sheath elongated: spadices short, spreading, with a very short thick peduncle, and fringed, rather thick, densely-fld. branches: spathes 2, symmetrical, oblong, flattened, the lower 2-winged: bracts adnate to the flower-bearing areas, subulate at the apex; bractlets scaly: fls. medium: fr. small or medium, ellipsoidal, smooth. Rhopalostylis belongs to the large group in which the ovule is borne on the side and is more or less pendulous, while in Areca and Kentia the ovule is at the base and erect. From the 5 cult. genera listed under Hedyscepe (which see) Rhopalostylis differs as follows: sepals of staminate fls. awl-shaped to lanceolate, not imbricated; stamens 6–12; pistillate fls. with short petals, valvate at the apex. Cult. as in kentia. Prop. by imported seeds under glass, over bottom heat. Hardy in S. Calif. if planted in shaded positions. Shade is necessary for thrifty growth as the fronds burn badly in the sun; and it will also furnish sufficient protection from frost.

sápida, H. Wendl. & Drude (*Arèca sápida*, Soland. *Kéntia sápida*, Mast.). Nikau Palm. St. 6–30 ft. high, 6–9 in. diam., cylindrical, green or often a pale glaucous green: lvs. 4–6 ft. long, pinnate; segms. very narrow, linear; margin replicate; nerves, midrib, and petiole covered with minute scales: spadix 18–24 in. long, half inclosed in the spathe, much branched; fls. pale pinkish: fr. an ovoid drupe, brown. New Zeal. B.M. 5139.

Baüeri, H. Wendl. & Drude (*Arèca Baüeri*, Hook. *Kéntia Baüeri*, Seem. *Seafórthia robústa*, Hort.). Stouter and taller than *R. sapida:* lvs. larger and broader, rarely, if ever, glaucous; segms. linear-lanceolate, acuminate; nerves, midrib, and petiole sparsely scaly: spadix 1–2 ft. long scarcely inclosed by the spathe; fls. white: fr. more globose, scarlet. Norfolk Isl. and Kermadecs. I.H. 15:575. B.M. 5735.

Jared G. Smith.
N. Taylor.†

RHUBARB. A garden vegetable, perennial, grown for the thick acid leaf-stalks which are used in spring for sauces and pies: *Rheum Rhaponticum*, which see, page 2927.

Rhubarb, known also as pie-plant, is a hardy plant and will withstand considerable neglect, yet, like most cultivated vegetables, it responds readily to proper care and good treatment. The large fleshy leaf-stems desired in culinary use are produced in part by the great store of plant-food held in reserve by the many big roots. Everything should be done to increase this supply of reserve food. Tillage and fertilizing, therefore, are fundamentals. In the choosing of a site a southern exposure is preferred, with sufficient slope to give good drainage. Plow the ground 6 to 8 inches deep, draw furrows 5 feet apart, set the plants 3 feet apart, with the buds 1 inch below the level of the ground. In home grounds, spade or trench the land deep, and set about 4 feet apart each way; or if in only one row or line with plenty of room on either side, the plants may go 3 feet or even as close as 2½ feet if they are well manured and often renewed. If the soil lacks in fertility, mix compost with the earth that is placed about the roots; never put fresh manure next to the roots. As soon after planting as possible, start the cultivator, and give a thorough stirring at intervals of six to eight days up to the middle or last of August. After the ground is frozen, cover the rows 3 to 4 inches deep with manure that is as free as possible from weed and grass seed. As early in the spring as the ground can be worked to advantage, start the cultivator and work the manure into the soil. Each alternate season the surface of the soil should have a good dressing of manure. For garden culture, a similar practice should be undertaken with the hoe or other hand tools.

In field culture, the third or fourth year after planting the hills should be divided. Remove the earth from one side of the hill and with a sharp spade cut through the crown, leaving three or four buds in the hill undisturbed. This work should be done in the fall or early in the spring. In garden culture, the beds should be similarly renewed, at least as often as every four or five years, but more pains may be taken in dividing the plants. The clumps of roots grow so large, and have so many eyes, that the stalks soon become more numerous than desirable, and run down in size. Take up the entire roots and cut them in pieces, leaving only one strong eye to the piece, and plant the pieces in a newly prepared bed (or even in the old one if properly enriched and prepared) 4 feet apart each way as before.

3395. Stalks of forced rhubarb. The leaf-blades do not develop.

Seed-stems are produced freely the entire season. These should be promptly pulled up, unless seed is wanted. The growth of these stems and the production of seed tend to lessen the vitality of the plant and to reduce the yield.

Propagation of rhubarb is commonly by division of

the roots, and this is the only method by which a particular type can be increased. Propagation from seed, however, sometimes proves satisfactory, and always interesting as the seedlings vary greatly. The seed germinates easily, and if started early the plants become fairly large and strong the same season. The seedlings may be started in any good clean garden soil. Sow seed in early spring, in rows a foot apart and not over an inch deep. Thin the plants promptly to stand a few inches apart in the rows, and give the same thorough tillage allowed to other garden crops. In the following fall or spring take the seedlings up, and set them in the well-prepared permanent patch, not less than 4 feet apart each way, and till frequently the entire season. In spring of the next year the stalks may be pulled freely.

3396. House for the forcing of rhubarb, covered with movable sash.

From ten to twenty good plants should supply the needs of the usual family, and probably with something to spare for the neighbors. Sometimes an early supply is secured by placing a bottomless barrel or box over the plant and piling warm horse-manure about it. If the barrel, keg, or box is not too broad, the petioles will make a straight upright growth and will be partially blanched and very tender. Victoria and Linnæus are the leading varieties.

L. H. B.†

Forcing of rhubarb.

In the winter and early spring months, the forcing of rhubarb in the vicinity of many city markets is a profitable industry. The plant may be forced either in the field where the roots were grown or lifted and placed in hotbeds, under greenhouse benches or in cellars. The bulk of the rhubarb forced for market and sold during the winter months is grown in cheap structures placed over the plants in the field. These houses may be of the lean-to type, although they are more commonly even-span post and rafter construction, the roof being covered with hotbed sash which is not needed for other purposes at the time. The side walls are 4 to 5 feet high, made of rough boards and covered with cheap building-paper. The even-span houses are mostly 24 to 36 feet wide and the lean-to house half that width. Heat is usually applied in an overhead system, steam being the most popular, although late in the season the sun is depended upon to supply the required amount of heat. When forced in the field in limited quantities, coldframes are often used, the outside walls being well banked with hot manure and the surface of the ground within the frames covered with 3 to 6 inches of the same material.

Beds intended for early spring forcing should be thoroughly cultivated in the fall and an application made of high-grade commercial fertilizer of 800 to 1,000 pounds to the acre. When growth starts, a dressing of nitrate of soda at the rate of one-half pound to a crown should be given. In field forcing, the moisture of the soil is usually sufficient so that no water is applied. When it is the intention to use a field for forcing for several years, the plants are usually set 2 by 3 feet and the land fertilized heavily each spring with a compost, one made from cow- and hog-manure being preferred. The sash are placed upon the first houses as soon as the roots have been frozen, five to seven weeks being necessary to bring the plants to maturity.

In field forcing, the cost of production is often greatly reduced by growing spinach or dandelion between the rows, the price obtained for these fillers usually being sufficient to pay labor and maintenance costs. The stalks are usually pulled twice, returning to the grower from $1 to $2 a sash, depending upon the season when placed upon the market.

Roots for forcing in the dark should be healthy and vigorous; the larger the roots the more satisfactory the results as a general rule. Crowns three to five years of age are mostly used, although satisfactory results are often obtained from one-year-old plants which have been grown on very rich land and have made an unchecked growth during the season. The roots should be dug early in the fall before the ground freezes and allowed to remain exposed to the weather until they are frozen solid when they should either be removed to a shed or covered with litter in the field to prevent alternate freezing and thawing. Thorough freezing is necessary, whatever the method of forcing, if the best results are to be obtained. With one-year roots very satisfactory results are sometimes secured if the roots are thoroughly dried before forcing. Anesthetics have been tried as a substitute for freezing but with unsatisfactory results. When used upon frozen roots they stimulate growth, resulting in the production of earlier and larger stalks with greater total weight of product. If the greatest benefit is to be derived from the anesthetic, it must be used in the early part of the resting-period. The most satisfactory results have been obtained by the use of 10 cubic centimeters of sulfuric ether to a cubic foot of space, exposing the roots to the fumes for forty-eight hours. Well-grown two-year-old roots seem to respond to this treatment in the most satisfactory way.

As soon as the roots are placed in position, whether it be under the greenhouse benches or in the cellar, all spaces should be filled with soil or ashes to prevent evaporation. If placed on a concrete floor, 2 or 3 inches of soil should be placed under the roots and sufficient material should be added completely to cover the roots. The bed as soon as completed should be thoroughly watered, the plants kept supplied with an abundance of moisture, which will necessitate water being applied about once a week. Care should be taken to guard against over-watering as this will result in the production of light-colored stalks, lacking in flavor and texture. In order to obtain the most attractive product, rhubarb should not be forced in full light or total darkness. If grown in diffused light, the development of the leaf-blade is very slight and the color of the stalk, instead of being green, is a beautiful dark cherry-red, giving to the product a very attractive appearance. In quality the product is superior to that forced in light, being more tender, less acid, with a skin so thin and tender as to make it unnecessary to peel the stalks. The temperature may range from 45° to 75°, the lower the temperature the greater the yield and higher the quality of the product. The time required for bringing a crop to maturity in darkness is practically the same as that required for forcing in the field.

Local market demands to a certain extent govern the method which is used in growing this crop for the winter market. When grown by any method which

requires the lifting of the roots, it must be remembered that they are worthless after having produced a crop. Therefore, this method cannot be practised with as great profit upon expensive land as can the method of field forcing or when roots were used for forcing which otherwise would be destroyed. Rhubarb-forcing in house cellars should receive more attention, as it adds at slight expense a pleasing vegetable to the winter dietary.

Whatever the method practised, success will be attained only when healthy well-developed roots, which have been allowed to freeze, are used. G. E. Adams.

RHŪS (ancient Greek name). *Anacardiàceæ.* Sumac. Ornamental woody plants, grown chiefly for their handsome foliage, often assuming brilliant autumnal colors, and some species also for their showy fruiting panicles. See also *Cotinus*.

Deciduous or evergreen shrubs, sometimes climbing by aërial rootlets, or trees, with milky or resinous juice: lvs. alternate, without stipules, simple, 3-foliolate or odd-pinnate: fls. dicœcious or polygamous, small, in axillary or terminal panicles; calyx 5-parted; petals 5, imbricate; stamens 5, inserted below a broad disk; ovary superior, with 3 styles: fr. a small 1-seeded dry drupe, smooth or hairy.—About 150 species in the temperate and subtropical regions of both hemispheres. Foliage and bark of most species are rich in tannin and are used for tanning leather, particularly the lvs. of *R. coriaria* in S. Eu. From *R. verniciflua* lacquer is obtained in China and Japan, used in the manufacture of lacquer-ware; *R. succedanea* yields a vegetable wax, used for candles in Japan, and also exported for various purposes. *R. lævigata* and some other S. African species are valued for their timber.

The sumacs are shrubs or trees with handsome simple or usually compound foliage assuming in most deciduous species brilliant autumnal colors, and with small comparatively inconspicuous flowers in usually large panicles, followed by small fruits which are deep red and showy in many species. The only species with rather showy flowers of creamy white color appearing in late summer is *R. javanica*, while *R. typhina*, *R. glabra*, and *R. copallina* are chiefly valued for their large pinnate leaves coloring scarlet in autumn and also for the conspicuous panicles of deep red fruits remaining almost unchanged on the plants during the winter; they are well adapted for mass-planting on barren ground and dry hillsides. Also *R. verniciflua*, *R. succedanea*, and *R. vernix* have handsome large foliage, but are poisonous like *R. Toxicodendron*, and for this reason are not recommended for extensive planting. The deciduous native species are hardy North, and *R. verniciflua*, *R. Potaninii*, *R. punjabensis* var. *sinica*, *R. javanica*, *R. trichocarpa*, and *R. sylvestris* are hardy as far north as Massachusetts, while *R. coriaria* is tender, and the evergreen species can be grown only in warmer temperate regions. Most species grow well in dry and barren soil, only *R. vernix* is a swamp-loving plant. Many species, particularly *R. Toxicodendron*, *R. glabra*, *R. typhina*, and *R. copallina*, spread by suckers and may become a nuisance in lawns and mixed plantations. Propagation is by seeds sown in autumn or stratified; all species grow readily from root-cuttings; some species, as *R. canadensis*, may be increased by layers or cuttings of mature wood.

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KEY TO THE SPECIES.

A. *Foliage simple, evergreen.*
  B. *Lvs. glabrous.*
    C. *Fr. pubescent, red.*
      D. *Length of lvs. 1–2 in., apex usually obtuse* ..... 1. integrifolia
      DD. *Length of lvs. 2–3 in., apex acute* 2. ovata
    CC. *Fr. glabrous, whitish* ..... 3. laurina
  BB. *Lvs. pubescent* ..... 4. mollis
AA. *Foliage compound.*
  B. *Lfts. 3.*
    C. *Plant evergreen.*
      D. *Petiole slender, terete* ..... 5. lævigata
      DD. *Petiole short, winged* ..... 6. lucida
    CC. *Plant deciduous.*
      D. *Fls. in dense catkin-like racemes: fr. hairy, red.*
        E. *Lfts. glabrate, ½–1 in. long, with few rounded teeth* ..... 7. trilobata
        EE. *Lfts. pubescent, 1–3 in. long, crenate-serrate* ..... 8. canadensis
      DD. *Fls. in loose panicles: fr. glabrous, whitish.*
        E. *Apex of lfts. obtuse, margin crenate* ..... 9. diversiloba
        EE. *Apex of lfts. acute, margin entire or serrate* ..... 10. Toxicoden-[dron
  BB. *Lfts. 5 or more.*
    C. *Infl. axillary: fr. glabrous, whitish: lfts. entire; lvs. crowded at the end of the branches.*
      D. *Under side of lfts. more or less pubescent, at least while young, pale green; texture thin; pairs of veins usually 10–12.*
        E. *Length of lfts. usually 2–4 in., base cuneate* ..... 11. vernix
        EE. *Length of lfts. usually 4–6 in., base usually rounded* ..... 12. verniciflua
      DD. *Under side of lfts. glabrous, grayish green, rarely green; texture firm; with usually 15–20 pairs of veins* ..... 13. succedanea
    CC. *Infl. terminal: fr. hairy, red.*
      D. *Fruiting panicles pendulous: lfts. entire, or sometimes serrate in young plants; rachis not or slightly winged.*
        E. *Number of lfts. 5–7, rarely to 9; rachis terete* ..... 14. Potaninii
        EE. *Number of lfts. 7–13; rachis narrowly winged in the upper part* ..... 15. punjabensis
      DD. *Fruiting panicle upright: lfts. serrate except in No. 18.*
        E. *Rachis winged.*
          F. *Lfts. obtusish, rarely over 2 in. long* ..... 16. coriaria
          FF. *Lfts. acute, over 2 in. long.*
            G. *Margin of lfts. coarsely serrate, base usually rounded* ..... 17. javanica
            GG. *Margin of lfts. entire or remotely serrate, base cuneate* ..... 18. copallina
        EE. *Rachis terete, or in No. 19 often winged below the terminal lfts. only.*
          F. *Lvs. densely brownish pubescent beneath: low shrub to 3 ft.* ..... 19. Michauxii
          FF. *Lvs. glabrous beneath or pubescent on the veins, glaucous.*
            G. *Branchlets and infl. densely hairy* ..... 20. typhina
            GG. *Branchlets glabrous, glaucous: infl. finely pubescent* ..... 21. glabra

1. **integrifòlia**, Brew. & Wats. Shrub or small tree, occasionally to 30 ft.: lvs. short-stalked, oval, obtuse or sometimes acute, entire or spinosely toothed, glabrous, 1–2 in. long, very rarely 3-foliolate: panicles hoary-pubescent, 1–3 in. long; fls. white or pinkish: fr. ovate,

flattened, ½in. long, dark red. Spring. Calif. S.S. 3:109.

2. **ovàta,** Wats. Shrub, to 10 ft.: lvs. short-stalked, ovate, acute or acuminate, entire or rarely spinosely toothed, 2–3 in. long: fls. in dense spikes ½in. long, sometimes crowded into terminal panicles, light yellow: fr. ovate, flattened, dark red, ¼in. long. Spring. S. Calif., Ariz.

3. **laurìna,** Nutt. (*Lithræa laurìna,* Walp.). Aromatic, glabrous shrub: branchlets purplish: lvs. oblong-ovate to lanceolate, acute and mucronulate, rounded at the base, entire, 2–3 in. long; petioles ½–1½ in. long: fls. in dense panicles, to 4 in. long, greenish white: fr. ovoid, beaked, ⅛in. long, whitish, with a waxy covering. Summer. S. and Low. Calif. —Will thrive in the hottest and driest places; very handsome with its dark green glossy foliage.

4. **móllis,** HBK. Tall shrub: branchlets tomentose: lvs. oval or ovate, rounded and mucronate at the apex, rounded or subcordate at the base, pubescent above, more densely so beneath, 1½–2½ in. long; petiole very short: fls. in dense pubescent panicles, about 1 in. long: fr. subglobose, pilose. Mex.

5. **lævigàta,** Linn. Glabrous shrub or tree: petiole 2–3 in. long; lfts. sessile or short-stalked, ovate, acuminate, cuneate at the base, entire or sometimes with 2–6 teeth, lustrous above, 2–3 in. long: panicles loose, axillary and terminal; fls. minute, whitish, slender-pedicelled: fr. globose, glabrous, lustrous, about ¼in. across. S. Afr. Sim, For. Fl. Cape Colony 45.

6. **lùcida,** Linn. Glabrous shrub, to 6 ft.: branchlets sometimes puberulous: petiole ¼–½in. long, narrowly winged; lfts. sessile, obovate, obtuse or emarginate, entire, rarely slightly toothed, lustrous, distinctly veined, 1–2½ in. long: panicles terminal and axillary, about as long as lvs.: fr. globose, glabrous, about ¼in. across. S. Afr.

7. **trilobàta,** Nutt. (*Schmáltzia trilobàta,* Small). Skunk-Bush. Ill-scented Sumac. Offensive-scented shrub, to 3, rarely to 6 ft. high: lvs. petioled, 1–2 in. long; lfts. sessile or nearly so, oval or obovate, obtuse, crenately toothed, puberulous while young, soon glabrous, the terminal one usually 3-lobed: fls. greenish, in clustered spikes before the lvs.: fr. subglobose, red, hairy, ¼in. across. Mo. to Wash., Calif., and Texas. B.B. (ed. 2) 2:483.

8. **canadénsis,** Marsh. (*Schmáltzia aromática,* Desv. *R. aromática,* Ait. *Schmáltzia crenàta,* Greene). Aromatic shrub, to 3 ft., with ascending or diffuse branches: lvs. petioled, 2–4 in. long; lfts. pubescent, the terminal one ovate or obovate, acute or acuminate, cuneate at the base; the lateral lfts. ovate, unequal at the base: fls. and frs. like those of the preceding species, but fls. yellow and frs. slightly larger. Ont. and Vt. to Minn. and south to Fla. and La.—A good cover plant for dry rocky banks; conspicuous in early spring by its yellow fls. B.B. (ed. 2) 2:482.

9. **diversíloba,** Torr. & Gray. Poison Oak. Upright shrub or sometimes climbing by rootlets: branchlets pubescent: lfts. ovate, elliptic or obovate, usually obtuse, coarsely crenate-serrate. or 3-lobed, sparingly pubescent while young, 1–3 in. long: fls. yellowish green, in peduncled panicles: fr. white, ⅛–¼in. across, falling soon after maturity. Brit. Col. to Calif.—Poisonous like the following and not to be recommended for planting.

3397. Rhus javanica. (×¼)

10. **Toxicodéndron,** Linn. (*Toxicodéndrum vulgàre,* Mill. *R. radìcans,* Linn. *R. Toxicodéndron* var. *radìcans,* Torr.). Poison Ivy. Poison Oak. Fig. 3088, p. 2728. Suberect and scrambling over walls and fences or high-climbing by aërial rootlets: lfts. ovate or rhombic, acute or short-acuminate, entire or sparingly dentate or sinuate, more or less pubescent beneath, 1–6 in. long: fls. greenish, in loose axillary panicles 1–3 in. long: fr. whitish, subglobose, ⅛in. across, remaining on the plant during the winter. Spring. Nova Scotia to Fla. west to Minn., Neb., and Ark. Em. 577.—It colors beautifully scarlet and orange in autumn, but is very poisonous to many and therefore should not be planted near places where persons are likely to come in contact with it; in such places it should rather be exstirpated. It is, however, very difficult to eradicate, for it spreads by suckers and each piece of root left in the ground sprouts again.—The plant described above is by some called *R. radicans,* Linn., and the name *R. Toxicodendron* is restricted to an upright shrubby form with pubescent crenate or crenately lobed lvs., native to the S. Atlantic states, also called *R. quercifòlia,* Steud.; also several other closely related species have been distinguished.

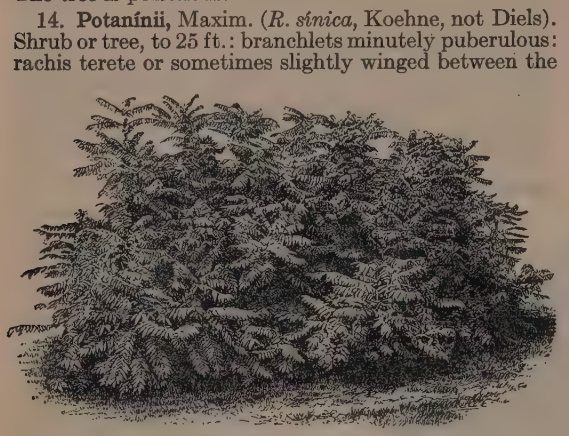
11. **vérnix,** Linn. (*R. venenàta,* DC.). Poison Sumac. Poison Elder. Fig. 3089, p. 2728. Shrub or tree, to 20 ft.: lfts. 7–13, oval to oblong, acuminate, cuneate at base, undulate, glabrous or slightly pubescent beneath usually 2–4 in. long: fls. greenish, in loose axillary panicles 3–8 in. long: fr. subglobose, gray, flattened, ⅛in. across. Swamps, R. I., Ont., and Minn., south to Fla. and La. S.S. 3:107, 108. Em. 575.—Very poisonous: foliage turns to a brilliant scarlet in autumn.

12. **vernicíflua,** Stokes (*R. vernicífera,* DC. *R. vérnix,* Thunb.). Varnish-Tree. Lacquer Tree. Tree, to 60 ft.: lfts. usually 11–15, short-stalked, ovate-oblong to oblong-lanceolate, acuminate, rounded or broadly cuneate at the base, entire, more or less pubescent beneath while young, 3–6 in. long: fls. whitish, in slender axillary panicles about half as long as the lvs.: fr. broader than long, compressed, straw-yellow, smooth, ¼in. broad. May. Japan, China, Himalayas. S.I.F. 1:57. I.T. 6:201. Gn. 34, p. 158.—From this tree the lacquer used for the highly polished woodenware is obtained in Japan and China; the fr. yields a fatty oil. The tree is poisonous like the preceding species.

13. **succedànea,** Linn. Wax-Tree. Shrub or small tree, to 30 ft.: lfts. 9–15, short-stalked, elliptic-oblong to oblong-lanceolate, long-acuminate, broadly cuneate at the base, entire, lustrous above, usually grayish green or glaucescent beneath, quite glabrous, usually with 15–20 pairs of veins prominent beneath, 2–4 in. long: fls. yellow-green, in axillary slender panicles: fr. broader than high, compressed, whitish, ⅓–¼in. broad. May.

Japan, China, Himalayas. S.I.F. 1:57. R.H. 1863, p. 130.—From the fr. of this tree a wax-like substance chiefly used for making candles is expressed in Japan. The tree is poisonous.

14. **Potanínii,** Maxim. (*R. sínica,* Koehne, not Diels). Shrub or tree, to 25 ft.: branchlets minutely puberulous: rachis terete or sometimes slightly winged between the upper lfts.; lfts. 5–7, short-stalked, ovate or elliptic-ovate, acuminate, rounded or broadly cuneate at the base, entire, on young plants usually coarsely toothed, pubescent beneath on the veins, 2–4 in. long: fls. whitish, in terminal panicles: fr. dark red, densely hairy, in pendulous panicles to 5 in. long. May, June. Cent. and W. China. M.D. 1910, p. 103, and G.M. 51:419; 52:721 (as *R. sinica*).



3398. Rhus typhina.—Staghorn sumac.

15. **punjabénsis,** Stew. Tree, to 40 ft.: branchlets short-pubescent: lfts. short-stalked, oblong or ovate-oblong, acuminate, rounded or subcordate at the base, slightly pubescent beneath, at least on the veins, entire, 3–5 in. long: fls. whitish, in broadly pyramidal panicle with spreading branches: fr. suborbicular, red, tomentose, ⅙–⅛in. broad. Himalayas. Var. **sínica,** Rehd. & Wilson (*R. sínica,* Diels). Upper part of the rachis narrowly winged; lfts. 7–11, on young plants sometimes 17 and wings more pronounced and often continuing down the whole length of the rachis: fruiting panicle 5–8 in. long and 4–6 in. broad. June, July; fr. in Sept. Cent. and W. China.—This and the preceding species are strong-growing plants with handsome foliage; very attractive in autumn with their large pendulous panicles of dark red fr.

16. **coriària,** Linn. Shrub, to 20 ft.: petiole short; rachis winged, at least in the upper part, villous; lfts. 9–15, oval to oblong, obtuse or acutish, coarsely toothed, pubescent beneath, 1½–2 in. long: fls. greenish, in a rather loose terminal panicle: fr. crimson, densely pubescent. July. Medit. region, W. Asia. H.W. 3, p. 33.—The lvs. are used for tanning leather.

17. **javánica,** Linn. (*R. semialàta,* Murr. *R. Osbéckii,* Decne. *R. semialàta* var. *Osbéckii,* DC.). Fig. 3397. Shrub or flat-headed tree, to 25 ft.: rachis and often the petiole winged, pubescent; lfts. 7–13, short-stalked or nearly sessile, ovate to ovate-oblong, acute or short-acuminate, rounded or broadly cuneate at the base, coarsely crenate-serrate, brownish pubescent beneath, 2–6 in. long: fls. creamy white, in large and broad panicles, to 12 in. long: fr. subglobose, compressed, red, densely pubescent. Aug., Sept.; fr. in Oct. Japan, China, S. Asia. S.I.F. 1:58. G.W. 1:99. M.D.G. 1899:166.—Valuable for its late blooming season and the most showy of the sumacs in bloom. Var. **Róxburghii,** Rehd. & Wilson (*R. semialàta* var. *Róxburghii,* DC.). Rachis not or very slightly winged. Himalayas.—Tender, rarely cult.

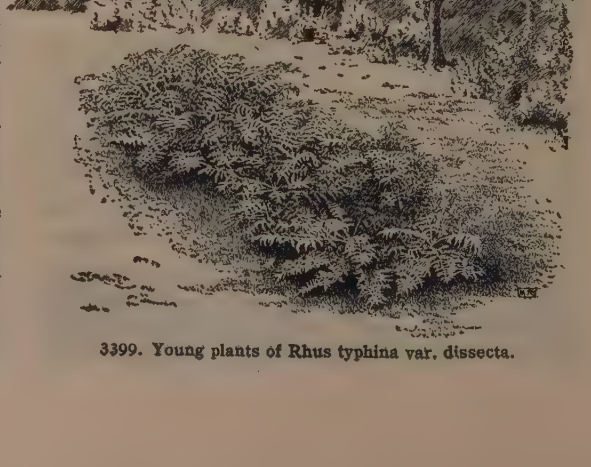
18. **copallìna,** Linn. (*Schmáltzia copállina,* Small). Black Sumac. Mountain or Shining Sumac. Shrub or tree, occasionally to 30 ft.: rachis winged, pubescent; lfts. 9–21, oblong-ovate to oblong-lanceolate, entire or few-toothed toward the apex, glabrous and lustrous above, usually pubescent beneath, 1½–4 in. long: fls. greenish, in dense terminal panicles: fr. compressed, hairy, crimson. July, Aug.: fr. Sept., Oct. Maine and Ont. to Minn., south to Fla and Texas. S.S. 3:104, 105. Var. **lanceolàta,** Gray. Lvs. narrowly lanceolate, often falcate. Texas. S.S. 3:106.—Succeeds well in dry soil; handsome with its dark green glossy foliage.

19. **Michaùxii,** Sarg. (*R. pùmila,* Michx. *Schmáltzia Michaùxii,* Small). Low shrub with decumbent sts. about 1 ft. high, densely pubescent: lfts. 9–15, oval to oblong-ovate, acuminate, coarsely serrate, 2–4 in. long: fls. greenish, in panicles 4–8 in. long: fr. compressed, deep red, pubescent. Spring. N. C. to Ga. G.F. 8:405.—Poisonous.

20. **typhìna,** Linn. (*R. hírta,* Sudw. *Schmáltzia hírta,* Small). Staghorn Sumac. Fig. 3398. Shrub or tree, to 30 ft.: branchlets densely velvety-hairy: lfts. 11–31, oblong-lanceolate, pointed, serrate, glaucescent beneath, 2–5 in. long: fls. greenish, in dense terminal panicles: fr. crimson, hairy. June, July; fr. Aug., Sept. Em. 571. S.S. 3:102, 103. Gn. 54, p. 505. G.F. 2:343 (adapted in Fig. 3398). Que. to Ont., south to Ga., Ind., and Iowa. Var. **laciniàta,** Wood. Lfts. and bracts deeply and laciniately toothed and the infl. sometimes partly transformed into contorted bracts. Var. **dissécta,** Rehd. (var. *laciniàta* Hort.). Fig. 3399. Lfts. pinnately dissected. M.D.G. 1900:211. G.M. 53:827. R.H. 1907, pp. 10, 11. A very handsome form with finely cut foliage. *R. typhìna filícina,* Sprenger, is probably not different.—The staghorn sumac grows in the driest soils and is a very desirable plant on account of its brilliant fall coloring, which in dry localities begins to show in Aug., and with its crimson fr.-clusters persisting through the winter. Trained in tree form it is very picturesque, but is short-lived.

21. **glàbra,** Linn. (*Schmáltzia glàbra,* Small). Smooth Sumac. Fig. 3400. Shrub, to 15 ft. with glabrous and glaucous branches: lfts. 11–31, lanceolate-oblong, pointed, serrate, glaucous beneath, 2–5 in. long: fls. green, in dense panicles, to 10 in. long: fr. scarlet, viscid-pubescent. July; fr. in Aug., Sept. Em. 572. G.W. 3, p. 145. F.E. 30:681. Var. **laciniàta,** Carr. Lfts. pinnately dissected. F.E. 31:875. G. 1:533. R.H. 1863, p. 7. V. 10:101. This variety with its deeply and finely cut lvs. is very handsome; it is tenderer than the cut-lvd. form of the preceding species and does not grow so high.

R. cotinoìdes, Nutt.=Cotinus americana.—*R. Cótinus,* Linn.=Cotinus Coggygria.—*R. Delavàyi,* Franch. Allied to R. succedanea. Glabrous shrub: lfts. 5–7, elliptic, 1–2 in. long, light green beneath:



3399. Young plants of Rhus typhina var. dissecta.

infl. 2–3½ in. long. W. China. Var. *quinquejùga*, Rehd. & Wilson. Lfts. 5–11, slightly pubescent while young. W. China.—*R. hýbrida*, Rehd. Hybrid between R. glabra and R. typhina, found occasionally among the parents: young branchlets sparingly or densely pubescent: lfts. on the veins beneath slightly pubescent: hairs of the fr. exactly intermediate in length between those of the parents.—*R. orientàlis*, Schneid. (R. Toxicodendron var. hispida, Engl.). Allied to R. Toxicodendron. Climbing: young branchlets hairy: lfts. dull green above, entire: fr. pilose. Japan, China.—*R. rhodánthema*, F. Muell.=Rhodosphæra rhodanthema.—*R. sylvéstris*, Sieb. & Zucc. Allied to R. succedanea. Shrub or tree, to 30 ft.: young branchlets, rachis, and lfts. beneath pubescent. Japan, China. S.I.F. 1:58.—*R. tomentòsa*, Linn. Allied to R. lævigata. Shrub or small tree: lfts. 3, oblong, entire or crenate-dentate,

3400. Rhus glabra. (×⅓)

tomentose beneath, 1½–3 in. long. S. Afr. I.T. 3:111.—*R. trichocárpa*, Miq. Allied to R. verniciflua. Shrub or small tree: petiole and lfts. beneath pubescent; lfts. usually smaller: panicle shorter and denser: fr. pilose. Japan, China.

ALFRED REHDER.

RHYNCHÁNTHUS (Greek, *beak* and *flower*, referring to the peculiar shape of the fls.). *Zingiberàceæ*. Slender glabrous perennial herbs with tuberous roots, suitable for the warmhouse: sts. erect, leafy, the lvs. sessile: fls. sessile, borne in a terminal, few-fld. spike; bracts solitary, elongate, and colored; calyx tubular, cylindrical; corolla funnel-shaped, the lobes ovate-lanceolate, acuminate, and erect; ovary 3-celled.—About 3 or 4 species, Burma. *R. Bluthiànus*, Wittm. Sts. up to 1 ft. high, not thickened at the roots: lvs. 4, oblong-lanceolate, sessile, acuminate, not marginate: fls. 2, up to 2 in. long; calyx beautiful red, truncate, 3-toothed; corolla red; ovary smooth. Burma. Gt. 48:1464. *R. Johniànus*, Schlecht. Tuberous: up to 4½ ft. high: lvs. distichous, lanceolate, acuminate, both sides glabrous: infl. many-fld., oblong, with bright red, lanceolate, acuminate bracts; fls. sulfur-yellow; calyx cylindrical, split, the apex 2-cleft; corolla 3-cleft to below the middle, the segms. lanceolate, acuminate; ovary cylindrical. Burma. Gt. 56:1560. *R. longifòlius*, Hook. f. Sts. 1½ ft. high, thickened at the roots: lvs. 8–12, regularly distichous, 5–7 in. long, oblong-lanceolate, acuminate, red-margined: fls. 4–5, up to 3½ in. long; calyx slightly shorter than the bracts; corolla-tube pale yellow-green, lobes green; ovary puberulous. Burma. B.M. 6861.

F. TRACY HUBBARD.

RHYNCHÒSIA (Greek, *beak*, alluding to the shape of the keel). *Leguminòsæ*. Twining, prostrate, or rarely erect herbs, shrubs, or subshrubs, suitable for the warmhouse or outdoors in the southernmost parts of the United States.

Plants often glanduliferous, with minute yellow glands: lvs. pinnately, or rarely subdigitately, 3-divided: fls. yellow, mostly in axillary racemes; calyx unequally 3-cleft or 4–5-parted; standard rounded, often darkly lined, rarely purple: legume compressed continuous.—About 100 species in the warmer regions of both hemispheres. The name Dolicholus is sometimes used for this genus, but Rhynchosia is one of the names maintained by the "nomina conservanda" accepted by the Vienna Congress.

mínima, DC. Tomentose or glabrescent herb: st. about 1 ft. high, low, twining, obtuse-angled: lfts. ovate-rhomboid, rather acute: fls. racemose, distant; calyx-lobes lanceolate-linear, the inferior about half as long as corolla: legume not constricted, oblong, tapering at the base, pubescent; seeds black. Texas, Mex. to Brazil, W. Indies, Trop. Afr., and Asia.

phaseoloìdes, DC. Tomentose or glabrate, a high climber, subshrubby: st. twining and subcylindrical: lfts. ovate or ovate-rhomboid, pointed: racemes many-fld.; calyx-lobes ovate-lanceolate or ovate, pointed, the inferior half as long as the standard: legume constricted between both seeds, tomentose or glabrescent; seeds black, with a scarlet-yellow ring around the hilum. Panama to Brazil, W. Indies and Galapagos Isls.

F. TRACY HUBBARD.

RHYNCHOSPÉRMUM (Greek, *beak* and *seed*, referring to the form of the seed). *Apocynàceæ*. Now referred to Trachelospermum. *R. jasminoìdes*, Lindl.= *Trachelospermum jasminoides*, Lem., which see. There is, however, a good botanical genus named Rhyncospermum, but it belongs to the composite family. It has only one species, *R. verticillatum*, a plant not in cultivation.

RHYNCHÓSPORA: *Rynchospora*.

RHYNCHÓSTYLIS (Greek, *beaked column or style*). *Orchidàceæ*. Epiphytic herbs closely related to Saccolabium and usually sold under that name.

Stems monopodial and 2-ranked: lvs. crowded, leathery or fleshy: fls. in dense racemes from the axils of the lvs., medium-sized; dorsal sepal and petals subsimilar, lateral sepals broader, decurrent on the foot of the column; labellum firmly joined to the base of the column, obovate, inflexed at the apex, not 3-lobed, spurred, the spur straight or curved backward. For cult., see *Saccolabium*.

retùsa, Blume (*Saccolàbium guttàtum*, Lindl. *S. præmórsum*, Lindl. *S. Rheèdii*, Wight. *S. retùsum*, Voigt. *S. Blùmei*, Lindl.). St. stout, with channeled lvs. 6–20 in. long: fls. in dense, cylindrical racemes about as long as the lvs., ¾in. across, white, blotched with pink or violet. June, July. Trop. India and Malay Isls. B.M. 4108. F.S. 7, p. 92; 14:1463, 1464. B.R. 1443 (as *Sarcanthus guttatus*). G.C. 1845:364; II. 1:219; 23:573; III. 15:812. Gn. 31, p. 537. A.G. 20:317. S.H. 2, p. 375.—Several varieties are in the trade. Var. **màjus**, Hort. Larger in all its parts. I.H. 15:545. Gn. 31, p. 69; 36, p. 230 (all as *Saccolabium Blumei* var. *majus*). Var. **Holdfordiàna**, Hort., an old form with large racemes of waxy white fls., spotted with crimson, the lip being also crimson. Var. **gigantèa**, Hort., very much like the type. Var. **álba**, Hort. Fls. entirely white. Var. **Dàyi** and var. **supérba** are offered.

violàcea, Reichb. f. (*Saccolàbium violàceum*, Reichb. f.). Lvs. 10–12 in. long: racemes 1 ft. or more long; fls. 1 in. across, white, spotted with pale mauve; labellum dark violet. Jan. Philippines. B.R. 33:30 (as Vanda).—The blossoms are said to have a disagreeable odor. Var.

Harrisoniànum, Hort. (*Saccolàbium Harrisoniànum*, Hook.). Lvs. distichous, oblong, obliquely bifid at the apex: raceme dense, cylindrical, pendulous; fls. white, fragrant; sepals ovate-oblong, somewhat incurved; petals narrower, oblong-spatulate; labellum oblong-obovate, with a thick blunt apiculus, saccate toward the apex; spur blunt; disk with a single thickened line. Malay Isls. B.M. 5433. F.S. 23:2412.—The racemes grow to a length of 2 ft.

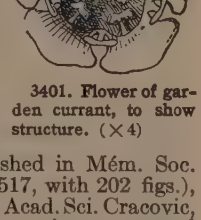
cœléstis, Reichb. f. (*Saccolàbium cœléste*, Reichb. f.). St. rather stout: lvs. 4–6 in. long, fleshy: peduncles erect, bearing a dense raceme: fls. crowded, ¾in. across; sepals and petals similar, oval-oblong, obtuse, white with a blotch of indigo at apex; lip obovate-oblong, white at base, bright indigo at apex. Siam.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

RHYTIGLÓSSA (Greek, *wrinkle* and *tongue*, the palate of the lower lip is wrinkled). *Acanthàceæ*. A genus in which about 75 species have been described, now referred to *Dianthera*, which see.

RÌBES (probably derived from *ribas*, the Arabic name for *Rheum Ribes*, or by some supposed to be the Latinized form of *riebs*, an old German word for currant). *Saxifragàceæ*. CURRANT. GOOSEBERRY. Woody plants partly grown for their edible fruits and partly for their handsome flowers, fruits, or foliage.

Unarmed or prickly shrubs with deciduous or rarely evergreen foliage: lvs. alternate, often fascicled, simple, usually palmately lobed and mostly plaited in the bud: fls. perfect or in some species dicœcious, 5-merous, rarely 4-merous, in many-fld. to few-fld. racemes, or solitary; calyx-tube cylindric to rotate, like the sepals usually colored; petals usually smaller than the sepals, often minute, rarely entirely wanting; stamens alternating with the petals, shorter or longer than the sepals; ovary inferior, 1-celled; styles 1 or 2 (Fig. 3401): fr. a many-seeded pulpy berry, crowned by the remains of the calyx. —About 150 species in the colder and temperate regions of N. and S. Amer., N. and Cent. Asia, Eu., and N. Afr. The genus is sometimes divided into two: the true Ribes with usually unarmed sts., racemose fls., and jointed pedicels, and Grossularia (p. 1414) with prickly sts.; fls. solitary or in short 2–4-fld. racemes and with the pedicels not jointed. The most recent monograph of the genus is by Janczewski, Monographie des Groseilliers, 1907 (originally published in Mém. Soc. Phys. Nat. Hist. Genève, 35:199–517, with 202 figs.), with important supplements in Bull. Acad. Sci. Cracovic, ser. B, 1910–13. The N. American species are treated by Coville & Britton in North American Flora, 22:193–225 (1908) under the two genera Ribes and Grossularia. There are also descriptions and figures of the more important species in Card's Bush Fruits, 444–84, figs. 80–109 (1911).



3401. Flower of garden currant, to show structure. (×4)

The currants and gooseberies are usually low, upright or less often procumbent deciduous, rarely evergreen shrubs with prickly or unarmed branches, small or medium-sized usually lobed leaves, with rather small solitary or racemose flowers often greenish or reddish and insignificant, but in some species white or brightly colored in shades of red, scarlet, orange or yellow; the fruits also are often attractive and either black, purple, scarlet, yellowish or greenish. The flowers appear in spring with the leaves, and the fruits ripen in June or July, but in *R. fasciculatum* they do not mature until September and remain on the branches all winter. Most species are hardy North except the evergreen ones; also *R. sanguineum*, *R. Roezlii*, *R. Lobbii*, *R. viscosissimum* are not quite hardy North. The tender *R. speciosum* with fuchsia-like bright red flowers is perhaps the most showy species of the genus, though also *R. sanguineum*, *R. odoratum*, *R. Gordonianum*, *R. Roezlii*, *R. Lobbii*, *R. pinetorum*, *R. cereum*, *R. inebrians*, *R. niveum*, and others are handsome in bloom, while some, as *R. alpinum* and *R. fasciculatum*, have ornamental scarlet fruits. They are well adapted for borders of shrubberies and, particularly the procumbent kinds, for planting on slopes. *R. alpinum* is excellent for shady places and as undergrowth. *R. alpestre*, a strong-growing and very spiny gooseberry from western China, may prove valuable as a hedge-plant. Many species bear edible fruits; the most important are the domestic currant, *R. vulgare*, and the European gooseberry, *R. Grossularia*; of less importance are the black currant, *R. nigrum*, the Buffalo or Missouri currant, *R. odoratum*, the European *R. rubrum* and some of the American gooseberries, as *R. hirtellum*, *R. Cynosbati*, *R. oxyacanthoides*, *R. setosum*, *R. inerme*. These plants are mostly of easy cultivation; they grow in any moderately good loamy soil, the gooseberries preferring as a rule drier and sunnier positions, while the currants like more humidity and grow well in partly shaded situations. Propagation is by seeds which germinate readily; also by hardwood cuttings in autumn and by greenwood cuttings in summer under glass; mound-layering in summer is sometimes practised; budding or grafting is usually resorted to only, if quick propagation of rare varieties is desired. In Europe, currants and gooseberries are sometimes grafted high on *R. odoratum* trained to one stem, to form little standard trees. See also *Currant* and *Gooseberry* for cultivation.

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KEY TO THE SPECIES.

A. *Branches unarmed (or 2 small prickles below the lf. in No. 19): fls. usually in racemes; pedicles not jointed.*
B. *Fls. tubular, red, yellow or white.*
C. *Color of fls. yellow; fls. glabrous: lvs. convolute in bud.*

DD. *Calyx-tube about twice as long as sepals; sepals revolute or spreading* ..... 1. **odoratum**
DD. *Calyx-tube 1–1½ times as long as sepals* ..... 2. **aureum**
CC. *Color of fls. red or white: lvs. plaited in bud.*
D. *The fls. red or red and yellow, rarely white.*
E. *Lvs. glabrous or nearly so beneath: fls. pale yellow and red* ..... 3. **Gordonianum**
EE. *Lvs. white-tomentose beneath: fls. red, rarely white* ..... 4. **sanguineum**
DD. *The fls. white, pink, or greenish: lvs. glabrous or pubescent and green beneath.*
E. *Plants glandular-viscid: raceme short.*
F. *Fr. black: calyx-tube cylindric-campanulate: lvs. 2–3 in. broad* ..... 5. **viscosissimum**
FF. *Fr. red: calyx-tube tubular: lvs. ½–1½ in. broad.*
G. *Bracts of raceme cuneate-obovate, toothed: fls. white or whitish* .... 6. **cereum**
GG. *Bracts rhombic, usually acute: fls. pink* ..... 7. **inebrians**
EE. *Plant not glandular-viscid: lvs. resinous-dotted beneath: racemes pendulous; fls. whitish: fr. black* ..... 8 **americanum**
BB. *Fls. saucer-shaped or open-campanulate, greenish or whitish.*
C. *Lvs. resinous-dotted beneath.*
D. *Racemes nodding, short; fls. broadly campanulate: lvs. 3-5-lobed* ..... 9. **nigrum**
DD. *Racemes upright, to 8 in. long; fls. rotate: lvs. 5–7-lobed* ..... 10. **bracteosum**
CC. *Lvs. not resinous-dotted.*
D. *Habit decumbent.*
E. *Ovary and fr. glandular: racemes erect* ..... 11. **glandulosum**
EE. *Ovary and fr. glabrous: racemes nodding* ..... 12. **triste**
DD. *Habit upright.*
E. *Racemes drooping, many-fld.; fls. perfect: petiole 1½–3 in. long.*
F. *Calyx-tube broadly campanulate; fls. purple, pink, or reddish* ..... 13. **petræum**
FF. *Calyx-tube saucer-shaped.*
G. *Stamens as long as sepals; sepals reflexed.* 14. **multiflorum**
GG. *Stamens shorter than sepals; sepals spreading.*
H. *Disk of fl. with a big narrow ring; anther-cells separated by a broad connective: lvs. cordate or subcordate* ..... 15. **vulgare**
HH. *Disk of fl. flat; anther-cells contiguous: lvs. usually truncate* .... 16. **rubrum**
EE. *Racemes upright; fls. dioecious, small, greenish: petiole about 1 in. long or less.*
F. *Branches always unarmed: lvs. truncate to subcordate.*
G. *Pistillate fls. in 2–4-fld. fascicles: lvs. subchartaceous* ..... 17. **fasciculatum**
GG. *Pistillate fls. in dense racemes: lvs. thin* ..... 18. **alpinum**
FF. *Branches with slender paired prickles, sometimes unarmed: lvs. usually cuneate at the base* .... 19. **diacantha**
AA. *Branches with prickles, rarely nearly unarmed: fls. 1–4 and pedicels jointed (except in No. 20).*

B. *Fls. in racemes; sepals broader than long: sts. very bristly* ..... 20. **lacustre**
BB. *Fls. 1–4; sepals longer than broad.*
C. *Color of fls. white or greenish suffused with purple.*
D. *Sepals white (or greenish white in No. 23).*
E. *Stamens as long as sepals or longer.*
F. *Filaments villous: branchlets brown.*
G. *Ovary glabrous; calyx-tube about as broad as long* ..... 21. **niveum**
GG. *Ovary glandular or pubescent; calyx-tube twice as broad as long* .. 22. **curvatum**
FF. *Filaments glabrous; stamens nearly twice as long as the greenish white sepals: branches yellowish* ..... 23 **missouriense**
EE. *Stamens shorter than sepals: young branchlets usually very bristly.*
F. *Peduncles scarcely exceeding the bud-scales: calyx-tube campanulate* ..... 24. **oxyacanthoides**
FF. *Peduncles elongated: calyx-tube cylindric-campanulate* ..... 25. **setosum**
DD. *Sepals greenish, often tinged purplish.*
E. *Lvs. cuneate or rounded at the base.*
F. *Sepals about as long as tube; stamens as long, rarely longer than sepals* .. 26. **hirtellum**
FF. *Sepals about twice as long as tube; stamens slightly exceeding the sepals* ..... 27. **rotundifolium**
EE. *Lvs. subcordate or occasionally rounded at the base.*
F. *Petals spatulate or flabellate, less than half as long as sepals; style and calyx-tube inside pubescent.*
G. *Fr. smooth or glandular-bristly.*
H. *Ovary glabrous.*
I. *Sepals longer than tube; stamens slightly longer than sepals* ..... 28. **divaricatum**
II. *Sepals shorter than tube; stamens slightly shorter than sepals* ..... 29. **inerme**
HH. *Ovary pubescent or glandular; stamens about half as long as sepals* ..... 30. **Grossularia**
GG. *Fr. prickly, not glandular, rarely smooth: stamens less than half as long as sepals* ..... 31. **Cynosbati**
FF. *Petals elliptic, more than half as long as sepals; style and calyx-tube inside glabrous* ..... 32. **alpestre**
CC. *Color of fls. orange, purple, or bright red.*
D. *Fls. 5-merous.*
E. *Stamens shorter than sepals: fr. prickly.*
F. *Sepals glabrous outside, orange; anthers oval, yellow* ..... 33. **pinetorum**
FF. *Sepals pubescent outside, purple; anthers sagittate, purple* ..... 34. **Roezlii**
EE. *Stamens longer than the purplish red sepals* ..... 35. **Lobbii**
DD. *Fls. 4-merous, bright red; stamens 2–4 times as long as sepals* ..... 36. **speciosum**

Section 1. Ribes. Currants.

1. **odoràtum,** Wendl. (*R. longiflòrum,* Nutt. *R. frágrans,* Lodd. *R. palmàtum,* Thory. *R. aùreum,* Auth., not Pursh. *R. missouriénse,* Hort. *Chrysobótrya revolùta,* Spach). Missouri Currant. Buffalo Currant. Golden Currant. Fig. 3402. Shrub, to 6 ft.: young branchlets pubescent: lvs. ovate to orbicular-reniform, cuneate or truncate at the base, deeply 3–5-lobed and coarsely dentate, glabrate, 1–3 in. broad; petioles pubescent, shorter than blade: racemes 5–8-fld.; rachis pubescent; bracts ovate to oval, foliaceous; fls. yellow, fragrant; tube about ½in. long, stout; sepals oblong, scarcely half as long as tube, spreading or revolute; petals nearly half as long as sepals, more or less red: fr. globose or ovoid, about ⅓in. across, black. East of Rocky Mts., S. D. to Texas, east to Minn. and Ark. L.B.C. 16:1533. B.R. 125. L.D. 5:301. H.F. 1872:225 (as *R. Oregoni*).—A handsome shrub with yellow fragrant fls. appearing early in spring with the lvs. A form with large berries nearly ¾in. diam. is sometimes cult. for its frs. as the Crandall.

3402. Yellow-flowering currant.—Ribes odoratum. (×½)

2. **aùreum,** Pursh (*R. tenuiflòrum,* Lindl. *R. jasminiflòrum,* Agardh. *Chrysobótrya intermèdia* and *C. Lindleàna,* Spach). Similar to the preceding species, but smaller and slenderer in every part: young shoots glabrous or pubescent: lvs. orbicular-reniform to obovate, 3-lobed and slightly crenate-dentate, cuneate to subcordate at the base, 1–2 in. broad, pubescent or glabrous; petioles about as long as the blades: racemes 5–15-fld.; bracts oblong to obovate; fls. yellow, fragrant or slightly fragrant; calyx-tube slender, ¼–⅓in. long or slightly longer; sepals ⅕ to nearly ⅓in. long, spreading, upright in the faded fl.; petals shorter than half as long as sepals: fr. globose, red or black, ¼–⅓in. thick. Wash. to Calif., west to Assiniboia, Mont., Colo., and N. Mex. B.R. 1274. Var. **chrysocóccum,** Rydb. Fr. yellow. Var. **leiobótrys,** Zabel (*R. leiobótrys,* Koehne). Quite glabrous, glandular while young: sepals recurved, calyx-tube longer.—The shrub cult. as *R. aureum* is usually the preceding species which has more showy and fragrant fls.

3. **Gordoniànum,** Lem. (*R. Beàtonii,* Hort. *R. Loùdonii,* Hort. *R. odoràtum* × *R. sanguíneum*). Intermediate between the parents. Habit of *R. odoratum:* lvs. usually 3-lobed, glabrous, truncate at the base: racemes about 20-fld.; fls. yellow, tinged red outside, somewhat glandular, sterile. Originated in England about 1840.—Hardier than the following species, though not quite so handsome in flower.

4. **sanguíneum,** Pursh (*Calobótrya sanguínea,* Spach). Shrub, to 10 ft., more or less glandular and aromatic: branchlets pubescent and glandular while young: lvs. cordate or nearly truncate, reniform-orbicular, 3–5-lobed with obtuse irregularly dentate lobes, dark green and puberulous above, whitish-tomentose beneath, 2–4 in. broad; petioles pubescent and glandular: racemes many-fld., pubescent and glandular; bracts oblanceolate; fls. red, pubescent; ovary glandular; calyx-tube about ⅓in. long, sepals slightly longer; petals white or reddish: fr. blue-black, bloomy, slightly glandular. Brit. Col. to N. W. Calif. B.M. 3335. B.R. 1349. Gn. 51:208, fig. 1. H.U. 6:260.—Of this handsome shrub several varieties are in cult. Var. **atrórubens,** Loud. (var. *atrosanguíneum,* Kirchn.). Var. **spléndens,** Barbier. Fls. dark blood-red, larger than those of the preceding variety. R.H. 1913:428. G. 35:363. Var. **cárneum,** Dipp. (*R. cárneum grandiflòrum,* Carr.). Fls. pink. Var. **albéscens,** Rehd. (*R. sanguíneum* var. *álbidum,* Hort., not Kirchn.). Fls. whitish. Gn. 51:208, fig. 2 (as *R. album*). G.M. 53:125. This variety is usually confused with *R. glutinòsum* var. *álbidum,* Jancz. (*R. álbidum,* Paxt.), which differs chiefly in the glabrescent under side of the more deeply lobed and more sharply serrate lvs., in the more pendulous racemes with the pedicels ¼–⅓in. long, longer than the recurved narrower bracts. Var. **flòre-plèno,** Hort. With double red fls. P.M. 12:121. F.S. 1, p. 247. G.C. II. 14:144. Var. **Brocklebánkii,** Bean. With yellow foliage. Gn. 78, p. 311.

5. **viscossíssimum,** Pursh. Shrub, to 3 ft.: young growth and infl. glandular-pubescent and viscid: lvs. grayish green, reniform-orbicular, 5-lobed, with rounded crenately dentate lobes, glandular-pubescent on both sides, 2–3 in. broad; petioles shorter than blade, glandular-pubescent: fls. fragrant, greenish white or pinkish, in 3–8-fld. racemes; ovary glandular; tube cylindric-campanulate, about ⅓in. long; sepals about as long as tube: fr. black, not bloomy, glandular-hairy. Brit. Col. to Mont., Colo. and Calif.

6. **cèreum,** Douglas. Much-branched, upright shrub, to 4 ft.: young growth puberulous and glandular: lvs. reniform-orbicular, 3–5-lobed with obtuse crenulate lobes, puberulous-glandular beneath, often glabrous or nearly so above, ½–1½ in. broad: racemes few-fld., pendulous; bracts cuneate-obovate, toothed at the rounded or truncate apex; fls. white or greenish; calyx-tube pubescent, ¼–⅓in. long, sepals ovate, about as long; petals minute, orbicular; ovary glandular or smooth; style usually hairy above: fr. bright red, about ⅓in. across. Brit. Col. to Calif., east to Mont., Idaho, Utah, and Ariz. B.M. 3008. B.R. 1263.—Early leafing and conspicuous with its pale grayish green foliage studded with numerous white or pinkish fls.; also the bright red frs. are ornamental. Var. **farinòsum** (var. *farinòsum cárneum,* Jancz.). Branchlets violet: lvs. whitish-pulverulent: fls. bright pink.

7. **inèbrians,** Lindl. (*R. Spaethiànum,* Koehne). Fig. 3403. Similar to the preceding species in habit and

3403. Ribes inebrians. (×⅔)

foliage: racemes few-fld.; bracts rhombic, usually acute, entire or occasionally with a lateral lobe; fls. usually pink; style glabrous; ovary with stalked glands: fr. bright red, usually glandular. S. D. and Mont. to Nev., Cent. Calif., Ariz. and New Mex. B.R. 1471. B.B. (ed. 2) 2:238.—A hybrid between this and the preceding species is *R. Berlandieri*, Jancz.

8. **americànum,** Mill. (*R. flòridum*, L'Her. *R. pennsylvánicum*, Lam. *R. missouriénse*, Hort.). American Black Currant. Upright shrub, to 5 ft., with rather slender arching branches: young shoots slightly pubescent and glandular: lvs. suborbicular, cordate or nearly truncate, 3–5-lobed with acute, or sometimes obtuse, dentate lobes, more or less pubescent at least on the veins, resinous-dotted beneath, 1–3 in. broad: racemes pendulous, many-fld.; bracts linear to linear-lanceolate; fls. greenish white or yellowish; bracts longer than pedicels; ovary glabrous; tube cylindric-campanulate, ⅛in. long, sepals obtuse, slightly longer, pubescent; petals and stamens about two-thirds as long as sepals: fr. black, smooth. Nova Scotia to Va., west to Man. and Colo. G.O.H. 1. B.B. (ed. 2) 2:238.—Foliage with the peculiar heavy odor of the following species, turning crimson and yellow in autumn.

9. **nìgrum,** Linn. European Black Currant. Upright shrub, to 6 ft., with rather stout branches, of strong disagreeable odor: lvs. suborbicular, cordate, 3–5-lobed, with broad, acutish irregularly serrate lobes, sparingly pubescent, resinous-dotted beneath, to 4 in. broad: racemes 5–10-fld.; bracts small, much shorter than the pedicels; ovary and calyx pubescent and glandular; calyx-tube broadly campanulate; sepals oblong, recurved; petals reddish or whitish, about half as long as sepals: fr. black, subglobose, ⅓–⅖in. thick. Eu., N. and Cent. Asia, Himalayas. S.E.B. 4:523. R.F.G. 23:137.—Sometimes cult. for its fr. and escaped in the eastern and middle states. Var. **heterophýllum,** Pépin (var. *aconitifòlium*, Kirchn., var. *crispum*, Hort., var. *laciniàtum*, Lav.). With divided lvs., sometimes nearly to the base, the lobes irregularly and deeply incised. Var. **apiifòlium,** Kirchn. (var. *dissèctum*, Nichols.). Lvs. 3-parted, usually to the base, the lobes pinnatifid with narrow segms. Var. **xanthocárpum,** Spaeth (var. *frúctu-lùteo*, Hort.). Fr. yellow. Var. **chlorocárpum,** Spaeth (var. *frúctu-víridi*, Hort.). Fr. greenish. Gt. 16:562, fig. 16. There are also forms with variegated lvs. as var. **variegàtum,** Nichols., var. **marmoràtum,** Mouillef., and var. **reticulàtum,** Nichols.

10. **bracteòsum,** Douglas. Californian Black Currant. Shrub, to 8 ft., with upright or ascending sts.: young growth sparingly pubescent and resinous-dotted: lvs. thin, cordate, deeply 5–7-lobed, with ovate to ovate-lanceolate, acute, sharply serrate lobes, 2–8 in. broad: racemes narrow, slender, upright, often 8 in. long; bracts spatulate, half as long as the pedicels, the lower foliaceous; fls. greenish or purplish; calyx-tube cup-shaped; sepals spreading, ovate-oblong, ⅛in. long; petals minute, obtuse: fr. globose, black with whitish bloom, resinous-dotted, edible. Alaska to N. Calif. B.M. 7419.—Hardy at the Arnold Arboretum; remarkable for its large maple-like lvs. and the long bracted racemes. A hybrid of this species with *R. nigrum* is *R. fuscéscens*, Jancz. (*R. bracteòsum* var. *fuscéscens*, Jancz.); it differs chiefly in its reddish brown fls., in the small linear bracts of the spreading or arching infl., and in the larger fr. Gt. 55, p. 162. Originated in Scotland.

11. **glandulòsum,** Grauer (*R. prostràtum*, L'Her. *R. rìgens*, Michx.). Fetid Currant. Skunk Currant. Decumbent shrub with prostrate or spreading and reclining sts. and ascending branches: young growth sparingly pubescent and sparingly glandular: lvs. thin, fetid, orbicular, cordate, deeply 5–7-lobed, with ovate-acute or acutish, doubly serrate lobes, glabrous above, pubescent on the veins beneath, 1½–3 in. broad: racemes ascending, 8–12-fld.; pedicels filiform, glandular, much longer than the narrow bracts; fls. whitish or pinkish; ovary glandular-hispid; calyx-tube cup-shaped; sepals short, spreading, glabrous outside: fr. red, glandular-bristly. Newfoundland to Brit. Col.; south to Mich. and Minn. and in the mountains to N. C. B.B. (ed. 2) 2:238.

12. **tríste,** Pall. Swamp Red Currant. Low shrub with creeping or ascending, often rooting sts.: young growth sparingly pubescent and sparingly glandular: lvs. thin, suborbicular, 3–5-lobed, with acute or obtuse, coarsely serrate lobes, dark green and glabrous above, pubescent or whitish-tomentose beneath, 2–4 in. broad: racemes drooping, 1½–3½ in. long; pedicels longer than the ovate bracts; fls. purplish; calyx-tube saucer-shaped; sepals spreading, obtuse; petals reddish: fr. red, smooth. N. Asia and boreal N. Amer., south to Maine and Vt. B.B. (ed. 2) 2:237. Var. **albinérvium,** Fern. (*R. albinérvium*, Michx.). Lvs. glabrous or nearly so beneath. N. Amer., south to N. H., Mich. and Wis.

13. **petræum,** Wulf. (*R. bullàtum*, Otto and Dietr.). Upright shrub, to 8 ft.: branches usually glabrous: lvs. roundish, subcordate or truncate, usually 3-lobed, with acutish lobes, rugose, pubescent beneath, 3–4 in. broad: racemes dense, to 4 in. long; fls. red or pink; pedicels short; bracts very small; calyx-tube broadly campanulate with short spreading rounded ciliate sepals; petals nearly half as long as sepals, with a callosity below the base: fr. dark red, acid. Mts. of Cent. and S. Eu., Caucasus, N. Asia. R.F.G. 23:138. Var. **carpàthicum,** Jancz. (*R. carpàthicum*, Kit.). Lvs. usually 3-lobed, rugose, glabrescent: racemes looser and smaller. Carpathian Mts. Var. **Biebersteìnii,** Jancz. (*R. Biebersteìnii*, Berl. *R. caucásicum*, Bieb. *R. macrobòtrys*, Hort.). Lvs. usually 5-lobed, with short obtuse lobes, cordate, not rugose, glabrescent or pubescent: racemes long; fls. reddish: fr. red or blackish purple. Caucasus. Var. **atropurpùreum,** Jancz. (*R. atropurpùreum*, C. A. Mey.). Lvs. subcordate or truncate, usually 3-lobed, with acutish lobes, not rugose, glabrescent or pubescent beneath, to 6 in. broad: racemes short; fls. purple; the disk inside without callosities: fr. red or blackish purple. Siberia.

3404. Ribes vulgare.—The common currant. (Natural size.) No. 15.

14. **multiflòrum,** Kit. Upright shrub with stout branches: winter buds large: lvs. roundish, subcordate or truncate, 3–5-lobed with acutish or obtusish, crenately dentate lobes, pubescent beneath, to 4 in. broad: racemes pendulous, dense, to 6 in. long, sometimes about 50-fld.; pedicels short; fls. greenish yellow; calyx-tube saucer-shaped; sepals reflexed; petals minute;

stamens and style equaling the sepals: fr. dark red, smooth. S. Eu. B.M. 2368. L.B.C. 14:1331. R.F.G. 23:138*a*. L.I. 31.

15. **vulgàre,** Lam. (*R. horténse,* Hedl. *R. satìvum,* Syme. *R. rùbrum* of many authors, not Linn.). Red or Garden Currants. Fig. 3404. Upright shrub, to 5 ft.: young growth pubescent and slightly glandular: lvs. thin, cordate or subcordate, 3–5-lobed, with short-ovate, acutish, serrate lobes, pubescent at least on the veins beneath, 1½–2½ in. broad: racemes drooping, many-fld., glabrous or nearly so; pedicels filiform, much longer than the ovate bracts; calyx-tube saucer-shaped, green or slightly purple inside between the stamens and the style with an elevated slightly 5-angled ring; anthers with a broad connective separating the cells: fr. red, whitish, or striped, juicy, the dried remnants of the fl. 5-angled at the base. W. Eu. S.E.B. 4:520. B.B. (ed. 2) 2:237. Var. **macrocárpum,** Jancz. (*R. acerifòlium,* Hort.). Of irregular habit on account of the lateral branchlets being partly without buds: lvs. large, deeply cordate, 3-lobed, with a very large middle lobe: racemes without lvs. at the base: fr. large, always red. To this variety belong most of the large-fruited "cherry currants," tenderer than the typical form. *R. vulgare* is the parent of most of the cult. currants. Some of the hardier and smaller-fruited varieties are probably crosses with the hardier *R. rubrum;* they have been named *R. Houghtoniànum,* Jancz. Other hybrids of this species are *R. Goudùnii,* Jancz. (*R. vulgare* × *R. petræum*). *R. Koehneànum,* Jancz. (*R. vulgare* × *R. multiflorum*) and *R. futùrum,* Jancz. (*R. vulgare* × *R. Warscewiczii*).

16. **rùbrum,** Linn. (*R. Schléchtendalii,* Lange. *R. sylvéstre,* Syme. *R. scándicum,* Hedl.). Northern Red Currant. Shrub, to 6 ft.: young growth usually glabrous: lvs. truncate, rarely subcordate, 3–5-lobed, usually nearly glabrous, to 5 in. across: racemes usually spreading; pedicels short; bracts very small; fls. greenish or brownish; calyx-tube saucer-shaped, without prominent ring inside; anthers with contiguous cells: fr. usually red, juicy, the dried remnants of the fl. circular at the base. Cent. and N. Eu. N. Asia. S.E.B. 4:522. Var. **pubéscens,** Swartz. Young shoots slightly pubescent: lvs. pubescent beneath: racemes shorter; fls. brown or pinkish: fr. small. N. Eu. Var. **glabéllum,** Trautv. & Mey. Young branchlets and lvs. glabrous: fls. larger, pink or brownish red: fr. larger. N. Asia.—*R. rubrum* is rare in cult. outside of the gardens of N. Eu. where forms with red, pink or whitish frs. are grown. Besides *R. Houghtonianum,* mentioned under the preceding species, two other crosses of *R. rubrum* are known: *R. pállidum,* Otto. & Dietr. (*R. rubrum* × *R. petræum*), and *R. holosericeum,* Otto & Dietr. (*R. rubrum* × *R. petræum* var. *caucasicum*).

17. **fasciculàtum,** Sieb. & Zucc. (*R. japónicum,* Carr., not Maxim. *R. alpìnum japónicum,* Nichols.). Shrub, to 4 ft., with upright or ascending branches: lvs. subchartaceous, truncate to cordate, 3–5-lobed, with obtusish lobes, glabrous or slightly pubescent, to 5 in. across: fls. dicœcious, small, greenish; male fls. in 4–9-fld. clusters, pistillate fls. 2–4; calyx-tube cup-shaped; anthers subsessile: fr. subglobose, scarlet, glabrous, ½in. across, insipid. April, May; fr. in Sept., Oct. Japan. Var. **chinénse,** Maxim. (*R. Billiárdii,* Carr.). Lvs. larger, persisting until the beginning of the winter, lobes more acutish, pubescent beneath like the petioles and young branchlets. N. China. S.T.S. 1:38. M.D.G. 1899:571.—Handsome shrub chiefly valued for its late persisting foliage and the bright scarlet berries remaining on the branches during the whole winter.

18. **alpìnum,** Linn. (*R. opulifòlium,* Hort.). Alpine Currant. Dense shrub, attaining 8 ft. and as much or more through, with upright sts. and spreading branches, nearly glabrous: lvs. truncate or subcordate, 3-lobed, rarely 5-lobed, with obtuse or acutish dentate lobes, 1–2 in. across: fls. dicœcious, small, greenish, in upright racemes, the male 1–2½, the female ¾–1½ in. long; the calyx-tube nearly flat; sepals ovate, petals minute; filaments very short: fr. subglobose, scarlet, glabrous, insipid. Eu. L.B.C. 15:1486. S.E.B. 4:519. R.F.G. 23:135.—Several named varieties of little importance are known; the best known are: Var. **pùmilum,** Lindl. (var. *hùmile,* A. Braun). Dwarf form with smaller lvs. Var. **laciniàtum,** Kirchn. Lvs. more deeply lobed and incisely toothed. Var. **aùreum,** Bean (var. *pùmilum aùreum,* Pynaert, var. *fòlìis-aùreis,* Hort.). Dwarf form with yellowish foliage. R.B. 4:233. The pistillate fruiting form is sometimes distinguished as var. *bacciferum,* Loud., and the staminate sterile form as var. *stérile,* Loud.—The Alpine currant is a desirable shrub of dense habit, unfolding very early its bright green foliage, adorned in summer and autumn with bright scarlet berries; it is one of the best shrubs to plant as undergrowth and in shady places.

19. **diacántha,** Pall. (*R. saxátile,* Pall.). Upright shrub, to 6 ft.: branches glabrous, slender, upright, with paired small slender prickles at the nodes or unarmed: lvs. oval or cuneate-obovate, 3-lobed with sparingly dentate, obtusish lobes, glabrous, lustrous, with obsolete veins, ¾–1¾ in. long; petioles about ½in. long: fls. dicœcious, small, greenish, in upright racemes, the staminate about 1¼ in. long, the pistillate ½–¾in. long; calyx-tube flat; sepals oval, petals minute: fr. subglobose or somewhat ovoid, scarlet. N. Asia.—Like the preceding species desirable for its bright green more lustrous foliage and for its scarlet fr., but habit upright, not spreading.

20. **lacústre,** Poir. Swamp Black Currant, or Swamp Gooseberry. Shrub with slender weak sts., usually densely bristly; prickles slender, often clustered: lvs. nearly orbicular, cordate, deeply 3–7-lobed, with acutish, incisely dentate lobes, glabrous or nearly so, 1⅓–2 in. across: racemes spreading or drooping, 10–15-fld.; fls. greenish or purplish; calyx-tube saucer-shaped; sepals spreading, broad and short; stamens very short: fr. subglobose, purple-black, with gland-tipped bristles. Newfoundland to Alaska, south to Mass., Mich., Minn., Colo., and Calif. L.B.C. 9:884. B.M. 6492.

Section 2. Grossularia. Gooseberries.

21. **níveum,** Lindl. (*Grossulària nívea,* Spach). Shrub, to 8 ft., upright or ascending: branches reddish brown, with stout brown prickles ½–¾in. long, without bristles: lvs. suborbicular, thin, 3–5-lobed, with

3405. Ribes hirtellum.—Parent of some of the American garden gooseberries. (×½)

few-toothed obtusish lobes, sparingly pubescent or glabrous, ¾–1½ in. long: fls. 1–4, white, on slender peduncles; bracts ovate, small, much shorter than the filiform pedicels; ovary glabrous; tube campanulate, sepals narrowly lanceolate, ¼–½in. long; stamens slightly longer than the sepals, with pubescent fila-

ments: fr. globose, bluish black, glabrous, subacid. Idaho and Wash. to Nev. B.R. 1962.—Attractive in bloom with its numerous white fls.

22 **curvàtum,** Small (*Grossulària curvàta,* Cov. & Brit.). Diffusely branched shrub, to 3 ft., with slender reddish brown or purplish branches, spines slender, about ⅛in. long: lvs. suborbicular, cuneate to subcordate, with obtusish, toothed lobes, sparingly pubescent, ½–1 in. across: fls. 1–5, white, on slender peduncles; bracts ovate, often 3-lobed, ciliate, much shorter than the slender pedicels; ovary glandular or pubescent; tube broadly campanulate; sepals linear-spatulate, about ¼in. long, revolute; petals small, lanceolate, toothed; stamens conspicuous, as long as the sepals, with villous filaments: fr. globose, greenish, ¼–⅓in. across, glabrous. Ga. to La. and Texas.—Graceful little shrub, similar to the preceding species, but slenderer and more spreading; perfectly hardy at the Arnold Arboretum.

23. **missouriénse,** Nutt. (*R. grácile* Pursh, not Michx. *R. rotundifòlium,* Jancz., not Michx. *Grossulària missouriénsis,* Cov. & Brit.). Shrub, to 6 ft., with smooth or sometimes bristly, grayish or whitish branches: spines about ¾in. long or shorter: lvs. suborbicular, broadly cuneate to subcordate at the base, 3–5-lobed, with coarsely dentate obtusish lobes, pubescent beneath, ¾–2⅓in. broad: fls. greenish white, 2–3, on slender peduncles ⅓–¾in. long; pedicels slender, much longer than the bracts; ovary glabrous; calyx-tube cylindric-campanulate; sepals linear, about ⅓in. long; filaments glabrous, nearly twice as long as sepals; style pubescent below: fr. globose, ⅓–½in. across, purplish, glabrous, subacid. Ill. to Minn., S. D., Kans., Mo. and Tenn. B.B. (ed. 2) 2:240.

24. **oxyacanthoìdes,** Linn. (*Grossulària oxyacanthoìdes,* Mill.). Low shrub with slender, often reclining branches, usually more or less bristly and with spines about ⅓in. long, sometimes nearly wanting: lvs. suborbicular, cordate to broadly cuneate at the base, deeply 5-lobed with dentate lobes, slightly pubescent or nearly glabrous, 1–2 in. broad: peduncles very short, scarcely exceeding the bud-scales, 1–2-fld.; pedicels short: fls. greenish white; sepals narrow-oblong, little longer than the tube; stamens somewhat shorter than the sepals: fr. globose, smooth, red, slightly bloomy, edible. Newfoundland to Brit. Col., south to Mont., N. D., and Mich. B.B. (ed. 2) 2:240.—The plant cult. as *R. oxyacanthoides* is usually *R. hirtellum* or *R. inerme.*

25. **setòsum,** Lindl. (*R. saximontànum,* E. Nelson. *Grossulària setòsa,* Cov. & Brit.). Shrub, to 3 ft., with reddish brown usually bristly branches: spines subulate, ¾in. or less long: lvs. suborbicular, cordate to truncate, rarely broadly cuneate, 3–5-lobed, with dentate lobes, finely pubescent and usually somewhat glandular, ½–1½ in. wide: fls. 1–4, white; calyx-tube cylindric-campanulate, glabrous, about twice as long as the sepals; petals half or two-thirds as long as the sepals, as long as the stamens; style pubescent below: fr. red to black, glabrous or somewhat bristly. Idaho to Assiniboia, S. D., and Wyo. B.R. 1237. B.B. (ed. 2) 2:240.

26. **hirtéllum,** Michx. (*R. saxòsum,* Hook. *R. grácile,* Jancz., not Michx. *R. oxyacanthoìdes* of many authors, not Linn. *Grossulària hirtélla,* Spach). Fig. 3405. Shrub, to 4 ft., with slender branches, usually unarmed, sometimes with subulate small spines, only at the base of vigorous shoots bristly: lvs. suborbicular, usually cuneate, incisely 3–5-lobed, with dentate, acute lobes, glabrous or sparingly pubescent, 1–2 in. broad; petioles often with long hairs: fls. 1–3, greenish; bracts much shorter than pedicels; ovary glabrous, rarely with stalked glands; calyx-tube narrow-campanulate; sepals oblong, often purplish, glabrous; stamens as long as sepals, petals half as long; style pubescent: fr. globose, smooth or rarely with stalked glands, purple or black, edible. Newfoundland to Pa. and W. Va., west to Man. and S. D. B.M. 6892 (as *R. oxyacanthoides*). B.B. (ed. 2) 2:241.—This is the most important of the edible American gooseberries and there are in cult. several hybrids with *R. Grossularia,* designated as *R. rústicum,* Jancz., to which such varieties as Downing,

3406. Ribes Cynosbati. (×⅓)

Houghton, and Smith are thought to belong, while Pale Red appears to be of pure *R. hirtellum* parentage.

27. **rotundifòlium,** Michx. (*R. triflòrum,* Willd. *Grossulària rotundifòlia,* Cov. & Brit.). Shrub, to 3 ft., with slender brown branches, or the younger ones gray; spines small, sparse, rarely over ⅛in. long: lvs. suborbicular, broadly cuneate to subcordate at the base, usually 3-lobed, with coarsely dentate obtusish lobes, minutely pubescent or nearly glabrous, 1–2 in. broad: fls. 1–3, purplish; peduncles slender; pedicels much longer than the small bracts; fls. greenish purple; calyx-tube campanulate; sepals linear, about twice as long as tube; petals obovate; stamens somewhat longer than the sepals; fr. globose, smooth, purplish. L.B.C. 11:1094. G.O.H. 3. B.B. (ed. 2) 2:241.—This species is rare in gardens; usually the following species is cult. under this name.

28. **divaricàtum,** Douglas (*R. divaricàtum* var. *Douglasii,* Jancz. *R. irriguum,* Koehne, not Douglas. *Grossulària divaricàta,* Cov. & Brit.). Shrub, to 10 ft.; branches gray to brown, with stout spines ½–¾in. long, sometimes unarmed and sometimes bristly: lvs. suborbicular, cordate to subtruncate, usually 5-lobed, with coarsely crenate-dentate obtusish lobes, pubescent beneath along the veins or glabrous, 1–2½ in. broad: fls. 2–4, greenish purple; peduncles slender; bracts ovate, small; ovary glabrous; calyx-tube campanulate; sepals oblong, longer than tube; stamens slightly longer than the sepals: fr. globose, smooth, black or dark purple. Brit. Col. to Calif. B.R. 1359. Var. **pubiflòrum,** Koehne (*R. divaricàtum* var. *villòsum,* Zabel). Lvs. pubescent: fls. smaller: vigorous sts. bristly. Var. **montànum,** Jancz. Low shrub with almost prostrate branches, smaller in every part. Calif.

29. **inérme,** Rydb. (*R. hirtéllum Purpùsii,* Koehne. *R. oxyacanthoìdes* var. *nevadénse* and var. *irriguum,* Jancz. *Grossulària inérmis,* Cov. & Brit.). Shrub, to 6 ft.: branches with few small spines less than ½in. long, sometimes unarmed, rarely with a few bristles: lvs. suborbicular, cordate to truncate at the base, 3–5-lobed with crenate-dentate obtusish lobes, glabrous or sometimes pubescent, ½–2½ in. broad: fls. 1–4, green or purplish; bracts small; ovary glabrous; calyx-tube narrowly campanulate; sepals oblong, slightly shorter than tube; stamens shorter than sepals: fr. purplish red, smooth, edible. Mont. to Brit. Col. to Calif. and New Mex.

30. **Grossulària,** Linn. (*Grossulària reclinàta,* Mill.). Shrub, to 3 ft.: branches ascending or reclining, with stout spines, about ½in. long, mostly in 3's, st. sometimes bristly: lvs. suborbicular, cordate to broadly

cuneate, 3–5-lobed with crenulate-dentate, obtusish lobes, pubescent or glabrous, ¾–2½ in. broad: fls. 1–2, greenish; bracts small; ovary pubescent and often glandular; calyx-tube short-campanulate, about as long as the usually pubescent reflexed sepals; stamens shorter than sepals; style pubescent: fr. globose to ovoid, usually pubescent and glandular-bristly. Eu., N. Afr., Caucasus. S.E.B. 4:518. R.F.G. 23:134. Var. **Ùva-crìspa,** Smith (var. *pubéscens,* W. D. Koch. *R. Ùva-crìspa,* Linn.). Low shrub: lvs. smaller, pubescent: ovary pubescent, not glandular: fr. very small, yellowish, pubescent. Var. **reclinàtum,** Berl. (var. *glàbrum,* W. D. Koch. *R. reclinàtum,* Linn.). Lvs., calyx and fr. glabrous.—This species is the parent of the European gooseberries.

31. **Cynósbati,** Linn. (*R. grácile,* Michx. *Grossulària Cynósbati,* Mill.). Fig. 3406. Shrub, to 5 ft., but usually lower, with spreading branches: spines slender, 1–3, ¼–⅖in. long: bristles few and weak or none: lvs. orbicular, truncate or cordate, deeply 3–5-lobed, with crenately or incisely dentate lobes, usually pubescent beneath, ¾–1½ in. broad: fls. 1–3, on slender stalks, green, ovary setose; calyx-tube broadly campanulate; sepals shorter than tube; petals about half as long; stamens little longer than petals: fr. globose or ovoid, vinous-red, prickly, edible. New Bruns. to N. C., west to Man., Mo. and Ala. B.B. (ed. 2) 2:239. Var. **inérme,** Rehd. Fr. without prickles, smooth. Var. **glabràtum,** Fern. Lvs. glabrous or only sparingly pilose on the veins.

32. **alpéstre,** Decne. Upright shrub, to 10 ft.: branches with stout spines to ¾in. long and usually in 3's, often bristly: lvs. cordate to truncate, 3–5-lobed, with incisely dentate, obtusish lobes, 1–2 in. broad: fls. 1–2, short-peduncled, greenish or sometimes reddish; calyx-tube campanulate, glandular; sepals oblong, reflexed, about as long as tube; petals white, elliptic, at least half as long as sepals; ovary with gland-tipped bristly hairs: fr. globose or ovoid, to ⅗in. long, with gland-tipped bristles. Himalayas, W. China. Var. **gigantèum,** Jancz. Shrub, to 15 ft. with stout spines over 1 in. long: fls. glabrous, with smooth ovary: fr. larger, smooth, green. W. China.—*R. alpestre* may prove to be a desirable hedge-plant, hardy at least as far north as Mass.; in W. China, E. H. Wilson found hedges 6–8 ft. high so thick and spiny that a yak, an animal as strong as an ox, could not break through them.

33. **pinetòrum,** Greene (*Grossulària pinetòrum,* Cov. & Brit.). Shrub, to 6 ft., with spreading and reclining branches, without bristles: spines 1–3, ½in. long or less: lvs. suborbicular, thin, cordate, usually 5-cleft, with obtuse irregularly incised-dentate lobes, dull green and glabrous above, puberulous beneath at least on the veins, ¾–1½ in. broad: fls. solitary, orange-red; bracts small, ciliate; ovary bristly; calyx-tube campanulate, pilose; sepals spatulate, reflexed, nearly twice as long as tube; petals orange, only one-third shorter than the sepals; stamens as long as petals: fr. globose, prickly, purple. Ariz., New Mex.—Hardy at the Arnold Arboretum; very striking on account of the unusual orange-red color of the fls.

34. **Roèzlii,** Regel (*R. amíctum,* Greene. *R. áridum,* Greene. *R. Wilsoniànum,* Greene. *Grossulària Roèzlii,* Cov. & Brit.). Shrub, to 5 ft., with pubescent branchlets; bristles wanting; spines slender, about ½in. long: lvs. thin, reniform-orbicular, truncate or subcordate, 3–5-lobed with incisely crenate-dentate lobes, finely pubescent on both sides or glabrous above, ½–1 in. broad: fls. 1–3, purple; bracts longer or sometimes shorter than pedicels; ovary bristly and usually white-hairy; calyx-tube cylindric-campanulate, pubescent; sepals lanceolate, longer than tube; petals white or pinkish, nearly half as long as sepals; stamens slightly longer than sepals; anthers sagittate: fr. globose, prickly, purple. Cent. and S. Calif. Gt. 28:982, figs. 1–3. R.H. 1899, p. 177. Var. **cruéntum,** Rehd. (*R. cruéntum,* Greene. *R. amíctum* var. *cruéntum,* Jancz.). Lvs. and fls. glabrous. Ore. to Cent. Calif. B.M. 8105.

3407. Ribes Lobbii. (Natural size.)

35. **Lóbbii,** Gray (*Grossulària Lóbbii,* Cov. & Brit.). Fig. 3407. Shrub, to 6 ft.; branchlets pubescent, rarely with a few bristles; spines 3, ½–¾in. long: lvs. thin, suborbicular, cordate or subcordate, 3–5-lobed, with crenate-dentate obtuse lobes, sparingly pubescent when young and glandular, or glabrous above, ¾–1½ in. R.H. 1908, p. 32.—Very handsome in fl., particularly on account of the contrast between the purple calyx and the white petals.

broad: fls. 1–2, purple-red, rather large; peduncles glandular-pubescent; bracts ovate, as long as pedicels or shorter; ovary stipitate, glandular; calyx-tube narrow-campanulate, finely pubescent; sepals reflexed, 2–3 times as long as the tube; petals whitish, half as long as sepals; stamens twice as long as petals; anthers oblong, glandular on back: fr. ovoid, purple, densely glandular. Brit. Col. to N. Calif. B.M. 4931 (as *R. subvestitum*). R.H. 1908, p. 30. G.C. II. 19:11.

3408. Ribes speciosum, the fuchsia-flowered gooseberry. (×½)

36. **speciòsum**, Pursh (*R. fuchsioìdes*, Moc. & Sessé. *Grossulària speciòsa*, Cov. & Brit.). Fig. 3408. Evergreen shrub, to 12 ft., with stout sts.; branches usually bristly; spines 3, stout, ½–¾in. long: lvs. coriaceous, orbicular to obovate, rounded to broadly cuneate, 3–5-lobed or crenate-dentate, glabrous or sparingly glandular-hairy, lustrous above, ½–1½ in. long: fls. 2–4, bright red, on slender pendulous peduncles, 4-merous; tube broadly campanulate; sepals upright, parallel, about ⅓in. long, about as long as the scarlet convolute petals; stamens 2–4 times as long as petals: fr. ovoid, glandular-bristly, red. Calif. B.R. 1557. B.M. 3530. Gn. 9, p. 586; 31, p. 333; 34, p. 230. G.C. III. 34:71. R.H. 1900:98; 1908, p. 29. J.H. III. 54:207.—One of the most showy gooseberries, but not hardy North.

R. aciculàre, Smith. Allied to R. Grossularia. Spiny shrub: branches slender, bristly: lvs. 3–5-lobed, usually glabrous, about 1 in. broad: fls. pinkish; sepals reflexed; style glabrous: fr. smooth, rarely hispid, red or greenish yellow. Cent. Siberia, Altai Mts. The earliest gooseberry to burst into leaf.—*R. affine*, Douglas= R. laxiflorum.—*R. álbidum*, Paxt.=R. glutinosum albidum.—*R. ambíguum*, Maxim. Low unarmed shrub: lvs. roundish, 3–5-lobed, with short, obtuse lobes, viscid-glandular beneath, to 2 in. broad: fls. 1–2, greenish; tube saucer-shaped; stamens shorter than sepals: fr. green, glandular-bristly. Japan.—*R. ambíguum*, Wats. =R. Watsonianum.—*R. búrejénse*, F. Schmidt. Allied to R. alpestre. Spiny and bristly shrub, to 3 ft.: lvs. deeply 3–5-lobed, pubescent and glandular, to 2 in. broad: fls. 1–2, reddish brown or pale: fr. greenish, prickly. N. E. Asia.—*R. californícum*, Hook. & Arn.=R. occidentale.—*R. Carrièrei*, Schneid. (R. intermedium, Carr., not Tausch. R. glutinosum albidum × R. nigrum). Intermediate between the parents: lvs. without the odor of R. nigrum: fls. pink, glandular, in horizontal racemes to 3 in. long: fr. black, not bloomy. Originated with Billiard at Fontenay-aux-Roses, France.—*R. cognàtum*, Greene (R. palousense, Elmer). Allied to R. oxyacanthoides. Spiny shrub to 10 ft., sometimes without bristles: fls. 2–5, white or whitish; calyx-tube cylindric, longer than sepals; stamens about half as long as sepals: fr. smooth. Wash., Ore.—*R. coloradénse*, Cov. (R. laxiflorum var. coloradense, Jancz.). Allied to R. glandulosum. Unarmed procumbent shrub: lvs. usually 5-lobed: sepals longer, glandular-pubescent outside: fr. black, not bloomy. Colo.—*R. Culverwéllii*, Macfarlane (R. Schneideri, Maurer. R. nigrum × R. Grossularia). Unarmed shrub: fls. similar to those of R. nigrum; the glandless lvs. and the infl. resembling those of the gooseberry: fr. dark red, hairy. G.C. III. 12:271; 44:120. J.H.S. 28, pp. 169–73. Originated in England and afterward also in Germany. Var. *wollénse* (R. wollense, Bean). Lvs. with a few glands beneath: fr. glabrous, shining black.—*R. dikùscha*, Fisch. Allied to R. bracteosum. Unarmed shrub: lvs. 3–5-lobed, glabrous, glandular beneath, to 5 in. broad: fls. white, tomentose, in upright racemes to 3 in. long; bracts linear, small: fr. bluish black, slightly bloomy. E. Siberia.—*R. erythrospérmum*, Cov. & Leiberg. Allied to R. glandulosum. Unarmed prostrate shrub: lvs. deeply 3–5-lobed, finely pubescent and glandular: racemes erect, 6–10-fld.; bracts about as long as pedicels; fls. yellow or salmon-colored: fr. glandular-hairy, scarlet. Ore. G.F. 10:184.—*R. fontenayénse*, Jancz. (R. sanguineum fontenayense, Hort. R. Grossularia × R. sanguineum). Intermediate between the parents: unarmed shrub: lvs. subcoriaceous, pubescent beneath: racemes horizontal or pendulous, stalked, 3–6-fld.; fls. vinous-red, pubescent: fr. purplish black. Originated in France with Billiard at Fontenay-aux-Roses.—*R. futúrum*, Jancz. (R. vulgare × R. Warscewiczii). Intermediate between the parents: fls. brownish red or pinkish: fr. dark red. Raised by Janczewski at Lemberg, Galicia.—*R. Gayánum*, Steud. (R. villosum, Gay, not Nutt. R. trilobum, Mey.). Evergreen unarmed shrub, to 4 ft., with pubescent branches: lvs. slightly 3-lobed, pubescent, 1–2 in. across: fls. dicœcious, yellow, honey-scented, in erect dense pubescent racemes 1–2 in. long: fr. purple-black, hairy. Chile. B.M. 7611. Not hardy North.—*R. Giráldii*, Jancz. Allied to R. diacantha. Spiny shrub, to 2 ft., with spreading bristly branches: lvs. 3–5-lobed, the middle lobe longer, pubescent and glandular, about 1½ in. broad: fls. dicœcious, brownish, in upright racemes: fr. scarlet, glandular-bristly. N. W. China.—*R. glaciále*, Wall. Allied to R. alpinum. Unarmed shrub, to 15 ft.: lvs. cordate to truncate, 3–5-lobed, the middle lobe elongated, acute or acuminate, glandular, to 2⅓ in. long: fls. dicœcious, greenish white or purplish, in upright racemes: fr. glabrous, scarlet, finally black. Himalayas, W. China.—*R. glutinòsum*, Benth. (R. sanguineum var. glutinosum, Loud.). Allied to R. sanguineum. Unarmed shrub, to 12 ft., with glandular-viscid pubescence: lvs. cordate, 3–5-lobed, glandular beneath, otherwise nearly glabrous, to 4 in. broad: racemes pendulous, to 4 in. long; bracts recurved; fls. pink-carmine: fr. black, glandular-hairy. Calif. Var. *álbidum*, Jancz. (R. sanguineum albidum, Kirchn. R. albidum, Paxt.). Fls. white, tinged pinkish, often confused with R. sanguineum var. albescens, which see.—*R. Hénryi*, Franch. Evergreen unarmed shrub, glandular: lvs. elliptic, crenulate, to 4 in. long: fls. dicœcious, small, greenish; pistillate racemes 7–9-fld., with large green bracts: fr. oblong, green, glandular. Cent. China.—*R. himalayénse*, Decne. Allied to R. petræum. Unarmed shrub, to 12 ft.: lvs. cordate, 3–5-lobed, with acute or obtusish lobes, glandular above, pubescent or glabrous beneath, to 5 in. broad: fls. greenish, tinged purple, in racemes to 5 in. long, broadly campanulate: fr. red or black. Himalayas, W. China.—*R. hudsonianum*, Rich. Allied to R. bracteosum. Unarmed shrub: lvs. 3–5-lobed, resinous-dotted beneath, 1½–4 in. broad: fls. white, in loose racemes about 2 in. long; bracts setaceous, as long as the pedicel: fr. black, smooth. Hudson Bay to Alaska, south to N. Minn. B.B. (ed. 2) 2:237.—*R. integrifólium*, Philippi. Evergreen unarmed shrub, to 3 ft.: lvs. coriaceous, lanceolate, dentate above the middle, glabrous, 1–1¾ in. long: fls. dicœcious, yellow, in pendent racemes ¾–1¼ in. long: fr. small, purplish black. Chile; not hardy North. Gt. 30:1047.—*R. irríguum*, Douglas. Allied to R. oxyacanthoides. Spiny shrub; to 10 ft., usually without bristles: lvs. 3–5-lobed, 1–2½ in. broad: fls. whitish, the peduncle exceeding the bud-scales; sepals nearly twice as long as tube; stamens about as long as petals: fr. smooth. Brit. Col. to Ore., Mont., Idaho. Has been confused with R. cognatum, R. divaricatum, and R. inerme, which see.—*R. japónicum*, Maxim. Allied to R. bracteosum. Shrub, to 6 ft.: branchlets hairy: lvs. cordate, 5-lobed, pubescent and glandular beneath, to 6 in. broad: fls. greenish or brownish, tomentose and glandular, in upright racemes to 8 in. long; bracts linear: fr. black, smooth. Japan.—*R. latifólium*, Jancz. Allied to R. petræum. Unarmed shrub, to 6 ft.: lvs. 3–5-lobed, with acute lobes, glabrous or glandular-hairy, to 7 in. broad: fls. in racemes to 3½ in. long, blood-red, campanulate: fr. red, rather large. Japan, Manchuria.—*R. laurifólium*, Jancz. Evergreen shrub, to 6 ft.: lvs. coriaceous, ovate to ovate-oblong, crenate-serrate, glabrous, 2–4 in. long: fls. dicœcious, greenish, flat; stamens and petals much shorter than sepals; staminate racemes pendulous, 1–1¾ in. long; pistillate upright, ¾in. long: fr. ellipsoid, ⅜in. long, pubescent, reddish. W. China. B.M. 8543. G.C. III. 55:239. Gn. 76, p. 143; 79, pp. 170, 171. J.H.S. 38, p. 54, fig. 36. Not hardy North.—*R. laxiflórum*, Pursh. Allied to R. glandulosum. Unarmed procumbent shrub: lvs. deeply 5-lobed, slightly pubescent beneath, 2–4 in. broad: racemes upright-spreading; sepals longer, pubescent, but not glandular: fr. dark purple, bloomy, glandular. Alaska to N. Calif. Var. *coloradénse*, Jancz.=R. coloradense.—*R. léntum*, Cov. & Rose=R. montigenum.—*R. leptánthum*, Gray. Spiny slender shrub, to 4 ft.; branchlets slightly pubescent: lvs. usually truncate, deeply 3–5-lobed, glabrous or pubescent, ¼–¾in. broad: fls. 1–3, white, tinged with pink; calyx-tube cylindric; sepals reflexed: fr. black, lustrous. Colo., Utah, New Mex. and Ariz. Gt. 53, p. 409. Graceful small shrub. Var. *quercetòrum*, Jancz.=R. quercetorum.—*R. longeracemòsum*, Franch. Allied to R. petræum. Unarmed shrub, to 10 ft.: lvs. cordate, 3–5-lobed, with acute or acuminate lobes, glabrous, to 6 in. broad: racemes pendulous, to 12 in. long, thinly set with greenish or pinkish fls.; calyx-tube broadly campanulate; sepals upright; bracts oval, half as long as the slender pedicels, persistent: fr. black, edible. W. China. Var. *Wilsonii*, Jancz. Young branchlets red: racemes shorter; fls. salmon-red. Cent. China.—*R.*

lùridum, Hook. f. & Thom. Allied to R. alpinum. Unarmed shrub; branchlets glabrous, red: lvs. 3–5-lobed, with obtusish lobes, glabrous or nearly so, glandular, to 2 in. broad: fls. dicœcious, dark purple, in upright racemes, the staminate 1–2 in. long, the pistillate shorter: fr. black, glabrous. Himalayas, W. China.—*R. malvàceum*, Smith (R. sanguineum malvaceum, Loud.). Allied to R. sanguineum. Unarmed shrub: lvs. rough above, grayish tomentose and glandular beneath: fls. pink or purple, smaller, white-pubescent and glandular; tube longer than the sepals: fr. viscid-pubescent. Calif. —*R. Márshallii*, Greene. Allied to R. Lobbii. Spiny shrub with puberulent branchlets: lvs. deeply cordate, 3–5-lobed, glabrous, 1–1½ in. wide: fls. solitary, large, purplish; sepals ½–⅔in. long; stamens slightly longer; petals salmon-pink: fr. purplish black, prickly. Calif.—*R. Maximòwiczii*, Batal. Allied to R. alpinum. Shrub, to 10 ft.; branchlets pubescent: lvs. slightly 3–5-lobed, middle lobe much longer, or undivided and ovate, pubescent on both sides, 1½–4 in. long: fls. dicœcious, in upright racemes 1–2 in. long: fr. glandular-hairy, red. N. W. China.—*R. Ménziesii*, Pursh (R. subvestitum, Hook. & Arn.). Allied to R. Lobbii. Spiny shrub, to 6 ft.; branchlets pubescent and bristly: lvs. deeply 3–5-lobed, pubescent and glandular beneath, 1–2 in. broad: fls. purple, with white petals; stamens as long as the sepals, with ovate-lanceolate anthers: fr. glandular-bristly. Ore. to Calif. G.C. III. 45:242. R.H. 1908, p. 31.—*R. Meÿeri*, Maxim. Allied to R. petræum. Unarmed shrub, to 10 ft.: lvs. usually 5-lobed, with acutish lobes, glabrous or glandular-hairy above, to 3½ in. broad: racemes horizontal, lax, to 2 in. long: fls. purplish, nearly sessile, small, with upright sepals: fr. black, lustrous. Cent. Asia, W. China. Var. *turkestánicum*, Jancz. Lvs. obtusely lobed: racemes longer; fls. blood-red. Turkestan.—*R. mogollònicum*, Greene=R. Wolfii.—*R. mólle*, Howell, not Poepp.=R. montigenum.—*R. montígenum*, McClatchie (R. lacustre var. molle, Gray. R. lentum, Cov. & Rose). Allied to R. lacustre. Sts. bristly: lvs. pubescent and glandular: racemes few-fld.: fr. red, glandular-bristly, edible. Wash. to Mont., Idaho to New Mex.—*R. moupinénse*, Franch. Allied to R. petræum. Shrub, to 15 ft.: lvs. 3–5-lobed, with acute or acuminate lobes, sparingly glandular, otherwise glabrous, to 6 in. broad: racemes pendulous, loose, 1½–5 in. long; fls. greenish tinged with red, or red; sepals upright: fr. black, lustrous. W. China.—*R. nevadénse*, Kellogg (R. sanguineum var. variegatum, Wats. R. variegatum, A. Nelson). Allied to R. sanguineum. Unarmed shrub: lvs. thin, 3–5-lobed, sparingly pubescent or glabrous: fls. smaller, rose-colored; sepals about twice as long as the tube; petals white: fr. blue, glaucous. Ore., Calif., Nev.—*R. occidentàle*, Hook. & Arn. (R. californicum, Hook. & Arn.). Allied to R. Roezlii. Spiny shrub, to 6 ft.: lvs. usually 5-lobed, glabrous or nearly so, about 1 in. broad: fls. green or purplish; calyx-tube about as long as broad; sepals glabrous, except a tuft of hairs at the apex; stamens as long as sepals: fr. prickly. Cent. Calif.—*R. orientàle*, Desf. Allied to R. alpinum. Unarmed shrub, to 6 ft.: young growth glandular-viscid: lvs. lustrous above, pubescent beneath: fls. dicœcious, greenish, tinged with red, glandular, in upright racemes 1–2 in. long: fr. red, pubescent. S. E. Eu., W. Asia. B.M. 1583 (as R. resinosum).—*R. palousénse*, Elmer=R. cognatum.—*R. pulchéllum*, Turcz. Allied to R. diacantha. Spiny shrub, to 6 ft., glabrous: lvs. truncate to subcordate, deeply 3-lobed, to 2 in. broad: fls. purplish, in upright racemes, the staminate to 2½ in. long, the pistillate shorter: fr. large, red, glabrous. N. China, Transbaikal.—*R. quercetòrum*, Greene. Spiny slender shrub, sometimes bristly: lvs. 3–5-cleft, finely pubescent or usually glabrous, ½–¾in. long: fls. 2–3, pale yellowish with short-cylindric tube; petals shorter than the sepals, a little longer than the stamens: fr. smooth, purple. Cent. Calif. to Low. Calif.—*R. resinòsum*, Pursh=R. orientale.—*R. robústum*, Jancz. (R. niveum × R. hirtellum). Intermediate between the parents. Spiny vigorous shrub, only the stronger shoots bristly: fls. white or pinkish, but sepals broader and shorter and filaments shorter and less pubescent than in R. niveum: fr. black. Origin unknown.—*R. Saùndersii*, Jancz. (R. hudsonianum × R. nigrum). Intermediate between the parents: fls. pink, fading to whitish: fr. black. Originated in Ottawa.—*R. stenocàrpum*, Maxim. Allied to R. alpestre. Spiny shrub, often bristly: lvs. cordate, 3–5-lobed, glabrous or pubescent, about 1½ in. across: fls. 1–3, short-peduncled, reddish or pale; calyx-tube campanulate, shorter than the reflexed sepals; stamens scarcely longer than petals: fr. oblong, ¾–1 in. long, glabrous or hispid. N. W. China.—*R. subvestitum*, Hook. & Arn.= R. Menziesii.—*R. succirùbrum*, Zabel (R. niveum × R. divaricatum). Intermediate between the parents. Lvs. similar to those of R. niveum: fls. pink or pinkish; stamens 1½ times as long as sepals: fr. black, slightly pruinose. Originated at Gotha, Germany.—*R. ténue*, Jancz. Allied to R. alpinum. Unarmed slender shrub: lvs. 3–5-lobed, lobes acute, incisely dentate, the middle one longer, glandular, to 1½ in. long: fls. reddish brown or greenish, dicœcious, in upright racemes: fr. red. Cent. and W. China, Himalayas.—*R. trílobum*, Mey.=R. Gayanum.—*R. urceolàtum*, Tausch (R. multiflorum × R. petræum). Intermediate between the parents. Fls. reddish: fr. red. Origin unknown.—*R. ùtile*, Jancz. (R. Cynosbati × R. Grossularia). Intermediate between the parents. Lvs. similar to R. Grossularia: fls. slightly pubescent; ovary glabrous: fr. purplish, sometimes with a few spines. A more detailed description will be found under the name of "Mountain" in G.F. 9:456. It originated with the Shakers of Lebanon, N. Y.—*R. variegàtum*, A. Nelson =R. nevadense.—*R. viburnifòlium*, Gray. Evergreen, unarmed, aromatically scented shrub, to 8 ft.: branchlets glandular: lvs. ovate or oval, obtuse, coarsely toothed, glossy above, resinous-dotted beneath, ¾–1¾ in. long: fls. dark pink, in upright racemes: fr. ovoid, red. Low. Calif., Santa Catalina Isl. B.M. 8094.—*R. villòsum*, Gay, not Nutt.=R. Gayanum.—*R. Vilmòrinii*, Jancz. Allied to R. alpinum. Unarmed shrub, to 6 t.: lvs. 3–5-lobed with obtuse or acutish lobes, glandular above, about 1 in. broad: fls. dicœcious in short upright racemes, greenish or tinged reddish brown: fr. small, black, glabrous or glandular. W. China.—*R. Warscewiczii*, Jancz. Allied to R. rubrum. Unarmed shrub, to 6 ft.: lvs slightly 3–5-lobed, slightly pubescent below, to 4 in. broad: fls. larger, pinkish, in pendent racemes 2 in. long: fr. larger, purplish black, very acid. E. Siberia.—*R. Watsoniànum*, Koehne (R. ambiguum, Wats., not Maxim.). Allied to R. pinetorum. Spiny shrub, upright or ascending: branches glandular, not bristly: lvs deeply 3–5-lobed, sparingly pubescent on the veins, 1–2 in. broad: fls. pinkish, pubescent; petals white, one-fourth shorter than sepals; stamens as long as petals: fr. greenish, prickly. Wash.—*R. Wólfii*, Rothr. (R. mogollonicum, Greene). Allied to R. sanguineum. Unarmed shrub, to 10 ft.: lvs. 3–5-lobed, pubescent on the veins and glandular beneath, 2–3½ in. broad: fls. greenish white, in upright long-stalked racemes, 1–1½ in. long: fr. black, bloomy, glandular-bristly. Colo., Utah, New Mex., Ariz. B.M. 8120.—*R. wollénse*, Bean=R. Culverwellii var. wollense.

ALFRED REHDER.

RÍCCIA (P. F. Ricci, Italian nobleman, patron of the botanist Micheli). *Ricciàceæ*. *Rìccia flùitans*, Linn., is one of the few flowerless or cryptogamous plants in cultivation aside from the ferns, mushrooms and selaginellas. It has been listed by one specialist in aquatics presumably for the benefit of students of botany. It is not generally advertised among aquarium plants. The form used in aquaria is the floating sterile state; the fruiting state (*R. canaliculàta*, Hoffm.) grows on the ground in muddy places. In this family of plants the plant-body is a thallus (i. e., a green, flattish body not differentiated into root, stem and leaves). The thallus of Riccia spreads out in green patches which are at first radiately divided, and the center of the plant often decays quickly. *R. fluitans* is distinguished from other species by the linear dichotomous thallus, with the capsule protuberant from the lower surface.

RICCIOCÁRPUS (*Riccia-fruited*). *Ricciàceæ*. The single formerly recognized species of this genus, *R. nàtans*, Corda, is offered abroad as an aquarium plant. It is a small floating plant, consisting of a single spatulate frond about ½in. or less long, more or less cleft or cordate at the larger end or dichotomously branched, from the under side of which many root-like bodies are emitted. It is widely distributed over the earth. From Riccia, the plant is distinguished by technical characters of archegonia and antheridia, and it has been united with that genus by some authors. A second species has recently been added to the genus, *R. velùtinus*, Steph., from W. Amer.; it appears not to have been listed for cultivators.

RICE: *Oryza*. **R. Flower:** *Pimelia*. **R., Mountain:** *Oryzopsis*. **R. Paper:** The Chinense rice paper is made from *Fatsia japonica*, which see.

RICHÁRDIA: *Zantedeschia*.

RICINOCÁRPOS (from *Ricinus* and Greek for *fruit*). *Euphorbiàceæ*. Tropical shrubs sometimes cult. for ornament; glabrous to stellate-tomentose, often heath-like: lvs. alternate, simple, entire, linear to lanceolate; stipules none: fls. small, solitary or clustered, rarely apetalous; calyx imbricate; stamens numerous; ovules 1 in each cell. Fifteen species of Austral. *R. pinifòlius*, Desf., NATIVE JASMINE, glabrous, lvs. linear; and *R. speciòsus*, Muell. Arg., tomentose, lvs. oblong, have occasionally been cult.

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RICINODÉNDRON (from *Ricinus* and Greek for *tree*). *Euphorbiàceæ*. Tropical trees with economic uses, but rarely cult.: juice milky: lvs. alternate, long-petioled, palmately 3–9-foliate, stipulate: fls. small, in loose panicles; calyx imbricate; petals connate or free; stamens numerous, filaments free; ovules 1 in each cell. Three or four species in Afr. *R. Heudelòtii*, Pierre, is a prominent plant in W. Afr.

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RÍCINUS (the name in classical languages applied to the castor bean seed and to a similar tick). *Euphorbiàceæ*. Plants cultivated for the oil of the seed and as tall annuals for the bold and ornamental foliage; useful for screens.

Herbaceous, or becoming small trees in the tropics, glabrous, or rarely subspinose, branching repeatedly from below the fl.-clusters: lvs. large, alternate, peltate, palmately 5–12-lobed, the lobes dentate or serrate; petiole with conspicuous glands: fls. monœcious, in terminal or apparently lateral racemes or subpaniculate, without petals or disk; calyx 3–5-parted, valvate; staminate fls. short-pedicelled, in the upper part of the raceme; stamens many, filaments much branched, no rudimentary pistil; pistillate fls. below, longer-pedicelled; styles 3, plumose: caps. generally covered with soft spinose processes, 3-celled, 1 ovule in each cell, explosively separating into 2-valved coccæ when ripe; seeds ovoid, with a large caruncle; seed-coat crustaceous, variously marked and colored; endosperm fleshy and oily; cotyledons broad, cordate or ovate.—Hundreds of forms are known, many so well marked as to deserve specific rank, were they not so thoroughly connected by intermediate forms and hybridizing so freely when brought together. Most botanists follow Mueller (De Candolle's Prodromus, vol. 15, pt. 2:1061, 1866) in referring them all to the one species. Probably a native of Afr., but now cult. and wild in most tropical and temperate lands.

3409. Fruit of castor bean, showing the capsules inside. (×1)

Castor beans have been cultivated from the earliest times for the oil of the seeds. The Hebrew name indicates that perhaps this is the plant referred to in the Book of Jonah as a gourd. The oil (castor-oil, *Oleum Ricini*) is used in medicine and in the arts and in some places in the preparation of food. The seed contains a poisonous principle, ricinin. For the cultivation of castor beans as a field crop, see "Cyclopedia of American Agriculture," 2:229. The chief castor-oil-producing region is in India, but some is grown in the United States, especially in Oklahoma.

3410. Ricinus communis.

Ricinus is one of the best plants for giving a tropical effect in beds and borders or planted singly. It thrives in rich well-drained sandy or clay loam, but is not suited for stiff clay or very sandy soil. For garden decoration the seeds may be planted in May where they are to grow, or sown indoors in small pots, two or three seeds each, in early spring, and after germination thinned to one plant to a pot. As they grow they may be transferred to larger pots and finally planted out. The castor beans have practically no insect or fungous enemies of importance. They have been erroneously supposed to keep away moles and malaria.

3411. Clump of Ricinus communis.

commùnis, Linn. Castor Bean. Castor-Oil Plant. Palma Christi. Figs. 3409–3411. Three to 15 ft. high when grown as an annual, 30–40 ft. in the tropics. The various varieties are distinguished by the size, color, and outline of the plant and lvs., the glands of the petiole, the number and size of the processes on the caps., the shape of the cotyledons, and especially the size, form, color, and markings of the seed, which show variations sufficient to distinguish individual plants, and even separate branches of the same plant. So far as the forms commonly in cult. are concerned, the species may be subdivided as follows:

A. *Markings of seed-coat marbled, distinct from the ground-color; seed less than twice as broad as thick; cotyledons elliptical or oblong, nearly truncate at base, petiole-glands various.*

B. *Seeds small to medium, brown-marked; petiole-glands flat, not projecting.* This includes most of the oil-producing varieties and the typical *R. communis* (illustrations, variety not designated: B.M. 2209. A.G. 17:363. F.W. 1868:98. Gn. 1, p. 541; 9, p. 460. Gt. 24, p. 281; 31, p. 20. Mn. 7, p. 223. R.H. 1861, pp. 9, 10. V. 2:224); also the following varieties: *gigantèus* (*lividus*, Willd., *pruinòsus*, *?*), glaucous foliage (V. 16:148); *arbòreus; màjor; mìnor; víridis*, sts. and lvs. green; *inérmis*, fr. smooth; *purpuráscens; africànus; elegantíssimus; speciòsus.*

BB. *Seeds medium to large, reddish to reddish-brown: glands of petiole large, projecting: plant usually red: st. often more hollow, short-lived and early-fruiting.* The typical form is var. *sanguíneus* (*Obermánni, lividus*, Jacq.?) (Gn. 5, p. 349. R.H. 1858, pp. 602, 603); *macrocárpus* (V. 16:148); *purpùreus* (*tricolor*); *atropurpùreus; sanguinoléntus; macrophýllus?; macrophýllus purpùreus; pulchérrimus.*

BBB. *Seeds as in* BB, *but dark brown to black: otherwise as in* B. *Bourboniénsis*, and its vars. *nànus* and *arbòreus* (V. 16:148).

AA. *Markings of seed-coat rather straight, slightly raised above the ground-color and distinct from it; seeds*

medium size, more than twice as broad as thick; cotyledons ovate, rounded at the base, glands small, flat: foliage red to almost black. Contains var. *Gibsonii*, dwarf, dark red with metallic luster; *Gibsonii coccínea; Gibsonii mirábilis*, bright carmine fr.; *cambogénsis*, very dark foliage; *hýbridus panormìtans*, large, dark and glaucous, a cross with *zanzibarensis* and *philippinensis*.

AAA. *Markings of seed-coat of fine bright red mottling, diffusing into the ground-color (gray or brown in some of the hybrids); seeds large, flat; cotyledons cordate; glands many, large, projecting at the apex and decurrent: plants large, generally without much red color, if any.* Contains var. *zanzibarénsis* (A.G. 16, p. 383. G.C. III. 14:783. Gn. 44, p. 563. Gt. 43, p. 69. I.H. 41:100) and its varieties, which seem to be crosses with some of the previous groups. (Gt. 44, p. 77.)

Other names in the trade, but not classified above, are: *cærùleus, Bismarckiàna*, and *insígnis*.

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RIGIDÉLLA (Latin, *somewhat rigid;* referring to the pedicels, which after the petals fall become erect and stiff). *Iridàceæ*. Half-hardy bulbous plants allied to Tigridia and useful for planting in the garden.

Leaves broad, plicate, with channeled petiole: fls. fugitive, bright red, pedicelled; perianth-tube none; segms. very unequal, outer oblong, connivent in a cup in the lower third, then spreading or reflexed; inner very small, erect, ovate, with a narrow claw.—About 3 species, Mex. Distinguished from Tigridia by the very small inconspicuous ovate and erect inner perianth-segms., those of Tigridia being larger, fiddle-shaped and spreading.

flámmea, Lindl. St. 3–5 ft. high: lvs. broadly equitant, plicate and sheathing the st. below: fls. in terminal fascicles, between the 2-valved spathe; peduncles recurved but becoming erect in fr.; perianth 3-foliate, the limb concave and revolute, bright scarlet striped black at the throat, spirally twisted after anthesis: caps. papery, 3-valved at the apex. Mex. B.R. 26:16. H.U. 2, p. 44.

immaculàta, Herb. St. 2–3 ft. high, forked: lower lvs. narrowly lanceolate, acute, about as tall as the scape: fls. bright crimson, not marked with black; perianth-segms. acute, undulate, recurved. Mex. B.R. 27:68. F.S. 5:502; 21:2215 (fls. brick-red).

F. TRACY HUBBARD.†

RINDÈRA (named after Dr. A. Rinder, the discoverer of the first plants of this genus). *Boraginàceæ*. Perennial herbs, erect, canescent-pubescent, scabrous or glabrous, base often cespitose: sts. simple or sparingly branched: lvs. alternate, narrow: cymes terminal, corymbose or paniculate-racemose, without bracts; fls. pedicelled; calyx 5-parted, lobes narrow; corolla tubular-funnel-shaped; lobes 5, imbricate, broad or oblong, erect or somewhat spreading; stamens 5; ovary 4 distinct lobes: nutlets 4. About 10–15 species, S. Eu., W. and Cent. Asia. *R. umbellàta*, Bunge. St. erect, 1–2 ft. high: basal lvs. tufted, evergreen, oblong to ovate-lanceolate, long-petioled; cauline lvs. lanceolate with a winged petiole or sessile, entire, gray-pubescent: fls. reddish yellow or dark brown; calyx densely woolly; corolla-lobes erect, oblong: nutlets ovate-orbicular, broadly winged. Hungary and Servia. G.C. III. 42: 226.

RITÀIA (named after Mr. Rita of the Khasia Commission). *Orchidàceæ*. Epiphytic orchid, rare in cult.: st. much and subdichotomously branched, densely clothed with scarious sheaths: branches short and bearing a terminal sheathed, 1–2-fld. peduncle: lf. fleshy, lanceolate, jointed to the axis at the end of a branch: fls. small, puberulous; lateral sepals broad-based, adnate to the foot of the column; lip adnate by its margins to the column. One species, Himalaya. Now referred to Ceratostylis. *C. himalàica*, Hook. f. (*Ritàia himalàica*, King & Pantl). Sts. pendulous with a solitary lf. and a single terminal peduncle: lf. fleshy, linear-oblong, apex obliquely notched: fls. 1, occasionally 2, pale yellow, pubescent outside; dorsal sepal ovate-lanceolate, lateral sepals broader, abruptly acuminate; petals linear, about as long as the sepals; lip fleshy, not lobed.

F. TRACY HUBBARD.

RIVÌNA (named after A. Q. Rivinus, professor of botany, at Leipzig, 1691–1725). *Phytolaccàceæ*. Erect herbs, shrubby at base, suitable for the warm-house and also useful outdoors as a summer annual.

3412. Rivina humilis. (×⅓)

Leaves alternate, slender-petioled, ovate, ovate-lanceolate or cordate-ovate; stipules minute and caducous: infl. racemose, axillary or rarely terminal; fls. small, perfect; perianth 4-parted; stamens 4: berry red, pea-like.—Species 3 (Walter, Engler's Pflanzenreich, hft. 39), native of Trop. and Subtrop. Amer., but intro. into Asia and Afr.

hùmilis, Linn. (*R. lævis*, Linn.). ROUGE PLANT. Fig. 3412. St. with spreading branches, ½–2 ft. high: lvs. 1–3 in. long: racemes slender, pendulous, many-fld., as long as the lvs.; fls. white, 1–1½ lines long; calyx pale rose: fr. 1–1½ lines long. S. Fla. B.M. 1781. V. 5:75. S.H. 2:111. Gn. 22, p. 68.—Variable.

F. TRACY HUBBARD.

ROBÍNIA (after Jean and Vespasien Robin, herbalists to the king of France in the sixteenth and seventeenth centuries). *Leguminòsæ*. LOCUST. Ornamental woody plants grown chiefly for their handsome white, pink, or purple flowers and the graceful foliage.

Deciduous trees or shrubs: branches without terminal bud, often with stipular spines: lvs. alternate, stipulate, odd-pinnate, with stalked entire stipellate lfts.: fls. slender-pedicelled, in axillary racemes; calyx campanulate, 5-toothed, slightly 2-lipped; corolla papilionaceous, with short-unguiculate petals, standard large, rounded, turned back, scarcely longer than wings and keel; 9 stamens connate, 1 free or partly free: pod oblong to linear, flat, several-seeded, dehiscent.—About 15 species in N. and Cent. Amer.

The locusts are all handsome shrubs and trees with bright green and graceful pinnate foliage and showy white, pink, or purple papilionaceous flowers in usually pendulous or nodding racemes followed by pods attractive in some species by the dense covering of purple hairs. *R. Pseudacacia* and *R. viscosa* are hardy as far north as Ontario, and most other cultivated species as far north as Massachusetts. They are not particular as to the soil and they do well even in poor sandy soil and dry locations. They stand transplanting well and grow rapidly while young. Some species, particularly *R. hispida*, spread by suckers and may for this reason become a nuisance in lawns and mixed groups. *R. Pseudacacia*, on account of its heat- and drought-resisting qualities, together with its ornamental merits, has become a favorite street tree for cities, particularly in Europe; in this country it is now not so much planted, as it is liable to the attacks of the borer and therefore short-lived; it stands severe pruning well. Propagation is by seeds sown in spring and germinating readily; they

may also be increased by suckers and some, particularly *R. hispida*, grow readily from root-cuttings. Varieties are usually grafted, either on young seedling stock in the house or outdoors in spring or on pieces of root in the greenhouse; some dwarf forms, as *R. Pseudacacia* var. *Rehderi* are propagated by division, and other varieties, particularly var. *Bessoniana*, by cuttings of mature wood in fall; some varieties, as var. *Decaisneana* and var. *monophylla*, may be raised from seed, as a large percentage comes true.

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A. *Fls. white (light pink in one variety): branchlets glabrous or slightly pubescent: pod smooth.*

1. **Pseudacàcia,** Linn. False Acacia. Black Locust. Yellow Locust. Fig. 3413. Tree, to 80 ft., with deeply furrowed dark brown bark and prickly branches: lfts. 7–19, oval or elliptic, rounded or truncate and mucronate at the apex, glabrous or slightly pubescent while young, 1–2 in. long: fls. white, very fragrant, about ¾in. long, in pendulous puberulous racemes 4–5 in. long: pod linear-oblong, reddish brown, 3–4 in. long. May, June; fr. in Aug. and Sept., remaining on the branches during the winter. Pa. to Ga., west to Iowa, Mo., and Okla., often naturalized elsewhere; probably the only American tree which has become extensively naturalized in Eu. S.S. 3:112, 113. F.E. 32:393. Gn. 61, p. 61. G.M. 45:513. H.W. 3:58, p. 104.—Many varieties are in cult., of which perhaps the following are the best known. Var. **umbraculífera,** DC. (var. *inérmis*, Kirchn., not DC.). Forming a dense subglobose head, with unarmed branches: rarely flowering. Much used in Eu., when grafted high, in formal plantations and as a small street tree. M.D.G. 1903:630. Var. **Bessoniàna,** Nichols., with slenderer branches forming a less dense head, and var. **Rèhderi,** Kirchn., a low subglobose form, usually grown on its own roots (G.W. 2, p. 217), are forms of var. *umbraculifera*. Var. **strícta,** Loud., is a broadly pyramidal form. Var. **pyramidàlis,** Pépin (var. *fastigiàta*, Nichols.), is a narrow pyramidal or columnar form with unarmed branches. Gt. 6:190. I.H. 6, p. 20. B.H. 14, p. 27. F. 1874, p. 242. G.C. III. 41:151. Var. **péndula,** Loud., with somewhat pendulous branches. Var. **tortuòsa,** DC. A slow-growing form with short twisted branches sometimes pendulous at the tips. G.W. 2, p. 218. Var. **Ulriciàna,** Reuter. With spreading slightly pendulous branches and large drooping lvs. Var. **inérmis,** DC. Branches unarmed: lvs. dark green: habit like the type. Var. **monophýlla,** Carr. Lvs. simple or partly with 3–7 large lfts. R.H. 1860, pp. 630, 631. Var. **bullàta,** Koch. Lfts. crowded, more or less bullate. Var. **críspa,** DC. Lfts. undulate or crisped. Var. **amorphifòlia,** Loud. (var. *mimosæfòlia*, Hort.), with narrow, oblong lfts. Var. **dissécta,** Nichols. Lfts. linear. R.H. 1875, p. 379. Var. **aùrea,** Kirchn. Foliage yellow. Var. **purpùrea,** Dipp. Young foliage purple. Var. **semperflòrens,** Carr. Flowering during the whole summer. R.H. 1875:191. Var. **Decaisneàna,** Carr. Fls. light rose-colored. R.H. 1863:151. F.S. 19:2027. I.H. 12:427. Gn. 9:36; 34, p. 174. G.Z. 9:160. G.M. 56:971.—This is the largest species of the genus and its hard and strong, close-grained timber is much esteemed for its strength and its durability in contact with the soil.

AA. *Fls. pink or purple.*

B. *Plant glabrous or merely pubescent or tomentose: lfts. usually less than 15.*

C. *Pod smooth.*

2. **Boỳntonii,** Ashe. Shrub, to 10 ft., unarmed: branchlets glabrous or minutely pubescent at first: lfts. 7–13, elliptic to oblong, obtuse, soon glabrous, ¾–1 in. long: racemes 8–12-fld., on spreading or ascending peduncles; corolla rose-purple or pink with white, ¾in. long: pod glabrous. May, June. N. C. and Tenn. to Ga. and Ala.

CC. *Pod hispid or glandular hairy.*

3. **Kélseyi,** Bean. Shrub, to 10 ft.: branches with slender prickles; branchlets glabrous: lfts. 9–11, oblong-lanceolate, acute, rounded at the base, glabrous, ¾–1½ in. long: racemes 5–8-fld.; rachis and pedicels sparingly glandular-hairy; calyx finely pubescent, with or without glandular hairs; corolla rose-colored, 1 in. long: pod oblong, densely covered with purple glandular hairs, 1½–2 in. long. May, June. N. C. B.M. 8213. G.C. III. 44:427; 47:391; 58:72. J.H. S. 36, p. 133, fig. 134. G. 33:461, 463. M.D. 1910, p. 101. Addisonia 1:3.—Very handsome and graceful; the purple frs. are also attractive.

3413. Robinia Pseudacacia. (×⅛)

4. **Élliottii,** Ashe (*R. hispida* var. *ròsea*, Elliott). Shrub, to 5 ft.: branches with short spines; young branchlets grayish or whitish tomentose: lfts. 11–15, elliptic, grayish pubescent beneath, ¾–1 in. long: racemes 5–10-fld.; peduncles, pedicels, and calyx grayish pubescent; corolla rose-purple or purple and white: pod linear, hispid. May, June. N. C. to Ga.—A very handsome species easily distinguished by the dense grayish pubescence without glands or bristles.

BB. *Plant more or less bristly or glandular-pubescent or viscid: pod hispid.*

C. *Peduncles and branchlets hispid or the latter sometimes glabrous: lfts. usually less than 15.*

5. **híspida,** Linn. (*B. ròsea*, Marsh.). Rose Acacia. Fig. 3414. Shrub, 1–3 ft., rarely higher: st., branchlets, and peduncles and often the petioles hispid: lfts. 7–13, suborbicular to oval, obtuse and mucronate, glabrous or nearly so, ¾–1½ in. long: fls. rose-colored or pale purple, 1 in. long, in short, 3–5-fld. racemes: pod rarely developed, densely hispid, few-seeded. F.S.R. 2, p. 57. J.H. III. 53:183. G. 4:499. Var. **macrophýlla,** DC. (var. *inérmis*, Kirchn.). Branchlets and petioles nearly destitute of bristles: lfts. and fls. often somewhat larger. Gn. 77, p. 268. G.M. 45:512.—This species spreads much by suckers, particularly in sandy soil; sometimes grafted high to form a small standard and as such displaying its large fls. to greater advantage.

6. **nàna,** Spach (*R. hispida* var. *nàna*, Elliott). Shrub, about 1 ft. high, in cult. sometimes higher: sts.

hispid, branchlets, petioles, and peduncles only pubescent or more or less hispid: lfts. 9–15, elliptic or ovate, acute, narrowed or rounded at the base, appressed-pubescent beneath, at least while young, ½–1 in. long: racemes 3–6-fld.; corolla ¾in. long, purple with white: pod oblong, hispid. May, June. N. and S. C.—This species usually fruits profusely, while the preceding species never or very rarely fruits.

CC. *Peduncles and branchlets glandular-hairy or viscid: lfts. usually more than 15.*

D. *Branchlets and peduncles glandular-hairy.*

E. *Rachis of lf. pubescent, glandless or nearly so.*

7. **neo-mexicàna,** Gray. Shrub or small tree, to 25 ft.: branches spiny; branchlets pubescent and glandular: petioles villous; lfts. 15–21, elliptic-oblong, rounded and mucronate, silky pubescent beneath at least while young, 1–1½ in. long: racemes many-fld., dense, more or less upright; peduncle and pedicels glandular-hairy; corolla pale rose-colored or sometimes nearly white,

3414. Rose acacia. —Robinia hispida. (×½)

nearly 1 in. long: pod glandular-hispid, 3–4 in. long. June to Aug. Colo. to New Mex., Ariz., and Utah. B.M. 7726. S.S. 3:114. F.S.R. 2:56. Gt. 41:1385. R.H. 1895.—Valuable for its late flowering.

8. **Hôldtii,** Beissn. (*R. neo-mexicana* × *R. Pseudacacia*). Tree, intermediate between the parents: lfts. larger than those of *R. neo-mexiana*, 1½–2 in. long, darker green and firmer than those of *R. Pseudacacia:* racemes looser than those of the first parent; corolla light pink to rose-colored: pod with scattered stalked glands. Originated in the nursery of F. von Holdt, Alcott, Colo. Var. **britzénsis,** Spaeth. A form with nearly whitish fls., originated in Spaeth's nursery near Berlin, Germany. Also *R. coloradénsis,* Dode, probably belongs here.

EE. *Rachis of lf. densely covered with stalked glands.*

9. **Hártwigii,** Koehne. Shrub, to 12 ft.: branchlets, petioles, lf.-rachis, and peduncle puberulous and densely covered with stipitate glands: lfts. 13–23, elliptic to lanceolate, mucronate, grayish pubescent beneath, 1–1¾ in. long: racemes dense; calyx pubescent and glandular-hairy; corolla rosy purple, ¾in. long: pod oblong, densely glandular-hairy, about 2 in. long. June, July. N. C. to Ala.

DD. *Branchlets and peduncles viscid.*

10. **viscòsa,** Vent. (*R. glutinòsa,* Sims). Tree, to 40 ft.: branches without or with small and slender spines; the dark reddish brown branchlets and usually the petioles and peduncles densely glandular-viscid: lfts. 13–25, ovate to oblong, obtuse or acute, broadly cuneate at the base, pubescent beneath or sometimes glabrous, 1½–2 in. long: racemes 6–15-fld., dense, rather upright; corolla ¾in. long, pink; standard with a yellow blotch: pod linear-oblong, glandular-hispid, 2–3½in. long. May, June. N. and S. C. to Ala.; naturalized elsewhere. S.S. 3:115. B.M. 560.

11. **dûbia,** Foucauld (*R. ambígua,* Poir. *R. intermèdia,* Soulange-Bodin. *R. Pseudacacia* × *R. viscosa*). Tree, intermediate between the parents, but more similar to *R. Pseudacacia,* from which it differs in the slightly viscid, less prickly branches, in the 15–21 lfts., and in the light pink fls. Of garden origin. Var. **bélla-rôsea,** Rehd. (*R. bélla-ròsea,* Nichols. *R. viscòsa* var. *bélla-ròsea,* Voss. *R. Pseudacàcia* var. *bélla-rôsea,* Cowell). Branchlets more viscid: fls. larger and deeper rose-colored. Garden origin.

R. Rúsbyi, Wooton & Standley. Nearly glabrous prickly shrub with oval or broadly oblong lfts. pubescent beneath, many-fld. racemes with the pedicels glandular-pubescent, and with smooth pods, from New Mex.; this and the 6 or 7 Mexican species are not in cult.

ALFRED REHDER.

ROBÝNSIA (derivation not known). *Leguminòsæ.* Twining shrubs, with trifoliate lvs. and elongated axillary racemes: fls. somewhat fascicled; calyx 2-lipped; corolla papilionaceous, standard somewhat rounded, sulcate at the base, wings oblong, obtuse, kèel incurved, obtuse; stamens diadelphous: pod compressed, 2-valved, linear-elongate.—Two or 3 species, Mex. The genus is now usually included in Pachyrhizus. *R. geminiflòra,* Hort., is apparently botanically unknown. H.U. 2, p. 231.

ROCAMBOLE (*Allium Scorodoprasum,* Linn.), is a humble member of the onion tribe, the underground bulbs of which are used abroad like garlic, known in America amongst the Canadian French and perhaps elsewhere. The plant is a hardy perennial, with a stem twisted spirally above and bears at the top an umbel of flowers, some or all of which are changed to bulblets. The presence of these bulblets distinguishes the plant from garlic. The species can be propagated by the bulblets, but quicker results are secured from the cloves of the underground bulbs. In mild climates, the bulbs should be planted in autumn or not later than February; in cold climates, plant in spring. In the autumn when the leaves decay, the bulbs are lifted, dried in the sun, and stored.

Rocambole is a native of Europe, the Caucasus region, and Syria. It has flat or keeled leaves, short spathe, bell-shaped six-parted perianth, and the three inner stamens broader than the others, three-cleft, and not longer than the perianth. Good seeds are rarely produced.

RÒCHEA (named after de la Roche, French botanist). Syn., *Kalosánthes. Crassulàceæ.* Succulent shrubby plants suitable for the greenhouse.

Leaves opposite, connate at the base, oblong-ovate or lanceolate: fls. rather large, aggregated in corymbose-capitate cymes, white, yellow, rose, or red; calyx 5-parted or 5-cleft; corolla salver-shaped, the elongated claws of the petals connate with the calyx-tube, limb spreading: follicles many-seeded.—About 4 or 5 species, S. Afr.

Rocheas are amongst the showiest of our summer-flowering greenhouse plants, and are very easy to propagate. If plants are desired from a single root, cuttings about 4 inches long should be selected in March, and potted singly in sandy peat. The small pots should be placed near the glass, in a night temperature of 50°. Do not keep them too wet, as they are of a fleshy nature, and are liable to rot. In a few weeks, the plants will be rooted and the points may be cut out to encourage breaks. A few days after they are cut back, repot into a pot two sizes larger, using two parts fibry loam, one of sand, and one of broken charcoal, adding a sixth part of sheep-manure. After they are rooted, keep them near the glass, in a night temperature of not over 40°, when this is possible.

XCVII. A rock-garden.

When all danger of frost is past, set them outdoors on a bed of ashes in the full sun, making some provision to protect them from rainstorms, so as to prevent water lodging in the points of the shoots, which is liable to bring about conditions favorable to disease. Toward the end of September, have the plants housed in their winter quarters; all that is necessary during the winter is to keep them from freezing. In spring, the points of the shoots may be cut out again, to encourage more breaks and soon after they may receive another shift. Treat them as advised above, and when the pots are well filled with roots, they may be watered with manure-water as advised for ixoras. Rocheas may be flowered the second summer after the cuttings are struck, and after flowering the plants may be cut back to 6 inches above the pot. These cut-back plants may be shifted along, after they break, and be grown into large specimens. Fine plants of rochea may also be grown in the following manner: Take a 10- or 12-inch pot, and fill it with the compost advised above, the last 2 inches being pure sand. Insert the cuttings as thick as they can be pricked into the pot. The cuttings may be secured from a plant that has flowered. Breaks will start all over the stems of such plants, and in the fall after flowering they will be large enough to use for cuttings. In eighteen months this pot of cuttings will come in flower and will have more than doubled the number of shoots. Aphides are the only insect pest that molest the rocheas, and these may be destroyed by fumigating with tobacco in some of its forms. These plants require at all times abundance of fresh air, and if this is not given, they will be attacked by fungous disease. (George F. Stewart.)

A. *Clusters usually 2-fld.*

jasmínea, DC. (*Crássula jasmínea,* Ker-Gawl). St. subshrubby, 4–12 in. high, decumbent, branched, flowering part erect: lvs. fleshy, oblong-oval or spatulate, ½–¾in. long: fls. white, tinted with crimson, sessile, not fragrant, 1½ in. long. Cape B.M. 2178. L.B.C. 11:1040.—Hybrids with *R. coccínea* are figured in A.F. 5:433.

AA. *Clusters many-fld.*

coccínea, DC. (*Kalosánthes coccínea,* Haw. *Crássula coccínea,* Linn.). Plant robust, shrubby, 1–2 ft. high: lvs. very closely imbricated, ovate-oblong or ovate, 1–1½ x ¾–1 in.: fls. bright scarlet, 1½–2 in. long, fragrant, borne in summer. Cape. Gn. 46, p. 360. B.M. 495.—Showy; hybrids are in cult.

R. falcàta, DC.=Crassula falcata.—*R. hýbrida albiflòra* is said to be a hybrid between R. jasminea and R. odoratissima.—*R. odoratíssima,* D.C. Somewhat shrubby, 12–20 in.: lvs. connate, erect-spreading, linear-lanceolate or subulate: fls. 1in. long, fragrant, pale yellow or cream-colored. Cape.

L. H. B.†

ROCK-GARDEN. An ornamental planting in very rocky places or in areas on which rocks have been placed for the particular purpose to make congenial conditions for certain classes of plants and also to lend interest and variety to a part of the grounds; a rockery. Figs. 3415–3419. See, also, *Alpine Plants,* Vol. I.

Nature in time will make a garden even on the broken surface of a rock, by clothing it with lichens, algæ, and mosses of many exquisite forms having much variety and often striking brilliancy in coloring. If there are soil-filled cracks and pockets, then ferns and flowering plants will find a place. At low elevations, however, these flowering rock-plants are comparatively few, for soil accumulates rapidly and strong-growing herbs, shrubs, and trees, aided by favorable climatic conditions, soon cover the rock surface or furnish so dense a shade that only mosses, lichens, and ferns will thrive.

The ideal rock- or alpine gardens are within that region on mountain summits between the limits of tree-growth and the edge of perpetual snow, and in the corresponding regions toward the poles, where the plants are protected from the rigors of a long winter by blankets of snow and are quickened into a short period of rapid growth by a comparatively low summer temperature. Here, where there are deep cool moist rock-crevices and pockets filled with fragments of broken stone and porous decayed vegetable matter, are the favorable conditions wherein the real alpine plants can multiply their neat and dainty cushions, tufts, and rosettes of dense and matted foliage and their abundance of exquisitely formed and brilliantly colored flowers. A successfully grown collection of these plants in contrast with ordinary garden flowers would be like a collection of cut gems as compared with one of rough minerals and rocks, for they have an exquisiteness of finish and depth of coloring that gives them as unique a place in the vegetable kingdom as they have in the plan of nature. Surely there are men and women who, if they knew these plants well, would be fired with an ambition to excel in their cultivation; and in so doing they may enter a comparatively untrodden path if they will limit their work chiefly to the alpines of this continent. They are represented in the New England mountain region by such species as *Arenaria grœnlandica, Loiseleuria procumbens, Silene acaulis, Diapensia lapponica, Arctous alpina, Vaccinium cæspitosum, Saxifraga Aizoon* var. *rivularis, Veronica alpina, Geum radiatum* var. *Peckii, Sibbaldia procumbens, Rhododendron lapponicum, Phyllodoce cærulea, Primula farinosa, Saxifraga oppositifolia, S. Aizoon,* and *S. aizoides, Aster polyphyllus,* and *Woodsia glabella;* and in the Rocky Mountains and Pacific Coast ranges by *Erigeron uniflorus, E. lanatus,* and *E. ursinus, Actinella Brandegei* and *A. grandiflora, Artemisia borealis, A. scopulorum,* and *A. alpina, Senecio Soldanella, S. Fremontii, S. petræus, S. uniflorus,* and *S. wernerifolius, Crepis nana, Campanula uniflora, Primula Parryi* and *P. suffruticosa, Androsace Chamæjasme* and *A. septentrionalis, Gentiana prostrata, G. frigida, G. Newberryi, G. Parryi,* and *G. simplex, Phlox bryoides* and *P. cæspitosa, Polemonium confertum, Cassiope Mertensiana, Phyllodoce Breweri, Draba streptocarpa, D. Parryi,* and *D. nudicaulis, Arabis Lyallii* and *A. platysperma, Smelowskia calycina,*

3415. A rock-garden bordering a lawn.

Lychnis montana and *L. Kingii, Calandrinia pygmæa, Claytonia megarrhiza, Spraguea umbellata, Dryas octopetala, Geum Rossii, Saxifraga chrysantha* and *S. bryophora, Cystopteris alpina, Aplopappus pygmæus, A. Lyallii,* and *A. acaulis, Omphalodes nana* var. *aretioides, Chionophila Jamesii,* and so on. (Not all of these names are accounted for in this work. They may be found in the current manuals of North American plants.)

The uncultivated American plants in this class are quite as numerous and attractive as are the European

species that have been long cultivated there. Here alpines have been but little undertaken. A very few easily grown European kinds, as *Aubrietia deltoidea*, *Achillea tomentosa*, *Campanula carpatica*, and *Arabis albida*, are offered by American nurserymen and cultivated in the open border. On a few private places small rock-gardens have been established, or advantage has been taken of favorable local conditions to cultivate some additional species, and in one or more botanic gardens considerable collections have been at times maintained, chiefly in frames. Generally what have passed for rock-gardens have been rockeries—mere piles of cobbles raised from the surface of turf or piled against dry banks in such a manner as rapidly to disperse instead of slowly conserve all soil-moisture. Even the most self-assertive weed fails to thrive in such a garden.

In general, we have a smaller rainfall, less humidity and a larger proportion of sunny days than in England, to which we must look for careful instruction in the cultivation of alpine plants. This must be regarded in the arrangement of our rock-gardens. Every precaution should be taken to secure the full advantage of rainfall and any natural water-supply, and there should

3416. A pocket in the rocks.

also be a liberal and constant artificial water-supply. It must be kept in mind, also, that at low elevations the long hot summers do not allow the period of rest that such plants require. This condition must be met by devices, methods, and locations that will retard the growth in spring, check it at an early period in autumn, and keep the plants fully dormant in winter, such as shade, mulching, and, in the case of particularly difficult plants, the protection of frames. It is essential that conditions be provided that will enable the roots to extend for a long distance, often many feet, in narrow crevices and pockets between rocks to depths where there is a uniform temperature and uniform moisture supplied by moving water, for frequent freezing and thawing and stagnant water are fatal. These cavities should be filled with such loose material as fragments of rock mixed with decayed vegetable matter, without manure, and arranged to provide for the free passage of hair-like roots, for perfect drainage and the free access of air. To provide these unusual conditions on the average private place in a large way would be so difficult and so expensive that it is not to be recommended. A small collection, comprising a few easily cultivated alpines and the similar rock-plants referred to in a later paragraph may, however, be successfully grown on reconstructed stone walls, on ledges, in small rock-gardens and in the open borders of almost any country or city place. Persons who desire to cultivate a large collection of true alpines should seek a situation where favorable natural or existing conditions may be taken advantage of. Such locations are likely to be found at the seashore and in rocky and hilly regions—such regions, for example, as are chosen by many persons for summer homes. A ledge, a natural mass of boulders or an abandoned quarry will often provide them. Pockets and crevices of ledges may be cleared of unsuitable material, and if they are not deep enough to hold moisture and have an equable temperature their depth may be increased by the judicious use of wedges, bars, and explosives. Boulders can be arranged in such a manner as to secure suitable deep pockets and crevices of soil, springs can be diverted to supply a constant flow of water, underground pipes can be carried from an artificial source of supply to various points where conditions require them. However favorable the conditions are, it will be found that much can be done to advantage in different localities to meet the special requirements of different groups of plants. In such work, however, it should be kept constantly in mind that there are plants that will grow in all sorts of surroundings, and that it will often be much better to seek such as are adapted to existing conditions than to go to the expense of radically modifying such arrangements.

If an artificial rockery is to be constructed, it should be borne in mind that it is not for the purpose of displaying a collection of curious rocks fantastically arranged, but to provide a place for growing a class of plants that cannot be so well grown elsewhere. It would be better never to think of securing mountain, valley and rock effects in the disposition of the material to be used, but only to think of providing many varied conditions and situations as regards exposure to sun and shade, depth of pockets and crevices, the character and depth of soils, subterranean and surface water-supply, and whether it be permanent or fluctuating. In selecting and arranging the rocks, freshly broken raw faces should not be exposed, but rather such faces as are already covered with a growth of lichens for sunny places and with mosses for shady spots. To take full advantage of surface water, pockets and crevices should have a decidedly downward direction from the exposed surface and not be sheltered by overhanging rock. That this does not apply in all cases, those who are familiar with the habitats of rock-plants know full well. The natural habitat of *Pellæa gracilis* in the upper Mississippi bluffs is in horizontal crevices well back from the edge of the overhanging rock, where it is absolutely protected from all surface water. It finds sufficient moisture in the horizontal seams. *Pellæa atropurpurea* will grow in narrow cracks and small pockets on the face of dry limestone boulders where there can be no possible internal supply of moisture. These examples go to show that the general principles that will apply to such plants as a class will not apply to all species, and it simply gives emphasis to the importance of trying a plant under all sorts of conditions before assuming that it can not be grown. The writer remembers well an attempt to grow that most exquisite alpine flower, *Gentiana verna*, in the open border on a little pile of rocks to give it suitable drainage. It was transplanted a number of times to places where its environment appeared to be about the same, and finally a situation was secured, where, instead of barely holding its own, it increased and produced a number of its great deep blue flower-cups.

The importance of protection from drying and cold winds and of securing shade in many situations must not be overlooked. Sometimes advantage may be taken of an existing deciduous or evergreen tree or shrub growth, or rapid-growing varieties may be planted to make a screen. While shelters of this character are of value about the outer limits of a rock-garden, they can hardly be used for separating its smaller compartments.

3417. An isolated rock-garden under a tree, southern California.

For this purpose, slow-growing dense-foliaged evergreens with a restricted root range are best. This would include the yuccas, a few of the dwarf forms of thuya, juniperus, picea, retinispora and practically all the broad-leaved evergreens. The latter, especially the rhododendrons (of which *Rhododendron maximum* can be secured in large plants at low cost), are particularly useful owing to their habit of growth, restricted root area, and the facility with which they can be moved from place to place as desired. As these shelter-belts and groups form the background and setting of the rock-garden and are the dominating landscape feature in views from a distance, their composition and disposition is a matter of much importance. The disposition must be governed, however, by the general arrangement of the ground, but in this arrangement an agreeably varied sky-line and composition of plant forms and of shades of green should be sought for. In the composition of the background, and in the planting of the rock-garden as well, a decided character should be given to the whole and to each distinct compartment by using some few effective plants in quantity rather than a great number of varieties in small quantities. Variegated and distorted garden freaks should be excluded, for they only distract the attention from the rock-garden, the primary object. Even more inappropriate are statuary fountains and vases.

Up to this point reference has been made for the most part to distinctly alpine plants, that is, plants that are confined exclusively to the region on mountains above the tree- and shrub-line. They are the ones that will test the skill of the cultivator. There are, however, many rock-plants, that is, plants that grow naturally on rocks, or plants having a tufted, matted, and more or less persistent and evergreen foliage similar to alpines, that can be used with them in less favorable positions in the rock-garden or in the open border. Many of such plants can be readily procured from American nurserymen and collectors. They are easy of cultivation and attractive in habit and flower. The writer would include also low-growing bulbous plants, especially such as have inconspicuous foliage. They may be planted with the low ground-covering plants to push up through them. From this list are omitted such plants as belong more properly in the wild-garden, especially such as spread rapidly by underground shoots and are likely to become a pest. (In a rockery conditions are such that it is almost impossible to extirpate deep-rooting, weedy plants, and they above all others should be rigidly excluded.) Among desirable rock-plants may be included *Geranium sanguineum*, *G. Andrewsii*, and *G. Robertianum*, *Gypsophila muralis*, *Helianthemum vulgare*, *Helleborus niger*, *Leontopodium alpinum*, *Linaria Cymbalaria*, *Lotus corniculatus*, *Lychnis Viscaria*, *Papaver alpinum* and *P. nudicaule*, *Ceratostigma Larpentæ*, *Saponaria ocymoides*, *Veronica Teucrium* and *V. rupestris*, *Arabis alpina*, *Campanula fragilis*, *Daphne Cneorum*, species of Alyssum, Bellis, Cerastium, Arenaria, Draba, Epimedium, Iberis, Thymus, Arabis, Armeria, Ajuga, Dianthus, Sedum, Sagina, Primula, Aquilegia, Saxifraga, Corydalis, Myosotis, Sempervivum, Parnassia, Viola, Hepatica, Opuntia, Houstonia; *Anemone patens* var. *Nuttalliana*, dwarf and creeping Campanulas, *Cornus canadensis*, *Dicentra eximia*, *Calluna vulgaris*, *Iris cristata*, *I. verna*, and *I. pumila*, *Leiophyllum buxifolium*, *Phlox subulata*, *P. amœna*, and *P. reptans*, *Saxifraga virginiensis*, *Silene pennsylvanica* and *S. virginica*, *Anemone thalictroides*, *Waldsteinia fragarioides*, *Galax aphylla*, *Asperula odorata*, low-growing ferns, mosses, and the like.

For more specific instructions as to the construction of rock-gardens and the care and propagation of rock-plants (for European conditions), see Robinson's "Alpine Flowers," London, 1870, and Sutherland's "Hardy Herbaceous and Alpine Flowers," Edinburgh and London, 1871.

WARREN H. MANNING.

The making of a rock-garden.

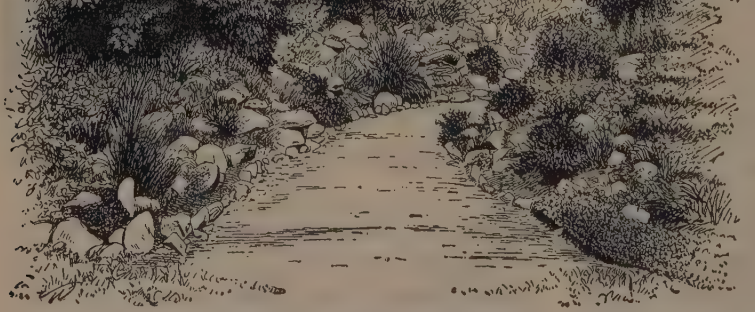
A rock-garden must of necessity often be "artificial" in the sense of made by man, because few gardens or grounds contain a natural rocky slope or even a natural bank upon which one might be constructed, and if they did the position may not be an ideal one. A southern slope would be too hot and dry in this climate, unless it was shaded by tall trees. A bank with a northern or northeastern aspect free from the roots of trees would suit this class of plants much better, and very attractive it can be made, especially if the bank is on the outer edge of a garden, or skirts a lawn. There is no form of gardening in which one has more opportunity to give expression to his natural taste than in the construction and planting of a rock-garden. But since all grounds or gardens do not have a natural bank or slope upon which an "open" rock-garden might be

3418. A picturesque rockwork for the wilder parts of the grounds (European).

constructed, a depressed rock-garden may be made in grounds that are perfectly level, and some of the best rock-gardens in the world are what are known as "underground," for example, the one in the Royal Botanic Gardens, Kew, London, England. Before this rockery was constructed the ground was perfectly level. A cutting was begun at one entrance, at first shallow,

but gradually deepening till a depth of some 6 or 7 feet was reached, and an average width of about 10 feet at the bottom. All the soil taken out was placed on the top of the slopes, thus still further increasing the height. The cutting was made in a winding manner, not formal or zigzag, but in such a form that when completed, not only would a variety of aspects be secured to suit the requirements of different plants, but each turn should seem to possess a peculiar charm of its own. The whole cutting is perhaps some 200 yards in length. The rocks are placed in the banks in as natural a manner as it would seem possible to place them; now they stand out boldly, almost perpendicular with the edge of the path, then again they recede into hollow recesses. There are not too many rocks, nor yet too few. In one place a cascade falls over the rocks into a small pool which not only provides a habitat for aquatic and bog-plants, but also adds greatly to the beauty of the rockery. For the convenience of the public, a broad gravel path runs through the whole rockery. Rhododendrons and other shrubs are planted on top of the banks in groups, and not in straight lines, while behind these, for protection and shade, are planted pines and other conifers, as well as some deciduous trees. The rocks were placed in most cases so as to form "pockets" of good size into which the plants could be placed, and the soil made in the pocket to suit the requirements of the different plants. With such a variety of aspects and conditions, this rockery is able to accommodate one of the largest collections of alpine and rock-plants in the world. Deep carpets of mossy saxifrage, aubrietia, arabis, cerastium, sedum, and the like, hang over projecting ledges of rocks, while in fissures and holes in the rocks are growing those dainty rosette-making saxifrages, *S. longifolia*, *S. Cotyledon*, *S. crustacea*, and *S. cæsia*, as well as the charming androsaces. In the deeper recesses of the rockery are to be found the large-leaved saxifrages, such as *S. crassifolia*, *S. ligulata*, *S. Stracheyi*, and *S. purpurascens*. Quite at home and in suitable positions are alpine primulas, auriculas, and cyclamens. There are Iceland poppies, Himalayan poppies (*Meconopsis Wallichi* and *M. nepalensis*), gentians from the tiny blue *Gentiana verna* to the tall *G. septemfida*, and many kinds of Hosta, Fritillaria, Erica, Epimedium, Cypripedium, Orchis, Lilium, Erythronium, Allium, Alyssum, Ajuga, Achillea, Armeria, Sagina, Sempervivum, and creeping Veronica, besides other plants too numerous to mention. Particularly prominent positions, as on top of the rocks, or at a turning point in the path, are occupied by some stately plant, such as *Rheum palmatum*, *Acanthus mollis*, or *Gunnera manicata*, or *G. chilensis*, while foxgloves, verbascums, and such plants would fill up the recesses in the shrubs on the top of the rockery. One end of the rockery beneath the shade of overhanging trees is devoted to hardy ferns, which grow with wonderful luxuriance. With the variety of rare and interesting plants, together with the artistic yet natural appearance of the whole rockery, a more beautiful place it would be difficult to conceive.

In 1898, the writer built a rock-garden in the Botanic Gardens of Smith College, Northampton, Massachusetts, somewhat after the pattern of the one at Kew, but on a very much more limited scale. (Fig. 3419.) The position chosen (the only one available) is near the outskirts of the garden proper, on what was formerly a grassy southern slope. A cutting was made through the slope in much the same manner as the one at Kew, but to secure good northern aspects the soil was all banked on the southern side. The path, which is quite level, varies in width from 3 to 6 feet. The height of the banks in which the rocks are placed ranges from 2 feet at the entrances to some 8 or 10 feet at the highest point. For rocks, large water-worn boulders collected in the vicinity were used. One shaded recess, with a northern aspect, is devoted to native ferns, which at the present time, 1916, comprises some forty species. The whole rockery outside is banked with flowering shrubs, and on the southern bank outside are planted some trees, chiefly catalpas, for the purpose of shading the southern aspect of the rockery, as well as for ornament. Water is laid on so that the plants might not suffer in dry weather. The writer has not been successful with alpine primulas, mossy saxifrages, tufted gentians and several other subjects which delight in a cool, moist climate, perhaps from his not having provided the ideal conditions for such plants, but more probably due to our extremes of climate. Still there is a large variety which does well here. The writer has found most of the low-growing veronicas, sedums, sempervivums, arabises, alyssums, achilleas, alsines, erysimums, aquilegias, campanulas, stellarias, pachysandras, the beautiful shrubby little *Daphne Cneorum*, and many others, do very well in the more sunny or southern aspects of the rockery, while on the northern aspects cerastiums, iberises, ajugas, Iceland poppies, rosette and large-leaved saxifrages, moss pinks, epimediums, herniarias, arenarias, cardamines, armerias, dianthuses, native orchises, cypripediums, and many other plants do well. On the top of the rockery, to fill in recesses in the shrubbery, are planted foxgloves, verbascums, and tall veronicas, while at conspicuous points are planted clumps of *Bocconia cordata*, *Buphthalmium speciosum*, *Aruncus sylvester*, or any herbaceous plant which looks well as an isolated specimen. In among the plants in irregular colonies are planted hardy bulbs, such as crocuses, scillas, ornithogalums, narcissi, snowdrops, chionodoxas, and grape hyacinths; these come up the first thing in the spring and blossom before the other plants get well started into growth, and are a decided acquisition to a rockery.



3419. Entrance to the sunken or "underground" rock-garden.—Botanic Gardens, Smith College, Northampton, Massachusetts.

Almost all alpine plants may be readily propagated by seed, cuttings, or division of the plants. A good plan is to sow the seeds in 4-inch pots early in February in a finely prepared light soil, and place the pots in a moderately warm greenhouse; here they soon germinate, and as soon as large enough to handle they are transplanted either into other pots similarly prepared, or into small shallow boxes. They grow vigorously through the early spring months, and by the first of

May they may be planted out permanently. Seeds may also be sown in a shaded frame in spring and the plants transferred to the rockery in autumn.

In planting a newly made rock-garden, it is a mistake to plant too thickly. Each plant should be given sufficient space for a reasonable growth, and to show its true character. Compact-growing and tufted plants may be planted closer than those of a spreading habit. All variegated-leaved varieties and plants having an aggressive habit or that cannot easily be kept within reasonable limits should be rigorously excluded from a rock-garden. The whole rock-garden should be replanted and fresh soil placed in the pockets about every four or five years. In dry weather a thorough watering should be given at least once in two days, and, as in other parts of a garden, weeds will insinuate themselves wherever they can gain a foothold; these, of course, should be removed as soon as they appear. In winter, the plants in the most exposed positions, such as those which overhang ledges of rocks, should be protected by branches of hemlock or pine laid lightly over them, and a light covering of half-decayed leaves or manure placed between most of the plants, especially on a southern exposure, protects them from excessive thawing and freezing. The general care required is usually much less than for an ordinary flower-garden, but the pleasure to be derived from a well-constructed and well-planted rock-garden is very much more.

EDWARD J. CANNING.

RODGÉRSIA (named in honor of Commodore Rodgers, United States Navy). *Saxifragàceæ*. Hardy herbaceous perennials suitable for garden planting, with showy terminal flower-clusters.

Rootstocks horizontal, thick and black: lvs. alternate, large, peltate or digitately or pinnately compound, usually dark green: infl. tall and variously compound, paniculate; fls. very numerous, small; calyx-lobes 5; petals usually none; ovary 2–3-celled.—About 8 species, China and Japan. Botanically Rodgersia is close to certain species of Astilbe, having 10 stamens and no petals; it differs in having connate carpels, scorpioid infl. and 5-cut rather than thrice-ternate foliage.

Perhaps the best-known species is *R. podophylla*, as it was the first introduced into cultivation. It grows 3 to 4 feet high, and the leaves are finger-shaped, the five lobes being bold in outline, angled, and serrate. In the spring the foliage is light green; in summer it assumes a metallic bronzy hue. The plant is a vigorous grower, and under favorable circumstances has been known to make a clump 9 feet in diameter, the largest leaves being a yard across and borne on stalks 3 feet long. The flowers are borne in midsummer on stalks 4 to 5 feet high. The general style of inflorescence is that of the popular astilbe, to which it is closely allied. The flowers are very small, but make a feathery spray of fluffy white bloom. The panicle is a foot or more long and as wide at the base. Technically the flowers have no petals; what seem to be petals are the white calyx-segments. As a flowering plant it has been said by enthusiasts to be superior to astilbe, but the bloom is scantier, rather greenish at first, and perhaps does not last so long. It may not be so amenable to forcing. Rodgersia is a native of the subalpine regions of Japan and is presumably hardy in our northern states. It is offered by importers of Japanese plants. The plant is highly esteemed by English connoisseurs, but seems to be nearly unknown to American gardens. Although any deep rich garden soil will do, it is said to prefer a moist peaty soil. It should be placed in a sunny position, with plenty of room, where high winds cannot damage it. Easily propagated. (Wilhelm Miller.)

æsculifòlia, Batalin. About 2½–6 ft. high: lvs. large, basal as much as 18 in. across, digitately compound, usually 7 lfts.; lfts. 4–10 in. long, narrowed to the base, coarsely toothed: infl. 1½–2 ft. long, composed of flat clusters of white fls.; sepals rounded or blunt at apex: petioles, peduncles, and principal veins of lvs. covered with shaggy brown hairs. China.—The lvs. are like those of the horse-chestnut.

pinnàta, Franch. Fig. 3420. Tall simple-branched, 3–4 ft. high, with a large horizontal rootstock: st. hollow: lvs. long-petioled, digitately pinnate; lfts. 5–9, 6–8 in. long, obovate or oblanceolate: fls. in a large much-

3420. Rodgersia pinnata.

branched panicle with rose-red rachis and branches; calyx puberulous, lobes ovate, red outside, white within. B.M. 7892. G.C. III. 32:131. G.M. 54:592. Gn. 73, p. 531; 76, p. 378. Var. **álba,** Hort., differs from the type in somewhat longer and broader panicles, the component parts of which are clustered more loosely: fls. white. China. G. 28:147. Var. **supérba,** Hort., is much finer than the type, with the infl. more than 1¾ ft. long: fls. delicate rose: fr. dark red. China.

podophýlla, Gray. Herb with a thick scaly rootstock, 2–3 ft. high: basal lvs. few, long-petioled, peltately 5-foliate, 6–18 in. diam.; lfts. sessile, 5–10 in. long, 3–6 in. broad, cuneately obovate or almost deltoid to above the middle, then trifid; margin coarsely serrate; cauline lvs. few, smaller, commonly 3-foliate or 3-lobed: infl. a large panicle composed of scorpioid cymes; fls. small, yellowish white calyx-lobes spreading-ovate: caps. very small. China. B.M. 6691. G.C. II. 20:141. G. 13: 239; 21:531; 35:67 and 431. Gn. 36, p. 171; 38, p. 125; 46, p. 34. G.M. 33:477. G.W. 5, p. 193. R.H. 1908, p. 15.

sambucifòlia, Hemsl. About 2–3 ft. high: basal lvs. 9–15 in. long, long-petioled, bright green; lfts. in 3–5 widely separated pairs with an odd one at the top; the cauline lvs. solitary or 2 uneven pinnate, 9–11-foliate; lfts. subsessile, subopposite and oblong-lanceolate: infl. small, terminal, densely cymose, paniculate; fls. white, small, and inconspicuous; sepals fleshy, ovate, subacute. China. G.C. III. 54:131.

tabulàris, Kom. Herb, about 3 ft. high: lvs. very long-petioled, peltate, 1–3 ft. diam., shortly many-lobed, resembling teeth, the lobes broad-acuminate, usually sparingly setulose: infl. scapose, many-fld., resembling an astilbe; fls. small, white; calyx-lobes 5, broad obovate-oblong, rounded; petals 5, obovate-oblong. China. G.C. III. 44:210; 54:130. G. 35:829. Gn. W. 25:648.

F. TRACY HUBBARD.

RODRIGUÈZIA (Emanuel Rodriguez, Spanish botanist and apothecary). Including *Burlingtònia. Orchidàceæ*. South American epiphytic orchids, a few of which are cultivated for graceful racemes of delicate flowers.

Pseudobulbs small, compressed, 1–2-lvd. and bearing

sheathing lvs. at the base: racemes erect or pendulous; dorsal sepal and petals similar, free, erect; lateral sepals united, concave, but scarcely saccate; labellum spurred or saccate, with a long claw parallel to the column, and a spreading blade usually exceeding the sepal; column slender. Robert Brown's genus Gomesa (sometimes written Gomeza), founded on *G. recurva*, is by some referred to Rodriguezia. See *Gomesa*. The fls. are nearly always fragrant. The plants vary somewhat in habit. Some species form neat, compact tufts, while others, like *R. decora*, have long, straggling rhizomes difficult to keep within the limits of a block or a basket.

Rodriguezias should be grown in very shallow pots filled with tough peat, and well drained. Rest them in a temperature of 50°, giving little water. The growing temperature should be from 65° to 75°. Give plenty of moisture and shade from direct sunshine. The stronger-growing kinds will need thicker potting material in baskets; they do well wired on tree-fern stocks. During growth, syringing is necessary. (Wm. Mathews.)

A. *Fls. large, white, spotted or rose.*

B. *Raceme erect.*

décora, Reichb. f. (*Burlingtònia décora*, Lem.). Plant with a long, slender rhizome, with oval, 1-lvd. pseudobulbs: scape nearly erect, 9 in. high, bearing 5–10 blossoms in a loose raceme; sepals and petals ovate, acute, connivent, white or pale rose spotted with red; labellum

3421. Rodriguezia secunda. (×⅓)

twice as long as the petals, white; middle lobe rounded, bifid, contracted into a broad claw which has several fringed lamellæ; column with falcate hairy ears. May, June. Brazil. B.M. 4834. F.S. 7:716. Var. **pícta,** Hort. (*Burlingtònia décora* var. *pícta*, Hook.). Pseudobulbs orbicular, compressed: fls. short, acute; sepals and petals spotted with deep purple-red. B.M. 5419.

BB. *Raceme pendulous.*

venùsta, Reichb. f. (*R. fràgrans*, Reichb. f. *Burlingtònia venùsta*, Lindl. *B. fràgrans*, Lindl.). Lvs. linear-oblong, forming compact masses: fls. in drooping racemes, large, white, or tinged with pink and having a yellow stain on the lip; dorsal sepal acute, the lateral pair entire; labellum transversely plicate near the middle. Flowers at various seasons. Brazil. I.H. 5:188. G.C. III. 4:757.—Very near *R. candida*.

cándida, Batem. (*Burlingtònia cándida*, Lindl.). Lvs. oblong, firm: racemes pendulous, 4–6-fld.; fls. white, with a light stain of yellow on the labellum, 2 in. long; dorsal sepal obovate, emarginate, the lower pair united into a concave, bifid blade, saccate at base; petals obovate, with the apex recurved; labellum with a broadly cuneate, bifid middle lobe, longer than the sepals and petals; base and lateral lobes parallel to the column, throat with many lamellæ. April, May. Guiana. B.R. 1927. F.M. 1871:548.

pubéscens, Reichb. f. (*Burlingtònia pubéscens*, Lindl.). Lvs. tufted, dark green, keeled: racemes many, pendulous, from the tuft of lvs.; fls. pure white; labellum 2-lobed, hastate; lateral lobes erect, with lamellæ; column pubescent, in which it differs from other species.

AA. *Fls. small, deep rose or spotted red.*

secúnda, HBK. Fig. 3421. Pseudobulbs bearing several thick, linear-oblong lvs.: raceme erect, secund, 6 in. high; fls. deep rose; sepals erect, ovate, convex, the lower pair keeled and gibbous; petals like the dorsal sepal; labellum obovate-oblong, emarginate, scarcely longer than the sepals. Aug. Trinidad, Guiana. B.M. 3524. B.R. 930. L.B.C. 7:676 (as *R. lanceolata*).

críspa, Lindl. Pseudobulbs elongate-ovate: lvs. oblong-lanceolate, spreading, undulate: raceme pendulous, rather dense; fls. green, with yellowish borders; sepals all free, undulate-crisp; petals similar; labellum lanceolate, sigmoid. Brazil. B.R. 26:54.

AAA. *Fls. greenish.*

planifòlia, Lindl. Pseudobulbs clustered, compressed: lvs. lanceolate: raceme long, drooping; fls. greenish yellow, fragrant; sepals oblong, waved, acute, the lower pair united except at the end; petals like the dorsal sepal; labellum broadly oblong, acute, reflexed, shorter than the petals. Feb. Brazil. B.M. 1748 (as *Gomesa recurva*) 3504. L.B.C. 7:660 (as *Gomesa recurva*). See also p. 1354.

HEINRICH HASSELBRING.

RŒTTLÈRA, also spelled *Rottlera: Chirita.*

ROGIÈRA: *Rondeletia.*

RÒHDEA (Mich. Rohde, physician and botanist of Bremen). Sometimes spelled *Rhodea*. *Liliàceæ*. A monotypic genus of Japan and China, essentially a tender foliage plant with numerous radical lvs. 6–18 in. long: fls. borne among the lvs. in short thick dense spikes a few inches high; perianth globular-bell-shaped; anthers sessile; stigma peltate; style nearly wanting: fr. a globular, usually 1-seeded berry. Rohdeas are excellent plants for dwelling-house decoration, doing well in the cooler positions. They are perfectly hardy at Washington.

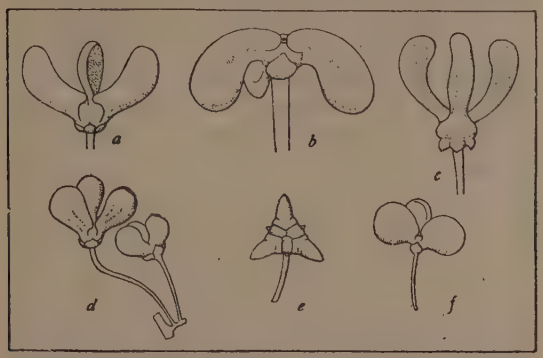
japónica, Roth. Root a long nearly cylindric rootstock with fleshy fibers: lvs. typically green, 9–12 in a rosette, erect, oblanceolate: berry about the size of a small olive, with a red pulp. B.M. 898 (as *Orontium japonicum*). Gn. 30, p. 541.—The following varieties, which differ in shape and color of the lvs., have been offered by Dutch bulb-growers: Vars. **aùreo-striàta, falcàta, latimaculàta, macrophýlla, marginàta mìnor, pygmæa, zebrìna.**—This plant known as *Omoto* or *Mannensei* is a favorite among the Japanese, and fine specimens often bring as much as $500, even when only a few inches high. The seven standard varieties of Japan are *Hinomoto, Nagashima, Kyūanji, Shikami, Daimyôsei, Jindai*, and *Akitsushima*. Retired persons of means often spend their declining years in the culture of this interesting plant, of which hundreds of named varieties are known to Japanese fanciers. A number of very beautiful books have been written on this plant, and it has an extensive literature. This plant is well known in China and was adopted by the Manchus as their national flower.

L. H. B.†

ROLLÍNIA (named in honor of the French historian, Charles Rollin). *Annonàceæ*. BIRIBÁ. ARATICÚ. CACHIMAN. Tropical American shrubs and trees.

Fruits fleshy, compound, subglobose, resembling those of Annona, but with fls. very distinct in form from those of Annona: corolla gamopetalous with the lobes corresponding to the outer petals of Annona pro-

duced into 3 rounded wings or obtuse spurs, in some species horizontally projecting, in others curved upward and inward, in others outward and downward; lobes corresponding to the 3 inner petals, alternating with the winged or spurred lobes, reduced to minute scales, almost closing the opening above the essential



3422. Types of Rollinia flowers. *a*, R. Sieberi; *b*, R. deliciosa; *c*, R. laurifolia; *d*, R. rugulosa; *e*, R. lanceolata; *f*, R. emarginata.

parts. The type species is *R. dolabripetala.*—The genus, including about 50 species, ranges from Mex. and the W. Indies southward to Argentina and Peru. It is well represented in Brazil and Paraguay. In some of the species the frs. are highly prized for the table and rival the cherimoya, for which they have sometimes been mistaken. Several have been intro. into cult. through the Miami (Fla.) Station by the Office of Foreign Seed and Plant Introduction, U. S. Dept. of Agric. Much confusion has resulted from the fact that in many original descriptions of species of Rollinia, the frs. were not included, and that edible frs. in the markets unaccompanied by lvs. or fls. have in many cases been botanically misidentified. It is impossible here to give a key to all the species. The principal ones may be grouped according to the form of the fl. into sections or subdivisions, as indicated in the accompanying illustration (Fig. 3422).

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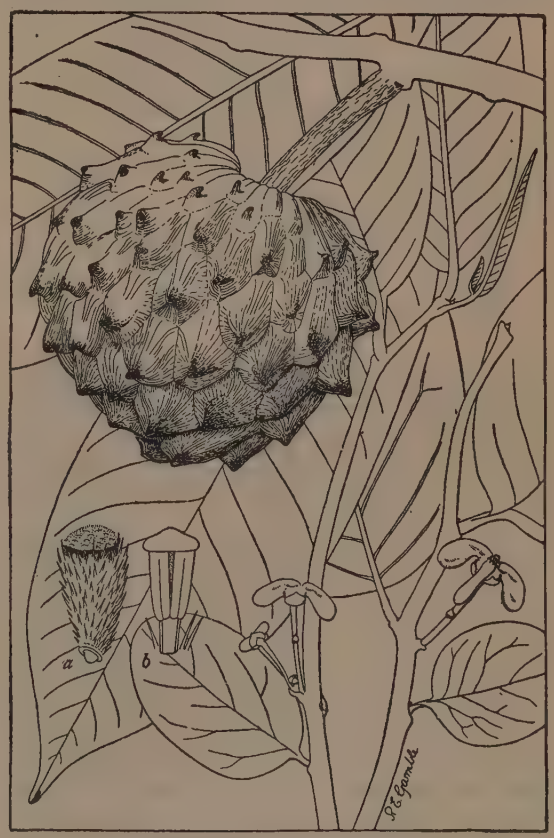
A. *Corolla-wings oblong, laterally compressed, widely spreading and more or less ascending.* (*Fig. 3422, a.*)

1. dolabripétala, St. Hil. (*Annòna dolabripétala*, Raddi. *Rollínia longifòlia*, St. Hil.). HATCHET-LOBED ROLLINIA. A small tree, 16½–23 ft. high: young branches, together with the lower surface of the young lvs., their petioles, and the fls. ferrugineous-tomentose: vegetative lvs. oblong-lanceolate or oblong, 4–6 in. long and about 1⅜ in. broad, those of the flowering branches much smaller, acutish or acute, or sometimes subacuminate at the apex, obtuse at the base, glabrous above, rufous-pubescent beneath, with the midrib prominent beneath, ferrugineous, with 20–28 lateral nerves; petiole about $\frac{8}{25}$in. long, grooved above, persistently ferrugineous-tomentose: peduncles solitary or rarely in pairs, ferrugineous-tomentose, bracteolate at the base, ½–1½ in. long: calyx-divisions cordate-ovate or suborbicular; corolla-wings rather fleshy, 1 in. long, ferrugineous-tomentose, laterally compressed in the form of a hatchet or broad knife with its blade in a vertical plane, at first ascending, at length broadly spreading: fr. (immature) globose, squamose, pubescent, with the areoles slightly convex; seeds compressed, somewhat cuneate, testa reddish yellow, thin, showing the wrinkles of the inclosed ruminate endosperm. This species, the type of the genus Rollinia, was first collected on Mt. Corcovado, near Rio de Janeiro, Brazil, where its fls. appeared in Feb. and its fr. in May.

2. mucòsa, Baill. (*Annòna mucòsa*, Jacq.). CACHIMAN MORVEUX. A small tree first described by Jacquin from specimens growing spontaneously in the forests of Martinique, and said by him to be rarely cult. In habit it bears a close resemblance to the common custard-apple, *Annona reticulata.* Lvs. oblong, pointed at the apex and base: corolla gamopetalous in the form of a roundish body from which 3 oblong lobes spread outward in such a way that it not inaptly represents a tricorn hat: areoles of fr. gibbous (convex) not papillose nor aculeate; fleshy pulp very viscous and not very well flavored.—*R. Sieberi* has been referred to this species, but Père Duss, in his Flora of the French Antilles has kept the two species distinct.

3. Sièberi, A. DC. CACHIMAN MONTAGNE. A small tree first described and figured from the island of Trinidad and erroneously referred by its collector to the common custard-apple, *Annona reticulata*, to which its fr. and lvs. bear a certain resemblance: lvs. oval-oblong, acute at apex and base, usually 5–6 in. long and 2–3 in. broad, thin, above puberulous with the nerves pilose, beneath paler and more pilose, narrowed at the base into pilose petioles ¼in. long, some of them at the base of the branches broadly ovate and obtuse, about 1 in. long: peduncles lf.-opposed, 1-fld., 1–1⅗ in. long, bearing 2 small ovate-acute bracteoles, one near the base, the other about the middle: corolla-wings laterally compressed, linear-oblong, rounded at the apex, diverging, straight or curving slightly upward: fr., according to Père Duss, usually larger than that of *Annona squamosa*, the surface divided into pronounced raised squamose



3423. Rollinia deliciosa. (×½)

areoles rounded at the tips; pulp fleshy, nearly white, melting in the mouth, slightly viscous, with a sugary agreeable flavor. Type collected by Sieber (No. 96), in the De Candolle Herbarium.

AA. *Corolla-wings laterally compressed, widely spreading and more or less decurved.* (*Fig. 3422, b.*)

4. **deliciòsa,** Safford. BIRIBÁ. Fig. 3423. A tree yielding a delicious, large, juicy fr., resembling the cherimoya: vegetative lvs. obovate-oblong or elliptical, rounded at the base and normally acuminate at the apex, blades 8–11 in. long and 3–4 in. broad, membranaceous, when young sparsely canescent-hirtellous above, densely so beneath, especially along the midrib and nerves, at length glabrous above and beneath except along the midrib and primary nerves (18–22 on each side), these reddish brown and slender but prominent

3424. Rollinia Jimenezii. (×½)

beneath; petiole about ⅜in. long: lvs. on flowering branches smaller, the lowermost ones relatively shorter and broader, sometimes broadly ovate or orbicular, 1⅜–2⅔ in. long and 1⅜–2 in. broad: peduncles lf.-opposed, often in pairs, sometimes solitary, rarely in 3's, 1–1⅜ in. long, bearing a small ovate sessile bracteole near the middle, strigillose with reddish hairs, like the petioles and nerves of the lowermost lvs. (prophylla) beneath: calyx and corolla canescent-puberulous; corolla-wings compressed laterally, widely diverging and decurved, rounded at the extremity; stamens numerous, closely crowded, the expanded connectives forming a pavement above the pollen-sacs; carpels numerous, ovaries hairy, styles expanded, glandular-puberulous: fr. a solid depressed subglobose syncarpium, 3–5 in. diam. with the areoles distinctly outlined and terminating in an obtuse beak; peduncle straight and woody, about 2 in. long; pulp fleshy, white or cream-colored, juicy, fine-flavored; seeds compressed, ⅜–⅘in. long and $\frac{8}{16}$–⅔in. broad, rounded at the apex, gradually narrowing to the base, hilum not prominent; testa thin, brown, wrinkled by the inclosed ruminate endosperm.—The type of this species, in the U. S. National Herbarium, is from a fr.-bearing tree cult. in the experiment station, Miami, Fla., grown from seeds sent by C. F. Baker from Para, Brazil (No. 22512) in 1908. Baker describes it as the finest annonaceous fruit of Trop. Amer. It was incorrectly referred to *R. orthopetala*, but it is readily distinguished from that species by the decurved wings of its fls.

5. **Pittièri,** Safford. A tree resembling *R. deliciosa*, but with lvs. more abruptly acuminate and glaucous beneath, the vegetative ones 6–8 in. long and 3–3⅔ in. broad, midrib and primary nerves (16–20 on each side) reddish brown beneath: lvs. on flowering branches smaller (with 10–12 primary nerves): peduncles often in clusters of 3 or 4, graduated in length, the longest 1⅔ in. long, rufous, minutely puberulent, never hairy like those of *R. deliciosa*, bracteolate near the middle: corolla-wings ⅜–½in. long, falcate, horizontally extended and decurved, rounded at extremity, and narrowed at the base, very finely puberulent, appearing under the lens as though composed of olive-gray felt: fr. not observed.—A beautiful species with elliptical or obovate lvs. remarkable for the pale color of the lower surface and the sharply outlined lateral nerves. These correspond with the description of *R. rufinerva*, Triana and Planch., but the corolla-wings are decurved, not "divergent ascending," as in that species. The type, in the U. S. National Herbarium, was collected near Puerto Obaldia, Panama, by Henry Pittier (No. 4358), in whose honor the species is named.

6. **Jimenèzii,** Safford. ANONILLA. Fig. 3424. A small tree of Costa Rica resembling *R. mucosa* but with fls. in clusters of 2 or 3, having the corolla-wings horizontally spreading and slightly decurved, and with fr. resembling that of the common sugar-apple (*Annona squamosa*), with the component carpels rounded at the tips when fresh, but more or less beaked when dry: lvs. ovate to oblong-elliptical, acuminate, those of the vegetative branches 7–8 in. long and 2⅜–3 in. broad, obtuse at the base, with 18–22 primary nerves on each side of midrib, those of the flowering branches smaller with 12–16 pairs of primary nerves and usually rounded at the base; point of acumen either acute or more usually obtuse or retuse; young branches, petioles, and lower surface of young lvs. covered thickly with ferrugineous hairs, lvs. at length glabrous or nearly so except along the midrib and nerves beneath: peduncles lf.-opposed, in clusters of 2 or 3, graduated in length, the longest about ½in. long, ferrugineous-tomentose like the ovate-acuminate calyx-lobes: corolla-wings oblong, rounded at the tip, scarcely at all narrowed at the base, widely spreading and usually decurved, never curving upward and inward, rufous-puberulent: fr. subglobose, about 2⅜ in. diam., closely resembling that of *Annona squamosa*, the component carpels loosely adhering, very gibbous, rounded or often retuse at the tip when fresh; pulp white, edible, but not so agreeably flavored as that of *Annona squamosa*.—This species is based upon specimens in the U. S. National Herbarium, received from Oton Jimenez, of San José, Costa Rica, the fls. collected by him at Nuestro Amo, March, 1912 (No. 427), and the fr. from the same tree, Oct., 1912. The accompanying figure is drawn from type material, the fr. from a field photograph sent by Mr. Jimenez, in whose honor the species is named.

AAA. *Corolla-wings linear-oblong or spatulate, ascending or erect and incurved.* (*Fig. 3422, c.*)

7. **orthopétala,** A. DC. A shrub or small tree with the habit of *R. Sieberi*, but with the lvs. somewhat longer petioled: lvs. oval-oblong, acute at apex and base, pilose: peduncles in pairs: calyx-lobes smaller than in *R. Sieberi;* corolla-wings erect and incurved: fr. not described.—This species was described by De Candolle from a specimen in the De Candolle Herbarium collected by Parker near Demarara, British Guiana. The name has been incorrectly applied to several rollinias with edible fr. Of these the principal

species, from an economic point of view, is *R. deliciosa* described above, which is readily distinguished from *R. orthopetala* by its widely spreading decurved corolla-wings.

8. **laurifòlia,** Schlecht. ARATICÚ MIRIM. A shrub or small tree with the new branchlets, petioles, peduncles, midrib, and nerves finely appressed-subfurfuraceous puberulent, the fls. and lower surface of the lf. clothed with finer and denser clay-colored puberulence: lvs. oblong-elliptical or oblong-lanceolate, acuminate, obtusish at the base, 3½–5 in. long, 1⅕–1⅗ in. broad; midrib prominent beneath, lateral nerves 10–15 pairs; upper surface apparently glabrous, but as seen under a lens covered with minute appressed white hairs: peduncles solitary or in 2's or 3's, graduated in length, the longest 3 times as long as the petioles (1 in. long), bracteolate at the base, gradually thickening toward the apex: corolla-wings ascending-erect, broadened at the apex, rounded or quite obtuse, ⅜in. long and ⅛in. broad near the apex, clothed with minute brownish-argillaceous tomentum: fr. subglobose, about the size of a horse-chestnut, composed of many carpels distinctly outlined and containing an edible, white, mucilaginous pulp with a pleasant sweet taste.—This species is based upon 2 flowering specimens collected in Brazil by Sellow (Nos. 809 and 1190).

9. **incúrva,** Moore. A diffuse shrub with long branches: lvs. short-petioled, lanceolate or lanceolate-oblong, obtuse, rounded at the base, coriaceous, above glabrous, often glossy, beneath paler, minutely puberulous, blades 4–5 in. long, 1½–2 in. broad, often more or less oblique at the base; midrib impressed above, rather prominent beneath, lateral nerves about 12 pairs inserted at a wide angle, undulate near the margin and curving upward: peduncles usually in pairs, sometimes solitary, longer than the petioles (1⅕ in. long), bracteate at the base, and bearing a small bracteole near the middle, puberulous: fls. yellowish green; calyx-lobes short and rounded, ferrugineous-pubescent; corolla-wings ferrugineous-tomentose, spatulate-oblong, ascending and incurved, ⅜in. long; stamens numerous, crowded; carpels albo-sericeous: fr. not observed.—This species described by Spencer Moore, was collected in Santa Cruz, Brazil, by the Matto Grosso expedition. Specimens from the type collection are in the Herbarium of Columbia University, at the Botanical Garden, New York City.

AAAA. *Corolla-wings compressed, obovate, and ascending.*

(*Fig. 3422, d.*)

10. **rugulòsa,** Schlecht. A shrub or small tree: lvs. lanceolate, or broadly lanceolate, obtusely and shortly acuminate, acute at the base, on both sides subglabrous, beneath glossy; young branchlets, petioles, and midrib appressed-puberulous: peduncles usually recurved or pendulous and thickened at the apex, warty and puberulous like the calyx, ⅕–⅖in. long: corolla-wings obovate, ascending, rounded or obtuse at the apex, narrowed at the base, tomentose-canescent, ⅕in. long and $\frac{1}{10}$in. broad: fr. globose, 1–1⅕ in. diam., with the component carpels forming 20–30 slightly raised rounded areoles; seeds small, pale brown, conoid, somewhat flattened.—Type collected in S. Brazil by Sellow. Closely related to *R. rugulosa* and with very similar fr. but with longer and narrower lvs. (suggesting those of *R. salicifolia*), is *R. Wármingii*, R. E. Fries, the type of which was collected on Mt. Tijuca, near Rio de Janeiro, by Glaziou (No. 6079).

AAAAA. *Corolla-lobes or -wings short, straight and spur-like, horizontally directed.* (*Fig. 3422, e.*)

11. **lanceolàta,** R. E. Fries. A small tree with small lanceolate lvs.: lvs. acute at the apex and base, above glabrous except along the midrib; beneath densely ferrugineous-villous along the midrib: young branches, petioles, and solitary or rarely geminate peduncles ferrugineous-tomentose: fls. ferrugineous-hirsute; outer corolla-lobes spur-like, short, rounded, and widely spreading: fr. not observed.—This species is based by Robert E. Fries on a specimen in the Copenhagen Herbarium collected by Glaziou in Brazil (No. 13509).

AAAAAA. *Corolla-lobes or -wings broadly ovate or suborbicular, and compressed.* (*Fig. 3422, f.*)

12. **emarginàta,** Schlecht. A glabrescent shrub, 6⅔–10 ft., growing in marshy places, with slender branches: lvs. oval or elliptical, obtuse at both ends or acutish at the base, emarginate or retuse at the apex, on both sides subglabrous and opaque: peduncles usually solitary, slender, about 1 in. long, minutely bracteolate at the base: corolla and calyx silky-hirtellous; corolla-wings obovate-orbicular, widely spreading, laterally compressed: fr. solid, about 1–1½ in. diam., ovate-globose, with the component carpels scarcely at all raised or distinctly outlined.—This species, very common in S. Brazil and Paraguay, is based upon specimens collected in the province of Rio Grande do Sul by Sellow.

13. **glaucéscens,** Sond. A glabrescent shrub closely allied to *R. emarginata*, but with the lvs. not emarginate and sometimes acute at the apex: lf.-blades ovate or lanceolate, obtuse or rarely acute at the apex, acute at the base, 2–3 in. long and 1 in. broad, glaucescent beneath; petioles ⅕–⅖in. long: peduncles in pairs, one shorter than the other, the longer one bearing a small bracteole below the middle: fls. canescent-puberulous; corolla-wings broadly obovate or suborbicular, widely spreading: fr. broadly ovoid or subglobose, small (about 1 in. diam.), solid and smooth, with the component carpels scarcely outlined and not at all gibbous.—Specimens in the U. S. National Herbarium collected by Dorsett, Shamel, and Popenoe, in S. Brazil.—This species was based by Sonder on a plant collected by Regnell on his second expedition, in the province of Minas Geraes, Brazil.

14. **sylvática,** St. Hil. ARATICÚ DO MATO. A medium-sized tree: lvs. elliptical or oblong, shortly acuminate, acute, or obtuse at the apex, acutish at the base, above puberulous when young, at length glabrous, beneath softly tomentose; petiole, midrib, and veins clothed with ferrugineous hairs, the remainder of the lower surface with white hairs: peduncles solitary or in pairs, clothed with ferrugineous tomentum; corolla-wings suborbicular: fr. globose, solitary, the size of a small apple, pubescent, with the component carpels forming prominent pentagonal areoles; pulp edible, somewhat like that of the cherimoya. W. E. SAFFORD.

ROLLINIÓPSIS (Greek derivative, signifying *Rollinia-like*, from the form of the fl.). *Annonàceæ.* FRUCTA DE MACACO. MONKEY-FRUIT. Shrubs or small trees of Brazil having fragrant 3-winged fls. like those of Rollinia, but with aromatic frs. in the form of a cluster of small distinct drupes, instead of a fleshy sweet syncarpium, as in Rollinia.—Only 4 species have thus far been described, all from Trop. Brazil. The type of the genus (*R. discrèta*, Safford), Fig. 3425, has been successfully intro. into cult. in the S. U. S. by the Office of Foreign Seed and Plant Introduction, U. S. Dept. of Agric. (S. P. I. No. 15508). This species, discovered by Dorsett, Shamel, and Popenoe in the vicinity of Januaria, state of Minas Geraes, has orange-colored pear-shaped drupes, locally known as Fruta de Macaco (monkey-fruit). The thin aromatic mesocarp surrounding the solitary seed tastes very much like the fr. of certain species of Xylopia, called malaguetas in the vicinity of Panama, and also suggests the flavor of the Mexican xochinacaztli, or earflower (*Cymbopetalum penduliflorum*) the spicy petals of which, together with vanilla, were used by the Aztecs for flavoring their chocolate in pre-Columbian times (see *Cymbopetalum*). The other known species are *R. simiàrum*, Safford, recently discovered by Rose and Russell, of the Carnegie

Expedition, in the state of Bahia; *R. parviflòra* (*Rollínia parviflòra*, St. Hil.), of Rio de Janeiro; and *R. leptopétala* (*Rollínia leptopétala*, R. E. Fries), of Piauhy, Brazil.—See Journ. Wash. Acad. Sci., vol. 6, p. 1916.

W. E. Safford.

ROMANÒVIA (derivation unknown). Also spelled *Romanowia*. *Palmàceæ*. A genus founded in G.C. III. 33:245 without generic description. *R. Nicolài*, Hort. A calamus-like palm with mealy down on the sts., long slender petioles without prickles: lvs. pinnate with

3425. Rolliniopsis discreta. *a*, Flower with a portion removed to show the mass of stamens surrounding the cluster of carpels beneath the minute inner petal, or corolla-lobe (×1½); *b*, a pair of stamens, showing a pair of parallel pollen-sacs beneath the expanded tip of the connective (×5); *c*, mature carpels which have fallen off the receptacle (×½); *d*, seed (×½).

remote segms., tapering to a wedge-shaped base and with the retuse apex divided irregularly into long acutely pointed lobes, somewhat as in caryota. Habitat not given. G.C. III. 33:suppl. April 25, p. iii.

ROMANZÓFFIA (named in honor of Count Nicholas Romanzoff). *Hydrophyllàceæ*. Low and delicate perennial herbs with the aspect of saxifrage, suitable for outdoor planting.

Leaves mainly radical, alternate, round-cordate or reniform, crenately 7–11-lobed, long-petioled: infl. scapose, racemosely or paniculately several-fld.; the pedicels filiform; fls. pale pink or purple, varying white; calyx-lobes oblong-linear or lanceolate: caps. retuse, 2-celled or nearly so.—Ten(?) species, Alaska southward to the coast range of Calif.

unalaschkénsis, Cham. Rootstock not tubiferous: scape erect, 3–5 in. high; the erect or ascending pedicels shorter than the fls.; calyx-lobes herbaceous; corolla very short-funnelform. Unalaska, and one isolated station in N. Calif.

sitchénsis, Bong. Rootstocks slender and tubiferous: plant sparsely pubescent or glabrate: scape filiform, weak, 6 in. high; the spreading pedicels longer than the fls.; calyx-lobes very glabrous; corolla funnelform. Alaska south to Monterey County, Calif. G. 36:649.

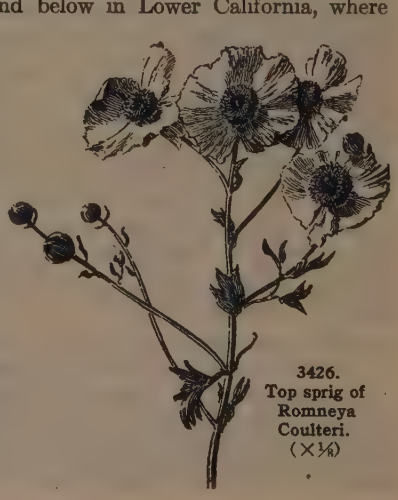
F. Tracy Hubbard.

ROMNÈYA (named for T. Romney Robinson, who discovered it about 1845). *Papaveràceæ*. Tall showy herbs or subshrubs used for garden planting.

Stems branching: lvs. petioled, pinnatifid, 2 or 3 pairs of segms.: fls. solitary at the ends of the corymbose branches, large, white and showy, 6 in. across; sepals 3, with a broad membranaceous dorsal wing; petals 6, all alike; stamens very numerous; stigmas numerous, connate at base into a little ring: caps. 7–11-celled, dehiscing to the middle, the valves separating by their margins from the firm persistent placentæ.—Two species, Calif. and Mex. Monographed by Fedde in Engler's Pflanzenreich, hft. 40 (IV. 104), 1909.

Romneya grows wild in California from San Diego to Santa Barbara County and also in Mexico, and in the wild state it blooms chiefly in June and July, but in cultivation the period of bloom is increased from May to August. In the region of Los Angeles, it is said to thrive best on dry rocky soil and needs only the water it obtains from the winter rains. Romneya can be transplanted safely if cut to the ground before it is lifted and can be raised from seed if the seed is fresh. Raising from seed under artificial conditions is not very satisfactory, however, as it takes a few years between the germination of the seed and blooming of the seedlings.

Romneya is difficult to transplant, due to the scarcity of fibrous roots; in middle California suckers which are produced in great abundance are transplanted without any loss, provided a good firm ball of earth is kept around the stout thick roots in transit, and if the stems are cut well back, almost to the base. At San Francisco it grows luxuriantly in a heavy adobe soil, producing immense flowers. The name Matilija poppy (pronounced Ma-til'li-ha) is the favorite in California. It comes from the Matilija Cañon, Ventura County, where the plant grows in particular abundance. Miss Parsons writes: "Many people have the mistaken idea that it grows only in that region. It is not common by any means; but it is found in scattered localities from Santa Barbara southward into Mexico. It is very abundant near Riverside, and also upon the southern boundary and below in Lower California, where the plants cover large areas. It not only grows in fertile valleys, but seeks the seclusion of remote cañons, and nothing more magnificent could be imagined than a steep cañon-side covered with the great bushy plants, thickly covered with enormous white flowers." Blossoms remain open for many days. (J. Burtt Davy.)



3426. Top sprig of Romneya Coulteri. (×⅙)

XCVIII. Romneya Coulteri, the Matilija poppy, one of the most showy of California flowers

Coùlteri, Harv. MATILIJA POPPY. Fig. 3426. Sts. flexuous, more branched above: lvs. rather papery than subcoriaceous, somewhat glaucous; the lower trijugate, the lobes lanceolate, the terminal one ovate: calyx rather glabrous, sepals purplish at the apex; petals white, membranaceous, thickened toward the base: caps. spreading, setose. Calif. and Mex. G.C. III. 27:131. G. 8:603; 35:3. Gn. 13:494; 26:400; 29, pp. 207, 211; 46, p. 405; 55, p. 208; 56, p. 239; 57, p. 263; 62, p. 63; 68, p. 89; 76, p. 611. G.M. 43:36. Gn.W. 20:19. G.F. 10:353. F.M. 1877:252. A.F. 5:397. A.G. 19:314 (suppl. April 16, 1898). C.L.A. 1:76.—Though not considered hardy in the eastern states, it has been successfully grown outdoors in northern states.

trichócalyx, Eastw. Sts. stout, erect, more simple above: lvs. subcoriaceous, 3-lobed or 3-dentate? calyx subglobose: caps. appressed setose. Calif. G.C. III. 42:414. G. 35:571; 37:65. Gn. 77:291. G.M. 54:186.

F. TRACY HUBBARD.

ROMULÈA (a name commemorative of Romulus, one of the mythical founders of Rome). *Iridàceæ.* Crocus-like bulbs, suitable for outdoor planting.

Leaves narrow, usually overtopping the fls.: sts. produced, simple or branched: spathe of 2 lanceolate valves: fls. lilac, purple, yellow or pale, always solitary; perianth funnel-shaped, about 1 in. across; ovary 3-celled: caps. globose or ellipsoid.—About 90 species, Medit. region, Trop. and S. Afr. They are closely allied to Crocus, but differ in being less hardy and in having a long peduncle and short fl.-tube. Very little known in cult. in Amer.

A. *Fls. rosy or crimson.*

ròsea, Eckl. (*Trichonèma ròsea,* Ker). Corm globose, ⅛–½in. thick: lvs. ½–1 ft. long, setaceous: peduncle 1–6 in. long, 1–3-fld.; outer spathe ¾in. long; perianth with a short funnel-shaped tube with a yellow throat and a red-lilac limb, about 1 in. long, the outer segms. with 3 faint purple stripes outside. S. Afr. B.M. 1225 (as *T. roseum*). F.S. 8:799 (as *R. Celsii*). G.C. III. 58:37. Gn. 79, p. 232. Var. **speciòsa,** Baker (*T. speciòsum,* Ker), has a larger perianth and outer segms. with 3–5 dark purple stripes of which the outer are feathered. B.M. 1476.

AA. *Fls. yellow or white.*

Clusiàna, Baker (*Trichonèma Clusiàna,* Lange). Fls. bright yellow, tipped with lilac. Spain. A white variety has been intro. abroad by Barr.

Macòwanii, Baker. Sts. very stout, 1–fld.: fls. bright golden yellow in the lower part, paler upward and sometimes tinged with red; perianth-segms. oblong. S. Afr. G.C. III. 58:35.

R. Bulbocòdium, Sebast. & Mauri(?), has pale lilac fls. with a yellow center, tinted golden brown, striped with blue outside. Italy and Spain. G. 34:307. B.M. 265 (as Ixia Bulbocodium). There is another R. Bulbocodium, that of Kunze, which is the same as R. Clusiana.—*R. Leichtlinii,* Hort., has cream-white crocus fls. with a golden center.

F. TRACY HUBBARD.

RONDELÈTIA (named in memory of William Rondelet, 1507–66, a French physician and naturalist). Syn. *Rogièra. Rubiàceæ.* Evergreen shrubs and trees, a few of which are grown in the warmhouse or outdoors in the extreme southern United States.

Leaves opposite, rarely ternately whorled, sessile or petiolate, coriaceous or membranaceous: infl. corymbose or paniculate, axillary or rarely terminal cymes; fls. red, yellow or white; calyx-lobes equal; corolla-tube usually slender, swollen or not, throat glabrous or bearded; limb 5-lobed (in some species 4-lobed); ovary 2-celled: caps. loculicidal.—About 85 species, Trop. Amer. The whole family is noted as furnishing numerous desirable stove plants, and Rondeletia is a highly esteemed genus. The following species are shrubs growing 4 ft. or more high. The fls. are generally fragrant, and the clusters 4 in. or more across. In the favorite species (*R. odorata*) the fls. number 10–30 in a cluster, each fl. being fully an inch across; in the other species the fls. may number 150–200 to a cluster, each fl. being less than ½in. across. *R. cordata* is often said to have a 4-lobed fl., a mistake that dates back more than half a century to a typograpical error.

Rondeletias are of slow growth, and not many cultivators of plants care to give time and space to raise them; nevertheless some of the species, notably *R. odorata* var. *major,* deserve to be more widely grown. Cuttings from the half-ripened wood may be rooted at any time of the year. Spring, however, is considered the best time, as one has the season's growth ahead, and good plants may be had in the fall. Insert the cuttings in a 3-inch pot, in a mixture of finely sifted peat and sand and place them in a tight propagating-bed, in a temperature of 70°. Water them thoroughly and shade them from the sun. In a few weeks the cuttings will be rooted, when they may be potted in small pots, in the siftings of the root of the osmunda fern, with enough sand to keep it open. If a good fibrous peat can be procured, it answers the same purpose. A night temerature of 60° is best for these plants. Large plants, however, will winter safely at 50° to 55°. The advantage of keeping small plants warmer is that they may be grown more quickly. As soon as the young plants have a good hold on their first pot, cut them back to two joints above the soil. Place them close to the glass and syringe two or three times a day. When the sun gets strong, shade them lightly in the middle of the day. As soon as they are well rooted in their first pot, shift them into a size 2 inches larger, which will carry them through until the following spring. They would flower in this pot if allowed to do so, but it is advisable to keep them growing right along the first year. They may be cut back as soon as the shoots are long enough to leave two sets of leaves, after the heart has been taken out of them. As the plants grow larger, a third part of good fibrous loam may be added to the peat, and at all times they must be potted very firmly. After the plants have reached the size of an 8-inch pot, they may go two seasons without repotting, if they are fed with liquid manure as advised for ixoras. After color shows in the flowers, it is best to withhold manure until they have finished flowering, as the flowers will last much longer. After the flowers decay, if they are removed without cutting away much of the stem, they are liable to flower a second time the same year. It is preferable, however, to cut them well back, and if they require potting, do so, after they have broken into growth. When the young breaks have made four pairs of leaves, take out the heart of them. This treatment will double the number of shoots, and give a far better appearance when they come in flower. Mealy-bug will sometimes be found on rondeletias. They may be easily gotten rid of if the plants are removed to a house that is being fumigated with hydrocyanic gas. (George F. Stewart.)

3427. Rondeletia cordata. (×¼)

AA. *Fls. red.*

odoràta, Jacq. (*R. speciòsa,* Lodd.). Lvs. ovate, nearly sessile: clusters 10–30-fld.: fls. crimson to brick-red, with a conspicuous yellow throat; lobes elliptical to roundish. Cuba, Mex. B. 2:53. B.M. 3953. B.R. 1905. F.C. 1:36. L.B.C. 19:1893. P.M. 2:242; 16:354. R.H. 1891:522 (throat not conspicuously yellow). G.W. 6, p. 125. Var. **màjor,** Hort., is a form with larger fls.

AA. *Fls. pink to white.*

B. *Base of lvs. more or less cordate.*

cordàta, Benth. (*Rogièra cordàta,* Planch. *R. thyrsiflòra,* Hort., not Roth). Fig. 3427. Lvs. ovate, acuminate, cordate: generally said to have pink or flesh-colored fls. with a yellow throat (as in F.S. 8:754), but in R.H. 1878:230 they are shown as pure white. B.M. 8540. J.F. 2:122. Guatemala. Possibly also native in Mex.

latifòlia, Hort. (*Rogièra latifòlia,* Decne.). Lvs. large, heart-shaped, acuminate, short-petioled: fls. in corymbose cymes, the tubes pink, the limb white; calyx-lobes oval, obtuse. Guatemala. R.H. 1853:121.

BB. *Base of lvs. not cordate.*

C. *Corolla-lobes ovate: stipules broadly ovate.*

amœna, Hemsl. (*Rogièra amœna,* Planch.). Lvs. elliptic, broader than in *R. gratissima,* and shorter, acuminate, 2–5 in. long: fls. rose-pink, with a conspicuous yellow throat. Guatemala. F.S. 5:442.—Intro. in Calif. See also *R. versicolor,* in suppl. list below

CC. *Corolla-lobes obcordate: stipules subulate.*

gratíssima, Hemsl. (*Rogièra gratíssima,* Lind.). Lvs. oblong-elliptic, 1–2 in. long, short-petioled, mostly rounded at the base: fls. with a bright rosy tube, the lobes fading from pale rose to whitish; throat not conspicuously yellow. Trop. Amer. I.H. 28:424. F.S. 15:1570 (corolla-lobes often obovate; stipules narrowly ovate). Gt. 490 (as *Rogiera elegantissima*). J.H. III. 52:365.

AAA. *Fls. blue.* (*Hindsia.*)

longiflòra, Cham. (*Hìndsia longiflòra,* Benth.). Lvs. opposite, entire, lanceolate, more or less oval or sometimes almost linear, petiole very short, attenuate at the base: infl. terminal corymb; fls. blue; calyx-tube short, lobes linear; corolla-tube very long; segms. of lip oval, spreading and acuminate. R.H. 1858, p. 329. H.U. 4, p. 243.—This is now placed in the genus Hindsia, which differs from Rondeletia in general appearance and in the form of the corolla which is rather funnel-shaped than salver-shaped, without any callous contraction or beard at the mouth of the tube and by the caps. which is differently dehiscent. A second species of Hindsia is *H. violàcea,* Benth., from Brazil. B.R. 30:40.

The following species have been occasionally cult.: *R. americàna,* Linn. White-fld. W. Indies and S. Amer.—*R. anómala,* Hort., is an imperfectly known species said to have the lvs. in 3's, and coral-red or deep scarlet fls. with a presumably yellow throat. Habitat (?).—*R. Báckhousii,* Hook., a pink-fld. species from Trop. Amer., is easily distinguished from those mentioned above by the much longer calyx-lobes, which are pink. B.M. 6290.—*R. Púrdiei,* Hook., a beautiful pale yellow-fld. species from Colombia, has a great pyramidal cluster 5 in. across and 4 in. deep, with an astonishing number of fls., perhaps 150–200 in B.M. 5669.—*R. versícolor,* Hook. (Rogiera versicolor, Lindl. & Paxt.), is referred to R. amœna by Index Kewensis but seems distinct. The fls. are said to be "remarkable for their play of colors: the tube is yellow; the limb in bud deep rose-color, changing when they expand to pale rose and then to white, with a yellow disk, and having a 2-lobed green spot in the center from the color of the stigmas, which protrude a little beyond the mouth." B.M. 4579. J.F. 2:112.

F. TRACY HUBBARD.†

ROOT-GALLS. Abnormal enlargements often appear on the roots of plants. These enlargements are much more frequent than is generally supposed, but from their position under ground are rarely observed. From an economic standpoint they have not received the attention that they merit.

Although the term root-gall is usually applied to the abnormal enlargement of roots due to insects and other animal organisms, it has a much wider application as used by most plant-growers. The presence of nodules or local enlargements on the roots of plants has been discussed by different authors under the names root-galls, root-knots, root-swellings, and the like. In cases in which the cause of the nodules of hypertrophied tissue is known, special names have been assigned to the enlargements. Thus the gall formed by the eel-worm (*Heterodera radicicola*) is known as the nematode root-gall (Fig. 3428); the enlargement on the roots of cabbage and related plants by the myxomycete (*Plasmodiophora Brassicæ*) is called club-root; the swellings on the roots of the peach, apricot, and many other plants, which are of characteristic appearance and usually appear at the crown of the plant, are known as crown-gall. Root-tubercles are small gall-like bodies found on the roots of many leguminous plants. They are symbionic in nature, the organism causing them being helpful to the plant. See *Legumes.*

Abnormal root enlargements are due to the following causes: (1) animal parasites, as in the nematode root-gall (Fig 3428), the galls formed on the roots of the grape by the phylloxera, woolly aphis galls on apple tree roots, and the like; (2) vegetable parasites, as in the club-root and the crown-gall (Fig. 3429); (3) mechanical injury, causing excessive callous development, root-burls, and so on. In addition to these the causes of these enlargements are oftentimes obscure or unknown.

3428. Root-galls due to nematodes.—Tomato roots.

Swellings on the roots of the mulberry are said to be due to the hypertrophy of the lenticels. Some investigators have attributed gall-like root-growths in some instances to the hypertrophy of adventitious buds.

The root-galls caused by the nematode (*Heterodera radicicola*) may usually be readily recognized from other forms of hypertrophied tissue by the numerous knotty enlargements on the smaller roots infested by the worms. By careful search, in most instances, the distended female worms may be found in the infested tissue, where they appear as small nearly spherical pearl-like bodies, readily seen with the unaided eye. This minute worm, commonly called eel-worm, feeds upon the roots of a great variety of cultivated plants and is particularly destructive in the South. It is usually injurious in the northern states only to plants growing under glass. However, ginseng and some other outdoor perennials often suffer severely as far north as Michigan and southern Canada. The most effective remedy in the case of field crops is the removal of all rubbish that would harbor the worms during the winter. In greenhouses steam can be forced through the infested soil. When potted plants are badly affected, they may be severely root-pruned and repotted in soil free from worms.

The root-swellings caused by the grape-vine gall-

louse (*Phylloxera vastatrix*) may be readily recognized from other root-galls by the presence of the insects. The young insects, by puncturing the epidermis of the roots and sucking the sap, cause the galls to develop. The insect is found on the diseased roots in all stages of development during the summer.

3429. A crown-gall.

The most effective method of holding the insect in check appears to be in the use of resistant roots, i. e., the grafting of the more tender varieties on roots of those that are stronger and better able to resist the attack of the insect. Bisulfide of carbon in some instances has proved effective in killing the lice.

The crown-gall appears to be the most harmful of root diseases affecting cultivated plants in this country. These galls have been reported upon the roots of the peach, apricot, almond, prune, plum, apple, pear, walnut, grape, raspberry, blackberry, cherry, poplar, and chestnut, and without doubt further investigation will find them on other plants as well. The crown-gall disease is now known to be due to a distinct species of pathogenic bacteria (*Bacterium tumefaciens*). It appears to be the same organism in all the host-plants affected by this disease. Seedlings from one to six months old appear to be most susceptible to this disease; hence it is particularly serious in the case of nursery stock. When the galls appear on young trees, they almost always occur on the side of the main root a few inches below the surface of the soil, or in the region of the crown. With more mature trees they are likely to occur at greater depth on lateral roots. At first the gall has a uniform outer appearance, but later it becomes warty from unequal growth. The tissue of the developing gall is soft and succulent, with nodules of woody tissue scattered through it. The galls vary much in size and may reach a diameter of 10 inches.

But little is known as to remedies for crown-gall. As the disease is primarily a nursery disease, the most effective remedy is in securing stock for planting from a non-infested nursery. This disease is often destructive to the roots of roses and asters in the greenhouse benches. Here the destruction of all diseased plants followed by steam sterilization of the soil is the only remedy.

J. W. Toumey.
H. H. Whetzel.†

ROQUETTE, or ROCKET-SALAD (*Erùca sativa*, Mill.), a low-growing hardy annual from southern Europe, whose leaves resemble those of radish and turnip, is much used by the French as a spring and autumn salad and pot-herb. The flavor of the young, tender leaves, which are the parts used, bears a strong resemblance to that of horse-radish. In America it is but little grown because there are milder-flavored plants that serve the same purpose. See *Eruca*.

The first sowing may be made in early spring, the seed being dropped thinly in shallow drills a foot apart, with successional plantings each second or third week through the season. The soil must be rich and well supplied with moisture, else the leaves will probably be tough and acrid. Inter-culture is the same as for spinach, lettuce, and similar crops. Frequent watering and tillage in hot dry weather to insure rapid vigorous growth should result in succulent mild-flavored leaves. In summer the plants run rapidly to seed; in spring and autumn they will produce abundantly after being cut. The pale citron-yellow flowers emit a perfume resembling that of orange blossoms. M. G. Kains.

RORÌPA (etymology unexplained); originally spelled *Roripa*, but later emended by its author. *Cruciferæ*. Here are included the plants long known as Nasturtium (but not the garden flowers of that name, which belong in Tropæolum), and by some later botanists as Radicula under which name they are described at page 2895. By a ruling of the International Botanical Congress at Brussels, however, the name Radicula is not permissible as it is based on a morphological character; therefore, the plants are transferred (at least temporarily) to Roripa. Under Roripa, the species become **R. Nastúrtium**, Rusby (*Sisýmbrium Nastúrtium-aquáticum*, Linn. *Radicula Nastúrtium-aquáticum*, Brit. & Rend.); the water-cress; **R. Armoràcia**, Hitchc. (*Radicula Armoràcia*, Rob.), the horse-radish; **R. índica**, Bailey (*Sisýmbrium índicum*, Linn. *Nastúrtium índicum*, DC.), the tropical cress. L. H. B.

RÒSA (ancient Latin name). *Rosàceæ*. Rose. Ornamental shrubs chiefly grown for handsome flowers, also for ornamental fruits and attractive foliage.

Deciduous or sometimes evergreen, upright, less often climbing or creeping shrubs with usually prickly sts.: lvs. alternate, odd-pinnate, rarely simple, stipulate (Figs. 3430, 3431): fls. solitary or corymbose at the end of usually short branchlets; petals and sepals 5, rarely 4; stamens numerous; pistils numerous, rarely few, inclosed in an urn-shaped receptacle, which becomes fleshy and berry-like at maturity, containing several or many bony achenes, usually erroneously called seeds; the fr. itself is called a "hip." (Figs. 3432, 3433.) Rosa is a widespread genus, easily distinguished by well-marked characters from allied genera, but in the limits of the genus itself the characters are exceedingly variable and it is very difficult to group into sections and species the innumerable forms which often pass gradually into each other. In no other genus, perhaps, are the opinions of botanists so much at variance in regard to the number of species. While some, as Bentham and Hooker, estimate the number at about 30, the French botanist Gandoger actually describes from Eu. and W. Asia alone 4,266 species. The larger number of botanists recognize over 100 species. The roses

3430. A five-foliolate rose leaf.

are almost equally distributed through the colder and temperate regions of the northern hemisphere, in Amer. extending to N. Mex., in Afr. to Abyssinia, and in Asia to India. The fls. show a remarkable tendency to become double, and such forms have been known and cult. from time immemorial. These innumerable garden forms, increasing every year, are almost exclusively of hybrid origin and are therefore omitted in the botanical classification of the genus.

3431. A nine-foliolate rose leaf.

Many attempts have been made to subdivide the genus with more or less satisfactory results; the more important are those by A. DeCandolle, Lindley, Regel, and Baker. Nowadays the arrangement proposed by Crépin is considered the most natural and satisfactory and has been followed in the account given below. No good general monograph has been published since Lindley's "Monographia Rosarum" (1820), except a rather short one by Regel in 1877. Of the more recent publications the most important are those of Crépin, especially his "Primitiæ Monographiæ Rosarum." In consulting his publications one has to bear in mind that the author changed his opinion somewhat respecting the value of the species during his studies of the genus. In his later publications he takes a broader view in regard to the specific value of the rose forms and unites under one species many forms which he formerly considered as distinct species. An illustrated monograph valuable for the knowledge of the older garden forms and species is Thory and Redouté's "Les Roses," with 160 colored plates (1817–20). It is quoted below as Red. Ros. As the first edition in folio is found in only very few libraries, the smaller edition is cited in parenthesis by volume, groups and the sequence of the plates, neither pages nor plates being numbered continuously in this edition. The most recent book on roses is Miss Ellen Willmott's "The Genus Rosa," with about 150 excellent colored and numerous black plates; in this work all the important species of roses, including most of the recently introduced Chinese species and the types of our cultivated garden forms, are described and figured. It is quoted below as W. R. (with the number of the species).

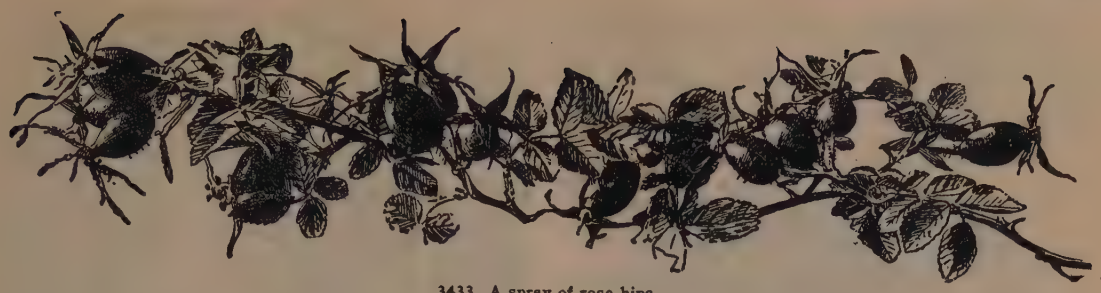
The economic properties of the rose are of little importance. The most valuable product is attar of roses, a highly fragrant essential oil. It is chiefly manufactured in southeast Europe and western Asia from *Rosa alba* and *R. damascena*, and of late this industry has been successfully transplanted to Germany. See *Perfumery Gardening*, page 2547. The fruits of some species, especially of *R. villosa* and *R. canina*, are made into preserves.

The roses are mostly low or medium-sized shrubs, usually with prickly stems, often more or less stoloniferous, sometimes climbing or creeping, with small or medium-sized odd-pinnate deciduous or evergreen foliage and with mostly large and showy, solitary or clustered flowers ranging in color from purple, crimson, or pink to white and yellow, and followed by ornamental usually scarlet or bright red fruits remaining on the branches a long time, sometimes through the whole winter. There is probably no flower more popular and better known than the rose. From time immemorial poets have sung its praise, and the love of it can be traced through the most ancient documents in the literature of the Aryan race. It is remarkable to note, however, that the rose has played a far inferior part in the horticulture of the Chinese and Japanese. It is probably the first flower known and cultivated in a double state, and it is the double-flowered garden form whose image the word "rose" almost invariably brings to the mind, while to the wild single-flowered roses much less attention has been given. The ornamental value of single roses is rarely fully appreciated. The wild roses have a simple charm and graceful beauty of their own. No doubt the bold and dominating beauty of the double roses has eclipsed the more modest attractions of the single roses. The longer blooming season of the garden roses is also a factor in their favor. Though the wild roses cannot, perhaps, be compared with their more noble sisters of the garden, they are nevertheless fully able to rival other ornamental shrubs for the adornment of park and plot. Most of the species are hardy or almost hardy North; among the hardiest are *R. rugosa*, *R. virginiana*, *R. carolina*, *R. acicularis*, *R. blanda*, *R. Woodsii*, *R. heliophila*, *R. palustris*, *R. rubrifolia*, *R. pendulina*, *R. canina*, *R. cinnamomea*, and *R. pomifera*. Hardy at least as far north as Massachusetts are *R. spinosissima*, *R. rubiginosa*, *R. multiflora*, *R. Helenæ*, *R. arvensis*, *R. setigera*, *R. gallica*, *R. setipoda*, *R. omeiensis*, while others, as *R. Wichuraiana*, *R. sempervirens*, *R. sericea*, *R. fœtida*, *R. hemisphærica*, require some shelter or protection. Hardy only South are *R. Banksiæ*, *R. bracteata*, *R. chinensis*, *R. lævigata*, *R. odorata*, *R. stellata*. The recently introduced species from central and western China have not yet been sufficiently tested, but a large percentage appears to be hardy as far north as Massachusetts.

According to the habit peculiar to each species, they can be used for a variety of purposes. Most of the species are shrubby, rarely exceeding 6 or 8 feet, and may be used for borders of shrubberies or for covering slopes and rocky ridges, especially *R. rugosa*, *R. carolina*, and various American species. Some kinds,

3432. Various forms of rose hips. *a*, Rosa rugosa; *b*, R. pendulina; *c*, R. carolina. (About natural size.)

as *R. rugosa* and *R. virginiana*, make handsome ornamental hedges. The climbing species are used for covering walls, trelliswork, arbors, porches, or pillars, but perhaps display their beauty to the most advantage when allowed to ramble over shrubs or rocks. The half-evergreen *R. Wichuraiana* makes a beautiful groundcover and may also be used for edging groups and flowerbeds. The fruits of most species are decorative and



3433. A spray of rose hips.

often remain on the branches all winter. The red stems of most of the species of the Carolinæ and Cinnamomeæ groups are effective in winter also. The foliage of most of the American species turns purple-orange or yellow in autumn, and so does that of *R. rugosa*, which is, in regard to the foliage with its dark green leathery and glossy leaves, the handsomest of the hardy roses.

With few exceptions the roses are of easy cultivation and grow in almost any kind of soil, except in a loose and very sandy one. They are readily transplanted. The wild roses need little pruning; they should only be thinned out and the weak and old wood be removed; long and vigorous shoots should not be shortened, especially in the climbing varieties, as these shoots are the most floriferous.

All true species can be propagated by seeds, but as roses are likely to hybridize, only seeds taken from isolated plants ought to be used. The hips should be gathered as soon as ripe, the seeds washed out and sown at once or stratified and sown in spring. They germinate the first year, but if kept in the hips during the winter and allowed to become dry, they usually do not germinate until the second year. Mice are very fond of the seeds. Almost all species grow readily from cuttings of nearly ripened wood in summer under glass. Many species, especially the climbing roses, can be propagated by hardwood cuttings taken in fall and planted in spring. Layering is less often practised, except with a few species, like *R. fœtida* and *R. hemisphærica*, which do not grow readily from cuttings. Some species, especially those of the groups of Cinnamomeæ, Carolinæ, and Gallicæ, can be increased by root-cuttings; the roots are taken up in fall, stored during the winter in sphagnum or sand in a frost-proof room, and sown in spring in drills and covered about 2 inches deep. The species of the last-named groups and some others are also often increased by suckers and division. Budding and grafting is less often done with the wild roses and should be avoided for roses in shrubberies where the individual plants cannot be carefully watched; the stock usually throws up suckers and outgrows the cion, often in a short time. For general notes on culture and varieties, see *Rose*.

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INDEX, CONTINUED.

KEY TO THE GROUPS.

(For a horticultural classification of roses, founded primarily on garden values, see the article *Rose*.)

Subgenus HULTHEMIA.

Lvs. simple, without stipules: fls. yellow.

Section 1. SIMPLICIFOLIÆ. Species No. 1

Subgenus EUROSA.

Lvs. pinnate stipulate.

A. *Styles exserted beyond the mouth of the receptacle.*

B. *Exserted styles connate into a column, usually as long as stamens.* (*See Fig. 3434 right.*)

Section 2. SYSTYLÆ. Species Nos. 2–10

BB. *Exserted styles free, about half as long as stamens: lfts. usually 3–5.*

Section 3. INDICÆ. Species Nos. 11–14

AA. *Styles reaching only the mouth of the receptacle and stigmas forming a sessile head over it* (*see Fig. 3434*), *but slightly exserted in Nos. 53 and 54.*

B. *Stipules free or adnate only at the base, small: sarmentose or climbing shrubs: fls. white or yellow.*

cc. *Branches glabrous: lfts. 3–5, stipules entire or denticulate.*
d. *Fls. small, umbellate, yellow or white: pedicels and receptacle smooth: stipules subulate, caducous.*
Section 4. BANKSIANÆ. Species Nos. 15, 16
dd. *Fls. large, solitary, white: pedicels and receptacle bristly: stipules denticulate.*
Section 14. LÆVIGATÆ. Species No. 59
cc. *Branches tomentose or pubescent: lfts. 7–9; stipules pectinate: fls. 1 or few, white, with large bracts at the base of the short pedicel: receptacle tomentose.*
Section 13. BRACTEATÆ. Species No. 58
bb. *Stipules adnate more than one-half of their length.*
c. *Receptacle smooth or hispid.*
d. *Lvs. of flowering branchlets 3–5-foliolate, large and firm: sts. usually with prickles and bristles: fls. upright, on long pedicels; receptacle bristly; sepals usually pinnate, reflexed after flowering, caducous.*
Section 5. GALLICÆ. Species Nos. 17–21
dd. *Lvs. of flowering branchlets 5–11-foliolate (rarely 3-foliolate, the fls. then short-pedicelled, with smooth receptacle).*
e. *Fls. usually corymbose: if solitary, pedicels with 1 or more bracts.*
f. *Sts. with only one kind of prickles, sometimes mixed with glandular bristles: prickles usually hooked, stout, scattered: outer sepals usually pinnate.*
Section 6. CANINÆ. Species Nos. 22–27
ff. *Sts., at least at the base, with usually straight often slender prickles and numerous bristles gradually passing into prickles.*
g. *Sepals after flowering spreading, usually entire, caducous: infl. usually glandular-hispid: fr. usually hispid, with the achenes only at the bottom. (See Fig. 3432, c.)*
Section 7. CAROLINÆ. Species Nos. 28–32
gg. *Sepals after flowering upright, usually entire, rarely caducous: fr. usually smooth, with the achenes at the bottom and wall. (See Fig. 3432, a, b.)*
Section 8. CINNAMOMEÆ. Species Nos. 33–48
ee. *Fls. solitary, without bracts, only occasionally corymbose; sepals erect, persistent: lfts. small.*
f. *Petals 5; styles not exserted.*
g. *Lfts. usually 9 on the flowering branchlets: prickles straight, usually mixed with bristles and slender: fls. white, pink or yellow; sepals entire.*
Section 9. PIMPINELLIFOLIÆ. Species Nos. 49, 50
gg. *Lfts. 5–7 on the flowering branchlets: prickles usually hooked, rather stout: fls. yellow; sepals pinnate, rarely entire.*
Section 10. LUTEÆ. Species Nos. 51, 52
ff. *Petals 4, only occasionally 5, white; styles somewhat exserted: lfts. 7–17.*
Section 11. SERICEÆ. Species Nos. 53, 54
cc. *Receptacle prickly.*
d. *Lvs. on flowering branchlets 3–7-foliolate; lfts. cuneate-obovate, incisely dentate.*
Section 12. MINUTIFOLIÆ. Species Nos. 55–57
dd. *Lvs. of flowering branchlets 7–15-foliolate; lfts. elliptic or elliptic-oblong, sharply serrate.*
Section 15. MICROPHYLLÆ. Species No. 60

SUMMARY OF SECTIONS.

Section 1.	SIMPLICIFOLIÆ	Species No. 1
Section 2.	SYSTYLÆ	Species Nos. 2–10
Section 3.	INDICÆ	Species Nos. 11–14
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Section 13.	BRACTEATÆ	Species No. 58
Section 14.	LÆVIGATÆ	Species No. 59
Section 15.	MICROPHYLLÆ	Species No. 60

Subgenus HULTHEMIA.

Section 1. SIMPLICIFOLIÆ. *Only one Asiatic species, distinguished from all other roses by the simple exstipulate lvs.*

1. **pérsica,** Michx. (*R. simplicifòlia,* Salisb. *R. berberifòlia,* Pall. *Lòwea berberifòlia,* Lindl.). Low straggling shrub, 2 ft. high, with slender, prickly branches: lvs. short-petioled, oval to oblong, acute at both ends, serrate, bluish green, pubescent, ¾–1½ in. long: fls. solitary, yellow, with red eye, about 1 in. across: fr. prickly. June. N. Persia to Siberia. B.M. 7096. B.R. 1261. G.C. III. 6:8, 9, 78. W.R. 1.—This peculiar rose is very rare in cult., since it is very difficult to grow. It has been successfully cult. in a cool greenhouse, exposed to the full sun, kept moist during summer and dry from October to March. The only way to prop. it seems to be by suckers; seeds are occasionally intro. from its native country. A hybrid of this species with *R. involucrata* is *R. Hárdii,* Cels., with 5–7-foliolate lvs. and large yellowish white fls., with a deep orange eye. G.C. II. 24:469. Gn. 19, p. 473. P.M. 10:195. W.R. 2.

3434. Section of rose flowers. To show two forms of styles. (×⅓)

Subgenus EUROSA.

Section 2. SYSTYLÆ. *A group of about 12 species (one of them American), well marked by the styles being connate into a slender exserted column. Sts. sarmentose or climbing, with hooked prickles: fls. in corymbs, few or many; outer sepals pinnate, rarely entire, reflexed after flowering, caducous.*

A. *Stipules pectinate: prickles usually in pairs* ..... 2. **multiflora**
AA. *Stipules entire or denticulate: prickles scattered.*
B. *Habit more or less upright with usually arching branches.*
C. *Lvs. of flowering branchlets 3–5-foliolate, pubescent beneath.*
D. *Fls. small, ½in. across: lfts. linear-lanceolate* ..... 3. **Watsoniana**
DD. *Fls. 2 in. across: lfts. generally ovate-oblong* ..... 4. **setigera**
CC. *Lvs. of flowering branchlets 5–9-foliolate.*
D. *Lfts. usually 5–7: corymb paniculate: fr. less than ½in. long, subglobose.*
E. *Under side of lfts. pubescent: prickles hooked* ..... 5. **Brunonii**
EE. *Under side of lfts. glabrous or a few hairs on the midrib: prickles straight or nearly so* ..... 6. **moschata**
DD. *Lfts. usually 7–9: corymb umbellate: fr. more than ½in. long, ovoid* ..... 7. **Helenæ**

BB. *Habit creeping, or prostrate.*
C. *Foliage half-evergreen, lustrous: fls. usually several.*
D. *Lfts. usually 9, obtuse, ⅓–¾in. long* ..... 8. **Wichuraiana**
DD. *Lfts. usually 5, acuminate, ¾–2 in. long* ..... 9. **sempervirens**
CC. *Foliage deciduous, dull; lfts. usually 7: fls. more often solitary.* 10. **arvensis**

2. **multiflòra,** Thunb. (*R. polyánthos,* Roessig. *R. thyrsiflòra,* Leroy. *R. intermèdia,* Carr. *R. Wichùræ,* Koch). Fig. 3435. Deciduous shrub, with vigorous, long, recurving or climbing branches: lfts. usually 9, obovate to oblong, acute or obtuse, serrate, pubescent, ¾–1⅓ in. long: fls. in many-fld. pyramidal corymbs, usually white, ¾in. across or more; sepals ovate, abruptly acuminate; styles glabrous: fr. small, globular. June. Japan, China. B.M. 7119. G.F. 3:405 (adapted in Fig. 3435); 4:535; 6:316, 317. A.G. 18:677. A.F. 6:1003. Gn. 49, p. 368 (as *R. microcarpa*); 55, p. 432; 66, p. 25. G.M. 44:425 (as *R. polyantha simplex*). R.H. 1902, p. 205. G.W. 7, p. 148; 13, pp. 342, 343. Gng. 5:120, 121.—The typical form which is sometimes distinguished as var. *Thunbergiàna,* Thory, has small single white fls. and is found in Japan and Korea. Var. **cathayénsis,** Rehd. & Wilson. Fls. pink, about 1½ in. across, in rather flat corymbs. China. This is the wild single-fld. form from which the two following varieties have been derived. Var. **cárnea,** Thory (var. *plèna,* Regel. *R. flórida,* Poir.). With double light pink fls. B.M. 1059. B.R. 425. Var. **platyphýlla,** Thory, with larger lvs. and larger double, deep pink fls. B.R. 1372. This is known as Seven Sisters Rose. A form of this with intense red and more numerous fls. is the well-known "Crimson Rambler," one of the best climbing roses (Fig. 3436). A.G. 16:233. Many hybrids have originated in cult.; they usually show their parentage by the pectinate stipules. A hybrid with *R. rugosa* is *R. Iwára,* Sieb., with single, rather small white fls. W. R. 61. Of the same parentage is *R. yedoénsis,* Makino, with small pink fls. *R. polyántha,* Hort., not Roessig, is a trade name for hybrids with *R. chinensis.* Gn. 29:118. G.C. III. 29:135. G. 27:347. J.H. III. 43:425. The Dawson rose, or *R. Dawsoniàna,* is a hybrid with General Jacqueminot. G.W. 7, p. 125. Hybrids with *R. setigera, R. gallica,* and *R. Wichuraiana* have also been raised.

3435. Rosa multiflora (×½)

3. **Watsoniàna,** Crépin (*R. multiflòra* var. *Watsoniàna,* Matsum.). Fig. 3437. Deciduous shrub, with sarmentose or recurving branches: lfts. 3–5, linear-lanceolate, with entire wavy margin, pubescent beneath, 1–2½ in. long: fls. in many-fld. pyramidal corymbs, ½in. across or less, white or pink; style glabrous: fr. small.

3436. Crimson Rambler rose. (See No. 2.)

June, July. R.B. 14, p. 183. G.F. 3:477 (adapted in Fig. 3437). W.R. 16.—A very curious rose of unknown origin, supposed to have been intro. from Japan, but not known in a wild state. Not quite hardy North.

4. **setígera,** Michx. Prairie Rose. Figs. 3438, 3439. Shrub with prickly branches attaining 6 ft., with long and slender recurving or climbing branches: lfts. 3–5, ovate to oblong-ovate, shortly acuminate, serrate, tomentose beneath, 1–3 in. long: fls. in rather few-fld. corymbs, deep rose, fading to whitish, about 2 in. across, almost scentless; pedicels and receptacle glandular-hispid; style glabrous: fr. globular, ⅓in. across. June, July. From Ont. and Wis. to Texas and Fla. Mn. 8:65. G.F. 10:323 (adapted in Fig. 3438). A.G. 13:196, 197; 16:229. Gng. 1:325. C.L.A. 4:339; 7:473. G.W. 7, p. 149. W.R. 23. M.D.G. 1900:423. Var. **tomentòsa,** Gray (*R. rubifòlia,* R. Br.). Lvs. more tomentose beneath: corymbs with more, but smaller fls. —A valuable hardy climbing rose. Several varieties with double fls. are in cult.; some are probably hybrids with *R. arvensis, R. multiflora, R. Noisettiana,* and other species.

5. **Brunònii,** Lindl. (*R. Bròwnii,* Tratt. *R. moschàta* var. *nepalénsis,* Lindl.). Himalayan Musk Rose. Tall shrub, with arching or sarmentose branches, glabrous or thinly villous while young: prickles scattered, hooked, short and stout: lfts. 5–7, elliptic-oblong to oblong-lanceolate, acute or acuminate, serrulate, soft-pubescent beneath, slightly pubescent or nearly glabrous above, 1½–2½ in. long; petioles and rachis pubescent, usually with scattered prickles: fls. white, fragrant, 1½–2 in. across, in large many-fld. corymbs; sepals lanceolate, lobed, much longer than receptacle; pedicels long and slender, pubescent and glandular; styles pubescent: fr. ovate, ⅓–½in. long, glabrous; sepals deciduous. June, July. Himalayas, W. China. B.M. 4030. B.R. 829 F.S. 4:366, 367. Gn. 73, p.

493; 77, p. 511; 79, p. 113 (as *R. moschata*). G. 6:529; 30:419. G.C. III. 36:152, 153. W.R. 10.—A handsome strong-growing rose, but more tender than the real musk rose with which it has been much confused.

6. **moschàta,** Mill. (*R. ruscinonénsis*, Desv.). Musk Rose. Shrub, with arching or sarmentose branches,

3437. Rosa Watsoniana (×½). No. 3.

glabrous: prickles rather small and slender, straight or slightly hooked: lfts. 5–7, elliptic-ovate to oblong-ovate, acute or acuminate serrulate, glabrous above, hairy on the midrib beneath, otherwise glabrous or nearly so, 1–2 in. long; petioles and rachis nearly glabrous, usually prickly: fls. white, 1½–2 in. across, fragrant with the odor of musk, in usually 7-fld. corymbs; sepals lanceolate, much longer than the receptacle, lobed, deciduous; pedicels slender, slightly pubescent and glandular; styles pubescent: fr. ovate, small. June, July. S. Eu., N. Afr. W.R. 9. Var. **nastaràna,** Christ (*R. Pissárdii*, Carr.). A more robust form: prickles slightly curved: lfts. nearly glabrous beneath: fls. more numerous, over 2 in. across. Persia. R.H. 1880, pp. 314, 315. W.R. 10. Hardier than the type. Var. **abyssínica,** Rehd. (*R. abyssínica*, Lindl.). More prickly and glandular: lfts. smaller, scarcely acuminate: infl. more compact; sepals with smaller lobes or without. Abyssinia. Tender; cult. in Calif.—The musk rose of the older writers, known since the 16th century, seems to have at present almost disappeared from cult.; the plant generally cult. under this name is *R. Brunonii*, which is superior as a garden plant, though it is somewhat tenderer. Several hybrids are known; the most important is *R. Noisettiàna*, a hybrid with *R. chinensis* (see No. 13). A hybrid with *R. gallica* is *R. Dupóntii*, Déségl. (*R. moschàta* var. *nívea*, Lindl.), which differs chiefly in its broader and fewer lfts., the glandular pedicels, the larger fls. with shorter styles and in the presence of bristles on the st. B.R. 861. Gn. 67:254; 77, p. 510. W.R. 13.—*R. moschata densa*, Vilm., belongs probably to *R. Gentiliana* (see suppl. list).

7. **Hélenæ,** Rehd. & Wilson. Sarmentose shrub, to 15 ft.: branches with stout hooked prickles: lfts. usually 7–9, rarely less, oblong-ovate or ovate-lanceolate, short-acuminate, rounded or cuneate at the base, sharply serrate, glabrous above, grayish green beneath and hairy on the veins, 1–2 in. long: fls. white, fragrant, 1½ in. across, in many-fld. umbel-like corymbs 3–6 in. broad; pedicels slender, about 1 in. long, like the receptacles stipitate-glandular, sepals lanceolate, sparsely pinnate; styles hairy: fr. ovoid or oblong-obovoid, scarlet, about ½in. long, with deciduous sepals. June. Cent. China.—A handsome free-flowering rose with large clusters of fragrant white fls. in June and scarlet frs. in autumn; has proved hardy at the Arnold Arboretum.

8. **Wichuraiàna,** Crépin (*R. Lùciæ* var. *Wichuraiàna*, Koidzumi. *R. bracteàta*, Hort., not Wendl.). Memorial Rose. Fig. 3440. Half-evergreen shrub with prostrate and creeping branches: lfts. roundish or broadly obovate, usually obtuse, serrate, glabrous, shining above, ⅓–¾in. long: corymbs few-fld. or many-fld., pyramidal; fls. white, fragrant, 1½–2 in. across; styles pubescent; pedicels slightly glandular-hispid: fr. ovoid, to ½in. high. July–Sept. Japan. B.M. 7421 (as *R. Luciæ*). G.F. 4:569 (adapted in Fig. 3440); 6:337. C.L.A. 7:621. G.M. 45:214. Gn. 62, p. 7; 73, p. 164. G.C. III. 22:99. R.H. 1898:105, 106. M.D.G. 1898: 580–5.—A handsome rose for covering banks and rockeries. A number of hybrids, especially with Hybrid Tea roses, have been raised. G.F. 6:337. Mn. 8, pp. 27 and 156. Gng. 6:353–5. Var. **rùbra,** André, with single carmine fls., 1½–2 in. across, and the lvs. with 5–7 somewhat larger lfts., is a hybrid of *R. Wichuraiana* and *R. multiflora* var. Crimson Rambler. R.H. 1901:20. A hybrid with *R. rugosa* is *R. Jácksonii*, Willmott, with bright crimson fls., extremely floriferous and of graceful habit. W.R. 20.

9. **sempérvirens,** Linn. Evergreen shrub with long and slender, sarmentose, somewhat reddish branches: lfts. 5–7, ovate-lanceolate, acuminate, serrulate, glabrous, shining above, ¾–2 in. long: fls. in few-fld., rarely many-fld. corymbs, white, to 2 in. across, slightly fragrant; pedicels glandular-hispid; styles usually pubescent: fr. subglobose or ovoid, orange-red. June,

3438. Rosa setigera (×½). No. 4.

July. S. Eu., N. Afr. B.R. 465. W.R. 5. Var. **prostràta,** Nichols. (*R. prostràta,* Lindl.). Lfts. smaller, oval, acute: fr. ovoid. Var. **scándens,** Nichols. (*R. scándens,* Mill.). Lfts. oblong or oval, obtuse: fr. subglobose. There are some double-fld. garden forms, probably hybrids with *R. chinensis* and other roses. Less hardy than the following.

10. **arvénsis,** Huds. (*R. rèpens,* Scop. *R. silvéstris,* Herrm.). Deciduous shrub, with sarmentose or creeping sts.: lfts. usually 7, ovate to ovate-elliptic, acute, serrate, dull above, glabrous or slightly pubescent beneath, rather thin, ½–1½ in. long: fls. in few-fld. corymbs, sometimes solitary, white, scentless, 1½–2 in. across; style glabrous: fr. ovoid. June, July. Eu. B.M. 2054. Gn. 60, p. 233; 77, p. 510. W.R. 3.—A hybrid with *R. chinensis* is *R. rùga,* Lindl., a trailing shrub with large, fragrant double pink fls. in several-fld. corymbs: lfts. ovate, glabrous. B.R. 1389. W.R. 17. Another hybrid is *R. Polliniàna,* Spreng. (*R. arvensis* × *R. gallica*). Upright or sarmentose: lfts. usually 5, large, of firmer texture: fls. long-stalked, large, white to purple. W.R. 111. Here belongs probably the Ayrshire Rose (*R. arvénsis* var. *capreolàta,* Neill.), with double white to deep pink fls. G.W. 1, p. 355.

Section 3. Indicæ. *Few Asiatic species with upright or procumbent sts.: prickles scattered, hooked, few: lfts. 3–5 rarely 7: infl. 1- to many-fld.; sepals entire or the outer ones sparingly pinnate, reflexed after flowering; bracts and stipules narrow, the latter with small, divergent auricles.*

A. *Sts. with uniform prickles: lvs. glabrous.*
B. *Lvs. persistent or subpersistent.*
C. *Fls. white, yellowish or light pink, very fragrant: fr. globose or depressed-globose; sepals usually entire: stipules without or with few marginal glands at the auricles* ..... 11. **odorata**
CC. *Fls. red or pink, rarely whitish, not or slightly fragrant: fr. ovoid or pyriform; sepals usually pinnate: stipules glandular-ciliate* . 12. **chinensis**
BB. *Lvs. deciduous: fls. many in a corymb* ..... 13. **Noisettiana**
AA. *Sts. with prickles and bristles: lvs. slightly pubescent beneath: fls. solitary or few* ..... 14. **borbonica**

11. **odoràta,** Sweet (*R. índica* var. *odoratíssima,* Lindl. *R. Thèa,* Savi. *R. chinénsis* var. *fràgrans,* Rehd.). Tea Rose. Shrub with long sarmentose often climbing branches armed with scattered hooked prickles: lvs. evergreen or half-evergreen; lfts. 5–7, elliptic or ovate to oblong-ovate, acute or acuminate, sharply serrate, lustrous above, glabrous, 1–3 in. long; stipules glandular-ciliate usually only above the middle,

3439. Baltimore Belle rose.—Rosa setigera (×½). No. 4.

3440. Rosa Wichuraiana (×½). No. 8.

often sparingly: fls. solitary or 2–3, on rather short, often glandular stalks, white, light pink or salmon. pink, or yellowish, 2–3½ in. across; sepals entire: fr. globose or depressed-globose, red. W. China. Red. Ros. 1:19 (3:25, 19). B.R. 804.—The original Tea Rose with double blush fls. was intro. into England in 1810 and in 1824 the form with pale yellow double fls., var. **ochroleùca,** Rehd. (*R. índica* var. *ochroleùca,* Lindl.). Red. Ros. (3:25, 20). From the crossing of the forms of this species between themselves and also with *R. chinensis* the Tea roses of our gardens have originated, while the Hybrid Teas are the offspring of crosses between the Tea roses and other garden roses. Var. **pseud-índica,** Rehd. (*R. chinénsis* var. *pseud-índica,* Willmott. *R. Fortuniàna,* Paxt., not Lindl.). Fortune's Double Yellow. Beauty of Glazenwood. Gold of Ophir. Branches sarmentose, with strongly hooked prickles: lfts. 5–7, elliptic-oblong, firm: fls. 3–4, double, salmon-yellow, sweet-scented, outside tinged with red. B.M. 4679. F.S. 8:769. W.R. 28. Var. **erubéscens,** Rehd. & Wilson, has single blush or pale pink fls. and is probably like the following one of the wild forms of the double-fld. garden varieties. *R. chinénsis* var. *grandiflòra,* Willmott (W.R. 29) is scarcely different. Var. **gigantèa,** Rehd. & Wilson (*R. gigantèa,* Collett & Hemsl.). Fls. creamy white, single, 4–6 in. across; pedicels and receptacles smooth. Very vigorous, climbing to 50 ft. S. W. China, Burma. G.C. III. 6:13; 37:136; 51:314. Gn. 67, p. 179; 71, p. 67. B.M. 7972. W.R. 34. To this variety *R. macrocárpa,* Watt (*R. xanthocárpa,* Watt) from Manipur, has been referred as a synonym, but the author maintains that it is a distinct species and that it has yellow fls. and edible yellow frs. as large as a small apple.—*R. odorata gigantea* is hardy only S. and is cult. in Calif., where it blooms from Nov. to May. Hybrids with *R. moschata* have been raised by Franceschi at Santa Barbara, Calif.; these are Madeleine Lemoine, Montarioso, and Montecito and they combine the vigor and the foliage of var. *gigantea* with the paniculate infl. of *R. moschata.* Other hybrids with different garden roses have been raised in Eu.

12. **chinénsis,** Jacq. (*R. índica,* Lindl., not Linn. *R. chinénsis* var. *índica,* Koehne. *R. índica* var. *vulgàris,*

Lindl.). China Rose. Bengal Rose. Low upright shrub with slender branches usually armed with scattered stout compressed more or less hooked prickles, sometimes almost unarmed: lfts. 3–5, broadly ovate to ovate-oblong, acuminate, serrate, shining and dark green above and pale beneath, glabrous, 1–2½ in. long; stipules narrow, glandular-ciliate: fls. usually several, less often solitary, on long usually glandular stalks, rarely short-stalked, crimson or pink, rarely whitish, about 2 in. across, not or slightly fragrant; outer sepals usually pinnate: fr. obovoid or turbinate, about ¾in. long. China. W.R. 26. The wild form recently discovered in Cent. China is var. **spontànea,** Rehd. & Wilson, with single deep red or pink, usually solitary fls. G.C. III. 31:438. The following varieties are garden forms.

Var. **semperflòrens,** Koehne (*R. semperflòrens,* Curt. *R. bengalénsis,* Pers.). Crimson Chinese Rose. Low shrub, with slender, prickly or almost unarmed, dark green branches: lfts. rather thin, mostly stained with purple: fls. usually solitary on slender pedicels, crimson, or deep pink. B.M. 284. W.R. 30.

Var. **longifòlia,** Rehd. (*R. longifòlia,* Willd.). Lfts. lanceolate: fls. single, deep pink. Red. Ros. (3:25, 8).

Var. **mínima,** Rehd. (*R. Lawrenciàna,* Hort. *R. índica* var. *pùmila,* Thory). Dwarf shrub, usually not over 1 ft. high, with small rose-red fls. about 1½ in. across; petals often pointed. There are single- and double-fld. forms. The Fairy Roses belong to this variety. B.M. 1762. Red. Ros. (3:25, 6, 7).

Var. **viridiflòra,** Dipp. Green Rose. With monstrous green fls.; the petals are transformed into small, narrow green lvs. F.S. 11:1136.

Var. **Manétti,** Dipp. (*R. Manétti,* Hort.). Fig. 3441. Of vigorous growth, upright: pedicels hispid-glandular: fls. deep pink, single or semi-double. This variety has been recommended as a stock for forcing roses; grows readily from cuttings, but is not quite hardy.

3441. The Manetti rose. Much used as a stock (×⅓).
See No. 12.

13. **Noisettiàna,** Thory. Noisette Rose. Champney Rose. Supposed hybrid of *R. chinensis* and *R. moschata.* Sts. upright to 6 ft., with hooked uniform reddish prickles: lfts. 5–7, usually oblong-lanceolate or oblong-ovate, glabrous: fls. usually many in corymbs, white to pink or red, sometimes yellow; styles pubescent, loosely cohering, protruding beyond the disk. Blooms in summer and fall. Gn. 71, p. 335. W.R. 32. —Numerous garden forms. The Noisette rose was raised about 1816 by John Champney, of Charleston, S. C., from seed of the musk rose fertilized by a blush China rose. From the seed of this hybrid Philippe Noisette, a florist at Charleston, obtained a rose which was afterward distributed as Blush Noisette by his brother Louis Noisette, of Paris.

14. **borbónica,** Morr. Bourbon Rose. Supposed hybrid of *R. chinensis* and *R. gallica.* Upright shrub, with prickly and often glandular-hispid branches: lfts. usually 7, ovate or ovate-lanceolate, acute, shining, slightly pubescent beneath: fls. 1 or few in a corymb, on glandular pedicels, double or semi-double, usually purple, blooming in summer and fall. W.R. 114. Originated from a rose intro. about 1819 from the Island of Bourbon where it was found among seedlings of the Bengal rose by Mr. Périchon and sent by Mr. Bréon, director of the botanic garden at Bourbon, to Jacques, gardener to the Duke of Orléans at Neuilly near Paris; this rose, called Rose Edward, by crossing with roses of the Gallica groups has given rise to the Hybrid Bourbon roses and is the origin together with crosses between this and other hybrids of *R. chinensis* and its varieties and *R. damascena* of the Hybrid Perpetual or Remontant class.

Section 4. Banksianæ. *Contains one Chinese species with climbing, sparingly prickly or unarmed sts.: stipules quite free, subulate, caducous: sepals entire, reflexed after flowering, caducous.*

A. *Pedicels glabrous; fls. small* ..... 15. **Banksiæ**
AA. *Pedicels hispid; fls. large* ..... 16. **Fortuneana**

15. **Bánksiæ,** R. Br. Banks' Rose. Climbing to 20 ft., evergreen: lfts. 3–5, sometimes 7, elliptic-ovate to oblong-lanceolate, acute or obtusish, finely serrate, shining, glabrous except at the base of midrib beneath: fls. on slender, smooth pedicels in many-fld. umbels, white or yellow, about 1 in. across, slightly fragrant. May, June. Cent. and W. China. G.C. III. 31:439. J.H.S. 27:501. Var. **álbo-plèna,** Rehd., with double white fls. B.M. 1954. Var. **lùtea,** Lindl. (var. *lùteo-plèna,* Rehd.), with double yellow fls. B.R. 1105. Var. **lutéscens,** Voss, with single yellow fls. B.M. 7171. Var. **normàlis,** Regel, with single white fls. is the wild form.—Intro. first into Eu. by Wm. Kerr, in 1807 in the double white form; the double yellow form was intro. about 1825, while the single white and yellow forms were not known until 40 or 50 years later. Not hardy N.; sometimes grown in greenhouses.

16. **Fortuneàna,** Lindl., supposed to be a hybrid of *R. Banksiæ* and *R. lævigata.* Climbing shrub, with sparingly prickly sts.: lfts. 3–5, ovate-lanceolate, lustrous: fls. solitary, large, double, white, on hispid pedicels. F.S. 7, p. 256. J.F. 2, p. 27. W.R. 36.

Section 5. Gallicæ. *Contains only one very variable species, native of Eu. and W. Asia. Low, upright shrub: the sts. with usually hooked prickles mixed with bristles: fls. few and often with narrow bracts or solitary on a usually bractless pedicel; sepals reflexed after flowering, caducous, the outer ones pinnate; upper stipules not dilated.*

A. *Prickles very unequal: lfts. usually doubly and glandular-serrate.*
B. *Texture of lfts. firm, leathery: pedicels upright* ..... 17. **gallica**
BB. *Texture of lfts. thin; lfts. sometimes simply serrate: fls. nodding, usually double* ..... 18. **centifolia**
AA. *Prickles uniform: lfts. simply serrate, not glandular. (Supposed hybrids of R. gallica.)*
B. *Prickles numerous.*
C. *Receptacle glandular-hispid: lfts. ovate-oblong, often pubescent beneath* ..... 19. **damascena**
CC. *Receptacle usually smooth: lfts. broadly ovate or broadly elliptic, pubescent beneath* ..... 20. **alba**
BB. *Prickles sparse, on the flowering branchlets nearly wanting: lfts. glabrous beneath or pubescent only on the midrib* ..... 21. **francofurtana**

17. **gállica,** Linn. Upright shrub, with creeping rootstock, rarely attaining 5 ft. high: sts. usually densely covered with prickles and bristles: lfts. 3–5, leathery, broadly oval or ovate, rounded at base, usually doubly serrate with glandular teeth, rugose above, pubescent beneath, deflexed, 1–2 in. long; rachis glandular-pubescent and often prickly: fls. on rather stout, upright,

3442. Rosa centifolia var. muscosa.—Moss rose. (×½)

glandular-hispid and bristly pedicels, deep pink to crimson, 2–3 in. across; receptacle glandular-hispid: fr. subglobose or turbinate, brick-red. June. Cent. and S. Eu., W. Asia. G.W.H. 1:89.—The following are the most important forms: Var. **Ágatha,** Thory. With rather small, very double purple fls., the outer petals spreading, the inner ones concave. Red. Ros. (2:17, 17–21). Var. **incarnàta,** Rehd. (*R. incarnàta,* Boreau, not Mill.). Lfts. narrower, elliptic-ovate to elliptic-oblong: rachis not prickly; flowering branches unarmed: fls. large, pale crimson, solitary: fr. ovoid. B.M. 7035. Var. **macrántha,** Hort., similar to the preceding, but fls. pale pink, finally white. Gn. 52:464. G. 29:417. R.H. 1901:548. Var. **officinàlis,** Thory (*R. provinciàlis,* Mill. Var. *plèna,* Regel), is like the typical form but with double fls. W.R. 121.

Var. **versícolor,** Thory. Rosa Mundi; also York and Lancaster Rose. Petals striped white and red. W.R. 110. Red. Ros. (2:16, 12). Var. **pûmila,** Braun (*R. austrìaca,* Crantz). Dwarf form, with creeping rootstock: fls. red, single. Red. Ros. (2:17, 2).

18. **centifòlia,** Linn. (*R. gállica* var. *centifòlia,* Regel). Cabbage Rose. Closely allied to the preceding species. Rootstock less creeping: prickles stouter: lfts. usually 5, pubescent on both sides or only beneath, larger and thinner; rachis not prickly: fls. usually pink, very double, on long and slender pedicels, nodding, fragrant; petals inflexed; sepals persistent. June, July. E. Caucasus. W.R. 115. G. 1:340. Of this rose the double-flowered form only is in cult., known already to the ancients. Var. **muscòsa,** Sér. (*R. muscòsa,* Ait.). Moss Rose. Fig. 3442. Fls. rose, with peduncles and calyx glandular-mossy. B.M. 69. Gn. 18:84. G.W. 7, p. 125. Var. **álbo-muscòsa,** Willmott. Like the preceding, but fls. white. B.R. 102. W.R. 117. Var. **cristàta,** Prévost, has the mossy excrescences confined to the edges of the sepals. B.M. 3475. G.W. 7, p. 125. W.R. 118. Var. **pompònia,** Lindl. (*R. pulchélla,* Willd. *R. dijonénsis,* Roessig). Pompon Rose. Dwarf form: lfts. elliptic, glabrous above, about 1 in. long: fls. double, bright red, 1½ in. across; pedicels densely setose. W.R. 119. Var. **parvifòlia,** Rehd. (*R. parvifòlia,* Ehrh. *R. burgundìaca,* Roessig). Burgundian Rose. Similar to the preceding, but smaller: lfts. ½–¾in. long: fls. about 1 in. across; pedicels slightly setose. B.R. 452. W.R. 120.—Numerous spontaneous hybrids are known. From this with its varieties, and *R. damascena,* the Hybrid Perpetual or Remontant roses have originated by hybridizing with *R. chinensis* and its forms.

19. **damascèna,** Mill. (*R. bífera,* Pers. *R. calendàrum,* Borkh.). Damask Rose. Attaining 5 ft.: sts. usually with numerous stout and hooked prickles, sometimes mixed with glandular bristles: lfts. usually 5, sometimes 7, ovate-oblong, serrate, more or less pubescent beneath, 1–2½ in. long; stipules scarcely dilated, sometimes pectinate; petioles prickly: fls. usually corymbose, double, red, pink or white, sometimes striped; pedicels and receptacles glandular-hispid; sepals deciduous, reflexing during flowering-time: fr. obovate. June, July, and again in autumn. Red. Ros. (2:16, 6). W.R. 124. Origin unknown: intro. to Eu. from Asia Minor in the 16th century. Var. **trigintipétala,** Dieck, with semi-double red fls., is considered to be the rose chiefly cult. in S. E. Eu. for the manufacturing of attar. Gt. 38, p. 129. G.C. III. 7:45.

20. **álba,** Linn. Upright shrub, becoming 6 ft. high: sts. with scattered hooked prickles and sometimes with bristles: lfts. usually 5, broadly ovate or broadly elliptic, serrate, pubescent beneath, 1–2 in. long: upper stipules dilated: fls. more or less double, usually several, white, fragrant; pedicels glandular-hispid; receptacle usually smooth: fr. ovate, scarlet. June. Origin unknown, probably hybrid of *R. gallica* and *R. dumetorum.* Var. **rubicúnda,** Roessig (*R. incarnàta,* Mill. *R. álba* var. *incarnàta,* Pers.). Fls. double, white tinged with pink. W.R. 137.

21. **francofurtàna,** Muenchh. (*R. turbinàta,* Ait.). Upright shrub, attaining 6 ft.: sts. with straight or hooked prickles: flowering branches almost unarmed: lfts. 5–7, oval, serrate, pubescent beneath; upper stipules much dilated: fls. 1–3, single or double, purple, 2–3 in. across, slightly fragrant; pedicels and receptacle glandular-hispid only at the base; sepals erect after flowering, entire or nearly so: fr. turbinate. June.

3443. Rosa palustris (×½). No. 28.

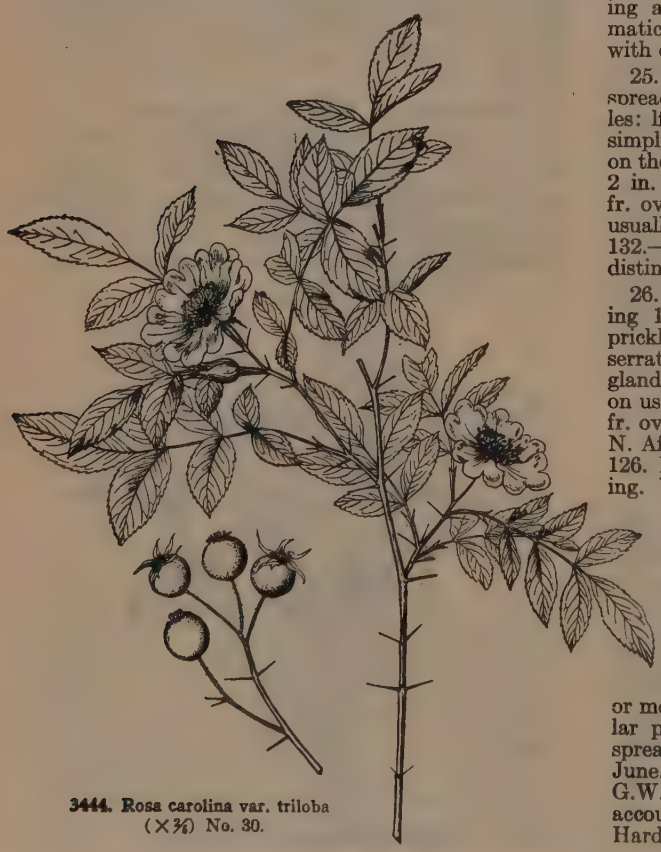
Supposed hybrid of *R. gallica* and *R. cinnamomea*. Red. Ros.(3:23, 1).

Section 6. CANINÆ. *Many species in Eu., N. Afr. and W. Asia. Upright shrubs, with scattered, usually hooked and numerous prickles: upper stipules dilated: corymb usually many-fld., with dilated bracts; outer sepals pinnate, reflexed after flowering and caducous or erect and persistent.*

A. *Lvs. pubescent, at least beneath, or glandular.*
  B. *Prickles slender, straight or slightly curved.*
    C. *Lfts. large, to 2 in. long: fr. large, to 1 in. across*.....22. **pomifera**
    CC. *Lfts. smaller: branchlets purple, bloomy: fr. smaller*.....23. **mollis**
  BB. *Prickles hooked, stout.*
    C. *Under side of lfts. glandular*.....24. **rubiginosa**
    CC. *Under side of lfts. pubescent*.....25. **dumetorum**
AA. *Lvs. glabrous.*
  B. *Foliage bright or dark green*.....26. **canina**
  BB. *Foliage bluish green, tinged with red*.27. **rubrifolia**

22. **pomífera,** Herrm. (*R. villòsa*, Linn., in part). Upright, densely branched shrub, attaining 6 ft., with almost straight spines: lfts. 5–7, oval to ovate-oblong, acute or obtuse, doubly glandular-serrate, grayish green, pubescent above, tomentose beneath, rarely glabrescent, 1–2 in. long: fls. 1–3, pink, 1½–2 in. across, on bristly and glandular pedicels: fr. scarlet, ovoid or subglobose, to 1 in. across, hispid, with persistent erect sepals. June, July. Eu., W. Asia. B.M. 7241. W.R. 141.—Hardy rose, with large ornamental fr.

23. **móllis,** Smith (*R. villòsa* var. *mollíssima*, Rau). Upright shrub, to 4 ft.: branchlets purple, more or less bloomy; prickles sometimes ⅛in. long: lfts. 5–7, broadly oval, rarely oval-oblong, doubly serrate, pubescent above, tomentose and usually silky beneath, ½–1½ in. long: fls. 1–3, 1½–2 in. across, deep pink, rarely white; pedicels usually only sparingly glandular: fr. small, glabrous or stipitate-glandular. June. Eu., W. Asia. W.R. 138.



3444. Rosa carolina var. triloba (×⅔) No. 30.

24. **rubiginòsa,** Linn. (*R. Eglantèria*, Linn.). SWEETBRIAR. EGLANTINE. Dense shrub, attaining 6 ft., with hooked prickles often mixed with bristles: lfts. 5–7, orbicular to oval, doubly glandular-serrate, dark green above and glabrous, pale beneath and often pubescent, glandular on both sides, ½–1½ in. long: fls. 1–3, on hispid short pedicels, bright pink, 1½–2 in. across; receptacle usually glandular-hispid: fr. subglobose or ovoid, orange-red to scarlet, with upright-spreading, usually caducous sepals. June. Eu.; naturalized in some localities in the East. B.B. (ed. 2) 2:286. W.R. 145.—A handsome hardy rose of compact habit, with bright green foliage exhaling a very agreeable aromatic odor. There are some double forms and hybrids with other species.

3445. Rosa foliolosa. (×½)

25. **dumetòrum,** Thuiller. Upright shrub with spreading or recurving branches with stout hooked prickles: lfts. 5–7, close, oval-orbicular to elliptic, usually simply serrate, pubescent on both sides or only below on the veins, 1–1½ in. long: fls. solitary to many, about 2 in. across; pedicels glabrous or stipitate-glandular: fr. ovoid to subglobose, orange-red, about ¾in. long, usually glabrous. June. Eu., W. Asia, N. Afr. W.R. 132.—Very close to the following species and chiefly distinguished by the pubescence.

26. **canìna,** Linn. DOG ROSE. Upright shrub, attaining 10 ft. or more, with often recurving branches: prickles stout, hooked: lfts. 5–7, oval or elliptic, doubly serrate, glabrous or slightly pubescent or somewhat glandular beneath, ¾–1½ in. long: fls. 1–3, light pink, on usually glabrous pedicels; sepals reflexed, caducous: fr. ovate, orange-red, or scarlet, glabrous. June. Eu., N. Afr., W. Asia; naturalized in some localities. W.R. 126. B.B. (ed. 2) 2:284.—Much used as stock for grafting. Var. **exìlis,** Keller (*R. éxilis*, Crépin). Low form with small lfts. about ⅓in. long, and small pink fls. about 1 in. across. W.R. 127.

27. **rubrifòlia,** Vill. (*R. glaùca*, Pourr. *R. ferruginea*, Déségl., not Vill.). Upright shrub, attaining 6 ft., with slender, purplish branches covered with glaucous bloom: prickles few, hooked or straight: lfts. 7–9, elliptic or ovate-lanceolate, simply serrate, bluish green and more or less tinged with red, ¾–1½ in. long: fls. 1–3 or more, pink, 1½ in. across, on usually hispid-glandular pedicels; sepals long, with dilated apex, upright-spreading, tardily caducous: fr. subglobose, scarlet. June. Mountains of Cent. and S. Eu. B.R. 430. G.W. 7, p. 139. W.R. 133.—A very striking rose on account of its reddish foliage: fls. less conspicuous. Hardy North and prefers partial shade.

Section 7. CAROLINÆ. *Contains only American species. Upright, mostly low shrubs: sts. slender, with usually straight prickles, placed in pairs and often mixed with bristles: upper stipules usually narrow: corymbs generally few-fld.; sepals spreading after flowering, caducous, the outer ones entire or with few erect lobes: achenes inserted exclusively at the bottom of the usually depressed-globose receptacle.*

A. *Pedicels rather long: lfts. 5–9.*
B. *Lfts. finely many-toothed: prickles usually hooked: stipules convolute.* . 28. **palustris**
BB. *Lfts. coarsely toothed: prickles usually straight and slender: stipules flat.*
C. *Branches prickly only at the nodes or unarmed, only vigorous shoots bristly.*
D. *Prickles hooked: lfts. shining above* . . . . . 29. **virginiana**
DD. *Prickles straight or nearly so: lfts. dull above* . . . . . 30. **carolina**
CC. *Branches densely bristly* . . . . . 31. **nitida**
AA. *Pedicels very short: lfts. 7–11, small and narrow* . . . . . 32. **foliolosa**

28. **palústris,** Marsh. (*R. carolìna,* Auth., not Linn. *R. corymbòsa,* Ehrh. *R. pennsylvánica,* Michx.). Fig. 3443. Upright shrub, attaining 8 ft., with slender sts.: lfts. usually 7, elliptic to narrow-oblong, acute at both ends, usually pubescent beneath, ¾–2 in. long; stipules narrow: fls. usually corymbose, pink, about 2 in. across: fr. depressed-globose, glandular-hispid, about ½in. high, like those of the following species. June–Aug. Nova Scotia to Minn., south to Fla. and Miss., preferring swampy and moist ground. Em. 2:488. B.B. (ed. 2) 2:285. W.R. 1:68. Mn. 1, p. 86. Var. **Nuttalliàna,** Hort., has larger fls. appearing later and continuing until Sept.

29. **virginiàna,** Mill. (*R. lùcida,* Ehrh. *R. hùmilis* var. *lùcida,* Best). Shrub, 6 ft. high, with few or no suckers: prickles sometimes hooked: lfts. 7–9, elliptic to obovate-elliptic, dark green and shining above, thickish, often slightly pubescent beneath, ½–1½ in. long; stipules somewhat dilated: fls. usually few or solitary, about 2 in. across; sepals usually entire: fr. like that of the preceding. June, July. Newfoundland to N. Y. and Pa. B.B. (ed. 2) 2:285. Gn. 55, p. 428; 71, p. 493. Gt. 56:1564, fig. 2. W.R. 63.—Well adapted for borders of shrubberies, handsome in summer with its shining foliage and bright pink fls.; ornamental in winter with the brownish red sts. and red frs. remaining plump until the following spring. Var. **álba,** Willmott. has white fls. and green sts. A.F. 12:1098. Gng. 5:306. M.D.G. 1904:205. W.R. 63*a*. Var. **plèna,** Hort. (*R. ràpa,* Bosc). With double fls.

3446. Semi-double Rosa rugosa (×½). No. 33.

30. **carolìna,** Linn. (*R. hùmilis,* Marsh. *R. parviflòra,* Ehrh. *R. virginiàna* var. *hùmilis,* Schneid. *R. Lyoni,* Pursh). Fig. 3432. Shrub, 3 ft. or sometimes 6 ft. high, spreading by means of numerous suckers, with slender prickles and usually numerous bristles: lfts. 5–7, resembling those of the former, but narrower, thinner, not shining, usually pubescent beneath: fls. often solitary; outer sepals lobed. June. Maine to Ga., west to Wis. and Okla. W.R. 64.—Much resembling the preceding, which is often considered a variety of this species. Var. **villòsa,** Rehd. (*R. hùmilis* var. *villòsa,* Best). Lvs. villous-pubescent beneath, thickish. Var. **grandiflòra,** Rehd. (*R. hùmilis* var. *grandiflòra,* Baker). Fls. 2 in. across: lfts. larger. W.R. 66. Var. **tríloba,** Rehd. (*R. hùmilis* var. *tríloba,* Wats.). Fig. 3444. Petals 3-lobed. G.F. 2:77 (adapted in Fig. 3444).

3447. Fruits of Rosa rugosa. (×¼)

31. **nítida,** Willd. Low upright shrub, 1½ ft. high: branches covered with straight prickles and numerous bristles: lfts. 7–9, narrowly oblong, acute at both ends, bright green and shining above, glabrous, ⅓–1 in. long: fls. usually solitary, 1–2 in. across, on slender glandular-hispid pedicels; sepals entire. June, July. Newfoundland to Mass. B.B. (ed. 2) 2:285.

32. **foliolòsa,** Nutt. Fig. 3445. Low shrub, 1½ ft. high: sts. with rather few slender prickles, sometimes almost unarmed: lfts. 7–9, narrow or linear-oblong, bright green and shining above, glabrous or pubescent on the midrib beneath, ⅓–1 in. long: fls. solitary or few, pink, about 1½ in. across; pedicels and receptacle smooth or sparingly glandular-hispid: fr. globose, with rather few achenes. May, June. Ark. and Okla. to Texas. G.F. 3:101 (adapted in Fig. 3445).—Like the preceding, a handsome dwarf shrub with graceful foliage.

Section 8. CINNAMOMEÆ. *Many American, Asiatic, and European species. Erect shrubs, with usually straight prickles, in pairs or scattered, and often with numerous bristles: lfts. 5–11: corymbs usually many-fld., with dilated bracts; sepals generally entire, upright after flowering, and persistent, rarely deciduous: receptacle usually smooth.*

A. *Branches and prickles tomentose* . . . . . 33. **rugosa**
AA. *Branches and prickles glabrous.*
B. *Stipules, at least on the shoots, more or less convolute* . . . . . 34. **cinnamomea**
BB. *Stipules flat.*
C. *Prickles nearly always wanting (sometimes present in No. 37).*
D. *Lfts. simply serrate, 5–7.*
E. *Rachis of lf. puberulous: fls. single* . . . . . 35. **blanda**
EE. *Rachis of lf. glabrous: fls. double* . . . . . 36. **Lheritierana**
DD. *Lfts. doubly serrate, 7–9: fr. oblong to ovoid* . . . . . 37. **pendulina**
CC. *Prickles present.*
D. *Lfts. 3–7, only on shoots occasionally 9: calyx persistent.*
E. *Upper stipules enlarged.*
F. *Fls. usually several, 1–2 in. across: lfts. generally obovate, ½–1½ in. long.* . 38. **Woodsii**
FF. *Fls. usually solitary, about 2 in. across or more: lfts. 1–2 in. long.*

G. *Flowering branchlets usually unarmed: lfts. generally ovate*.....39. **nutkana**
GG. *Flowering branchlets prickly: lfts. generally oblong*.....40. **acicularis**
EE. *Upper stipules narrow, like the lower.*
F. *Prickles hooked: lfts. doubly serrate*.....41. **californica**
FF. *Prickles straight, usually slender: lfts. usually simply serrate*.....42. **pisocarpa**
DD. *Lfts. 7–11.*
E. *Sepals persistent.*
F. *Fls. corymbose; sepals pinnate or serrate.*
G. *Shrub 1–2 ft.: sts. with numerous slender prickles*.....43. **heliophila**
GG. *Shrub to 10 ft.: sts. with paired stout wide-based prickles*.....44. **setipoda**
FF. *Fls. 1–3; sepals entire.*
G. *Lfts. 1–2 in. long, pubescent beneath: fls. 1–3.*.45. **macrophylla**
GG. *Lfts. ¼–1¼ in. long, glabrous or nearly so beneath: fls. usually solitary, short-stalked*..46. **Moyesii**
EE. *Sepals with their base falling off as a whole: fls. solitary on short lateral branchlets: lfts. 5–9, ¼–1 in. long.*
F. *St. with bristles and prickles: lfts. doubly serrate, ½–1 in. long*.....47. **gymnocarpa**
FF. *Sts. without bristles: lfts. simply serrate*.....48. **Willmottiæ**

33. rugòsa, Thunb. (*R. fèrox,* Lawr. *R. Regeliàna,* André & Lind. *R. corùscans,* Waitz). Figs. 3446–3448.

3449. Bud of Madame Georges Bruant rose. One of the rugosa hybrids (×⅔). No. 33.

Upright shrub, attaining 6 ft., with stout sts. densely beset with prickles and bristles: lfts. 5–9, oval to obovate-oval, rugose, shining and dark green above, glaucescent and pubescent beneath, thick and firm, ¾–2 in. long; petioles tomentose and bristly; stipules dilated: fls. solitary or few, purple or white, 2½–3½ in. across;

3448. Rosa rugosa (×⅔). No. 33.

bracts large; pedicels prickly; receptacle smooth: fr. depressed-globose, brick-red, to 1 in. across. May–Sept. N. China, Korea, Japan. S.Z. 1:28. B.R. 420. Gt. 30:1049; 42, p. 537. G.C. II. 14:372. Gn. 46, p. 324; 52:384; 55, p. 434. I.H. 18:47. Gng. 1:7; 5:339. A.G. 13:342, 344; 18:567. C.L.A. 2:76; 7:624. F.E. 18:6. J.H. III. 45:159.—Forms of typical *R. rugosa,* which is sometimes distinguished as var. *Thunbergiàna,* C. A. Mey., are the following: Var. **àlba,** Rehd. (var. *albiflòra,* Koidzumi), with white fls. Gn. 9:452. G. 8:261. Var. **àlbo-plèna,** Rehd., with double white fls. Var. **ròsea,** Hort., with pink fls. Var. **rùbra,** Hort., with purple fls. Var. **rùbro-plèna,** Rehd., with double purple fls. Gt. 24:846. Geographical varieties, not of garden origin, are the following two: Var. **Chamissoniàna,** C. A. Mey. (*R. pubéscens,* Baker, not Roxbg.). Bristles almost entirely absent on the branches: lfts. narrower and smaller, less rugose. A double-fld. form of this variety is sometimes cult. in Cent. China, but apparently not yet intro. into western gardens. Var. **kamschàtica,** Regel (*R. kamschàtica,* Vent.). With slenderer less densely armed branches, thinner less rugose lvs. and smaller fls. and frs. B.M. 3149. B.R. 419.—*R. rugosa* is one of the most ornamental and at the same time hardiest of the single roses, valuable for shrubberies; it is very handsome on account of its dark green shining foliage, large fls. appearing during the whole summer, bright red conspicuous frs., and its beautiful orange and scarlet fall coloring. It is also attractive in winter by reason of its stout, densely armed sts. Large numbers of hybrids have been raised. By crossing with double-fld. garden roses, *R. rugosa* has given rise to a new race of hybrid roses remarkable for their hardiness and long blooming season; one of the best known is Mme. Georges Bruant (Fig. 3449), with double white fls., a cross of *R. rugosa* and the Tea rose Sombreuil. Another cross with a form of *R. chinensis* is *R. calocàrpa,* Willmott (*R. rugòsa* var. *calocàrpa,* Bruant), with single rose-colored fls. and handsome fr. produced very abundantly. Gn. 46, p. 548; 52, p. 384. R.H. 1895, pp. 446, 447. I.H. 42, p. 15. W.R. 60. Remarkable for its large frs. and large fls. is *R. micrugòsa,* Henkel (*R. rugosa* × *R. microphylla. R. Vilmòrinii,* Bean). Upright, very spiny shrub: lfts. 7–11, small, pubescent: fls. pink, 3–4 in. across: fr. depressed-globose, about 1¾ in. across, prickly, orange-red. Gt. 59:1581. R.H. 1905:144. It is of vigorous growth and hardy and will probably make a good hedge plant. Hybrids are also known with *R. multiflora* (see *R.*

Iwara under No. 2), with *R. Wichuraiana* (see *R. Jacksonii* under No. 3), with *R. cinnamomea*, with *R. spinosissima*, with *R. carolina*, a pretty rose with purplish red fls. (W.R. 65), with *R. blanda*=*R. warleyénsis*, Willmott, a handsome rose with pink fls. and 5–7 small lfts. (W.R. 59), with *R. palustris*=*R. Spaethiàna*, with large purple corymbose fls. (Gt. 51:1504, 3), and there are probably others.

34. **cinnamòmea,** Linn. Cinnamon Rose. Sts. slender, 6 ft. high, with hooked prickles, flowering branches sometimes unarmed: lfts. 5–7, sometimes 3, on lvs. of flowering branchlets, oblong, simply serrate, dull green, densely pubescent beneath, ½–1½ in. long: fls. solitary or few, purple, about 2 in. across, on short, naked pedicels: fr. depressed-globular, scarlet. May, June. Eu., N. and W. Asia. A.G. 13:343. W.R. 45. Var. **fœcundíssima,** W. D. Koch (*R. fœcundíssima,* Muenchh.). Figs. 3450, 3451. With double fls. Sometimes escaped from cult. in the East.

3450. Rosa cinnamomea var. fœcundissima.

3451. Rosa cinnamomea var. fœcundissima. One of the old-fashioned hardy roses. (×⅛)

35. **blánda,** Ait. (*R. virginiàna,* Koehne, not Mill. *R. fraxinifòlia,* Borkh.). Sts. slender, 5 ft. high, with few slender prickles or unarmed: lfts. 5–7, elliptic to obovate-oblong, usually acute, simply serrate, glabrous or pubescent beneath, ½–2½ in. long; stipules dilated: fls. usually several, pink, 2–2½ in. across, on smooth peduncles: fr. globular, sometimes elongated. May, June. Newfoundland to N. Y., west to Wis. and Ill. B.B. (ed. 2) 3:283. W.R. 104. Var. **Willmôttiæ,** Baker. Sts. red: lfts. smaller: fls. bright coral-pink. W.R. 104, 3.

36. **Lheritieràna,** Thory (*R. reclinàta,* Thory. *R. Boursaùltii,* Hort.). Supposed hybrid of *R. pendulina* and *R. chinensis.* Climbing to 12 ft., with slender, sparingly prickly branches: lfts. 3–7, oblong-ovate, glabrous: fls. in corymbs, purple, double or semi-double, nodding: fr. subglobose, smooth. Red. Ros. (3:26, 3). W.R. 102.—Varying with lighter and deeper colored and more or less double fls.

37. **pendulìna,** Linn. (*R. alpìna,* Linn.). Fig. 3432. Sts. slender, 3 ft. high, usually nearly unarmed, rarely prickly and bristly: lfts. 7–9, oblong-ovate or oblong-elliptic, obtuse, doubly glandular-serrate, usually glabrous, ½–1½ in. long: fls. pink, usually solitary or 2–5, to 2 in. across; pedicels and receptacle usually smooth: fr. usually nodding, oblong or ovate, with elongated neck, scarlet. May, June. Mountains of Eu. B.R. 424. J.H. III. 43:9. W.R. 99.—Handsome free-flowering shrub. Var. **pyrenàica,** W. D. Koch (*R. pyrenàica,* Gouan). Dwarf, with the pedicels and usually also the receptacles glandular-hispid. B.M. 6724. Gn. 27:544. Possibly a hybrid of this species and *R. spinosissima* is *R. Mályi,* Kerner, similar in foliage to *R. spinosissima,* but with bright red fls. W.R. 100; one of the handsomest of the wild roses.

38. **Woòdsii,** Lindl. Sts. to 3 ft. high, with slender, straight or recurved prickles, often bristly: lfts. 5–7, or sometimes 9 on shoots, obovate to oblong, mostly simply serrate, usually pubescent beneath, ¾–1½ in. long: fls. corymbose or solitary, pink, rarely white, 1½–2 in. across, on very short smooth pedicels: fr. globose, with short neck. June, July. Sask. to Colo. and Mo. B.R. 976. B.B. (ed. 2) 2:284. W.R. 77. Var. **Féndleri,** Rydb. (*R. Féndleri,* Crépin). Slenderer and often taller: lfts. usually smaller, usually doubly glandular-serrate, often glabrous, fls. and fr. somewhat smaller. Brit. Col. to W. Texas and New Mex. W.R. 56.

39. **nutkàna,** Presl. Fig. 3452. Sts. stout, 5 ft. high, with usually straight prickles and sometimes bristly: lfts. 5–7, or sometimes 9 on shoots, broadly elliptic to oblong-lanceolate, generally rounded at the base, usually doubly glandular-serrate, almost glabrous, often glandular beneath, ½–2 in. long: fls. usually solitary, pink, 2–2½ in. across: fr. globose, without neck. June, July. Alaska to Ore. and Utah. G.F. 1:449 (adapted in Fig. 3452). W.R. 75.—Has the largest fls. of the western species; pink. Var. **híspida,** Fern., has the receptacle glandular-hispid.

40. **aciculàris,** Lindl. Sts. low, densely prickly: lfts. 3–7, broadly elliptic to narrowly oblong, rounded at base, simply or doubly serrate, pubescent beneath, ½–2 in. long: fls. solitary, deep rose, 1½–2 in. across, fragrant; sepals entire and nearly glabrous: fr. usually pyriform, ½–1 in. long. May, June. Alaska to Ont. and Colo., N. Eu., N. Asia, Japan. B.B. (ed. 2) 2:283.—A very variable species. Var. **Bourgeauiàna,** Crépin (*R. Sàyi,* Schwein. *R. aciculàris* var. *Sàyi,* Rehd.). Fig. 3453. Lfts. glandular and pubescent beneath, usually somewhat doubly glandular-serrate: fls. larger, often 2½ in. across: fr. usually globular. Ont. to Brit. Col. and Colo. Var. **Éngelmannii,** Crépin in herb. (*R. Éngelmanni,* Wats.). Fig. 3454. Similar to the preceding: lfts. distinctly doubly glandular-serrate: fr. oblong, to 1 in. long. Colo. to Brit. Col. G.F. 2:377 (adapted in Fig. 3454). Var. **nipponénsis,** Hook. f. Lfts. smaller, ½–¾ in. long; petioles bristly: branchlets and

3452. Rosa nutkana. (×⅛)

pedicels glandular-hispid: fls. 1½ in. across. Japan. B.M. 7646. W.R. 47.

41. **califórnica,** Cham. & Schlecht. Sts. 8 ft. high, with stout, hooked or straight prickles, often bristly: lfts. 5–7, broadly elliptic to oblong-obovate, simply or doubly glandular-serrate, pubescent beneath or on both sides, often glandular, ½–1½ in. long: fls. on slender, usually smooth pedicels, over 1 in. across, few or several in dense corymbs, pink: fr. globose-ovate, usually with a prominent neck. June–Aug. Brit. Col. to Calif. W.R. 72 (a semi-double form).

42. **pisocárpa,** Gray. Sts. thin, with slender, straight or ascending prickles, without bristles, sometimes unarmed: lfts. 5–7, oblong to oblong-obovate, acute or obtuse, simply serrate, pubescent or sometimes glabrous beneath, ½–1½ in. long: fls. pink, about 1 in. across, on short usually smooth pedicels, in several- to many-fld. corymbs: fr. globose, with a very short neck. June–Aug. Brit. Col. to Ore. B.M. 6857.

43. **heliophila,** Greene (*R. pratincola*, Greene, not H. Braun). Low shrub, to 2 ft.: sts. very prickly, usually green: lfts. 7–11, broadly elliptic to obovate-oblong, acute or obtuse, cuneate at the base, simply serrate, pubescent beneath at least on the veins, 1–1¾ in. long; stipules rather narrow, entire or glandular-toothed above: fls. corymbose, pink, 1–1½ in. across; pedicels and receptacle glabrous; outer sepals lobed: fr. globose, ⅓–½in. across, red June. Man. to Mont., south to Mo. and Texas, prairies. B.B. (ed. 2) 2:284. Mn. 3:116. W.R. 105.—Adapted for dry slopes and barren places. Var. **álba,** Rehd. With white fls. about 2 in. across.—*R. pratincola* has been confused with *R. arkansana* and is sometimes cult. under the latter name. The true *R. arkansana*, Porter, differs in its glabrous foliage, glandular and bristly stipules, and reflexed sepals; it is known only from Colo.

3453. Rosa acicularis var. Bourgeauiana (×½). No. 40.

44. **setípoda,** Hemsl. & Wilson (*R. macrophýlla* var. *crásse-aculeàta*, Vilm.). Shrub, to 10 ft.: branches with paired straight, wide-based prickles: lvs. 2½–7 in. long; lfts. 7–9, elliptic or ovate, obtuse or acutish, serrate or doubly serrate, dark green and glabrous above, glaucous beneath and puberulous on the veins, 1¼–2½ in. long: fls. about 2 in. across, pale pink, in loose corymbs; pedicel and receptacle copiously glandular-hispid; sepals ovate-lanceolate, long-caudate with foliaceous serrate tips: fr. oblong-ovoid with narrow neck, about 1 in. long, deep red. June. Cent. China. B.M. 8569. J.H.S. 27:486.—This handsome rose has proved fairly hardy at the Arnold Arboretum and is very showy in June with its ample clusters of large pink fls. and again in fall with the nodding clusters of deep red hips.

45. **macrophýlla,** Lindl. Large, upright shrub: flowering branches with few prickles or unarmed: lfts. 9–11, elliptic-ovate to elliptic-oblong, acute, simply serrate, glabrous above, pubescent beneath, 1–2 in. long; stipules glandular-ciliate: fls. 1–3, red, about 2 in. across; pedicels and receptacle glandular-setose or naked; sepals lanceolate, long-caudate, entire: fr. oblong-ovoid, red, 1–1½ in. long. Himalayas. W.R. 50. This species is tender and rarely cult. but several of the allied Chinese species when first intro. were distributed as *R. macrophylla* or varieties of *R. macrophylla*, such as *R. Moyesii*, *R. setipoda*, *R. Davidii*, *R. sertata*, *R. persetosa* (see suppl. list for the last three species); to *R. persetosa* belong *R. macrophylla* var. *acicularis*, Vilm., and *R. macrophylla f. gracilis*, Vilm., while *f. gracilis*, Focke, belongs partly to *R. sertata* and partly to *R. Moyesii*.

46. **Moÿesii,** Hemsl. & Wilson (*R. macrophýlla* var. *rùbro-staminea*, Vilm. *R. Fàrgesii*, Hort.). Shrub, to 10 ft.: branches with scattered short straight prickles: lfts. 7–13, nearly sessile, ovate or elliptic to ovate-oblong or sometimes nearly orbicular, closely serrulate, glabrous except the slightly pilose midrib beneath, ¼–1¼ in. long; rachis puberulous, glandular and bristly; stipules wide, glandular-ciliate: fls. solitary or 2, deep blood-red, 1¾–2½ in. across; pedicels short, stipitate-glandular like the receptacle, or the latter glabrous; sepals are ovate, abruptly long-caudate: fruit deep orange-red, oblong-ovoid, narrowed into a neck, 2–2½ in. long. June. W. China. B.M. 8338. J.H.S. 27:489. V.F. 95. G. 37:427. Gn. 72, p. 313. J.H. III. 56:587. G.M. 51:478.—A strikingly beautiful rose; its fls. vary considerably in color, from dark blood-red, the color of the typical form, through deep rose to light pink. The extreme light pink form has been distinguished as *f. ròsea*, Rehd. & Wilson.

47. **gymnocárpa,** Nutt. Sts. slender, attaining 10 ft., with straight slender prickles and bristles: lfts. 5–9, broadly elliptic to oblong, doubly glandular-serrate, usually glabrous, ½–1 in. long: fls. solitary on short lateral branchlets, pale pink, about 1 in. across; sepals short: fr. orange-red, globose, small; calyx drops before maturity. June, July. Brit. Col. to Calif., east to Mont. W.R. 71.

48. **Willmottiæ,** Hemsl. Densely branched shrub, 5–10 ft., nearly glabrous: branches with slender paired prickles: lvs. crowded, ¾–1¼ in. long; lfts. usually 7, elliptic to obovate or sometimes nearly orbicular, usually rounded at the apex, closely and nearly doubly serrate, ¼–½in. long: fls. rose-purple, 1–1¼ in. across, solitary, short-stalked, on short lateral branchlets; sepals lanceolate, caudate: fr. subglobose, ⅓–½in. long, bright orange-red; the calyx tardily falling off at maturity. May, June. W. China. B.M. 8186.—Very pretty rose, not to be confused with *R. Willmottiana*, Léveillé, which is *R. longicuspis* (see suppl. list), nor with *R. blanda* var. *Willmottiæ*, Baker.

Section 9. PIMPINELLIFOLIÆ. *Few Old-World species. Upright shrubs, usually low: prickles straight, scattered, usually numerous and mixed with bristles: lfts. very small, usually 9; stipules narrow, with divergent and dilated auricles: fls. solitary, without bracts; sepals entire, erect and persistent.*

A. *Flowering branches bristly and prickly: lfts. usually rounded at the base: fls. pink, white, or yellow: fr. black*.....49. **spinosissima**

AA. *Flowering branches without bristles: lfts. usually cuneate at the base: fls. yellow: fr. scarlet*.....50. **Hugonis**

49. **spinosíssima,** Linn. (*R. pimpinellifòlia,* Linn.). SCOTCH ROSE. Low shrub, with upright recurving or spreading branches, 3–4 ft. high, usually densely beset with slender prickles and bristles: lfts. 5–11, usually 9, orbicular to oblong-ovate, simply or doubly serrate, glabrous, sometimes glandular beneath, ¼–¾in. long: fls. solitary, but usually very numerous along the sts., pink, white, or yellowish, 1¼–2 in. across; pedicels smooth or glandular-hispid: fr. globular, black. May, June. Eu., W. Asia to China. Gn. 55, p. 425; 60, p. 24; 74, p. 598. W.R. 82.—Very variable. Var. **altàica,** Rehd. (*R. altàica,* Willd. *R. grandiflòra,* Lindl.). More vigorous: fls. large, white; pedicels smooth. B.R. 888. Gn. 53:170. A.F. 12:1099. Gng. 5:307. F.E. 18:7. C.L.A. 7:620; 20:20. G. 31:389; 34:501. W.R. 86.

Var. **myriacántha,** Koehne (*R. myriacántha,* DC.). Branches very prickly: lvs. doubly glandular-serrate, very small: fls. small, white, blushed. Red. Ros. (1:6, 7). W.R. 88. Var. **inérmis,** Rehd. (var. *mitissima,* Koehne. *R. pimpinellifòlia* var. *inérmis,* DC. *R. mitissima,* Gmel.). Branches almost unarmed: fls. pink. Red. Ros. (1:6, 6). Var. **híspida,** Koehne (*R. híspida,* Sims. *R. lutéscens,* Pursh). Taller: lfts. simply serrate: pedicels smooth: fls. sulfur-yellow, 2½–3 in. across, rather large. B.M. 1570. Gn. 56:398; 62, p. 17. J.H.S. 27:508. W.R. 87. Var. **lutèola,** Andr. (*R. ochroleùca,* Swartz). Similar to the preceding variety: fls. pale yellow, 2 in. across: lfts. 7. G. 28:281. Var. **Andrewsii,** Willmott. A low form with double red fls. W.R. 89. There are also other varieties with double or semi-double, pink, white (G.W. 7, p. 139), or yellow fls. (Gn. 29:448). Several hybrids are known. *R. hibérnica,* Smith, a low shrub with glaucous green foliage and small pale pink fls., is a hybrid with *R. canina.* W.R. 98. *R. revérsa,* Waldst. & Kit. (*R. rubélla,* Smith), with dark green foliage, red fls. and scarlet, pendulous ovate-oblong frs., is a hybrid with *R. pendulina.*

3455. Rosa Hugonis. (×¼)

50. **Hugònis,** Hemsl. Fig. 3455. Shrub, to 6 ft.: branches with rather stout compressed prickles, on the shoots mixed with bristles: lfts. 5–11, oval or obovate, to elliptic-oblong, usually broadly cuneate at the base, finely serrate, glabrous, ⅓–¾in. long: fls. 2½ in. across, yellow, solitary on slender glabrous pedicels; sepals lanceolate: fr. depressed-globose, deep scarlet. May, June; fr. Aug. W. China. B.M. 8004. G. 35:417. G. M. 51:243. Gn. 71, p. 295. W.R. 95. —A very handsome free-flowering rose; hardy.

3454. Rosa acicularis var. Engelmannii (×⅔). No. 40.

Section 10. LUTEÆ. *Four Asiatic species. Upright or somewhat sarmentose shrubs, with scattered, straight or hooked prickles, without bristles: stipules usually narrow, with divergent and dilated auricles: fls. yellow, without bracts; sepals usually pinnate, persistent, upright.*

A. *Prickles straight: lfts. doubly serrate, dark green*.....51. **fœtida**

AA. *Prickles hooked: lfts. simply serrate, bluish green*.....52. **hemisphærica**

51. **fœtida,** Herrm. (*R. lùtea,* Mill. *R. Eglantèria,* Linn., not Mill.). AUSTRIAN BRIAR. Shrub with long, slender, often sarmentose or climbing brown sts., becoming 10 ft. high, usually with straight prickles: lfts. 5–9, broadly ovate to oval, doubly glandular-serrate, dark green above, often glandular, ½–2 in. long; stipules glandular-serrate: fls. sometimes several, but without bracts to the main pedicel, bright yellow, 2–2½ in. across, of unpleasant odor: fr. globular. June. W. Asia. B.M. 363. Gn. 53:22. W.R. 90. Var. **bícolor,** Willmott (*R. lùtea* var. *punícea,* Aschers. & Graebn. *R. punícea,* Mill. *R. bícolor,* Jacq.). COPPER AUSTRIAN BRIAR. Fls. orange-scarlet within. B.M. 1077. Gn. 53, p. 23; 55, p. 425. W.R. 91. Var. **persiàna,** Rehd. (*R. lùtea* var. *persiàna,* Lem. *R. lùtea* var. *plèna,* Hort.), PERSIAN YELLOW, is a double-fld. form; it is more double and more free-flowering than the Sulphur Rose. F.S. 4:374. Var. **Hárisonii,** Hort., HARISON'S YELLOW ROSE, is of paler color and a little less double than Persian Yellow, but it blooms more freely, is more vigorous, hardier and easier to grow. It is of American origin and may be a hybrid of the Austrian Briar rose with *R. spinosissima.* F.E. 18:6.

52. **hemisphærica,** Herrm. (*R. glaucophýlla,* Ehrh. *R. sulphùrea,* Ait. *R. Rapínii,* Boiss. & Bal.). SULPHUR ROSE. Closely allied to the preceding: sts. slender, with hooked prickles: lfts. obovate, cuneate at the base, simply serrate, bluish green: fls. usually solitary, double, scentless, light yellow; pedicels glandular-hispid. June. W. Asia. B.R. 46. W.R. 93.

Section 11. SERICEÆ. *Three Asiatic species. Erect shrubs with the prickles in pairs: stipules narrow, with erect dilated auricles: fls. solitary, without bracts; sepals entire, persistent, and upright; petals usually 4; styles somewhat exserted.*

A. *Lfts. generally ovate or obovate, 7–11: fr. slender-stalked* ..... 53. **sericea**
AA. *Lfts. generally oblong, 9–17: fr. on a thickened fleshy stalk ½in. long* .... 54. **omeiensis**

53. **serícea,** Lindl. (*R. tetrapétala,* Royle). Attaining 12 ft., with prickly and often bristly branches: lfts. 7–11, oval or obovate, serrate, glandular or silky pubescent beneath, ½–¾in. long: fls. white, 1½–2 in. across; petals usually 4, rarely 5: fr. globose or turbinate. May, June. Himalayas. B.M. 5200. R.H. 1897, pp. 444, 445. J.H. III. 43:7. W.R. 52.

3456. Rosa omeiensis. (×⅗)

54. **omeiénsis,** Rolfe. Fig. 3456. Shrub, to 10 ft.: the young shoots densely bristly: lfts. 9–17, oblong or elliptic-oblong, acutish, cuneate at the base, serrate, glabrous, ⅛–¾in. long: fls. white, over 1 in. across; petals usually 4: fr. ellipsoid, ⅓–½in. long, red, borne on a yellow or red thickened stalk of about equal length. May, June: fr. in July, Aug. W. China. B.M. 8471. —A graceful shrub with handsome fern-like foliage, early white fls. and especially attractive in summer on account of the contrasting color of the red fr. and its yellow or red fleshy stalk, a feature which distinguishes it at once from any other cult. rose. Has proved hardy in Mass., while *R. sericea* is tender. Var. **pteracántha,** Rehd. & Wilson (*R. sericea* var. *pteracántha,* Franch.). Prickles much enlarged at the base, decurrent and often confluent, forming wide wings, red and translucent on the young shoots. B.M. 8218. G.C. III. 38:260, 261. Gn. 69:300. J.H.S. 27:491.—The large wing-like prickles, which are red and translucent while young, make this rose a conspicuous and striking object.

Section 12. MINUTIFOLIÆ. *Three American species. Low shrubs with slender, scattered prickles: lfts. small, incised-serrate: stipules with dilated and divergent auricles: fls. solitary, without bracts; sepals erect, persistent, the outer ones pinnate: fr. prickly.*

A. *Lfts. cuneate-obovate: fls. 1½–3 in. across.*
B. *Branches glabrous: lfts. usually 5* ... 55. **mirifica**
BB. *Branches stellate-pubescent: lfts. usually 3.* ..... 56. **stellata**
AA. *Lfts. ovate to oblong: fls. about 1 in. across* ..... 57. **minutifolia**

55. **mirífica,** Greene. Upright shrub, 3–4 ft.: st. green, glabrous, with slender yellowish white prickles and numerous bristles: lfts. usually broadly cuneate-obovate, incisely or crenately dentate, the teeth sometimes glandular-serrulate, slightly pubescent on both sides or nearly glabrous, light green, ⅛–¾in. long: fls. solitary, deep rose-purple, 1½–3 in. across: fr. irregularly and broadly turbinate, wrinkled, dull red, prickly ½–¾in. across. April, May. New Mex., White and Sacramento Mts.—This is one of the most beautiful and the most strikingly distinct of the American roses. The fact that it flowers in its native habitat, according to the writer's observation on the Sacramento Mts., New Mex., freely a second time in Aug. indicates a horticulturally valuable trait. Not hardy N.

56. **stellàta,** Wooton. Upright shrub to 2 ft.: sts. with whitish prickles, densely stellate-pubescent while young: lfts. usually 3, broadly cuneate-obovate, incisely dentate, pubescent on both sides, somewhat rough above, ¼–⅓in. long: fls. solitary, deep rose-purple, 1¾–2¼ in. across: fr. turbinate, prickly. April, May. New Mex., Organ and San Andreas Mts. J.H.S. 27:457. W.R. 103.—Not hardy N.

57. **minutifòlia,** Engelm. Fig. 3457. Dense shrub, to 4 ft. high: branchlets pubescent with slender brown prickles: lfts. 5–7, ovate to oblong, incisely dentate, pubescent, ⅛–½in. long: fls. short-pediceled, pink or white, about 1 in. across: fr. subglobose, hispid. April, May. Calif. G.F. 1:102 (adapted in Fig. 3457). J.H.S. 27:456.—Tender.

Section 13. BRACTEATÆ. *Two Asiatic species. Shrubs with erect or sarmentose and tomentose or pubescent sts.; prickles in pairs: stipules slightly adnate and pectinate: infl. with large bracts; sepals reflexed after flowering, entire; receptacle tomentose.*

58. **bracteàta,** Wendl. (*R. Macártnea,* Dum.). MACARTNEY ROSE. Sts. usually procumbent or sarmentose, villous-tomentose, with stout hooked prickles: lfts. 5–9, oval to obovate, crenately serrulate, bright green above and somewhat shining, almost glabrous beneath, ½–2 in. long: fls. 1 or few, short-stalked, white, 2–2¾ in. across; sepals and receptacle densely tomentose. June–Oct. S. China, Formosa; naturalized in Fla. and La. B.M. 1377. B.B. (ed. 2) 2:268. Gn. 70, p. 192.—Handsome half-evergreen climber, not hardy N. There is a double-fld. form.

Section 14. LÆVIGATÆ. *One Asiatic species. Climbing shrub, with scattered hooked prickles: lfts. generally 3; stipules almost free: fls. solitary, without bracts, large, white; sepals erect, entire, persistent.*

59. **lævigàta,** Michx. (*R. sínica,* Murr. *R. cherokénsis,* Donn. *R. ternàta,* Poir. *R. nívea,* DC. *R. Camèllia,* Hort.). CHEROKEE ROSE. Figs. 3458, 3459. High climbing shrub, with slender green prickly branches: lfts. 3, rarely 5, elliptic-ovate to ovate-lanceolate, sharply serrate, shining and glabrous, 1½–2½ in. long: fls. solitary, white, rarely rose, 2½–3½ in. across, fragrant; pedicels and receptacle densely bristly: fr. large, obovate, bristly. June. China, Formosa, Japan; naturalized in the southern states. B.M. 2847. B.R. 1922. G.C. III. 6:497. Gn. 53, p. 207; 60, p. 29; 64, p. 95; 68, p. 206; 71, p. 225. F.S.R. 1:294. G. 34:447. M.D.G. 1906:397.—Handsome climbing rose, but not hardy N. A hybrid with *R.*

3457. Rosa minutifolia. (×½)

Banksiæ is *R. Fortuneana* (see No. 16). A hybrid with a Tea rose is the ANEMONE ROSE, with large single light pink fls. M.D.G. 1896:345. R.H. 1901:548. Gn. 62, p. 413. G.M. 43:525. W.R. 41.

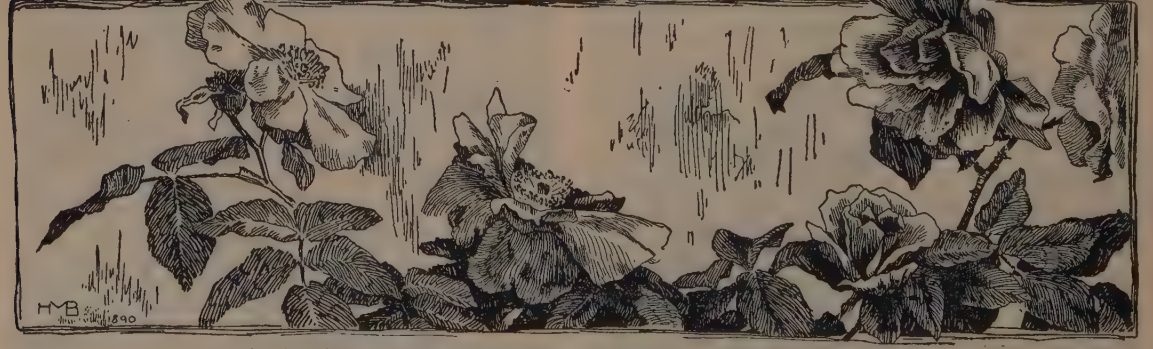
Section 15. MICROPHYLLÆ. *One Asiatic species. Upright spreading shrub, with the straight prickles in pairs: lfts. 7–15; stipules very narrow, with subulate divergent auricles: fls. usually several, with small and quickly caducous bracts; sepals broad, erect and persistent, the outer ones pinnate; carpels only at the bottom of receptacle.*

60. Róxburghii, Tratt. (*R. microphýlla,* Roxbg., not Desf.). Much-branched spreading shrub 6 ft. high, with straight or ascending prickles: lfts. 7–15, elliptic to oblong-elliptic, acute, sharply serrate, glabrous beneath: fls. pale pink, often solitary, 2–2½ in. across, short-pedicelled; sepals and receptacle prickly: fr. depressed-globose, 1½–2 in. across, very prickly. June, July. China. Var. **plèna,** Hort. With double fls. B.M. 3490. B.R. 919. W.R. 44. Not quite hardy N. Var. **normàlis,** Rehd. & Wilson, is the wild form with single fls. Var. **hírtula,** Rehd. & Wilson (*R. microphýlla* var. *hírtula,* Regel). Lfts. elliptic or ovate-oblong, usually acute, pubescent beneath, ½–1 in. long. Japan. B.M. 6548. For a hybrid with *R. rugosa,* see the latter species.

3458. Cherokee rose.—Rosa lævigata. Commonly known as R. sinica (×½). No. 59.

(The figure following the name indicates the section to which the species belongs.) *R. agréstis* Savi (R. sepium, Thuill.) (6). Allied to R. rubiginosa. Without bristles; pedicels smooth: fls. small, pale pink or whitish. Eu., N. Afr. W.R. 147.—*R. Álberti,* Regel (8). Allied to R. Willmottiæ. Branches slender, recurving: lfts. 5–9, ovate, pubescent beneath, ¼–1¼ in. long: fls. white, 1½ in. across; sepals deciduous; pedicels smooth. Songaria, Turkestan. —*R. amoyénsis,* Hance=R. microcarpa.—*R. anemonifl̀ora,* Fort. (1). Half-evergreen climbing shrub: lfts. 3–5, ovate-lanceolate, dark green, glabrous and shining: fls. few, white or slightly pinkish, double, the inner petals narrower and smaller. China. Half-hardy. R.H. 1849:281. W.R. 21.—*R. anserinæfl̀olia,* Boiss., is a variety of R. Beggeriana, with silky pubescent lfts.—*R. Aschersoniàna,* Graebn. (R. blanda×R. chinensis). Shrub, to 6 ft., with slender brown branches: prickles hooked: lfts. 5–7: fls. very numerous, small, bright light purple; styles usually exserted. Garden origin. Gt. 51:1504, 1.—*R. banksiópsis,* Baker (8). Branches brown, with subulate prickles, sometimes in pairs: lfts. 7–9, oblong, glabrous, 1 in. or more long: fls. corymbose, red; receptacle glabrous; sepals entire. W. China. W.R. 2:166.—*R. Beggeriàna,* Schrank (8). Dense shrub, to 5 ft.: prickles in pairs: lfts. very small and bluish green: fls. corymbose, white; calyx and apex of fr. falling off, leaving the small, globular fr. with an opening at the top. N. Persia to Altai and Songaria. I.T. 5:122. W.R. 54.—*R. bélla,* Rehd. & Wilson (8). Allied to R. Moyesii. Shrub, to 8 ft.: lfts. 7–9, elliptic or ovate, acutish, glaucescent and glabrous or nearly so beneath, ⅛–¾in. long: fls. solitary, 1¾–2 in. broad, pink: fr. ovoid, scarlet, ¾in. long. N. W. China. Var. *pállens,* Rehd. & Wilson. Fls. pale pink.—*R. britzénsis,* Koehne (6). Shrub, to 6 ft.: lfts. 7–11, elliptic, glabrous, 1–1½ in. long: fls. 1–2, pale pink changing to white, 3–4 in. across: fr. brown, ovoid. Kurdistan. M.D. 1910, p. 94.—*R. caudàta,* Baker (8). Allied to R. macrophylla. Much branched: prickles subulate: lfts. 7–9, oblong, glabrous, but hispid on midrib beneath, 1–2 in. long: fls. red, few; pedicels and receptacle bristly; sepals entire: fr. oblong. W. China. W. 163.—*R. cerasocárpa,* Rolfe=R. Gentiliana.—*R. clinophýlla,* Thory (13). Closely allied to R. bracteata. Branches silky pubescent, prickles straight: lfts. elliptic-lanceolate, tomentose beneath: fls. white. India. B.R. 739. Tender.—*R. collìna,* Jacq. (5). Allied to R. alba, but fls. rose-colored; sepals shorter. Probably hybrid of R. gallica with R. dumetorum.—*R. coriifólia,* Fries (6). Allied to R. canina. Lfts. pubescent beneath; petioles tomentose: fls. pink, short-pedicelled; bracts large; sepals upright after flowering. Eu., W. Asia. W.R. 129. Very variable. Var. *Froèbelii,* Rehd. (R. canina var. Froebelii, Christ). Of vigorous growth: lfts. simply or doubly serrate, bluish green: fls. small, white.—*R. corymbulòsa,* Rolfe (8). Upright or scandent, to 6 ft.: lfts. 3–5, ovate-oblong, doubly serrate, puberulous beneath, ⅔–1½ in. long: fls. ¾–1 in. across, red with white eye, in dense umbel-like corymbs; pedicels and receptacle glandular-bristly: fr. globose. W. China. B.M. 8566.—*R. Dàvidii,* Crépin (8). Allied to R. macrophylla. Shrub, to 10 ft.: sts. with scattered straight prickles: lfts. 7–11, elliptic to ovate-oblong, serrate, pubescent beneath, 1–2½ in. long: fls. corymbose, pink, 1½–2 in. across; styles exserted: pedicels like the oblong receptacle glandular-setose, rarely glabrous: fr. scarlet, oblong-ovoid or ovoid, long-necked, ½–¾in. long. W. China. Var. *elongàta,* Rehd. & Wilson. Lfts. 2–3 in. long: fls. fewer: fr. ¾–1 in. long. W. China.—*R. davùrica,* Pall. (8). Allied to R. cinnamomea. Prickles straight and slender; stipules narrow: lfts. smaller, doubly serrate: pedicels longer, glandular: fr. ovate. Manchuria, Dahuria, Saghalin.—*R. Écæ,* Aitch. (R. xanthina, Auth., not Lindl.) (10). Upright shrub, to 4 ft., with brown branches: prickles numerous, stout, straight, wide-based: lfts. 9–11, oval, obtuse, dentate, glabrous, glandular, ¼–½in. long: fls. pale yellow, solitary, short-stalked, 1–1¼ in. across: fr. obovoid, ⅛–½in. long, with reflexed sepals. Turkestan, Afghanistan. B.M. 7666. W.R. 2:94.—*R. ellíptica,* Tausch (6). Allied to R. rubiginosa: lfts. cuneate-obovate, pubescent beneath: pedicels short, usually not glandular: fls. pinkish or whitish. Eu.—*R. elymaítica,* Boiss. & Hausskn. (6). Dwarf shrub, to 3 ft., with prickly zigzag branches: lfts. small, usually 5, glaucescent: fls. 1–3, small, pink: fr. globular, small. N. Persia. —*R. Fedtschenkoàna,* Regel (8). Sts. arching, with prickles and bristles: lfts. 7–9, oblong, glabrous or pubescent beneath, ¾–1¼ in. long: fls. 1–4, white, 1½–2 in. across; pedicels and receptacles hispid. Turkestan. B.M. 7770. W.R. 49.—*R. fèrox,* Bieb. (6). Allied to R. rubiginosa. Dwarf: lfts. glandular on both sides: pedicels short, not glandular. S. E. Eu., W. Asia. W.R. 154.—*R. filípes,* Rehd. & Wilson (2). Allied to R. Brunonii. Sarmentose shrub, to 15 ft., with few hooked prickles: lfts. usually 5–7, oblong-ovate to lanceolate, acuminate, serrate, nearly glabrous, pale beneath, 1¾–3 in. long: fls. white, fragrant, about 1 in. across, in large, loose corymbs; pedicels filiform, 1–1¾ in. long, glandular: fr. globose, ⅛–½in. across, scarlet; sepals deciduous. W. China.—*R. floribúnda,* Baker= R. Gentiliana.—*R. Freundiàna,* Graebn. (R. moschata alba hybrida, Hort. R. gallica×R. moschata). Vigorous shrub, to 6 ft.: branches with prickles and bristles: lfts. usually 5: fls. white, 1½–2 in. across, very fragrant; style often exserted. Garden origin. Gt. 57, p. 471. G. 25:311.—*R. Froèbelii,* Hort.=R. coriifolia var. Froebelii.—*R. Gentiliàna,* Léveillé (R. floribunda, Baker. R. cerasocarpa, Rolfe) (2). Allied to R. Brunonii. Sarmentose shrub, to 12 ft., with scattered hooked prickles: lfts. 5, elliptic, abruptly acuminate, serrate, glabrous, glaucescent beneath, 1½–2 in. long: fls. corymbose, white, fragrant, 1–1½ in. across; pedicels and receptacles glandular: fr. dark red, globose, ½in. across, with deciduous sepals. Cent. China.—*R. Giráldii,* Crépin (8). Slender-branched shrub, to 6 ft., with straight slender prickles: lfts. usually 7, suborbicular to obovate or elliptic, acute or obtuse, serrate, pubescent, ¼–¾in. long: fls. solitary or few, pink, 1 in. across: fr. scarlet, ovoid, ⅓–½in. long. Cent. China. Var. *venulòsa,* Rehd. & Wilson. Lfts. reticulate beneath, glabrous above.—*R. Giráldii,* Cat. Hesse, is described as having rosy pink fls. with white eye and oblong scarlet frs. It is possibly a synonym of one of the species related to R. macrophylla.—*R. glaùca,* Vill. (6). Allied to R. canina. Lfts. broadly ovate, bluish green: fls. pink; sepals upright after flowering. Eu.—*R. glomeràta,* Rehd. & Wilson (2). Sarmentose shrub, to 20 ft., with few scattered hooked prickles: lfts. usually 5–7, oblong or oblong-ovate, short-acuminate, serrulate, rugose above, reticulate beneath and pubescent on the veins, 1½–4 in. long: fls. white,

fragrant, 1 in. across, in dense corymbs: fr. subglobose, orange-red, about ½in. across; sepals deciduous. W. China.—*R. glutinòsa*, Sibth. & Smith (6). Allied to R. rubiginosa. Dwarf, densely prickly: lfts. densely glandular on both sides: fls. small, pink. S. E. Eu., W. Asia. W.R. 150.—*R. gratíssima*, Greene (8). Allied to R. californica. Lfts. glabrous, bright green and glandular, fragrant, thin. Calif.—*R. hawràna*, Kmet. (6). Allied to R. pomifera: flowering shoots usually unarmed: lfts. 5–7, elliptic, pubescent beneath, glabrous above: fls. pink, about 2 in. across: fr. globose, densely bristly. Hungary. W.R. 140.—*R. Heckeliàna*, Tratt. (R. Hackeliana, Nym.) (6). Allied to R. rubiginosa. Dwarf: lfts. tomentose on both sides: fls. usually solitary, small, pink. S. Eu.—*R. índica*, Linn.=R. microcarpa.—*R. inodòra*, Fries (R. agrestis var. inodora, Keller) (6). Allied to R. rubiginosa: lfts. 5–7, obovate, not glandular above: fls. white or pinkish, 1–1½ in. across: fr. ovoid, bright red. Eu. W.R. 151.—*R. involucràta*, Roxbg.=R. clinophylla.—*R. involùta*, Smith (6). Probably hybrid of R. spinosissima and R. tomentosa. Lfts. doubly glandular-serrate, tomentose beneath: fls. whitish. W.R. 96.—*R. Jáckii*, Rehd. (R. Kelleri, Baker, not Dalla Torre & Sarnth.) (2). Allied to R. moschata: low procumbent shrub, with ascending branches: lfts. 7–9, elliptic or elliptic-oblong, glabrous, 1½–2½ in. long: fls. in corymbs, white, 1½ in. across; sepals ovate, abruptly caudate: fr. ovoid, red, ½in. long. Korea. Hardy.—*R. Jundzillii*, Bess. (6). Allied to R. canina but resembling also R. gallica. Upright shrub, with straight spines: lfts. almost glabrous, doubly glandular-serrate, rather large: fls. large, pink; fr. subglobose. Eu., W. Asia. W.R. 149.—*R. Kélleri*, Baker=R. Jackii.—*R. láxa*, Retz. (8). Upright shrub, with hooked prickles in pairs: lfts. 7–9, small, light green: fls. small, white: fr. oblong-ovate, small. Turkestan to Songaria and Altai. W.R. 53.—*R. láxa*, Lindl.=R. lucida.—*R. láxa*, Hort.=R. coriifolia var. Froebelii.—*R. Leschenaultii*, Wight & Arn. (R. moschata var. Leschenaultii, Crépin) (2). Similar to R. Brunonii, but fls. larger, in few-fld. corymbs; pedicels and receptacle glandular-hispid. India. W.R. 15.—*R. longicúspis*, Bertol. (R. Sinowilsonii, Hemsl. R. Willmottiana, Léveillé. R. lucens, Rolfe). Half-evergreen scandent bush, to 20 ft., with hooked prickles: lfts. usually 7, elliptic-ovate to oblong-lanceolate, acuminate, glabrous, lustrous, 1–3 in. long: fls. corymbose, white, 1½ in. across; petals silky outside; pedicels about 1 in. long: fr. ovoid, ¾in. long, scarlet or orange-red. W. China. Himalayas. Tender.—*R. lùcens*, Rolfe =R. longicuspis.—*R. Lùciæ*, Franch. & Rochebr. (2). Allied to R. Wichuraiana. Habit more upright: lfts. usually 7, narrower and thinner: fls. smaller. Japan.—*R. Lyèlli*, Lindl. Probably hybrid of R. moschata and R. clinophylla. Climbing: lfts. usually 7, oblong, shining: fls. corymbose, large, white, single or double. Intro. from Nepal.—*R. Macoùnii*, Greene (8). Allied to R. Woodsii: low shrub, with rather stout, deflexed prickles: lfts. 9–11, obovate to obovate-oblong, sharply serrate, except at the cuneate base, pubescent beneath, ½–¾in. long: stipules glandless: fls. small, pale pink: fr. depressed-globose. Assiniboia to Wyo.—*R. macrántha*, Desportes (R. canina × R. gallica). Shrub with uniform hooked prickles: lfts. 5–7, chartaceous, ovate to ovate-oblong, pubescent beneath, 1–1½ in. long: fls. few, 3 in. across, light pink. Spontaneous in S. France. W.R. 134.—*R. Marcyàna*, Boullu (R. gallica × R. tomentosa). Low, to 2, rarely to 4 ft., prickly and bristly: lfts. 5–7, broadly oval, pubescent on both sides, 1–2 in. long: fls. long-stalked, pink to light purple, 2½–3 in. across. Spontaneous in S. France. W.R. 112.—*R. Mariæ-Graèbneræ*, Aschers. (R. carolina × R. virginiana). Shrub, to 5 ft., with slightly recurved prickles: lfts. 7–9, elliptic: fls. few, pink: fr. subglobose: blooms almost all summer and very handsome in fall with orange and red foliage, red frs. and pink fls. Garden origin. Gt. 51:1504, 4.—*R. micrántha*, Smith (6). Allied to R. rubiginosa. With hooked prickles, without bristles: lfts. slightly pubescent beneath: fls. pale pink, small; styles slightly exserted, glabrous. Eu., N. Afr., W. Asia.—*R. microcárpa*, Lindl. (R. indica, Linn., partly, not Lindl. R. sorbiflora, Focke) (4). Branches slender, with scattered, hooked prickles: lfts. 3–7, elliptic to ovate-lanceolate, glabrous, 1½–2½ in. long; stipules almost free: fls. corymbose, small, white: fr. small, globose; sepals deciduous. China. G.C. III. 37:227.—*R. microcárpa*, Hort.=R. multiflora.—*R. montàna*, Chaix (6). Allied to R. canina. Of vigorous growth, with strong spines: lfts. broader, tinged reddish: fls. pink; pedicels and receptacle glandular-hispid. S. Eu., N. Afr.—*R. multibracteàta*, Hemsl. & Wilson (R. reducta, Baker) (8). Shrub, to 6 ft., with straight paired prickles: lfts. 7–9, broadly oval, glabrous, ¼–½in. long: fls. pink, 1¼ in. across, corymbose with numerous crowded bracts, sometimes few or solitary; styles exserted: fr. ovoid, ⅓–½in. long, orange-red; sepals persistent. W. China. W.R. 158 (form with few-fld. infl.).—*R. Murièlæ*, Rehd. & Wilson (8). Slender-branched shrub, to 8 ft., with bristles and slender prickles: lfts. 9–15, elliptic to elliptic-oblong, rarely oval, acutish, serrate, glabrous, except the pubescent midrib beneath, ½–¾in. long: fls. white, about 1 in. across, in 3–7-fld. corymbs; pedicels slender, ¾–1½ in. long: fr. ellipsoid, orange-red, ½–¾in. long. W. China.—*R. orbiculàris*, Baker (8). Sts. slender, with subulate prickles in pairs: lfts. 5–7, orbicular, simply serrate, glabrous, ½in. long: fls. 1–3, 1½ in. across, white. S. W. China.—*R. orientàlis*, Dup. (6). Allied to R. rubiginosa. Dwarf: prickles slender, subulate: lfts. 5–7, simply serrate, pubescent on both sides: fls. pink, solitary, short-pedicelled. W. Asia.—*R. persetòsa*, Rolfe (R. macrophylla var. gracilis and var. acicularis, Vilm.) (8). Upright shrub, with densely bristly sts.: lfts. 5–9, elliptic to elliptic-ovate, serrate, puberulous beneath, ¾–2 in. long: fls. deep pink, 1 in. across, in large panicles; sepals entire; pedicels and receptacle glabrous. W. China. J.H.S. 27:487, 488.—*R. phœnícia*, Boiss. (2). Allied to R. moschata. Lfts. usually 5, obtuse or acute: corymbs usually many-fld., pyramidal: styles glabrous. Asia Minor.—*R. Práttii*, Hemsl. (8). Slender-branched shrub, to 8 ft., with slender prickles and numerous bristles: lfts. 7–15, elliptic, obtusish, serrate, pubescent on the veins beneath, ¼–½in. long: fls. 1–3, pink, ¾in. across: fr. subglobose to ovoid, scarlet, ¼–½in. long; calyx persistent. W. China.—*R. reducta*, Baker=R. multibracteata.—*R. Rùbus*, Léveillé & Vaniot (2). Scandent bush, to 20 ft., with small hooked prickles: lfts. usually 5, ovate-elliptic to obovate, abruptly acuminate, sharply or coarsely serrate, pubescent beneath, rarely nearly glabrous, 1½–2½ in. long: fls. in dense corymbs, white, fragrant, 1–1½ in. across; pedicels ½–¾in. long, glandular: fr. subglobose, dark scarlet, about ½in. across. Cent. China.—*R. sáncta*, Rich. (5). Low shrub, with unequal scattered hooked prickles: lfts. 5–7, elliptic to ovate-oblong, crenate, rugose, pubescent beneath: fls. few, large, pink, on setose pedicels. Abyssinia. W.R. 113.—*R. saturàta*, Baker (8). Shrub, to 8 ft., unarmed or with few small prickles: lfts. usually 7, ovate to ovate-lanceolate, acute or short-acuminate, sharply serrate, pale or somewhat glaucescent beneath, pubescent on the veins or sometimes nearly glabrous, 1–2½ in. long: fls. solitary, dark red, about 2 in. across; anthers purple: pedicels glabrous, ¾–1 in. long: fr. globose-ovoid, ¾in. long, coral-red; calyx persistent. Cent. China.—*R. Scharnkeàna*, Graebn. (R. californica × R. nitida). Shrub, to 3 ft., with slender, often procumbent and ascending sts.; prickles slender, in pairs, below often mixed with bristles: lfts. 7–9, elliptic-oblong to oblong, cuneate: fls. 1–5, rose-purple. Garden origin. Gt. 51:1504, 2.—*R. sèpium*, Thuill.=R. agrestis.—*R. Seraphínii*, Viv. (6). Shrub, 1–3 ft., with copious, unequal, partly hooked prickles: lfts. 5–7, orbicular-ovate, doubly serrate, glandular beneath, ¼–½in. long: fls. solitary, very short-stalked, 1 in. across, pink: fr. globose-ovoid, with reflexed, finally deciduous sepals. Medit. region. W.R. 153.—*R. Seraphinii*, Guss.=R. sicula.—*R. sertàta*, Rolfe (8). Shrub to 5 ft.: branches glaucous, with straight slender prickles in pairs: lfts. 7–11, oval-oblong to narrow-oblong, serrate, glabrous, ¼–¾in. long: fls. solitary on short branchlets, rose or rose-purple, 2–2½ in. across; sepals caudate, entire. W. China. B.M. 8473. G.C. III. 54:166. W.R. 2:153.—Very handsome graceful rose; has proved hardy at the Arnold Arboretum.—*R. sícula*, Tratt. (R. Seraphinii, Guss., not Viv.) (6). Low, ½–2 ft., with equal, slender, nearly straight prickles: lfts. 5–9, broadly elliptic to orbicular, glandular beneath, ¼–½in. long: fls. solitary, rarely to 4, short-stalked, deep red to whitish, 1–1¼ in. across: fr. small, globose, with upright sepals. Medit. region. B.M. 7761 and G.W. 8, p. 17 (as R. Seraphinii).—*R. Sinowilsonii*, Hemsl.=R. longicuspis.—*R. sonoménsis*, Greene (8). Allied to R. californica. Low shrub, to 1 ft., with straight prickles: lfts. broadly ovate, doubly glandular-serrate: fls. small, in dense corymbs. Calif.—*R. sorbiflòra*, Focke=R. microcarpa.—*R. Soulieàna*, Crépin (2). Upright spreading shrub, to 12 ft., with scattered hooked prickles: lfts. usually 7, oval to ovate-oblong, acute, finely serrate, glabrous, about 1 in. long: fls. corymbose, white, 1½ in. across; sepals ovate: fr. ovoid or subglobose, ½–⅝in. long, orange-red. W. China. B.M. 8158. W.R. 1:18. G. 77, p. 511.—*R. spithàmea*, Wats. (8). Allied to R. californica. Sts. usually not over ½ft. high, sparingly branched: lfts. doubly glandu-



3459. Rosa lævigata. Run wild in the South and known as Cherokee rose. No. 59.

lar-serrate: fls. usually solitary. Calif.—*R. stylòsa*, Desv. (R. systyla, Bastard) (6). Shrub with long arching prickly branches: lfts. 5–7, ovate-oblong, pubescent beneath, ¾–2 in. long: fls. few, white or light pink, 1½–2 in. across; styles connate into an exserted column. W. Eu. Red. Ros. (1:5, 2). W.R. 14.—*R. Sweginzòwii*, Koehne (8). Shrub with large compressed prickles: lfts. usually 9, ovate to ovate-oblong, doubly serrate, pubescent beneath, 1½–2 in. long: fls. 1–3, pink, 1¾ in. across; sepals nearly entire; pedicels and receptacles glandular-hispid: fr. oblong, 1 in. long. W. China. M.D. 1910, p. 96.—*R. sýstyla*, Bastard=R. stylosa.—*R. tomentòsa*, Smith (6). Allied to R. villosa. Sts. slender, often arching: prickles often slightly curved: lfts. smaller, grayish green: fls. pale rose, on longer pedicels: fr. smaller, with the sepals upright spreading, caducous at maturity. Eu. W.R. 139. Gn. 77, p. 511.—*R. trachyphýlla*, Rau=R. Jundzillii.—*R. Vórbergii*, Graebn. (R. fœtida × R. spinosissima). Shrub, to 3 ft.: lvs. similar to those of R. fœtida: fls. white with a delicate flushing of yellow, 2 in. across, early. Garden origin. Gn. 79, p. 323 (as R. Vorbegii).—*R. Webbiàna*, Wall. (8). Erect shrub, with prickly sts.: lfts. 5–9, very small, orbicular or oblong, usually glabrous: fls. mostly solitary, pink, large: fr. ovoid. Himalayas to Afghanistan and Turkestan. W.R. 76.—*R. Willmottiàna*, Léveillé=R. longicuspis.—*R. xánthina*, Lindl. (10). Upright shrub, to 10 ft. with brown branches: prickles straight, stout: lfts. 7–11, oval or elliptic, obtuse, dentate, pubescent beneath, or sometimes glabrous, not glandular, ⅛–¾in. long: fls. solitary, short-stalked, yellow, double, 1¾ in. across. N. China, Korea. Var. *normàlis*, Rehd. & Wilson, is the single-fld. wild form. —*R. xánthina*, Auth.=R. Ecæ.

ALFRED REHDER.

ROSCHÈRIA (name unexplained). *Palmàceæ*, tribe *Arèceæ*. A genus of one species, a palm from the Seychelles, allied to Hyophorbe.

Slender, erect, spiny at the nodes: lvs. terminal, long-petioled, at first 2-fid, later unequally pinnatisect; segms. numerous, linear-lanceolate, 2-fid at the apex, the numerous nerves scaly beneath; petiole spineless, somewhat 3-sided, concave above; sheath long, prickly: spadix 2–6 ft. long: peduncle long, slender, compressed; branches slender, rather simple, divaricate: spathes many, entire, narrowed, compressed, naked, the 2 lower ones persistent, the upper deciduous: fls. pale: fr. fusiform, small, black. Roscheria is little known in Amer. and may not now be in the trade. Cult in warmhouse with plenty of moisture. Prop. by imported seeds, obtainable only rarely. Of little general horticultural importance, but the plant is likely to be seen in choice amateur collections.

melanochætes, Wendl. (*Verschaffèltia melanochètes*, Wendl.). Trunk 15–25 ft. high, 2–3 in. diam., with many aërial roots, and when young with a ring of spines below each lf.-scar: lvs. 4½–7 ft. long; petiole 1½–2½ ft. long, smooth, with a pale band running from the top of the sheath down the back of the petiole; sheath 1½–2½ ft. long, with a few fine black spines; lf.-blade pale green, 3–5 ft. long, 2–3 ft. broad, entire when young, unequally pinnate; segms. 1–1½ ft. long, 2-fid at the apex, clothed beneath with peltate scales. Seychelles. I.H. 18:54.

JARED G. SMITH.
N. TAYLOR.†

ROSCÒEA (named after Wm. Roscoe, 1753–1831). *Zingiberàceæ*. Half-hardy perennial herbs often grown in the warmhouse, but also used for border planting.

Roots thick, fleshy, and fascicled: lvs. lanceolate or oblong: infl. in terminal spikes; bracts persistent, 1-fld.; fls. purple, blue, or yellow; calyx long, tubular, slit down one side; corolla-tube slender, lateral segms. spreading, upper broad, cucullate, erect; lateral staminoides oblanceolate, petaloid, erect, lip large, cuneate, deflexed, 2-cleft or emarginate; ovary 3-celled: caps. cylindric or clavate.—About 15 species, Himalaya region and China. Monographed by Schumann in Engler's Pflanzenreich, hft. 20 (vol. IV:46). Roscoeas thrive in light turfy loam and are prop. by division. *R. purpurea* is the species best known in cultivation.

alpìna, Royle. About 4–6 in. high: lvs. 3–4 in. long, not fully developed at flowering-time, sessile, oblong-lanceolate: spike sessile, 1–2-fld., calyx-tube green, 1 in. or more long, slit nearly to base; corolla-tube white, 1 in. long; limb dark purple, the upper segm. orbicular; staminoid oblong-spatulate, lip deeply 2-cleft. Himalayas and Burma.

cautleoìdes, Gagnep; also spelled *cautlioides*. About 9–12 in. high: roots fleshy, almost tuberous, lvs. reminding one of an iris and springing from the base: scapes 6–7-fld.; fls. pale primrose-yellow, borne singly in the axils of sheathing bracts. China. G. 36:669. Gn. 77, p. 275; 78:159.—The roots should be planted 4–5 in. below the surface in sandy loam.

purpùrea, Smith. Fig. 3460. About 6–12 in. high: sts. with 5–6 sessile, lanceolate lvs.: fls. few, in a sessile spike; calyx green, 1½ in. long, slit deeply down one side as the fl. expands; corolla-tube rather dilated upward; limb purple, rarely pale lilac or white, upper

3460. Roscœa purpurea. (×⅙)

segm. about 1 in., very cucullate, lower lanceolate, decurved; staminoid oblanceolate-unguiculate: caps. cylindric. Himalayas, Assam, and Burma. B.M. 4630. B.R. 26:61. L.B.C. 15:1404. G.C. III. 8:191. Gn. 78:159. G.W. 14, p. 370. J.F. 3:230.—A variable species, the hardiest of the genus. Var. **sikkimènsis,** Hort. (*R. sikkimènsis*, Hort.), is said to differ from the type in being epiphytic, in its roots and sts., and its more numerous fls. which are a different shade of purple. Himalayas. Gn. 78:159.

F. TRACY HUBBARD.

ROSE (see also *Rosa*). The queen of flowers; woody plants, some of them distinctly shrubby, many forms much developed horticulturally, all grown for the beautiful and mostly fragrant flowers in white, yellow, and shades of red. See also *Rosa*.

It been been said that the garden rose does not thrive in North America as it does in Europe; but however true this may have been, it scarcely holds today. The success of the rose in this country is very largely a question of the selection of adaptable varieties. These varieties are mostly the compounds of various types and species. In most garden roses it is now impossible to trace the original species with accuracy. For horticultural purposes, a purely botanical classification is of minor consequence, although, in the main, the leading garden-groups follow old specific lines. For a garden classification that follows botanical lines closely, see Baker in Gardener's Chronicle, II. 24, p. 199 (1885). It is essential to success, however, that the intending rose-grower have a clear understanding of the main horticultural groups and the kinds of varieties in them, and this information is provided in Barron's article, beginning on page 3001.

Following are the equivalents of some of the common names of roses:

Ayrshire	*R. arvensis* var. *capreolata.*
Banks Rose	*R. Banksiæ.*
Bengal	*R. chinensis.*
Bourbon	*R. borbonica.*
Champney	*R. Noisettiana.*
Cherokee	*R. lævigata.*
Cinnamon	*R. cinnamomea.*
Damask	*R. damascena.*
Dog	*R. canina.*
Eglantine	*R. rubiginosa.*
Macartney	*R. bracteata.*
Memorial	*R. Wichuraiana.*
Moss	*R. gallica* var. *muscosa.*
Musk	*R. moschata.*
Noisette	*R. Noisettiana.*
Prairie	*R. setigera.*
Provence	*R. gallica.*
Scotch	*R. spinosissima.*
Sweetbrier	*R. rubiginosa.*
Tea	*R. odorata.*

When one speaks of roses, the hearer is likely to think only of the large improved kinds of the gardens; and yet there are more than one hundred well-recognized species-forms of Rosa, while only a dozen or so have entered largely into the horticultural forms. The systematic account beginning on page 2981 describes sixty species, and many more are entered in the supplementary list at its conclusion. The results of domestication are marvelous, and yet the real breeding of roses is little more than begun, and it confounds the imagination if one contemplates what may appear when endless new combinations are made with the many species that are yet little modified by man. The beginnings in this endeavor by persons in this country and elsewhere, indicate a rich field for useful experiment.

These other species of Rosa, aside from the domesticated forms, are of interest and merit largely for landscape planting. Usually we do not think of roses as "shrubbery" but rather as "flowers;" yet *Rosa rugosa* is a good landscape subject, and the same is true of *R. setigera, R. multiflora, R. lævigata,* and many other species. The lists and suggestions by Rehder, on page 2982, are valuable in this connection. Some of the native wild roses are most attractive in their natural setting, not alone in flowers but in foliage, color of stems, fruit, and general habit; and if the grounds include a suitable area, these plants may well be transferred in quantity. In half-wild and informal borders, on banks, along streams and the margins of woods, many of the roses are admirable. The usual horticultural roses are of little merit in landscape work, because they do not supply sufficient foliage and they lack strong shrubby characteristics; and this fact has no doubt obscured the merits of the wild single roses as material for planting.

3461. American Pillar rose.—One of the Multiflora group. (×¼)

The highly improved roses are essentially flower-garden subjects, and they produce better bloom when grown by themselves in regular areas, plantations or beds, where they may receive tillage and such other treatment and care as are specially adapted to them. The preferable location is in the private parts of the place, at the side or rear, and well removed from tall buildings and overhanging trees. They should be given ample space, good soil, and liberal fertilizing, as one would provide these requisites for strawberries, bush-fruits or tomatoes.

The value of the rose product is particularly difficult to estimate. A census-accounting could assemble figures for the nursery stock, the glass devoted to rose-culture, and the value of roses sold by commercial establishments; but the greatest value of the rose is the unmeasurable satisfaction that it returns in thousands of homes and the ministry that it renders to millions of persons.

The literature of the rose is voluminous. The American book writings on the subject are listed on page 1552, Vol. III. For a list of rose books in all languages, see "Bibliografia de la Rosa," by Vergara, Madrid, 1892.

Rose organizations.

The American Rose Society was organized in New York, March 13, 1899, "to increase the general interest in the cultivation and improve the standard of excellence of the rose for all the people," to organize a system of exhibitions, and otherwise "to foster, stimulate, and increase the production in every possible way of improved varieties of the rose, suitable to our American climate and requirements." The Society is a clearing-house for those interested in roses.

Including at first primarily so-called commercial rose-growers—those who grow roses the year round for cut-flowers—the Society has gradually broadened until a considerable number of interested and capable amateur rose-growers are included. Intensive consideration for the rose is fostered by the exhibitions that the Society either conducts or over parts of which it exercises authoritative supervision. For example, four so-called national flower shows, held in Chicago, New York, Boston, and Philadelphia, have had as a prominent attraction notable displays of roses forced into bloom in the early spring, usually offered in competition for the prizes gathered under the leadership of the Society. Inasmuch as these displays have included many of the better climbers and garden roses, large numbers of persons are thereby brought into contact with these advances in rose-culture.

Rose test-gardens have been established under the supervision of The American Rose Society in several places, including, for example, Hartford (Conn.), Washington, Minneapolis, and at Cornell University, Ithaca, N. Y. In these gardens no less than five plants of certain varieties are grown

XCIX. Rose.—White, Bride; pink, Bridesmaid.

under comparable conditions, and committees of the Society make an annual inspection at the time of bloom. The rose test-garden in Hartford, in connection with the well-known and beautiful municipal garden planted in 1904 by Theodore Wirth, has proved a wholesome attraction to the more than 115,000 persons who have annually visited it. The superintendent of the Hartford park system estimates that the area included in the rose-garden attracts visitors at the rate of 85,000 persons a year, thus increasing the use of a park system.

The Society maintains a bureau of registration for new roses, provides a scale of points for judging both blooms and plants, and awards medals and certificates for new roses. Its membership includes three classes—life, active, and associate—the latter relation being open only to amateur rose-growers. In 1916, The American Rose Society began the publication of The American Rose Annual, under the editorship of J. Horace McFarland.

Under the leadership of E. M. Mills, of Syracuse, New York, an organization was formed in that city under the title of the Syracuse Rose Society, for the purpose of stimulating local interest in rose-growing. The ideal proposed by Dr. Mills is noted in the following extract from his article in the 1916 American Rose Annual: "It is far more important that 500 people in a city have rose-gardens with from twenty-five to a few hundred bushes in each of them than that there should be only a few large show gardens." Other societies have been formed in the Pacific Northwest directly to promote rose-growing, and various garden clubs and local societies have affiliated with The American Rose Society under its rules. There are a number of affiliated interests. Any horticultural society in the United States or Canada holding an annual exhibition of roses may affiliate with The American Rose Society, and receive medals for the exhibitors.

The present assembly on the rose, aside from the systematic account of Rosa, pages 2981 to 2999, comprises the following articles:

	Page
Horticultural classification of roses (Barron)	3001
Propagation of roses (Watson)	3004
Roses for the amateur (Huey, Beal)	3006
Outdoor roses for the mid-continental region (Irish)	3010
Roses in California (Braunton)	3012
The cultivation of roses under glass (Pierson)	3014
Rose insects (Crosby and Leonard)	3018
Rose diseases (Massey)	3019

L. H. B.

Horticultural classification of roses.

The garden classification of roses presents considerable difficulty, as the several groups have been so much mixed that the original characteristics of each overlap at nearly all points. This is particularly true of the Perpetuals, of which any close classification is impossible. The difficulties increase as one advances. Certain clear-cut characters may be taken to mark given distinct groups in the summer roses, with which the horticulturist has not busied himself so much. Nearly all of these characters are reproduced in the Perpetuals, and, being blended, give rise to endless confusion; thus the following scheme is merely suggestive and should be studied in comparison with the botanical classification (see page 2983).

American rose-culture, so far as garden varieties are concerned, can hardly be said to have established itself as yet. Our growers are today striving to overcome the short-lived character of the blooms, so as to secure in our gardens something of the rose beauty of Europe. The Wichuraiana, Rugosa, and Multiflora roses, combined with our native species and blended again with the best representatives of the garden-groups already grown, with the admixture of some of the newer species from western China, seem to offer the solution. The beginning has already been made. The hot sun and trying climatic conditions of our summers are fatal to the full beauties of the roses of France and England. The flower is developed so quickly that it has no opportunity to "build" itself, and once developed it fades as rapidly. What has been accomplished for the other florists' flowers remains yet to be accomplished for the rose, and the American rose of the future must be developed to suit the circumstances in the same way that the American carnation has been produced.

CLASS I. SUMMER-FLOWERING ROSES, BLOOMING MOSTLY ONCE ONLY.

A. *Large-flowered (double).*		
B. *Growth branching or pendulous: leaf wrinkled*	1.	*Provence* Moss Pompon Sulphurea
BB. *Growth firm and robust: leaf downy*	2.	*Damask* and *French* Hybrid French Hybrid Provence Hybrid Bourbon Hybrid China
BBB. *Growth free: leaf whitish above, spineless*	3.	*Alba*
AA. *Small-flowered (single and double).*		
B. *Growth climbing: fls. produced singly*	4.	*Ayrshire*
BB. *Growth short-jointed, generally, except in Alpine and Prairie*	5.	*Briers* Austrian Scotch Sweet Penzance Prairie Alpine
BBB. *Growth climbing or rambling: fls. in clusters*	6.	*Multiflora* Baby Ramblers.
BBBB. *Growth free: foliage persistent (more or less), shiny*	7.	*Evergreen* Sempervirens Wichuraiana Cherokee Banksian
BBBBB. *Growth free: foliage wrinkled*	8.	*Pompon*

CLASS II. SUMMER- AND AUTUMN-FLOWERING ROSES, BLOOMING MORE OR LESS CONTINUOUSLY.

A. *Large-flowered.*		
B. *Foliage very rough*	9.	*Hybrid Perpetual*
	10.	*Hybrid Tea*
	11.	*Moss*
BB. *Foliage rough*	12.	*Bourbon*
	13.	*Bourbon Perpetual*
BBB. *Foliage smooth*	14.	*China* Tea Lawrenceana (Fairy)
BBBB. *Foliage smooth, very shiny and vigorous*	15.	*Pernetiana*
AA. *Smaller-flowered.*		
B. *Foliage deciduous.*		
C. *Habit climbing*	16.	*Musk* Noisette
	17.	*Ayrshire*
	18.	*Perpetual Multifloras* Wichuraiana Hybrids
CC. *Habit dwarf, bushy*	19.	*Perpetual Briers* Rugosa Lucida Microphylla Berberidifolia Scotch
BB. *Foliage more or less persistent*	20.	*Evergreen* Macartney Wichuraiana

Garden-group 1. *Provence.* Fragrant: branching or pendulous: fls. generally globular: foliage bold, broad, wrinkled, deeply serrate: prickles uncertain; sometimes fine and straight, sometimes coarse and hooked. Rich soil. Prune closely unless very vigorous. Types are Moss rose, a crested form of the Provence (Fig. 3442).

3462. American Beauty, one of the most popular roses in America. One of the Hybrid Perpetual class. The picture shows a specimen grown in the open. (×⅛)

Pompon, a dwarf group; cupped flowers. See also No. 8. Sulphurea, an undesirable yellow form of difficult cultivation.

Garden-group 2. *The Damask and French.* Damask roses are fragrant: growth robust; spinous: lvs. light green, downy, coriaceous. Hardy: free-flowering: scent destroyed on drying.

French roses: Fragrant (moderately): more upright and compact in growth than the Provence: prickles smaller and fewer: fls. generally flat. Very hardy, growing in any soil; petals bleach in strong sunlight; makes abundance of wood, which should be thinned out; perfume develops in the dried petals.

Hybrid French or Hybrid Provence, a less robust group with smoother, short-jointed wood and generally light-colored flowers. Type Princess Clementine. Other subdivisions include hybrids with nearly all of the Perpetual group. Madame Plantier is a Hybrid Noisette. Coupe d'Hebe is a Hybrid Bourbon.

Hybrid China (China × French and Provence, partaking more of those parents). Growth more diffuse than the French rose: foliage smooth, shining, and remains on the bush late in the year; thorns numerous and strong. Vigorous of growth; very hardy, and not generally well adapted to poor soil; requires but little pruning.

Garden-group 3. *Alba, or white roses.* A very distinct group: all light-colored flowers of moderate size: leaf whitish above, deep green below: spineless (some hybrids with other groups are very thorny), of free growth; prune closely. Type, Felecite Parmentier and Maiden's Blush.

Garden-group 4. *Ayrshire.* Climbing roses; very hardy: slender shoots suitable for trellises and trunks of trees: fls. produced singly. Useful for pot cultivation when trained over a frame; fls. vary from white to deep crimson. Type, Queen of the Belgians, Dundee Rambler. Ruga is a hybrid between this group and one of the Teas; fragrant.

Garden-group 5. *Briers.* Under this heading may be grouped most of the well-defined types of garden roses, mostly small-flowered and which do not readily respond to high cultivation. They are more useful as flowering shrubs in the garden than for cut-flowers. The blooms are generally short-lived.

Austrian or Yellow Briers. Small leaflets: solitary flowers: bark chocolate-brown. Very hardy, but require free air and dry soil; will stand very little pruning, as it produces flowers from the upper ends of the old wood. Types, Harison's Yellow, Austrian Copper, and Persian Yellow.

Scotch or Spiny. This group is well recognized by its excessive spininess; compact low bushes, flowering abundantly and early: flowers small, double. Multiply by underground suckers; fragrant. One hybrid of this group, Stanwell, is a Perpetual.

Sweetbrier. Distinguished by the fragrance of its leaves: the fruits are also decorative: foliage small: flowers light-colored and not of much merit.

Lord Penzance Briers. This is a group of hybrids of *R. rubiginosa* (the Sweetbrier), and the older large-flowered varieties, especially Bourbon and Damask. The results are hardly distributed in America as yet; a few are to be found in select collections. Generally speaking they may be described as very greatly improved Sweetbriers. Brenda is particularly desirable for its fruit.

Prairie rose (*R. setigera*). A native species; promises under cultivation to develop some valuable acquisitions, especially in hybridization with other groups: Type, Baltimore Belle (Fig. 3439).

Alpine or Boursault. Native of the Swiss Alps; semi-pendulous, long, flexible, smooth shoots: flowers in large clusters; mostly purple or crimson flowers. Good for pillars; very hardy; especially suitable for shady places; should be well thinned in pruning, but the flowering wood left alone: type Amadis. Produced by crossing Teas and *R. alpina.*

Garden-group 6. *Multiflora.* The Multiflora group divides itself naturally into the Multiflora true and Baby Perpetual Ramblers. *R. multiflora,* the parent type, is characteristic of the varieties here, the flowers being produced in large corymbs and continuing over a comparatively long time. These varieties are useful as pillar and trellis roses and respond to high cultivation. In pruning, remove only the old canes, leaving the young new growth to carry flowers next year. The American Pillar rose belongs here (Fig. 3461). This group is particularly well adapted to the wild-garden. The name Polyantha, sometimes applied to these roses, should be dropped to avoid confusion. The *Rosa polyantha* of botanists is a synonym of *R. multiflora* (p. 2985), but the Polyanthas of horticulturists are hybrids of *R. multiflora* with *R. chinensis* or Hybrid Perpetuals; they are low bushy plants, first described as Polyantha varieties by Carrière in Revue Horticole, 1884.

Garden-group 7. *Evergreen.* The so-called Evergreen roses hold their foliage until very late in the year and in hybridization appear likely to yield varieties which are practically evergreen.

Sempervirens, useful as pillar roses, producing flowers in corymbs: very hardy: vigorous growth: free bloomer: requires considerable thinning in pruning. Types, Felicite perpetuella.

Wichuraiana (Fig. 3440), most popular of all the rampant roses: very hardy, growing in any soil: this promises to be the basis of a very valuable race of American roses: flowers in the type white. Hybrids have been raised from Hybrid Perpetual and Tea varieties giving large flowers, scented; such are Gardenia and Jersey Beauty. Many hybridists have worked on this species, and the past few years have thoroughly made good the early promise of remarkable developments.

Cherokee (*Rosa lævigata*) of the southern states can be grown satisfactorily away from its native regions only in a greenhouse. (Figs. 3458, 3459.)

The Banksian (*Rosa Banksiæ*). Two varieties of this are known, the yellow and the white. Requires greenhouse treatment: evergreen: needs very little pruning, merely shortening the shoots that have bloomed. Yellow variety scentless, white variety possessing the odor of violets: flowers are produced in graceful drooping clusters.

Garden-group 8. *Pompon.* A small-flowered Provence rose. See No. 1.

Garden-group 9. *Hybrid Perpetual, or Hybrid Remontant.* A large and comprehensive group of much-mixed origin. The mixture with other groups has become so involved as to render separation practically impossible. The characteristics may be described as stiff, upright growth, sometimes inclined to pendulous: flowers of all types: foliage dull green, wrinkled, not shiny: embracing generally the characteristics of the Provence, Damask, French, and the Chinese groups: flowers large, inclined to flat, generally of dark colors. By far the largest and most comprehensive division. (Figs. 3462, 3463.)

Garden-group 10. *Hybrid Teas* form a section of the Hybrid Perpetual group crossed back on to the Tea-scented China, gradually losing all identity. They differ from the pure Hybrid Perpetuals by having foliage of a deeper green and less wrinkled. Some of the best forcing roses are in this group, which promises the greatest development for American rosarians; Robert Scott is a type of this class and is raised from Merveille de Lyon, Hybrid Perpetual, and Belle Siebrecht, Hybrid Tea. The La France type belongs here. (Fig. 3464.)

Garden-group 11. *Moss.* A perpetual-flowering group of the Provence. See Summer Roses and Fig. 3442.

Garden-group 12. *Bourbon.* Dwarf and compact growth, with rounded, more or less shining leaflets: very floriferous: brilliant colors: good outline: in perfection late in the season: requires close pruning. Type, Hermosa (or Armosa).

Garden-group 13. *Bourbon Perpetual.* Very floriferous: flowers moderate-sized, well formed, in clusters. Type, Madame Isaac Pereire.

Garden-group 14. *China* (*Rosa chinensis*). The China or Monthly rose is characterized by its positively perpetual manner of flower. Its blooms become much darkened in color from the action of the sun's rays: flowers small and irregular in shape. Somewhat tender.

The Tea-scented China or Tea Rose (Fig. 3465), *Rosa odorata*, is an allied species. It has large thick petals, with the characteristic tea scent: flowers generally light-colored, pink and creamy yellow: growth free; the best for forcing. The group has been hybridized with all other sections and the Tea influence is seen throughout the rose family. Some of the varieties are climbing. Type Bon Silène and Homer.

Lawrenceana. Dwarf forms, requiring the same treatment as the Teas. Commonly known as the Fairy Rose.

Garden-group 15. *Pernetiana.* Crosses of Hybrid Teas and "Austrian" brier. Habit generally like Hybrid Teas but more vigorous, with stout spines and coarse

3463. Paul Neyron rose. A good rose-colored variety of the Hybrid Perpetual type. (×⅓)

shiny foliage. The chief distinction, however, is in the remarkable coloring of the flowers, which is indescribable, but often spoken of as "shrimp," with blendings and shadings of burnished copper. Tendency to shed foliage unless grown on almost pure clay. Some forms, as Juliet, show affinity to Austrian in resenting pruning, but later kinds are closer to Tea. Type Madame Edouard Herriot.

Garden-group 16. *The Musk.* Very fragrant: rather tender: derived from *Rosa moschata:* flowers of pale color. This group has been much hybridized with others, and its identity is lost as a garden plant in that of its derivatives, especially the Noisette. The flower-buds are elongated and the flowers produced in clusters.

Noisette (Fig. 3466). Larger flowered than the true Musk roses, flowering very late: free growth: more hardy. The group bears a certain superficial resemblance to the Teas and requires moderate pruning; will grow in any soil. The subgroup has been largely blended with the Teas and with a loss of hardiness. In consequence it has fallen into disuse.

Garden-group 17. *Ayrshire.* Perpetual forms of the Ayrshire. For characters, see Summer Roses.

Garden-group 18. *Perpetual-flowering varieties of the Multiflora group.* The term in gardens is taken to include a large number of small cluster-flowered, climbing roses, and is particularly important in American rose-culture, as the basis of a new section of hybrids with the Teas and (erroneously) including hybrids of Wichuraiana and Teas. M. H. Walsh in Mas

sachusetts, M. Horvath in Ohio, and Jackson Dawson in Massachusetts have accomplished important work in this field. Some of Walsh's recent introductions, as Debutante and Sweetheart, not as yet fairly tried, and the Dawson rose, may be classed here. They are valuable as trellis and pillar roses for garden decoration.

3464. La France, a famous Hybrid Tea rose. (×⅛)
This picture was made from the White La France. The original La France is pink.

Garden-group 19. *Perpetual Briers.* Of this group there are about five important types.

Rugosa or Japan rose, a low-growing bush: hardy: useful as a hedge plant, and specially adapted for exposed situations near the seashore (Figs. 3446–3448). Hybrids have been made with other Perpetual groups, especially Teas and H. P.'s. Mme. Georges Bruant is a type. The Rugosa blood is strongly seen in all cases.

Microphylla has minute leaflets; now called *Rosa Roxburghii.*

Berberidifolia has leaves somewhat resembling barberry; now known as *Rosa persica.*

Perpetual Scotch, a perpetual-flowering form of *Rosa spinosissima,* probably a hybrid from the Damask.

Garden-group 20. *Evergreen.* Two types, as follows:

Macartney, slender: sweetly scented and very floriferous throughout the season. Is derived from *R. bracteata.*

Wichuraiana. The Wichuraiana hybrids already referred to under Group 7 may dubiously be included here. They have not yet been sufficiently tested. The perpetual-flowering Ramblers have foliage partaking of Wichuraiana and Tea characteristics.

LEONARD BARRON.

Propagation of roses.

The rose is propagated by seeds, cuttings, grafting or budding, by layers and by divisions. The genus is so large and diversified and the requirements are so many that the whole art of the propagator is needed to satisfy the claims of the Queen of Flowers.

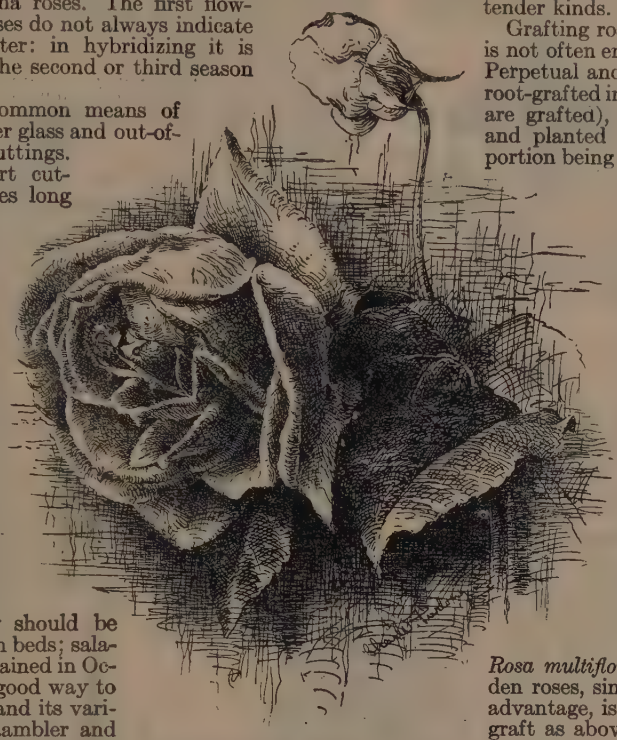
Seeds.—Roses are grown from seeds not only to obtain new varieties but also because many true species are economically procured in this way, e. g., *R. canina, R. multiflora, R. ferruginea, R. rugosa, R. rubiginosa,* and the like. The seeds should be gathered in autumn and at once stratified with moist sand or allowed to ferment in tubs with a little water, and kept in a fairly warm place. When well rotted they can be easily rubbed and washed clean and should be planted at once, either in carefully prepared and well-manured beds out-of-doors or in pans or flats in a cool greenhouse. It is sometimes advised that the hips should first be dried and then rubbed clean, but this method often causes delay in germination, a matter sufficiently troublesome without additional complications; they should always be kept moist. Whether they are planted under glass or in the garden it is difficult to forecast their coming up. It may be within a few weeks, e. g., *R. multiflora* under glass; or at the beginning of the second growing season after planting, e. g., Sweetbrier seed planted out-of-doors in November, 1914, may be expected to germinate in the spring of 1916, while *R. rugosa* sown at the same time may come up the following spring, i. e., in 1915, or, a season intervening, it will appear with the Sweetbriar in 1916. Stratifying or fermenting the seeds tends to secure uniform germination within a reasonable time. It has also been suggested, and many things confirm the idea, that early gathering helps to hasten germination; in other words, do not wait for excessive ripeness, but pick the hips as soon as the seeds harden, some time before the fruit is deep red. Until these matters are better understood, all rose seed sown out-of-doors, either in autumn or spring, should be mulched 2 to 3 inches deep with pine needles or other litter. Frequent examinations should be made in spring and the covering at once removed when the seedlings appear; if they do not appear, let the mulch remain to keep down weeds and retain moisture in the seed-bed. Pans or flats in which seed has been planted should be kept at least eighteen months before discarding, with the soil always moist. Notwithstanding the difficulties of germination, the young seedlings make most satisfactory growth and may generally be transplanted into nursery rows when

3465. Yellow Tea rose, Madame Honore Defresne, useful in the South. (×⅛)

one year old. When two years old they are fit for permanent planting. A winter protection of pine boughs is helpful to the young plants. Some seedling roses are extremely precocious, blooming before they are one year old, e. g., some Hybrid Perpetuals and so-called Polyantha roses. The first flowers of seedling roses do not always indicate their real character: in hybridizing it is well to wait for the second or third season before discarding.

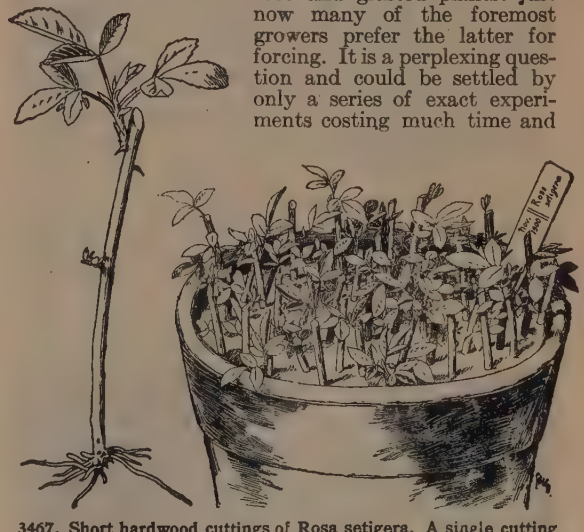
Cuttings.—A common means of propagation, under glass and out-of-doors, is by cuttings. Under glass short cuttings 2 to 3 inches long can be made in November and December from wood of the current year's growth. They should be firmly planted in sand, in flats or pans (Fig. 3467) and kept in a cool greenhouse. They root in February or March, and can either be potted in thumb-pots or kept on in flats until May or June, when they should be planted out in rich beds; salable plants are obtained in October. This is a good way to strike *R. setigera* and its varieties, Crimson Rambler and its allies, *R. multiflora*, and their various offspring, *R. Wichuraiana* and its hybrids, Madame Plantier and doubtless many others. *Rosa indica*, in all its forms, all tender species, and many Hybrid Perpetual roses, are propagated by cuttings of hardened wood grown under glass. Peter Henderson says the wood is in the best condition when the bud is "just open enough to show color." Blind eyes can also be used, and the smaller wood is better than the strong rampant growth. Plant in sand and in a warm house; bottom heat and a close frame are often used but are not necessary. The cuttings are from 1½ to 2 inches long; single eyes strike readily.—In the open air, cuttings of ripened wood may be planted in spring in V-shaped trenches in carefully prepared and well-manured ground. They make strong plants in autumn. Wood of the season's growth is gathered before severe frost, cut into 6-inch lengths, tied in bundles, and stored through the winter by burying in sand. When planted, one eye only should show above ground. This method is recommended for the hardy varieties named above for propagating from short cuttings under glass, but will not give such a large percentage of rooted plants. It is highly probable that some Moss roses, *R. virginiana*, *R. palustris*, *R. spinosissima*, and the like, roses which sucker, can be propagated by cuttings of root or rootstock, but no systematic attempt has been made in this direction.

Budding and grafting.—These are old and well-established methods of propagation. Budding in foreign nurseries is practised in the open air, in June and July, with us in July or August. A dormant shield-bud is employed. The stock is *R. Manetti*, *R. canina*, or any good briar, or *R. multiflora;* in Holland *R. palustris* is esteemed. In European nurseries, *R. canina* is used for standard, *R. Manetti* for dwarf stocks. Under glass roses are budded also, with a shield-bud, at any season when the bark slips, using for stock a vigorous variety. About Boston the yellow and white Banksian roses once had high local repute for stock for Tea and other tender kinds.



3466. Marechal Niel rose. One of the most popular of the Noisettes. Color yellow. (×½)

Grafting roses in the open air in this country is not often employed, but in the South, Hybrid Perpetual and other hardy roses are said to be root-grafted in winter (very much as apple stocks are grafted), tied in bundles, stored in sand, and planted out in early spring, the worked portion being set well below the surface. Root-grafting is an easy and convenient method of propagation under glass. Jackson Dawson's practice is to use the whip- or splice-graft, but the veneer-graft is also employed, with bits of *R. multiflora* root 2 to 3 inches long for the stock, the cion being somewhat longer but of equal diameter. They are firmly tied with raffia and waxed; made into bunches, they are covered with moist moss in an open frame in a coolhouse and left until united. They are then potted off and grown on until they can be hardened off and planted out in May or June, the point of union being well below the surface. A specimen of Dawson's work is shown in Fig. 3468, the stock being a bit of *R. multiflora* root; its age is about three months. *Rosa multiflora* is an excellent stock for garden roses, since it does not sucker; this great advantage, is also obtained by using the root-graft as above described. (See article on roses in Country Life in America, March, 1916, by Geo. C. Thomas, Jr.) The commercial florists use Manetti stock planted in thumb-pots. Cut back to the crown, this is splice-grafted and kept in a warm close frame until united; plants are afterward grown on in pots until large enough to put out in the beds, in which they will flower the following winter. There is some difference of opinion among gardeners as to the respective merits of own-root and grafted plants: just now many of the foremost growers prefer the latter for forcing. It is a perplexing question and could be settled by only a series of exact experiments costing much time and



3467. Short hardwood cuttings of Rosa setigera. A single cutting is shown at the left.

money. It is also quite possible that matters of temperature, soil, moisture, and food are equally important factors.

Layering.—This method is employed only when few plants are required; it is cumbersome and wasteful. Layer in early spring, using wood of the last year's growth when possible; the bark of the buried portion should be abraded.

Division is an easy means of increasing *Rosa virginiana, R. nitida, R. palustris, R. spinosissima,* Crimson Moss and many other varieties which sucker. Plant thickly in good soil, allow them to grow from three to four years, then lift and tear apart. It will be found that the increase is large and that plants so obtained are salable after one year's growth in the nursery. The year in the nursery may be omitted with the quicker-growing kinds which are to form new plantations on the same estate.

B. M. Watson.

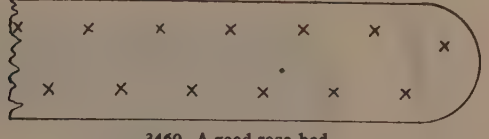
Roses for the amateur.

Roses may be successfully grown in any soil that will produce fair crops of grain, vegetables, or grass. Certainly the best results will be secured in the more favorable soils and situations, but everyone who loves a rose and possesses a few feet of ground with plenty of sunshine can have his own rose-garden and find pleasure and health in cultivating the plants.

The soil and the beds.

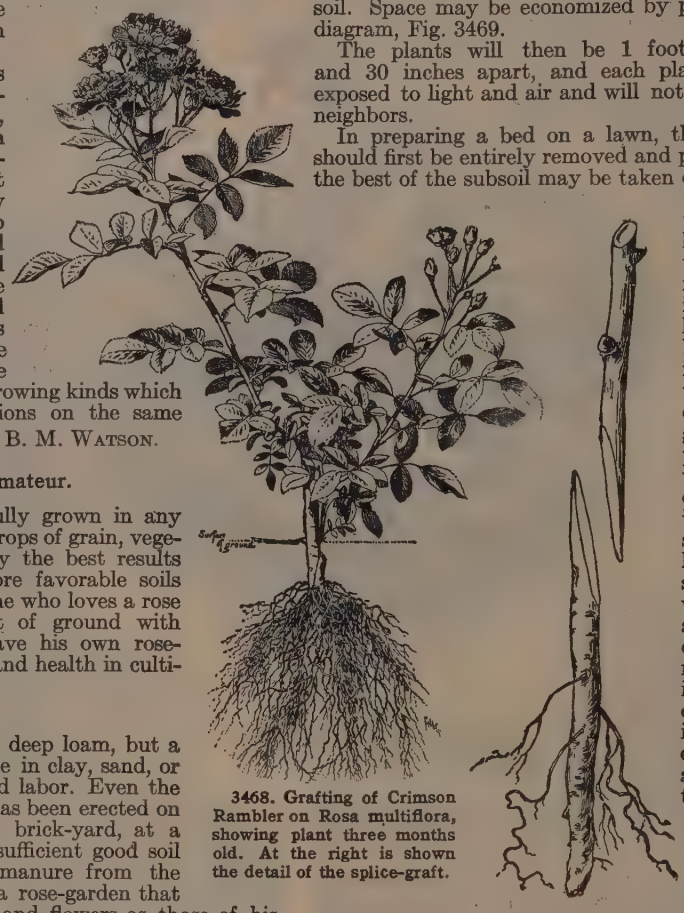
The ideal soil is a rich deep loam, but a good rose-bed can be made in clay, sand, or gravel at little expense and labor. Even the city resident whose house has been erected on the site of an exhausted brick-yard, at a small expense can secure sufficient good soil from the outskirts and manure from the adjacent stables to make a rose-garden that will grow as good plants and flowers as those of his more favored friends who have acres at their disposal, provided always that the sunlight can reach the beds for at least half the day.

The preparation of the ground is the first step of importance. Roses are injured by wet feet, and if the soil is wet it must be thoroughly drained. This can be accomplished by digging out the bed to a depth of 3 feet and filling in 1 foot with broken stone, bricks,



3469. A good rose bed.

cinders, or anything that will allow a free passage of the water through the soil. If this is not sufficient and the water is not carried away, provision must be made for tile-draining; but, except in very extreme cases, the drainage before mentioned will be found amply sufficient. The composition of the soil should depend on the class of roses to be grown, for the Hybrid Remontants do best in a heavy soil containing clay, while those having Tea blood prefer a lighter, warmer ground.



3468. Grafting of Crimson Rambler on Rosa multiflora, showing plant three months old. At the right is shown the detail of the splice-graft.

The beds may be made of any desired shape, but a width of 4 feet will usually be the most satisfactory, as a double row can be planted at intervals of 2½ feet, which will be all that is necessary for the strongest-growing varieties, and the blooms can be gathered from each side without the necessity of trampling on the soil. Space may be economized by planting as in the diagram, Fig. 3469.

The plants will then be 1 foot from the edge and 30 inches apart, and each plant will be fully exposed to light and air and will not interfere with its neighbors.

In preparing a bed on a lawn, the sod and earth should first be entirely removed and placed apart; then the best of the subsoil may be taken out and placed on the other side of the trench, and, lastly, the portion to be discarded is removed, making in all a depth of at least 2 feet. The bottom or floor is then loosened to the full depth of a pick-head, the good subsoil replaced and mixed with a generous dressing of well-decomposed stable manure; lastly, the surface soil and sod are well broken up and also thoroughly enriched with manure, and the bed is filled to the level of the adjoining surface with enough good soil added to replace the discarded earth. When the bed has settled, the surface should be at least 1 inch below that of the adjoining sod, in order that all the rainfall may be retained. It is a mistake to make any flower-bed higher than the adjacent surface, as in hot weather the soil dries out and the plants suffer.

If the bed is intended for the hardy Hybrid Perpetual or Remontant class, it should contain a fair proportion of clay well mixed with the soil. A sufficient amount is always present in what is known as a heavy loam. If the soil does not contain this naturally, the material should be added and thoroughly incorporated with the other ingredients. If the bed is intended for Hybrid Teas, Teas, Bourbons, or Noisettes, the soil should be lighter, and, if naturally heavy, should have added to it a proper quantity of sand or leaf-mold, and be thoroughly mixed as before. Roses are rank feeders; therefore be liberal with manure for every class.

The plants and planting.

Garden roses may be secured from the dealers grown in two ways: on their own roots, and budded on the Manetti or similiar stock. There is much difference of opinion among growers as to the relative value of the two methods of propagation, and it must be admitted that some of the stronger varieties will do equally well either way; but the opinion of the writer, based upon the experience of more than a quarter of a century, is that all of the less vigorous varieties are far better budded

than on their own roots, and some are utterly worthless unless budded, notably, Reine Marie Henriette and Viscountess Folkestone, both charming roses when well grown. The budded plants are mostly grown in Europe, taken up as soon as the wood is ripened in the autumn, and shipped to us in the dormant state in time for planting in the latitude of Philadelphia before the ground is frozen. They are usually received in such excellent condition that rarely one in a hundred of the hardy sorts fails to make a good growth, and a fair bloom the following season.

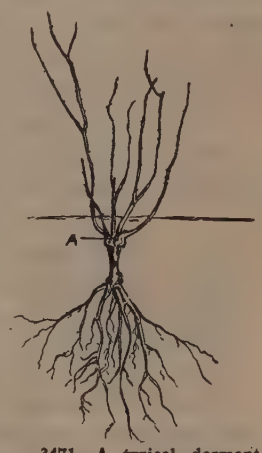
3470. Flower of the Manetti rose, used as a stock.

With the tender sorts, dormant planting out-of-doors in late autumn is attended with much risk, because of the inability of these plants to endure the rigors of our winters before becoming established. Consequently they need much more protection than the hardy varieties. It is really much better to defer the planting until the early spring, if the plants can be safely housed through the winter. After they have become successfully established their safety is assured, and they will repay in vigor and excellence the extra work expended on them. Few amateurs, however, have the conveniences for caring for a number of plants under cover in the winter. Therefore they must take the risk of planting in the autumn or cultivate plants grown on their own roots. (For further discussions of budded and grafted roses, see page 3005.)

For budded roses, holes at least 1 foot deep and 15 inches wide should be made for each plant, the collar or point where the bud was inserted and from which the new growth starts placed 2 inches beneath the surface of the soil, the roots spread out and downward (care being taken that no roots cross each other), and all roots covered with fine soil free from lumps of manure. (Fig. 3471.) Manure should never be placed in actual contact with the roots, but near at hand, where the new feeding roots can easily reach when growth begins. The remaining soil should then be packed in firmly, the surface leveled and covered with about 3 inches of coarse litter and manure, and the long wood cut back to about 18 inches to prevent the plant being whipped and loosened by high winds. This extra wood is left to encourage root-action in the spring and should be cut back to three or four eyes as soon as they can be detected when pushing out. Always cut above and close to a strong outside bud, without injuring it, to develop an open and free head, this admitting light and air. If the uppermost bud is on the inside surface of the shoot, the new growth will be directed inward, dwarfing and hampering the plant and preventing proper development. The deep planting above described is necessary to prevent suckers from being thrown out by the roots, as these will speedily choke and kill the less vigorous wood which we are endeavoring to develop. From the writer's experience, the only objection to budded plants is this danger of suckering from the roots; therefore no one should attempt to cultivate budded roses who cannot distinguish the brier should it appear, or who is too careless to dig down at once and cut the wild shoot clean off at the root, rubbing it smooth to prevent its starting again. A very little experience will enable anyone to distinguish the brier. The canes are covered with minute thorns and bear seven leaflets, instead of the usual five. Should any doubt remain, follow the shoot down through the ground and if it starts below the collar, it is a brier; remove it. These wild shoots usually appear a few inches outside of the regular growth, rarely inside; consequently there is little difficulty in detecting and removing them.

Roses from pots should be planted as soon as the spring weather has fairly settled and all danger of frost is over, that the plants may be firmly established before the heat of summer. Roses planted late in the season never do well. The holes need be made only a little larger than the pot in which the plant in growing. Choose a cloudy day, or the time just before a rain, or late in the afternoon, and, after making the hole, knock the pot off by inverting the plant and striking the edge sharply on a firm object (the handle of a spade which has been firmly placed in the ground in an upright position will answer well). Press the ball of earth firmly between the hands to loosen the earth without injuring the roots, fill the hole with water, insert the plant a very little deeper than it stood in the pot, fill in with soil and pack the earth around it firmly. Pot-grown plants always require staking if the varieties are of upright growth.

Tea roses make a charming effect, where the climate is too cold to winter them in the open successfully, by planting in a bed 6 feet in width, the rows 1 foot from the edge and 2 feet apart, and the bed of any desired length or any multiple of 3 feet. A sectional frame made from tongued and grooved fence-boards, 2½ feet in height at the back and 2 feet in front, facing east or southeast and fastened together with hooks and eyes or screws, the whole covered with ordinary coldframe sash (6 by 3 feet), will preserve the tender varieties through a severe winter. The sash should be freely opened when the temperature is above 30° F. and air admitted during the day when it is 10° or 15° lower. Always close before sunset and open as soon as the sun shines each morning. Opening the sash to keep the plants cool and prevent growth is just as essential as covering to protect from cold, if abundance of flowers is desired. A few days' neglect in opening the sash when the temperature is above 30° will destroy most of the buds for the coming June, as they will be forced out, and one cold night will kill them. Protect from rains or snows, and do not water. Sufficient moisture reaches the roots from the outside to keep the plants in a healthy condition. Teas may be grown successfully in such a bed for many years, and give hundreds of fine blooms from May until November and remain so vigorous that many of the new shoots will be ½ inch in diameter.



3471. A typical dormant rose as it should be planted. *A*, point where bud was inserted.

Climbing roses make a very effective background, and if trained on a high wire fence give a beautiful display. The strong-growing varieties should be planted 8 feet apart and will each easily fill a trellis 9 feet high. They also look well trained on the house porch, but are much more likely to be attacked by insect enemies than when planted in the open. Roses grown on porches are usually attacked by aphides and slugs, the leaves becoming riddled and skeletonized, which only infrequently occurs when they are planted in the open sunny garden. If roses are wanted around porches, the Microphyllæ, white and pink, and the Crimson Rambler can be safely planted, as they are not attacked by the slug; but the blooms do not compare favorably with many other roses of their habit. The other varieties

may also be grown around porches, provided that they can be planted where the drippings from the roof will not fall on them and they are kept free from slugs.

Climbing Teas can be grown successfully in the latitude of Philadelphia only in the case of a few varieties.

3472. Reine Marie Henriette, the finest climbing Tea rose for the latitude of Philadelphia. This shows the vigorous growth, the trellis being 10 feet wide and 9 feet high.

Many of the finer kinds are worthless, in spite of all the protection that can be given them, unless they are covered with glass. Lamarque, Bouquet d'Or, Cloth of Gold, Triomphe de Rennes, Marechal Niel, and Reve d'Or have, in the writer's experience, all perished in the first winter, but Reine Marie Henriette, Gloire de Dijon, William Allen Richardson, and Celine Forestier will do well and yield satisfactory results. Reine Marie Henriette blooms finely and makes a magnificent growth, as may be seen in Fig. 3472. The trellis is 10 feet wide and 9 feet high.

Hybrid Sweetbriers, of the Marquis of Penzance kind, are a valuable addition to rose collections. The foliage is abundant, healthy, vigorous, and fragrant, and the exquisite shading of each variety forms a beautiful contrast with the others. It would be difficult to choose among them, for all are worthy of a place, when there is sufficient space for them to revel. They should have a high trellis and be planted fully 8 feet apart.

Pruning roses.

Of the common garden roses, the flowers are produced on new wood of the season that arises from the canes or the crown, or else, in the case of shrubby species, from old trunks or arms. It should be the aim of the grower to secure strong clean canes for this flower-bearing, and not to have so many of them on each plant as to produce much small weak bloom.

Standard or "tree" roses are sometimes grown, but they require so much care in keeping down suckers and in staking and tying, that they are little known in this country. They are grown abroad when a few excellent blooms are desired or where space is limited. These tree roses are top-budded, on strong stocks, to the desired variety. Sometimes an effect approaching the true tree rose is produced by tying up a few very strong canes to a stake, as shown in Fig. 3474. The usual type of rose-bush in America, however, of the Hybrid Perpetual class, is shown in Fig. 3475.

3473. Illustrating the pruning of the rose shown in Fig. 3472.

Pruning the dwarf-growing Hybrid Perpetuals may be begun late in March and regulated by the quantity or quality of the blooms desired. If the effect of large masses be wanted, four or five canes may be left 3 feet in height and all very old or weak growth entirely removed. This will give a large number of flowers, effective in the mass but small and with short weak stalks scarcely able to support the weight of the heads and not effective as cut-flowers, as this sort of pruning is entirely for outside show. After the bloom is entirely past, the long shoots should be shortened back, that the plant may make good and vigorous wood for the next season of bloom. But if quality be desired, all weak growth should be removed, every remaining healthy cane retained and cut back to 6 or 8 inches. Always cut just above an outside bud, to make an open head that will admit light and air freely. After the first season's growth, there may be about three canes to be retained, but with good care and cultivation the number will increase yearly, until after fifteen or twenty years there will be at least as many canes to be utilized as the plants are years old. The writer had a bed over twenty years from planting, in which each plant, after close pruning, measured 15 to 18 inches in diameter, each cane throwing up four to six shoots 1 to 2 feet in length and sufficiently vigorous in most varieties to hold up the largest flowers and to give magnificent specimen flowers for cutting. Roses grown in this way do not need stakes. They are sufficiently strong and vigorous to hold erect any weight they may be called upon to bear; but late in the autumn, before the high gales of November arrive, they should be cut back to about 2 feet to prevent their being whipped by the winds, for this would loosen the plant and break the newly formed feeding-roots. The plant should not be cut back to the point suggested for spring pruning, as in the hot Indian summer the upper eyes will surely be forced out and the promised blooms for the ensuing season destroyed; so in pruning for protection from November blasts, enough wood should be left to avoid all danger of the lower buds being forced out. The upper buds always develop earliest. Some varieties will not produce large flower-stalks under any method of treatment, notably Prince Camille de Rohan, La Rosarie, and Rosieriste Jacobs; but almost all the other kinds do better under this method than any other, if quality is desired.

3474. Rose trained to a few shoots.

Pruning dwarf-growing Tea roses is conditioned on the fact that they will not endure such vigorous cutting back as the Hybrid Perpetuals. All good strong shoots should be retained unless they form a very close head, when it is better to remove a few from the center. The canes should be shortened about one-third of their length, the branches cut back to one or two eyes, and after each period of bloom the longest shoots should be trimmed back sparingly.

Bourbons need even less trimming. Souvenir de Malmaison, Mrs. Paul, and others of this class should have only the weak ends of each shoot removed, and no more wood cut away than is necessary to remove weak and unhealthy parts.

Climbing roses should be pruned sparingly by simply shortening-in the too vigorous shoots and cutting the laterals back to two eyes. Tie all to the trellis in a fan shape, dividing the space as evenly as possible. Fig. 3473 shows the same Reine Marie Henriette pruned and trained on trellis. These continue in flower until November, the early bloom in June being the finest.

Hybrid Teas should be pruned for quality, and the proper time is when the buds are swelling. The amount of wood to leave on the plant varies with the variety. Shortening the shoots to 4 to 8 inches gives fair results. Cut back the weak growers more severely than the vigorous kinds. To provide for good blooms later, leave three good buds in the axils of the leaves at the base of the shoot when removing flowers or withered blossoms (Beal).

Hybrid Sweetbriers require only such pruning as to shorten back the over-vigorous growth and occasionally to remove some of the oldest shoots to prevent crowding.

3475. A well-grown rose-bush.

Tillage.

Just before growth begins in spring, the surplus rough manure should be removed from the beds and all the remaining fine particles forked in. Deep cultivation is not desirable, as the roots are likely to be injured or broken. Three inches in depth is quite sufficient for a bed that has not been trampled on, and this should be performed with a four-tined digging-fork, which is less likely to cause injury to roots than a spade. The beds should then be neatly edged and the surface raked off smooth and even. Frequent stirring of the surface with a sharp rake is all that is necessary afterward, until the buds begin to develop. Then half a gallon of weak liquid manure applied around the roots of each plant just before a shower will be beneficial. The manure-water should be prepared beforehand, and as soon as a good promise of rain appears, all hands should be called into service and every plant given a full ration. One person should dig a shallow trench with a garden trowel around each plant, the next follow and fill with the liquid manure, being careful to avoid besmirching the leaves; afterward the bed may be raked over level and the rain will wash the food to the roots. This feeding may be repeated with benefit every week until the season of bloom is over, after which stimulation should cease and the plants be permitted to perfect the new wood for the next season's growth. Little pruning is necessary with "cut-backs." So much wood has been removed in gathering the blooms that but little more is left than needed to keep the plants vigorous and healthy. There is another advantage from the system of close pruning: all growths are so strong and vigorous that they are better able to resist insects or disease.

The notion that roses exhaust the soil in a few years and require to be changed into new ground is generally accepted, and is true in most cases; but when beds are formed as previously described and budded roses planted, the vigorous feeding roots find sufficient nutriment in their far-reaching growth to support a healthy development of wood and flowers for many years, especially if a generous top-dressing of manure be applied each autumn and liquid manure supplied liberally during the development of the buds. A top-dressing of wood-ashes after the first spring tillage will materially increase the vigor of the wood and flowers.

Varieties.

The following roses are sufficiently hardy for planting, with more or less protection, even in central New York, where all have been tested (Beal):

Hybrid Perpetual.—Alfred Colomb, A. K. Williams, Anna de Diesbach, Baron de Bonstetten, Baroness Rothschild, Captain Christy, Captain Hayward, Clio, Dr. O'Donel Browne, Duke of Edinburgh, Duke of Teck, Frau Karl Druschki, General Jacqueminot, George Arends, Gloire de Chedane Guinoisseau, Gloire Lyonnaise, Hugh Dickson, J. B. Clark, John Hopper, Lady Helen Stewart, Madame Gabriel Luizet, Magna Charta, Margaret Dickson, Marshall P. Wilder, Mrs. John Laing, Mrs. R. G. Sharman-Crawford, Oscar Cordel, Paul Neyron, Prince Camille de Rohan, Ulrich Brunner.

Hybrid Tea.—Antoine Rivoire, Augustine Guinoisseau, British Queen, Caroline Testout, Chateau de Clos Vougeot, Chrissie Mackellar, Dean Hole, Dorothy Page Roberts, Duchess of Sutherland, Duchess of Westminster, Earl of Warwick, Edith Part, Etoile de France, Francis Scott Key, Frau Lilla Rautenstrauch, Geoffrey Henslow, George Dickson, Grace Molyneux, Gruss an Teplitz, Gustav Grunerwald, Hector MacKenzie, Irish Brightness, Jonkheer J. L. Mock, Kaiserin Augusta Victoria, Killarney, Killarney Queen, Königin Carola, Lady Alice Stanley, Lady Ashtown, La France, Laurent Carle, Lieutenant Chaure, Madame Jules Grolez, Madame Hector Leuillot, Madame Segond Weber, Marquise de Sinety, Mevrouw Dora Van Tets, Monsieur Joseph Hill, Mrs. A. R. Waddell, Mrs. Wakefield Christie-Miller, Old-Gold, Prince de Bulgarie, Queen Mary, Simplicity, Souvenir du President Carnot, Souvenir de Gustave Prat, Sunburst, Viscountess Folkestone, Wellesley, White Killarney, Willowmere.

Pernetiana.—Arthur R. Goodwin, Louise Catherine Breslau, Lyon, Madame Ruau, Rayon d'Or, Soleil d'Or.

Polyantha or Baby Rambler.—Bordure, Catherine Zeimet, Cecile Brunner, Clothilde Soupert, Ellen Poulsen, George Elger, Gruss an Aachen, Leonie Lamesch, Louise Walter, Madame Jules Gouchault, Maman Turbat, Marie Brissonet, Marie Pavie, Mignonette, Mosella, Mrs. W. H. Cutbush, Schneekopf, Triomphe Orleanais.

Moss roses.—Blanche Moreau, Comtesse de Murinais, Crested Moss, Crimson Globe, Princess Adelaide.

Hybrid Sweetbriers.—Amy Robsart, Anne of Geierstein, Brenda, Catherine Seyton, Edith Bellenden, Flora McIvor, Green Mantle, Jeannie Deans, Julie Mannering, Lady Penzance, Lord Penzance, Lucy Ashton, Lucy Bertram, Meg Merrilies, Minna, Rose Bradwardine.

Hardy Yellow roses.—Austrian Copper, Harison's Yellow, Persian Yellow.

Bourbon and Noisette.—Beauty of Rosemawr, Burbank, Caroline Marniesse, Champion of the World, Hermosa, Mrs. Paul, Souvenir de la Malmaison.

Hybrid China and Gallica roses.—Madame Plantier, Rosa Mundi, York and Lancaster.

Rugosa hybrids.—Agnes Emily Carman, Conrad Ferdinand Meyer, Madame Georges Bruant, Madame Lucien Villeminot, Nova Zembla, Perfection l'Hay, Blanc Double de Coubert.

Climbing roses, large-flowered types.—Baltimore Belle, Christine Wright, Climbing American Beauty, Countess M. H. Chotek, Dr. W. Van Fleet, May Queen, Prairie Queen, Ruby Queen, Tausendschön, W. C. Egan.

Climbing roses, many-flowered types.—Count Zeppelin, Crimson Rambler, Dawson, Dorothy Perkins, Excelsa, Gardenia, Goldfinch, Lady Gay, Lady Godiva, Minnehaha, Mrs. F. W. Flight, Mrs. M. H. Walsh, Rene Andre, Rubin, Source d'Or, Thalia, Trier, Wartburg, White Dorothy.

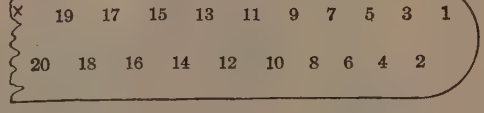
Climbing roses, single-flowered types.—American Pillar, Bonnie Belle, Delight, Eisenach, Evangeline, Jersey Beauty, Hiawatha, Leuchstern, Paradise, Pink Roamer, Silver Moon.

Tea-scented roses.—Duchesse de Brabant, Harry Kirk, Helen Gould, Isabella Sprunt, Madame Lambard, Madame Joseph Schwartz, Maman Cochet, Marie Lambert, Mrs. Herbert Hawksworth, Papa Gontier, Princesse de Sagan, Souvenir de Catherine Guillot, William R. Smith, White Maman Cochet.

Climbing Tea and other tender roses.—Birdie Blye, Climbing Testout, Madame Alfred Carriere, Madame Driout, Mrs. Robert Peary, Reine Marie Henriette.

Bengal roses.—Archduke Charles, Douglas, Lucullus, Madame Eugene Marlitt, Maddalena Scalarandis, Queens Scarlet, and Viridiflora.

Single Hybrid Tea roses.—Iona, Irish Beauty, Irish Brightness, Irish Elegance, Irish Harmony, Irish Modesty, and Simplicity.



3476. Suggestions for a variety record in the notebook. 1 to 6, Her Majesty; 7 to 12, Margaret Dickson; 8 to 15, Gloire Lyonnaise; 16 to 20, White Baroness.

Much of the charm of growing roses is derived from the accurate knowledge of each variety by name. Yet few amateurs ever accomplish this, chiefly because the labels have been lost or misplaced, and not infrequently a plant becomes known to the cultivator by a name belonging to a neighboring specimen whose label has been placed on the wrong plant. To obviate this, a record should be made in a book kept for the purpose,

with a chart for each bed. Fig. 3476. This should be made at once after the plants are set out and before the labels have become detached.

ROBERT HUEY.
A. C. BEAL.†

Outdoor roses for the mid-continental region.

An intercontinental region, of which central Missouri may be considered a typical representative, often presents gardening problems which markedly differ from those in territory adjacent to large bodies of water. The longer season of intense heat combined with extreme low humidity, together with the frequently sudden and extreme fluctuations in temperature, both during winter and summer, so influence vegetation that if the same degree of perfection is to be attained, and competition successfully met, horticultural operations must be strictly orthodox, and confined to fewer varieties than may be grown elsewhere. This appears to be preëminently true in outdoor rose-growing. This crop can be as successfully produced under the varying conditions to which the region is subject, providing well-established rules, practised by expert rose-growers everywhere in planting and cultivation, are strictly followed, and if the right varieties are chosen. The most hopeless situation is the congested city conditions with air contaminated with poisonous gases. Energy and enthusiasm in gardening in such a place are better spent with other plants.

In planning a location and the arrangement for roses, the purposes for which they are to be grown must be considered. A rose-garden separated from other features of the ground is becoming more and more an important part of parks and private estates. Into this area are grouped a general collection, or specimens of all kinds. It should have a sunny position, though the ground-surface may gradually slope in any direction. Other conditions being identical, a gentle northerly slope is preferred. The kinds may be grouped by types, color, and habit of plant, with all specimens of one kind together rather than the different varieties mixed, —the rugosa, briers, and wild roses bunched in masses, and the climbing sorts on a pergola or trellis. The general dwarf kinds are arranged in irregular or geometrical beds, which, for the sake of convenience, should not be more than from 4 to 6 feet in the greatest width, but of any desired length. Rose-beds may also be located on other parts of the grounds. Low, swampy or poorly drained soil should be avoided, and the beds well separated from trees or large masses of other shrubs. Tea and Perpetual roses should not be grown as single specimens, but always in groups or beds.

3477. Rosa rugosa. (×½)

Suitable hedges may be made from many varieties of roses: notably rugosa and its hybrids for a broad or thick hedge, Orleans for a dwarf, and Gruss an Teplitz for medium to tall. Hybrid Perpetual sorts may also be used. With the exception of rugosa, it is better to plant in double rows, about 9 inches apart, the plants 18 inches to 2 feet apart, alternating in each row.

3478. Russian form of Rosa rugosa. (×½)

Shrubbery masses containing roses only or with an admixture of other shrubs may be made by using wild species, sweetbrier, and rugosa. Climbers and trailers are well and largely used on porches, trellises, tree stumps, and to trail on banks, mounds, and the like.

Types and varieties.

While the Tea roses are the most tender of the groups, many of its varieties can be made to succeed by selecting a location most sheltered from extreme cold, and by providing a thorough winter mulch. Without the latter provision it is useless to attempt any varieties of this type. The following are among the best for this region: Étoile de Lyon, yellow; Maman Cochet, silvery rose; Maman Cochet White; Perle des Jardins, yellow; Mme. Francisca Kruger, coppery yellow; William R. Smith, creamy white; Duchesse de Brabant, pink.

As a type, the varieties of the Hybrid Tea group are more hardy and bloom as freely and continuously as the Teas. There are exceptions with some of the varieties. There is considerable variation in the different sorts, the character of some partaking strikingly of the delicate Teas, while others resemble the more vigorous Hybrid Perpetuals. Many kinds display the best qualities of both types, having their long flowering period and beautiful blooms of good substance, prëeminent among which are: Gruss an Teplitz, scarlet; Jonkheer J. L. Mock, pink; General MacArthur, scarlet; LaFrance, pink; Kaiserin Augusta Victoria, white; Antoine Rivoire, pale yellow; Mrs. Aaron Ward, yellow; Lady Ashtown, soft rose; My Maryland, salmon-pink; William H. Taft, pink; Helen Gould, carmine-red; William Shean, pink.

The Hybrid Perpetual is a still hardier type in which are to be found varieties producing blossoms that command the highest prices because of their large size, good substance, and long stems. The most noted representative is American Beauty, still largely grown under glass and in many localities out-of-doors, but for the latter purpose not now generally counted on for the degree of success usually attained by other kinds in

this region. The limited season of flower-production, and the unattractive plant-display the remainder of the year, places this group second to the Hybrid Teas in usefulness for outdoor culture, even though little or no winter covering is required with the one, while it is important that some protection be provided for the other in the more northerly section of this region: General Jacqueminot, brilliant scarlet-crimson; Coquette des Alpes, white; Ulrich Brunner, cherry-red; Frau Karl Druschki, snow-white; Victor Verdier, crimson; Paul Neyron, dark rose; Madame Charles Wood, scarlet; Magna Charta, bright pink; Mrs. John Laing, soft pink.

Roses of the dwarf rambler class are as hardy as Hybrid Perpetuals and as continuous as Hybrid Teas. The dwarf compact habit, together with the clustered masses of bloom, gives it a distinction all its own. The class is very showy in the garden, but with rather short stems, and therefore less valuable for cut-flowers. Occasionally the blossoms bleach a little in conditions following alternate rain and warm sunshine, but this fault is more than outdone by the wealth of color produced over most of the period from beginning of blooming to frost: Clotilde Soupert, rosy white; Baby Rambler, crimson; Baby Rambler, pink; Orleans, red; Katherine Zeimet, white.

The varieties and hybrids of *Rosa rugosa* are useful, especially in landscape masses and usually make excellent hedge-rows. (Figs. 3477–3480.) The single-flowered forms produce bright red hips or seed-vessels that remain on the bushes late in the winter. The bright green leaves give these and similar varieties an interesting and pleasing appearance a large part of the season. Good varieties are: *R. rugosa alba*, white; *R. rugosa rosea*, pink; *R. rugosa rubra*, red; Madame Georges Bruant, double white; and others.

Hybrids of the Sweetbrier type are most charming when in bloom, though the flowers are only medium to small in size, and endure for less than a fortnight. It produces conspicuous fruits and fragrant foliage. The plants are a little slow in making their growth, but meet all weather conditions without injury and live to a great age. The plants form a good shrubbery mass or border group. Three good varieties are: Lord Penzance, Lady Penzance, Brenda.

Many of the native species of roses are well used for mass planting, similar to the Sweetbriers. There are several American species known to thrive and bear abundant bloom at St. Louis: *R. palustris*, *R. virginiana*, *R. setigera*.

The most valuable climbing roses for this region fall under two types, *R. multiflora* and *R. Wichuraiana*. Isolated examples have been reported of other forms doing equally well, but the above are by far the most common, and the varieties give so wide a range of color as practically to make other forms unnecessary. They grow rapidly in good soil, and when trained to tree-stumps, trellises, walls or the sides of buildings, quickly make a thorough covering. For covering solid walls and sides of buildings it is better to provide lattice-work a few inches from the building to give opportunity for free circulation of air between the wall and the vines. The Wichuraianas are especially adapted for trailing over banks, mounds, and the like. Good varieties are: Crimson Rambler, crimson; Dorothy Perkins, both pink and white.

After several years' experience with Moss roses, the writer has never seen a plantation that was as satisfactory as other types. At St. Louis they were no more hardy than Hybrid Teas and appear to be more subject to mildew than any other roses. The blooms were not superior to other roses and are rarely grown except by persons maintaining collections of old-fashioned flowers, from whom some good reports have been made. They are more valuable here for their associations than for real horticultural merit.

Soils.

Roses take most kindly to a heavy clay loam enriched with well-rotted cow-manure. Such a soil is characteristically abundant in this region. Sand and ground limestone are added to the average clay loam unless it is known that the soil already contains enough of one or more of these ingredients. Except for Tea

3479. Rosa rugosa var. Kaiserin. (×½)

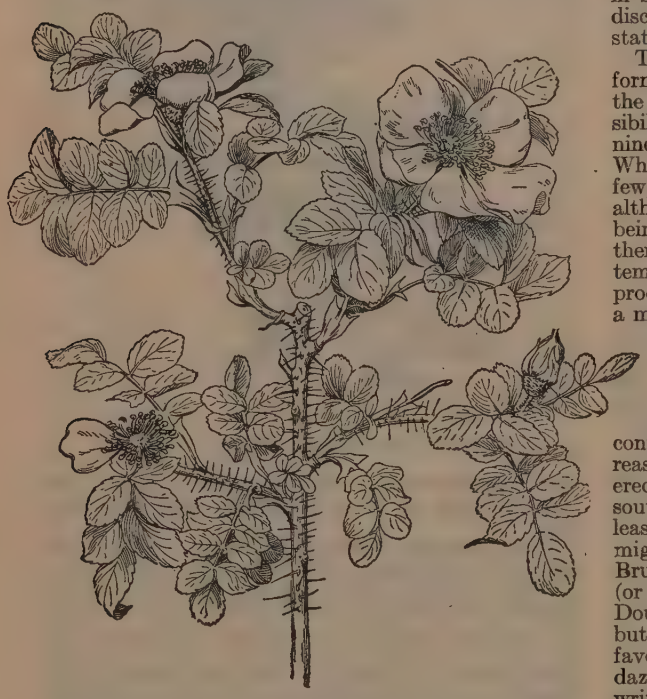
roses, lighter soils are avoided as much as possible, and even the Teas do better in ground moderately compact.

Great care must be exercised in the preparation of the soil and providing perfect drainage. Ground for a rose-bed should be excavated 2 to 2½ feet deep and the lower 6 inches filled with pieces of rock or broken brick. The bottom should be connected with a drain-tile to carry the surplus water quickly to a lower level. About a foot of cow-manure, preferably rotted, should be spread over the broken rock and brick, and the excavation filled with heavy clay loam of sufficient depth to keep the surface when settled slightly lower than the surrounding level. To most soils in this region some form of lime should be added to neutralize any acidity that may occur. If there is a greater proportion of clay than loam in the soil a little pulverized sheep-manure, dried blood, or other quick-acting chemical fertilizer will provide available plant-food immediately and give the plants a better start.

Planting.

In starting a rose-plantation, the stock may be dormant wood or growing plants in 3- or 4-inch pots. The plants may have been grown from cuttings on their own roots or budded or grafted on other stock. Plants on their own roots are equally good, cheaper to buy, and there is no danger of the stock plants making growth from the roots in place of the desired kind. Most roses in this region are grown on their own roots. Dormant roses may be set out either in fall or spring, using preferably one- or two-year-old plants. Spring is the most common season, but autumn-planting is practised by some and considered equally good, or even better by many successful growers. The plants are set in the ground 2 or 3 inches deeper than they originally grew, and if planted in autumn, earth is drawn up around the stem and the ground mulched with the most convenient material suitable for the pur-

pose,—rotted manure, leaves, straw, pine needles, and the like. All broken roots are removed and the top cut back to three or four buds. Potted plants are started from cuttings taken in August, September, or October, rooted under glass and grown on during fall and winter to a 3- or 4-inch pot, hardened off in a coldframe, and set out when the ground is warm. For Teas and Perpetuals, the potted plants usually give more bloom the first season and are equally good the following years. There is less labor in planting and the potted stock is no more expensive than dormant material. In setting, the plants are removed from the pots with the soil intact, placed a little deeper than the ground-level, and watered. A frequent and serious error is made in setting



3480. A Rugosa hybrid.—Harison's Yellow × R. rugosa. (×⅓)

the plants too close. They must have plenty of room for light and air. The Baby Ramblers should have about 18 inches apart; other dwarf roses about 2 feet; climbers 4 feet. The surface is cultivated a few times, and at the beginning of hot summer weather the ground is given a thorough mulch, preferably of rotted manure. This feature is probably the most important operation in making a success of monthly roses in this region. Cultivation and mulching should be continued each year, and about every fifth season Tea and Perpetual roses should be lifted and reset after the ground has been thoroughly shaped.

Pruning.

Roses are pruned in the dormant season, mainly in the early spring, and the method varies somewhat with the different types, as well as individual plants within the types. The severity of the preceding winter often governs the amount of pruning, especially with Teas. Plants are sometimes frozen to the ground unless winter protection is given, when it is necessary to remove practically all of the top. All dead wood should be removed. As a general rule, uninjured plants of Teas should be pruned more severely than others. The stronger the growth the smaller the proportion of wood to be removed. Climbers, rugosa, sweetbrier, and wild roses need only enough to keep the plants in shape and to the desired size. In pruning rose-hedges, a special effort should be made to keep the base as full of new growth as possible.

H. C. Irish.

Roses in California. (Fig. 3481.)

In many localities in California the rose attains a striking and perhaps unique perfection. That this perfection is not general throughout the state is partially owing to adverse conditions, such as great range of temperature during each twenty-four hours, heavy fogs at critical periods, and the like, but as a rule, failure in whole or in part is due to the lack of intelligent treatment. In the present article, the conditions in southern California are specially in mind, but the discussion will apply, in the main, to other parts of the state.

The chief obstacle to successful rose-culture in California is the attempt to produce blooms every day of the year. Although this practice is quite an impossibility with any rose, the evil is still persisted in by ninety-nine in every hundred possessors of a garden. While roses are grown in great profusion in Los Angeles, few, if any, do as well here as in Pasadena, which, although only 9 miles distant, has the advantage of being several hundred feet higher than Los Angeles, and therefore less subject to fog or great range in daily temperature. In some places a certain few roses will produce an astonishingly fine crop of bloom, when but a mile or two distant, with no change of soil and very slight difference in altitude, they will be utterly worthless; while a like number of other varieties will give as good returns as those first mentioned.

Many roses do fairly well everywhere, and among these Duchesse de Brabant more nearly produces a continuous crop of blossoms than any other. For this reason it stands in a class by itself and is not considered in the appended list of the best dozen roses for southern California, though every one should grow at least one bush of this variety. Along with the Duchesse might well be placed the Polyantha, Mademoiselle Cecile Brunner, and the climbers Cherokee, Banksia, Ophire (or Gold of Ophir), Beauty of Glazenwood or Fortune's Double Yellow. All these produce most wonderful crops, but none more so than the last mentioned, which in favored regions produces a wealth of flowers simply dazzling to behold. Many well-known Californian writers assert that Gold of Ophir and Beauty of Glazenwood are one and the same rose, but this is not the case. Gold of Ophir was here for many years before the other made its appearance, and some of the original plants are still growing on many of the homesteads of Los Angeles and vicinity.

All the roses named thus far are worthy of a place in any garden. One of the chief causes of failure by the average amateur is the lack of an intelligent knowledge of the plant's first requirement—recurring periods of absolute rest. These necessary resting-periods are best secured by the withholding of the water-supply. Most amateurs, and a larger part of self-styled "gardeners," persist, against all rules of common sense, in planting roses either in the lawn or in mixed borders with other plants. In either case, all but the roses require a constant watering. Having planted in this fashion, the grower has cast away all chances of first-class results. Rose-beds should never be made a feature in landscape gardening, as the plants when dormant and judiciously pruned are unsightly objects at best. The most obscure spot obtainable with the proper exposure is the place to grow flowers. To obtain the best results the rose requires the same amount of rest here that it secures where the winter season leaves the grower no alternative. But the same amount of rest may here be given semi-annually, with equally good and perhaps better results than is possible with one long annual period of inactivity.

Climate is the all-important feature of rose-culture in California, and if that is satisfactory the character of the soil makes little difference. The dry summer air is a serious drawback to the growth of many roses, there being few places where Moss roses thrive, and these must be grown in whole or partial shade. Niphetos and Marechal Niel are good examples of roses requiring partial shade if good results are desired. Many localities cannot grow the two last mentioned, or such as Perle des Jardins, Meteor, Catherine Mermet, Madame Francisca Kruger, Reine Marie Henriette, and many others, on account of mildew. Even among varieties whose buds are immune, it is often impossible to get foliage unaffected. Injudicious watering is more largely to blame for these unfavorable conditions than any other agency. Laurette is a rose which often produces the only perfect flowers to be found among a hundred varieties, and this is particularly the case in places visited by heavy frosts, Laurette remaining unscathed while all others are more or less blasted. The great rose of the eastern United States, American Beauty, is almost a complete failure here and is not worth growing except in a very few well-favored gardens, and even then it is far from being perfect.

Persons in the southern end of the state and inland sections have yet to learn that fine roses may be grown in summer either in light or heavy shade.

Many roses, also, are of little value in California unless budded or grafted. Of this class Marechal Niel is the most striking example. Examples may be found where this rose has thrived unusually on its own roots, but such cases are marked exceptions. Some persons maintain that all roses are best on their own roots, but such opinions are easily refuted by consulting any of our veteran rosarians. The best roses are root-grafted, but of course this procedure is too expensive for the general nurseryman, and the bulk of the local stock is budded on Manetti or Maiden's Blush, though the Dog rose (*Rosa canina*) and even the Banksia are often used. Those roses grown on their own roots are usually propagated from hardwood cuttings, grown out-of-doors, and December is usually the best month, although they have been successfully rooted from October to March, according to the variety.

Rust bothers but little; likewise scale, although in many neglected gardens the bush and climbers alike may be found covered with both the rose-scale and the red scale of the orange. Fuller's rose-beetle is a nuisance only in small areas, but green-aphis is a pest in winter and spring. La France for many years was the leading rose in California and grew well, budded or on its own roots, in almost any locality, but is now rapidly becoming a thing of the past, though it can never be wholly discarded, for it is still, in a few gardens, the queen of the family; its involuntary retirement from our rose-gardens is due entirely to a "die back" (anthracnose), which affects many other plants than the rose, but seems to have a special liking for La France. Thus far no cure has been found.

(1) A list of the best dozen bush roses and the best half-dozen climbing sorts, as agreed upon by many experts within a range of 20 miles of Los Angeles, is as follows:

Bush roses.—Frau Karl Druschki, Kaiserin Augusta Victoria, Madame Abel Chatenay, Heinrich Munch (Pink Druschki), The Lyon, William Shean, Magna Charta, Ulrich Brunner, Edward Mawley, General MacArthur, Lady Hillingdon, Duchess of Wellington.

Climbing sorts.—Climbing Kaiserin Augusta Victoria, Lamarque, Climbing Souv. of Wootton, Francois Crousse, Duchesse de Auerstadt, Reve d'Or. Outside this list are members of widely divergent classes which should find a place in every large garden, such as the Banksias, the three Cherokees, and both the bush and the climbing Cecile Brunner.

(2) Following are lists of a dozen varieties each of the different recognized standards of color of roses which have proved best adapted to southern California conditions:

White: White La France, Frau Karl Druschki, Ivory, Kaiserin Augusta Victoria, Mabel Morrison, Molly Sharman-Crawford, Niphetos, Perle von Godesburg, The Bride, The Queen, White Killarney, Maman Cochet. *Pink:* Belle Siebrecht, Betty, Clara Watson, Killarney, Madame Abel Chatenay, Madame Leon Pain, Mlle. Cecile Brunner, Paul Neyron, Maman Cochet, Souv. du President Carnot, The Lyon, William Shean. *Red:* Agrippina, American Beauty, Edward Mawley, General Jacqueminot, General MacArthur, Hugh Dickson, J. B. Clark, Jonkheer J. L. Mock,

3481. California rose-bush.

Lady Battersea, Magna Charta, Papa Gontier, Ulrich Brunner. *Yellow:* Duchess of Wellington, Franz Deegen, George C. Waud, Harry Kirk, Lady Hillingdon, Marie Van Houtte, Mrs. Aaron Ward, Mrs. A. R. Waddell, Perle des Jardins, Rayon d'Or, Soleil d'Or, Sunburst.

Climbing roses.—*White:* Devoniensis, Kaiserin Augusta Victoria, White Mamam Cochet, Madame Alfred Carriere, White Banksia, White Cherokee. *Pink:* Belle Siebrecht, Cecile Brunner, Caroline Testout, Dorothy Perkins, Gainsborough, Pink Cherokee, Tausendschön. *Red:* Papa Gontier, Souvenir of Wootton, Crimson Rambler, Francois Crousse, Red Cherokee (Ramona), Reine Marie Henriette, Reine Olga de Wurtemburg. *Yellow:* Beauty of Glazenwood, Celine Forestier, Duchesse de Auerstadt, Marechal Niel, Reve d'Or, William Allen Richardson, Yellow Banksia. *Sunset and Copper:* Mrs. A. R. Waddell, Lady Hillingdon. Duchess of Wellington, Juliet, Sunburst, Mme. Edouard Herriot, Los Angeles.

(3) Following are roses suitable to California as a whole (John Gill): General MacArthur, Madame Caroline Testout, Lady Hillingdon, Juliet, George Dickson, Mrs. Aaron Ward, Radiance, Mad. Abel Chatenay, Miss Kate Moulton, Ulrich Brunner, Ophelia, Mlle. Cecil Brunner, Frau Karl Druschki,

Laurent Carle, Irish Elegance, Lady Pirrie, Miss Cynthia Forde, Sunburst, Betty, My Maryland, White Maman Cochet, Rayon d'Or, George Arends, Mad. Edouard Herriot.

Climbers.—Climbing Testout, Climbing Belle Siebrecht, Climbing Cecile Brunner, Francois Crousse, Gainsborough, Reve d'Or, Climbing Papa Gontier, Climbing White Cochet, Caroline Goodrich, Climbing Sunburst, Madame Alfred Carriere, Duchesse de Auerstadt.

ERNEST BRAUNTON

The cultivation of roses under glass.

The growing of roses for cut-flowers is the largest item in the greenhouse industry of America at the present time, and the total sales amount to many millions of dollars annually. The rose industry is the backbone of the florist business. With the introduction of varieties that are prolific bloomers, roses have reached a selling value which puts them in reach of the purse of the masses of the people, and the demand is unlimited. Exhibitions have been a factor in educating the public to know roses and in bringing about their present popularity.

The industry is widespread and embraces every section of the country. Southern California grows good roses for the markets in the open field and better quality under glass. In the dry central portion of the West where roses were once considered an impossibility, they are now grown with good success. The climate of the eastern part of the United States seems particularly well adapted to roses, and this section has been considered the home of the greenhouse rose industry. However, careful knowledge of climatic conditions and proper treatment will produce good roses in almost any locality which is favored with weather cool enough to allow proper time for maturity of the flowering stems which, if forced into flower by excessive heat, do not, in warm climates, produce the quality of bloom that is obtainable where more time can be given their development by lower temperatures.

Types of rose-houses (Figs. 3482, 3483).

There are two distinct types of greenhouse construction used by the large commercial rose-growers. The single house has the approval of many, while the connected houses, or ridge-and-furrow sections, are favored by others, because of the smaller expense of construction, the lower cost of heating owing to the absence of outside walls, and the ease of superintendence. Advantages of the single house are its better control, more light, and less trouble with snow and ice, the latter being a serious consideration in the maintenance of the connected houses.

The single house is constructed with iron frame and concrete sides and built even span or two-thirds span to the south. Houses strong and permanent, with good ample ventilation and ample light seem to be the essentials of construction. With connected houses, the essential factor in addition to these is to have the gutter at least 12 feet from the ground, which almost entirely overcomes the effect of shade which the gutter casts by diffusing this over a larger area. A heating-pipe beneath the iron gutter to assist in melting snow and ice is a necessity.

The size of houses to be preferred is largely a question of opinion, but there are certain factors which must not be overlooked. The wide house must necessarily be high, and a house that is high is likely to be lacking in humidity, and the plants consequently will suffer. This seems to be the only objection of consequence to the wide single house. From 40 to 60 feet is the normal width and should be satisfactory, and the length is controlled by the capital of the owner or the natural lay of the land. Houses are workable with economy up to 1,000 feet provided, naturally, with crosswalks at least every 300 feet to save steps for employees. The width of connecting houses should be from 36 to 44 feet, and the length as given also applies to these connecting houses.

Beds and benches.

There is but small connection between the bed or bench and the house containing them, except that in planning new construction the approved plan is to have a walk next to the outside walls and, if the proper width house is selected, this can be accomplished without varying the width of walks and beds or benches. As the modern house is relatively high at the plate or eave, either bed or bench may be used at the discretion of the builder. The construction of the bench is simple, the essential point being durability; this is secured by using cypress lumber and double cross-pieces, which enables the builder to put nails back a short distance into the bottom board and prevents the breaking of the bench at the joint, as the bottoms usually decay first at the ends of the boards. Benches not over 24 inches to the bottom from the ground surface are to be preferred, being easier to work, as the larger part of the actual labor is on the plant itself, at least 12 inches above the bench surface and, if the bench is higher, the labor is correspondingly harder. Ample drainage must be provided by leaving cracks between bottom boards from ¼ to ½ inch and using 6-inch width boards. The concrete bench for rose-growing is in the experimental stage and has not as yet shown superiority.

3482. Commercial rose-house showing method of staking, wood-bench construction, and connecting houses.

The solid bed, so called, is not in reality solid, except as to side walls. Ample drainage of the ground itself is needed, if solid beds are to be built. If the soil is naturally gravelly, the making of solid beds is simple. If the soil is of heavy clay texture, the building of the solid bed necessitates not only under-draining the surface, but the supplying of coarse gravel or ashes through which the water from the soil may escape to the permanent drain-tiles. These drain-tiles should be laid crossways of the house every 100 feet, and the smaller tile running lengthwise under each bed should empty into these larger cross-tiles. Sides of solid beds are best built with concrete which can be made as thin as 2½ inches

at the top, and the outsides can be made perpendicular. The inside should be on an angle, and a base width of 6 inches with the flare on the inside will give the wall a purchase on the soil under the bed and hold it in place. Solid beds are cheaper of construction, provided the land is naturally well-drained. They are more expensive when much ashes or gravel must be used. There is another type of solid bed made by using plank nailed to posts for siding which is just as good, but not durable. The bed built by laying broken stone, to serve as drainage, and which elevates the bed to a better working level, is a permanent and satisfactory one, but natural conditions as to stone make this impracticable under usual conditions. Results as to roses grown on raised tables or benches and on solid beds vary very little. The raised bench having the heating-pipe beneath it seems to produce better in the winter months. The solid bed having a cooler soil and a greater rooting depth will give a better quality in the summer months. On the yearly average there is small difference in quantity and quality of product, and the question of bed or bench must be settled by the opinion of the owner and the questions of cost and permanence.

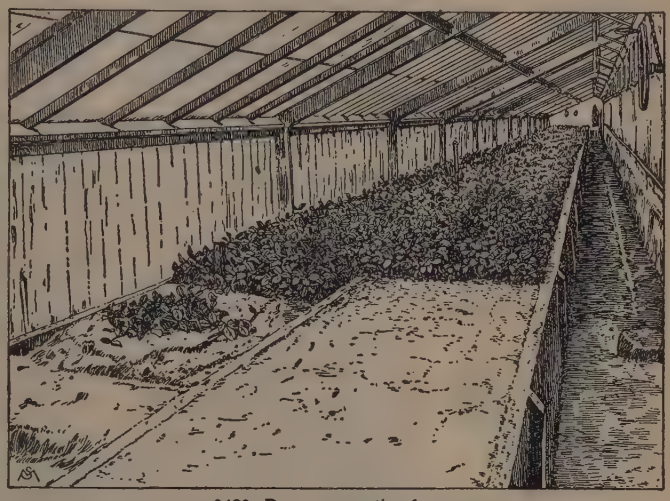
Heating.

In close connection with houses and beds is the question of heating. It is a universally recognized fact that steam heat is essential to the growing of good roses. No attempt will be made to explain boilers and the piping of the houses, except to say that sufficient steam-pipes must be supplied to carry normal temperature in the coldest possible weather, that such pipes should be evenly distributed over the area inclosed, and that the heat should not be overhead, but on the level with or below the level at which the plants are set. The use of steam is due to the fact that quick heat in rose-houses is necessary. The change that comes with the dropping of the sun in the fall and winter must be counteracted by a quick steam-service to prevent a chilling of the plants. A pipe or two in all big houses in summer nights prevents the condensation of moisture on the plants and means the difference between success and failure. Hot-water heat is more uniform than steam, but loses because steam can be obtained on much shorter notice. The use of a hot-water system in conjunction with steam is admirable, and in large establishments is to be recommended. The gentle warmth radiating from the hot-water pipes during the day is not detrimental and enables the grower to use more ventilation, which is a distinct benefit.

Soils for roses.

Soils for rose-culture should be of clay body, but have enough of more friable ingredients to pulverize readily. The grower usually chooses land for the building of commercial rose-houses which has on it the character of soil required. Good heavy clay turf is the material from which to form the compost for rose soil. The fiber of the turf as it decays gives the humus required and leaves the soil open, porous, and in good condition for root-action. Winter-preparation is to be preferred, and the freshly prepared compost which is not over six months old is in ideal condition. Piling alternate layers of soil and cow-manure, using two parts of good heavy clay turf to one part of cow-manure, makes an ideal rose soil. Horse-manure may be used with good results, or a mixture of the two, but cow-manure has the preference.

Lowland soil usually has the body and fiber that is needed, and soil which is part of the year under water has been found to be free from eel-worm or nematode, which attacks the rose roots; this troublesome pest often infests the soil of the uplands. The meadow soil should be plowed into ridges in the fall and hauled on frozen ground to the place where it is to be composted. The thorough freezing of the soil is considered beneficial as it tends to make it more friable. The compost should be worked over when the frost has gotten out, and after settling will be ready to use when needed. A point should be made to lay the soil-compost near the section where needed in order to save labor in handling when filling the houses.



3483. Rose propagating-house.

Greenhouse propagation of roses.

Roses are propagated in two ways for greenhouse growing. These two methods will be discussed separately, considering roses on their own roots before taking up grafted roses.

The usual type of wood selected for own-root cuttings is the strong non-flowering growths. These are commonly known as blind-wood cuttings, but experiment has shown that these growths, if stopped or pinched, as the process is called, can be made to flower, which refutes the statement that such growths are blind, and from these growths flowering plants are produced, which shows clearly that the flowering ability is present. Whether varieties run out by constant use of this type of cutting is an open question which only long-continued experiment can answer, but observation has shown that certain varieties, if propagated from this surplus, or so-called blind growths, will tend to reproduce more of that growth in proportion and to lessen the production of strong flowering wood. The problem seems to be to get into the cutting a sufficient number of dormant eyes to provide good strong flowering growth, and the cutting of this type taken to the heel or union of the shoot with the flowering stem will have such dormant eyes and make a stronger, more vigorous, better producing plant than the cutting which consists of the top few eyes from a growth of this character.

The cutting of flowering stems is usually heavier than the blind-wood cutting, and the wood should be hard or mature enough to allow clean cuts to be made without injury to bark or pith. When the bud shows color is the proper stage of development for the propagation of flowering wood. Two or three eyes should be used, making a clean cut just below the eye and removing the lower leaf; trim back the top leaves at least one-half, and the cutting is ready for the propagating-bed. Cuttings should not be stood in water, but kept sprinkled to prevent wilting.

The propagating-bed should have ample drainage, which can be secured by using coarse ashes for the bottom half of the bed. Five-inch side boards with ashes for drainage and above it 2½ inches of good clean sand constitute a workable propagating medium. Rose-cuttings can be rooted with good success in screened soft coal-ashes, if sand is not available, but extra care must be taken to prevent breaking off the roots in taking the cutting from the ashes, when ready for potting. Distance in the propagating-bed depends on the variety. The leaves should not be allowed to overlap and thus invite fungus. With the heating-pipes beneath the bench, and a uniform temperature of 58° to 60° in the sand and 54° to 60° overhead, the cuttings should be rooted and ready to pot in about four weeks. Do not allow the cutting to begin growth in sand, which it will if not potted when the roots have started. Be sure that clean pots are provided, and the 2¼-inch size is ample for the newly rooted cuttings. Pot carefully so that the tender roots are not broken or bruised and be sure that some soil is between the cutting and the pot. Water carefully and provide shade for the first few days until the cutting has recovered from the check of moving. Make sure that all the soil is thoroughly moistened, but do not over-water it. Light sprinklings are all that will be required until the roots show activity, which can be ascertained by knocking the plant and ball of soil carefully from the pot, taking care not to break the ball of soil. As the plant begins to grow, remove all shade and keep the plant growing. It will require more water with the increase in foliage. When the plant fills the pot nicely with roots, repot into a larger pot,—the 3-inch size will be ample for its requirements for the next six weeks. Keep the young plants clean and growing, using the same treatment as for plants on the bench for the various insects and fungi. Shift into larger pots, if necessary, but keep them growing.

3484. Grafted rose, seven weeks from the graft.

Grafted roses are very distinct in handling from the own-root plants. It is best to start with strong-rooted Manetti stock, which rose species has been chosen for its strength of growth and the freedom with which the cions unite with it. Manetti is grown from hardwood cuttings taken during the winter months, and which are planted in early spring in the open field. These are kept growing rapidly throughout the summer, are dug in the fall and are ready when potted for grafting. Manetti should be disbudded or suckered, which means the removal, so far as is possible, of all eyes which are below the point at which the graft is to be made. In growing Manetti, deep planting is advisable as the stem which has been under ground all summer, cuts better and makes a better union than the harder stem which has been exposed. Manetti varies very little with the section, but varies with the method of growing and grading. The deep-planted, well-graded Manetti, whether English-, French-, Dutch- or American-grown, is equally valuable and serviceable, but the great variation in the growing and handling has caused the erroneous opinion that Manetti from certain sections is superior. Labor values alone prevent the American grower from producing his own Manetti, but irrigation is necessary in our climate. Having pencil-size Manetti,—being for best work about the thickness of a lead-pencil,—the process of grafting is simple. A cut is made as close to the pot-level as possible diagonally across the Manetti. The cion is cut on the same slant and is tied to the stock with raffia fiber (Fig. 3484). Raffia is used because it decays and does not need to be cut away as will be necessary with string, and it covers the union more completely. The union of the cambium layer is the essential point, and if the cion is not equal in size to the stock, one should be sure of a perfect union on one side. The rapid flow of sap which occurs when the new grafted plant is put into the case covers the union and growth begins. In a temperature from 76° to 78° the first week and from 70° to 72° the two succeeding weeks, with careful ventilation and shade from hot sun, the union should be perfect and the young plant ready to be taken into the air and light when hardened sufficiently by increasing these gradually. The grafting-case is usually constructed by having sufficient steam-pipes beneath it to maintain the temperature—a miniature greenhouse.

The advantages of grafted roses over those grown on their own roots are: a stronger root-action, a more rapid-growing plant, and a root-system that will be immune to eel-worm or nematode. Experiments conducted by the Illinois Experiment Station have proved that the production from grafted roses is sufficiently larger to warrant the use of grafted plants. There may be a connection between the use of flowering wood for grafting and increased production, as all cions for grafting purposes should be from selected flowering wood. There is also a difference in varieties and a few are superior on their own roots. It has been generally stated that all yellow or yellow-tinted roses are better on their own roots, but results contradict this statement.

The after-care of the grafted plant varies little from the care of own-root plants. One should be sure to remove any Manetti suckers that appear, cutting close to the stock, and mulch once in small pots before shifting into larger, using for this mulch a compost of good rose-soil with a heavy sprinkling of bone-meal added. Repotting will furnish all the feed necessary, but the top mulch will often keep the plant growing and economize room. Grafted plants come into bud and flower early. The blooms should be kept cut off.

General cultivation, diseases and insect pests.

Having good, clean, thrifty, young plants in 3- or 4-inch pots and a compost soil in the benches or beds, one is ready for planting. The correct spacing is about 12 by 18 inches or 14 by 16 inches; there is some difference in varieties, but the average is about as stated. Planting should be deep enough to cover the union by an inch or more with grafted plants and yet away from the bottom of the bench. Plant firmly and water thoroughly. Growth will soon begin. Keep the plants clean from red-spider by thorough and consistent syringing of the under sides of the leaves with water under pressure. Red-spider is an insect which multiplies rapidly when favored by a dry warm atmosphere, and as its sustenance is the foliage of the plant, it must be eradicated.

Stakes should be set and the plants tied to the stake as soon as they have become established and growth has begun. Wires should be run above the bench, tying the stake made of heavy wire to this 3 feet from the soil-level. In tying the stake to the wire use string, and raffia for tying plants to the stake.

The general care of a rose-house consists in keeping the house properly ventilated, heated and watered, in addition to keeping the plants clean from insects and fungi, and the cutting of the flowers. Ventilation should be given more attention than any other of these problems. How properly to ventilate a rose-house is

dependent upon the condition of the plants and the weather. It is the custom to ventilate freely on bright sunny days, and to guard the plants against draughts, which invites mildew. To obtain the maximum amount of growth, it is advisable to allow the temperature to go above the normal 70° day temperature in bright weather, giving ventilation at the same time, but not sufficient materially to lower the house-temperature. Careful ventilation at night in the summer, and the keeping of a certain amount of fire-heat to dispel dampness does away with black-spot, which disease of the foliage is favored by the condensation of dew or moisture on the plants during the night. Just how to check black-spot is the hardest problem of the rose-grower. Increased temperature with some quick-acting fertilizer and allowing the house to run warm on bright days will often check the disease by inducing quick growth and rapid sap-circulation, giving the plant the new foliage to replace that lost. When the black-spot is persistent, pruning back the plant and allowing it to start again with clean foliage may be the only way of eradication. Black-spot occurs on the Hybrid Tea varieties and, as few pure Tea roses are grown, practically all greenhouse varieties are subject to this serious fungus. Spraying with copper solutions will help to a certain extent in checking it. See the special discussion of this and other diseases, page 3019. The question of temperature is dependent upon the variety grown, but the normal is 60° at night, 70° on bright days, 65° on dark days.

3485. A forcing Tea rose. (×⅛)

Mildew is a fungus which also attacks the foliage, giving it a dusty appearance and curling the leaf. It also appears on the buds, and, if not controlled, will ruin an entire house. It spreads rapidly when once established. Dusting the plants with flowers of sulfur will kill the fungus if applied on bright days, but fumes from the evaporation of the flowers of sulfur on the steam-pipes will eradicate it much more effectively. Mildew is induced by poor ventilation. Plants should be so grown that the foliage, by constant fresh air, is kept hard and mildew-resisting. A draught from a door or broken glass will bring mildew. When the first sign appears, kill the fungus and prevent it from spreading.

The rose-midge (*Neocerata rhodophaga*) is the worst pest which the rose-grower has to combat, but fortunately this insect has been known to exist only in a few localities, and, to a considerable extent, only in the rose-growing section near Chicago. It is microscopic and is recognized first by its effect. The female deposits its eggs beneath the sepals of the flower-bud or between the folded leaves of the leaf-bud. The egg period is two days, and the maggots, as soon as hatched, begin to attack the buds. The maggots reach maturity in seven days and then drop to the ground where they pupate and the adult fly emerges six weeks later. As the damage to the plant is done by the maggot which eats the petals, the work of the midge does not affect the growth of the plant, but the buds fail to develop, usually dropping off after being attacked by the maggots. Overgrown plants that do not flower are indications of its presence. The seriousness of the pest is apparent and no precaution is too great to prevent the rose-midge from getting a foothold. Buy plants that are grown in sections not affected. Keep the houses absolutely free from rubbish, both outside and under the benches. If the work of the insect is apparent, get rid of plants and soil in the house and grow other crops for a season, and start afresh, which is the safest and best plan. See the specialist's account by Crosby, on p. 3013.

The rose is subject to the attack of a nematode, or eel-worm, which infests the roots. The use of Manetti for grafting purposes has, to a large extent, relieved the rose-grower of this trouble, for the Manetti root does not suffer from the attack of nematodes; the use of lowland soil is also a safeguard. Sterilization by means of steam will render soil safe and its usefulness is not impaired, but this is, as a rule, unnecessary.

Rose-galls are a bacterial disease which cause growths on the plants, varying in size, and usually brown in color. These appear at the joints or where cuts have been made. Remove these at once and do not cut them open with a knife used for cutting flowers, because the infection can be carried to the other plants in this manner. Cut off the affected branch and burn it.

Thrip is an insect which attacks the leaves and petals. It is small and its work usually can be recognized by the white lines on dark-colored flowers, showing where the surface has been eaten. Green-fly is a sucking insect which attacks the new growths. Both can be readily killed by the evaporation of nicotine preparations upon the steam-pipes, this having almost entirely replaced the burning of tobacco-stems.

Feeding the plants is accomplished by top-mulching, or by liquid fertilizer, or by using both. Aside from bone-tankage, few commercial fertilizers are in use, cow-manure, well-rotted, clear or mixed with well-rotted horse-manure, being more generally used. These manures in liquid form may be used to advantage. Feed light and often is the rule when plants are well established.

Watering depends on crop-condition. Water copiously when the plants are coming into bearing. Water less when the crop is being cut, and sparingly after the crop is cut and before the new growth starts.

The question of humidity in the house is a serious one with the wide, large houses, and where the atmosphere lacks moisture the growths will be hard-wooded and the plants will not be prolific. It is safe to say that a house with all cement walks fails to grow good roses for lack of humidity, and the gravel or ash walk will do much toward furnishing the atmosphere the needed moisture.

Varieties.

Varieties to grow depend largely on the market to which the grower caters. There are two types of greenhouse roses: those which are at their best in the warm summer months, and those which are at their best in cooler weather.

The varieties best suited for summer cutting are My Maryland and its sports, Kaiserin Augusta Victoria, Francis Scott Key, and Mrs. Aaron Ward.

For general use, the best varieties are Killarney and its sports, which are numerous, and of which Double White Killarney, Killarney Brilliant, White Killarney, and Killarney Queen are such notable examples that they must be mentioned; Ophelia, Mrs. Aaron Ward, Mrs. George Shawyer, Hoosier Beauty, Hadley, Milady, Richmond, Radiance, Lady Alice Stanley, Jonkheer J. L. Mock, Sunburst, Mrs. Charles Russell, American Beauty, and the Polyantha roses—Cecile Brunner, Perle d'Or, and George Elgar, which are widely used for corsage bouquets and decorative work. Mrs. Aaron Ward, Double White Killarney, Mrs. George Shawyer, Killarney Brilliant, and Ophelia are the best varieties for cutting continuously for the entire year. Of these varieties mentioned, American Beauty, Mrs. George Shawyer, Radiance, Lady Alice Stanley, and Sunburst are better grown upon their own roots, while the balance of the varieties are superior when grafted on manetti. Mrs. W. C. Whitney was formerly grown as a forcing rose.

Cutting the flowers.

Proper care and cutting of the flowers has as much to do with financial success in the rose industry as the proper growing of the plants. Just when flowers are mature enough to be cut is a matter of variety to a considerable extent. Those varieties which do not have many petals should be cut in the bud, while many of the very double varieties, such as Francis Scott Key and Mrs. Charles Russell, should be allowed partly to expand before being taken from the plant. How much wood to leave when cutting the flowers is also a question of variety to a certain degree, but as a rule two good eyes are sufficient. Certain varieties which naturally throw strong flowering growth from the main stems or hard wood can be cut to one eye from good-sized plants. There is a tendency of plants to increase in size and become awkward to handle if much growth is left in cutting, and production from large overgrown plants is as a rule no greater than from plants more closely headed in by carefully cutting the flowers.

It is customary with some growers to "pinch" all flowering shoots when the bud has reached the size of a pea, and this removal of the bud and first leaf causes a new flowering growth and gives a longer stem, as the flower is cut back to the proper place in the older growth. This method of pinching allows the grower to control the time of maturity of the crop very accurately, eight weeks in the early winter months and seven weeks in February and March being the necessary time for the maturity of the new flowering shoot. This varies a few days with the character of the growth when the pinching is done; those shoots nearer maturity will require less time than the softer or more immature growths. There is also a slight difference in varieties as to the time required to mature the shoot and flower. Thus pinching allows the grower to bring in a crop at the holiday season and produce flowers for exhibition use. The stronger and more vigorous the growth pinched, the better the quality of the resultant flower and by selection of strong heavy flowering growths and by pinching and careful timing, the roses for exhibition purposes are produced.

When flowers are cut they should at once be placed in water and kept at a temperature from 38° to 42° for several hours to harden them. The stems and flowers fill with water and are then in a condition to be graded. The American Rose Society has established a grading standard to which the leading growers adhere in preparing the product for market. Length of stem is the basis, but quality and substance of bud should be in proportion to length of stem, and a poor quality flower on a large stem on the open market will by no means command the price of a good flower on a stem of the same length. In grading, keep the flowers uniform in length of stem and quality.

Marketing cut roses.

There are three methods of marketing cut roses, viz.: retailing direct to the consumer; supplying flower shops direct; and the shipment of the product to the commission stores which supply the large city florists. It is of first importance to have the product reach the consumer fresh, well hardened, and not too open, for the demand for open flowers is limited. Careful packing for the wholesale market necessitates wooden boxes with cross cleats to hold the roses from moving about in the box, which bruises the flowers. Wooden boxes allow the use of ice to keep the flowers in condition for sale. Heavy waxed paper between the layers of flowers in the boxes aids in handling them conveniently. Any precaution taken to insure the product reaching the consumer in perfect condition is a paying investment, for a good product has little value when bruised and in poor condition.

The sale of flowers direct to the consumer by the grower is becoming greater every year, many of the leading florists operating their own ranges of glass and using the product in their own store. The demand from the large cities where this is not possible to any great extent is increasing yearly. Returns from money invested is in fair proportion to the money earned by investments in any well-conducted line of production, but is dependent upon the skill of the grower and the business-like conduct of the enterprise. The risk of handling a perishable product and the property risk also is heavy, owing to wind, hail, snow, and ice. Deterioration is also heavy because of the excessive humidity necessary to good culture. Rose-growing is an industry catering to the demand for a luxury, and the path to profit is often a thorny one.

W. R. Pierson.

Rose insects.

Rose Aphis (*Macrosiphum rosæ*).—Greenish or pinkish plant-lice about one-twelfth inch in length that cluster in great numbers on the tender tips and buds, stunting the growth and injuring the bloom; injurious both in the open and on roses grown under glass. The insect hibernates in the egg stage in the North, but in the South breeding continues throughout the winter. The eggs hatch as the buds are bursting. The aphids of the first generation are wingless as are also a large proportion of the succeeding broods, but winged forms are produced from time to time which serve to disseminate the species. The insects multiply with great rapidity, each female being capable of producing thirty to forty-five young in the course of her life. A generation is completed in less than a month.

Treatment.—Spray with nicotine sulfate (containing 40 per cent nicotine), one part in 800 parts of water—about one teaspoonful in two gallons of water. The efficiency of this solution is increased by the addition of a small amount of soap. Good results may be obtained by thorough spraying with whale-oil soap, or any good soap, one pound in eight or ten gallons of water. It is sometimes a good plan to dip the buds and tips of the branches in a dish nearly full of the solution.

Small Green Rose Aphis (*Myzus rosarum*).—A green plant-louse much smaller than the preceding; more troublesome in greenhouses than in the open.

Treatment.—Same as for the rose aphis (above).

American Rose Slug (*Endelomyia rosæ*).—Greenish or yellowish larvæ that skeletonize the upper surface of the leaves. The eggs

C. Rose, American Beauty.

are laid in the tissue of the leaves by a shining black four-winged fly.

BRISTLY ROSE SLUG (*Cladius pectinicornis*).—Yellowish or greenish, more or less bristly larvæ about ⅜ inch in length that skeletonize the leaves when young but later eat out holes in the leaf, often leaving only the larger veins. In the North there are three generations annually, the cocoons of the summer brood being placed on the leaves or twigs, those of the winter brood on the ground. The eggs of this species are inserted in the petiole of the leaves by the parent fly which very closely resembles the preceding.

COILED ROSE SLUG (*Emphytus cinctus*).—Larvæ about ¾ inch in length that feed on the edge of the leaf with the body coiled beneath it. The larva is metallic green spotted with white above, grayish white beneath; head orange; first segment of the thorax blue and the last two gray. Pupation takes place in the pith of a dead twig.

Treatment for rose slugs.—Arsenate of lead, two pounds in fifty gallons of water or one ounce in 1½ gallons is an effective spray, but if applied too freely may leave a whitish deposit on the foliage. Hellebore, one ounce in two or three gallons of water, or used in the dry form diluted with double its weight of powdered plaster or cheap flour, is also effective. Rose slugs may also be killed with the nicotine solution as recommended for the rose aphis.

ROSE LEAF-HOPPER (*Typhlocyba rosæ*).—A small nearly white leaf-hopper, feeding on the under side of the leaves, extracting the juices and causing the leaves to turn yellowish. The insect spends the winter as eggs which are inserted in the bark.

Treatment.—This leaf-hopper may be controlled by thorough spraying of the under side of the leaves with nicotine solution as recommended for the rose aphis.

ROSE LEAF-ROLLER (*Archips rosaceana*).—Black-headed olive-green caterpillars, about ¾ inch in length when mature, that roll and web together the leaves on which they feed. They become full grown in about a month and transform to dark brown pupæ within the rolled leaves. In two or three weeks the light brownish moths emerge and deposit their eggs on the leaves. There are two broods annually on roses grown in the open.

Treatment.—Spray the plants with arsenate of lead, two pounds in fifty gallons of water and make the application early in the season. In greenhouses close watch should be kept for the first appearance of the insect and the caterpillars destroyed before they gain a foothold.

ROSE CHAFER (*Macrodactylus subspinosus*).—Long-legged ungainly grayish brown beetles that swarm into the rose-garden, and devour the leaves, petals, and opening buds. The grubs from which these beetles develop feed on the roots of grasses in sandy soil only. In New York the beetles emerge from the ground about the middle of June and disappear in about a month or six weeks.

Treatment.—This is a difficult insect to control because the beetles will avoid feeding on foliage poisoned with an arsenical. They will, however, eat leaves sprayed with arsenate of lead sweetened with molasses. This method, however, cannot be relied upon to protect the plants when the beetles are numerous, for much damage will be done before the poison has had time to take effect. In the case of a few choice plants it is safer to protect them with mosquito-netting during the period when the beetles are most abundant.

ROSE MIDGE (*Neocerata rhodophaga*).—Small whitish or pinkish maggots about one-fourteenth inch in length that infest opening buds, either killing them or causing the leaves and blossoms to be more or less deformed. The maggots become full grown in five to seven days, leave the buds and complete their transformation in the ground. In the summer the total life cycle is completed in about two weeks. As a rule the maggots are most troublesome during June and July. This insect is more injurious to roses grown under glass than in the open.

Treatment.—This is a difficult pest to eradicate once it has become well established in a greenhouse. Rotation with some other crop, such as violets, may be practised to advantage. Fumigation with hydrocyanic acid gas in March, when the growth of the maggots is slow, will be found of value in killing the flies before egg-laying. Fumigation does not give so good results in the summer. It is a good plan to watch the plants carefully and to pick off and destroy all infested buds. See the florist's statement on this pest, page 3017.

ROSE SCALE (*Aulacaspis rosæ*).—Snow-white nearly circular scales, about one-tenth inch in diameter, encrusting the branches. More troublesome when roses are grown in partial shade.

Treatment.—Spray with lime-sulfur solution, one gallon in eight gallons of water, while the plants are dormant. It may also be advisable to cut off the worst infested stems.

ROSE CURCULIO (*Rhynchites bicolor*).—A bright red snout-beetle, with black legs and snout, which appears on the rose-bushes early in June, eating holes into the unopened buds and puncturing the flower-stems. Some of the injured buds fail to open, while others have the petals riddled with holes. The grubs feed within the buds and young fruit and in late summer descend to the ground where they spend the winter as pupæ.

Treatment.—In the garden continued hand-picking of the beetles will be found effective. In larger plantings, arsenate of lead, two pounds in fifty gallons of water—one ounce in one and one-half gallons—will destroy many of the beetles. As the beetles breed in the fruit of the wild rose, these plants should not be permitted to grow in the vicinity of the rose-garden.

ROSE SLUG-CATERPILLAR (*Euclea indetermina*).—Occasionally in the South roses are subject to the attack of a caterpillar of striking appearance, about ¾ inch in length, orange in color, and covered with tufts of spines.

Treatment.—In small plantings the caterpillars may be picked off by hand. While doing this work gloves should be worn, as the spines of the caterpillar emit an irritating fluid. In larger plantings the caterpillars can be controlled by spraying with arsenate of lead as recommended for the preceding.

FULLER'S ROSE BEETLE (*Aramigus fulleri*).—Small grayish brown snout-beetles about ½ inch in length which are often very destructive to the foliage of roses grown in the greenhouse. The white, curved grubs, about ⅛ inch in length, burrow in the soil and feed upon the roots of the plant.

Treatment.—Persistent hand-picking should be practised to prevent the pest from gaining a foothold in the greenhouse.

MEALY BUGS.—These common greenhouse pests are sometimes injurious to rose plants. They may be controlled by syringing the plants with tobacco extract, or a stiff stream of water may be used to dislodge them.

THRIPS.—Minute yellowish or orange insects about one-thirtieth inch in length which often injure the opening blossom-buds of roses grown under glass. They may be controlled by spraying with tobacco extracts or by the use of a sweetened poison made according to the following formula: Water, twelve quarts; paris green, one tablespoonful; sugar, three pounds.

C. R. CROSBY and M. D. LEONARD.

Rose diseases.

POWDERY MILDEW, caused by the fungus *Sphærotheca pannosa*, is one of the most common and injurious diseases of roses wherever they are grown. It is usually first noticed as grayish or whitish spots on the young leaves or shoots. Later, as the spots enlarge, they have a white, powdery appearance, a felt-like coating being formed, especially about the thorns. The young leaves, stems, and buds are dwarfed, curled, or variously deformed. Injured leaves soon drop, and growth and flower-production is seriously interfered with. Frequently the young buds themselves are attacked by the fungus, rendering the flowers worthless.

Treatment.—(1) Under glass. Thoroughly dusting with sulfur, or spraying with potassium sulfide, one ounce to three gallons of water, every ten days is often sufficient. Ammoniacal copper carbonate is also effective. Vaporized sulfur, produced either by boiling sulfur in a pot over an alcohol lamp, or by painting the heating-pipes with equal parts of sulfur, lime, and water, can be successfully used. No time should be lost in applying one of these treatments as soon as the mildew appears. Burned sulfur is likely to injure the plants. As one of the conditions favorable to the spread of mildew is dry, cool air, such as would come into the greenhouse from ventilation, broken glass, or open door, care should be taken to eliminate all drafts. (2) Out-of-doors. Outside, rose mildew can be controlled by dusting with finely ground sulfur. Frequent applications should be made, starting with the first appearance.

BLACK SPOT, caused by the fungus *Diplocarpon rosæ* (more commonly known as *Actinonema rosæ*), is the most common and injurious disease aside from powdery mildew. Roses grown both out-of-doors and under glass are affected. The disease is most destructive during the summer, The more or less circular spots may attain a diameter of a centimeter or more, are of a black color, and are characterized by an irregularly fringed border. The spots occur on the upper surface of the leaf, and by confluence may involve the entire surface. Frequently the leaves become yellow, both in the invaded and uninvaded tissue. Defoliation soon takes place. Bushy sorts are more susceptible than the climbing varieties.

Treatment.—The fungus lives over winter on fallen leaves. Therefore, the source of spring infection will be eliminated by gathering and burning all the leaves either late in the fall or early in the spring before the buds expand. However, this is not sufficient entirely to control the disease. It is recommended that the plants be sprayed as soon as the disease becomes manifest, several applications at intervals of a week or ten days being sometimes necessary. Bordeaux mixture is said to be effective but is objectionable in that it coats the foliage. As a spray of ammoniacal copper carbonate is just as effective and lacks this objectionable feature of bordeaux mixture, it is to be given the preference.

ROSE RUST, caused by the fungus Phragmidium (several species), has been reported occurring on indoor and out-of-door roses. It is abundant on wild roses. The disease manifests itself in early spring as orange powdery patches on leaves, shoots, and buds. Frequently the greater portion of the surface of the leaf may be covered. The patches on the wood are often large, and distortion or curving of the part affected may occur. Toward autumn, black pustules are to be found on the under side of the leaves and on the stems, the latter of some varieties being killed to the ground.

Treatment.—All fallen infected leaves and all diseased plants or plant parts should be collected and burned. Spraying with potassium sulfide has been recommended, but further experimentation with this fungicide is desirable.

STEM CANKER, caused by the fungus *Coniothyrium wernsdorfiæ* (probably the same as *C. fuckelii*). Cankers are formed on the canes and branches, being characterized by a brown center with a black border, outside of which is a reddish zone.

Treatment.—Diseased canes should be cut and burned.

CROWN-GALL, a bacterial disease caused by *Bacterium tumefaciens*. The disease occurs on plants grown in the open and under glass and is characterized by galls or tubercles being formed on the stems or roots, or both.

Treatment.—Removal or sterilization of the soil by steam, thorough disinfection of the benches, and so on, is the only remedy to be suggested. Rejection of all stock showing any indication of galls is advisable.

DOWNY MILDEW is caused by the fungus *Peronospora sparsa*. It is particularly a disease of greenhouse roses, and is of somewhat rare occurrence. The disease is characterized by wilting and rapid killing of young leaves.

Treatment.—Dusting with sulfur is held to be effective against this disease.

L. M. MASSEY.

ROSE ACACIA: *Robinia hispidia.* **R.-Apple:** *Eugenia Jambos.* **Rosebay:** *Nerium.* **R. Campion:** *Lychnis Coronaria.* **R., Christmas:** *Helleborus niger.* **R., Japanese:** *Kerria japonica.* **R. Mallow:** *Hibiscus.* **Rosemary:** *Rosmarinus.* **R. of China:** *Hibiscus Rosasinensis.* **R. of Heaven:** *Lychnis Cœli-rosa.* **R. of Jericho:** *Anastatica,* see *Resurrection Plants.* **R. of Sharon:** *Hibiscus syriacus.* **R., Rock:** *Cistus* and *Helianthemum.* **R., Sun:** *Helianthemum.*

ROSELLE. An annual hibiscus (*H. Sabdariffa,* page 1485, Vol. III), cultivated in tropical and subtropical regions for the acid of the immature calices and involucels or bracteoles; known also as red sorrel and Jamaica sorrel; it also yields a fiber.

The roselle is used in the making of an acid drink and also for jellies, jams, sauces, and marmalades, being a good substitute for cranberry and currant in regions where these fruits do not grow. It is grown somewhat in the southernmost parts of the United States. The culture is essentially that of the eggplant. Seeds are sown in a seed-bed, and the young plants transferred to rows in the field far enough apart to allow of horse-tillage, and 1½ to 2 feet apart in the row. The plant usually grows 4 to 5 feet high if not too highly fertilized, and produces a bush of many stalks. No special tillage or care is required. Before the bolls are woody or stringy, they are broken off by hand. They may be utilized fresh, or dried for future use. The common forms of roselle are rich red and make very attractive products; the yellowish forms appear not to be grown in this country. The yield of one plant may be three to sixteen pounds.

ROSMARÌNUS (Latin, *sea-dew;* the plant is common on the chalk hills of the south of France and near the seacoast). *Labiàtæ.* ROSEMARY. Hardy evergreen shrub; a well-known garden plant, with aromatic leaves used for seasoning.

Leaves narrow, entire, with revolute margins: fls. in short axillary racemes, few, approximate, opposite, subsessile, bluish or white; calyx ovoid-campanulate, 2-lipped, posterior lip concave, minutely 3-toothed, anterior 2-cut; corolla-tube exserted, limb 2-lipped, posterior lip erect, emarginate or shortly 2-cut, anterior spreading, 3-cut, the midlobe largest, concave, declined; perfect stamens 2: nutlets smooth, ovoid-subglobose.—One species, Medit. region. The genus is placed near Salvia, being distinguished by the calyx being only shortly 2-lipped, not hairy in the throat and the connective of the anthers continuous with the filament and indicated only by a slender reflexed tooth.

Rosmarinus officinalis has small light blue flowers, which are much sought by bees. Oil of rosemary, a volatile oil distilled from the leaves, is a common preparation in drug-stores. The leaves are also used in making Hungary water. In northern herb-gardens, it lasts for years if given well-drained soil and some winter protection. It is recommended for hedges in southern California, especially for dry and rocky places near the coast.

officinàlis, Linn. ROSEMARY. OLD MAN. Shrub, 2–4 ft. high: lvs. numerous, linear, with revolute margins: fls. axillary, in short racemes, borne in early spring. V. 3:61. Var. **prostràtus,** Hort. (*R. prostràtus,* Hort.), is distinguished from the type by its prostrate habit.—A good plant for dry positions on the rockery.

F. TRACY HUBBARD.†

ROTHRÓCKIA (named for Prof. J. T. Rothrock). *Asclepiadàceæ.* Perennial twining herb hardy in the southwestern United States.

Stems somewhat woody at base: lvs. opposite, cordate-acuminate, long-petioled: infl. loose axillary cymes; fls. white; calyx 5-parted; corolla rotate, deeply 5-cleft, the lobes oblong; crown simple, inserted at the junction of the corolla and stamen-tube, 5-parted: follicles thickened, acuminate, smooth.—Three species, N. W. Mex. and Ariz.

cordifòlia, Gray. Lvs. opposite, slender-petioled, cordate, acutely acuminate: fls. white or whitish, in racemes; corolla-lobes 3–4 lines long. N. W. Mex. along water-courses near the borders of Ariz. and also in Ariz.—Cult. in S. Calif.

F. TRACY HUBBARD.†

ROTTBOÈLLIA (Christen Friis Rottboell, a Danish botanist, 1727–1797). *Gramineæ.* Annual or perennial, usually robust grasses of the tribe Andropogoneæ, found mostly in warmer regions of the world. The species furnish some forage but they are scarcely horticultural. Spikelets in pairs as in Andropogon, awnless, arranged in cylindrical spikes, more or less embedded in the axis, the first glume coriaceous and covering the excavation of the rachis-joint. The genus is more properly referred to Manisuris by recent authors, this name being taken up on technical grounds.

A. S. HITCHCOCK.

ROUPÀLA (probably a native name in Guiana). Also spelled *Ropala, Rupala, Rhopala.* *Proteàceæ.* Trees, smooth or ferrugineous-tomentose, suitable only for the warmhouse.

Leaves alternate, leathery, stiff, entire or dentate, undivided, or those of the sterile branches (and younger trees?) pinnate: fls. in axillary or terminal racemes, pedicelled in pairs, perfect; perianth cylindrical, slightly dilated at base, the limb scarcely broader, subglobose, oblong or elongated, finally laxly revolute; ovary sessile: caps. hard, oblique, 2-valved, short-stipitate.—About 40 species, Trop. Amer.

A. *Hairs rust-colored.*

Pòhlii, Meisn. (*R. corcovadênsis,* Hort.). A tree, with branches clothed with rusty colored woolly tomentum: lvs. 1 ft. or more long, pinnate, with 5–8 pairs of lfts. which are 3–5 in. long, on stout petiolules 1 in. or less long, ovate or obliquely ovate, acuminate, acutely serrate: fls. ⅛in. long, white or yellowish, in nearly sessile axillary racemes 3–5 in. long. B.M. 6095.

AA. *Hairs golden.*

aùrea, Lind. According to Belg. Hort. 1866:202, this species was named for the golden hairs covering the upper parts of the st. and petioles. Brazil.—Rare and imperfectly known.

R. Jónghei, Hort., is a plant offered by Siebrecht which does not appear in botanical works.

F. W. BARCLAY.
F. TRACY HUBBARD.†

ROUPÈLLIA: *Strophanthus.*

ROYAL FERN: *Osmunda regalis.* **R. Palm:** *Oreodoxa regia.*

ROYÈNA (named for Adrian van Royen, of Leyden; died 1779). *Ebenàceæ.* Evergreen trees or shrubs suitable for the warmhouse.

Leaves alternate: infl. axillary; fls. small, hermaphrodite; calyx deeply 5- (rarely 4-) lobed, often accrescent in fr., lobes more or less pubescent or silky; corolla campanulate or urceolate, 5-cleft, lobes obtuse, reflexed; stamens 10 in one rank; ovary conical, pubescent: fr. globose, ovoid or oblong, leathery, indehiscent or splitting.—About 20 species, natives of Trop. and S. Afr. The genus is distinguished from the 4 or 5 other genera of the ebony family by the fls. being hermaphrodite instead of dicœcious and the stamens in a single series.

Royena lucida is one of the old-time Cape shrubs formerly cultivated under glass for ornament in England and lately offered in southern California. It has small white flowers about ½ inch across, with five more or less reflexed lobes.

lùcida, Linn. Tender evergreen shrub, 4–12 ft. high, or a small tree: bark nearly smooth, dusky gray or whitish: lvs. oval or somewhat ovate, leathery, shining above, more or less hirsute beneath: fls. solitary, axillary, white or yellowish; calyx 5-toothed; corolla-tube urceolate, limb reflexed, 5-parted, puberulous; segms. rounded: fr. ovoid or subglobose, red or purple and fleshy when ripe. S. Afr. B.R. 32:40.

F. Tracy Hubbard.

ROYSTÒNEA: *Oreodoxa.*

RUBBER PLANTS. Various plants furnish rubber. The best gutta-percha is said to be produced by *Isonandra Gutta* (which see), a native of India. For the rubber tree of South America, see *Hevea brasiliensis.* The rubber tree of tropical Africa is *Landolphia florida;* see B.M. 6963. The rubber plant of horticulturists is *Ficus elastica.* For an agricultural account of rubber, see "Cyclopedia of American Agriculture," Vol. II.

RÙBIA (Latin, *red;* referring to the color of the dye extracted from the root). *Rubiàceæ.* Mostly hardy herbs, sometimes shrubby at base, of little horticultural worth, but one, *R. tinctorum,* is of economic value.

Plants frequently rather stiff, hispid, or aculeate: lvs. in whorls of 4–8 or very rarely opposite and stipulate, sessile or petioled, lanceolate or obovate, rarely cordate: fls. small or minute, in axillary or terminal cymes, 5-merous; involucre none; calyx-tube ovoid or globose, limb lacking; corolla rotate or subcampanulate; ovary 2-celled or through abortion 1-celled: fr. didymous, fleshy, 2- rarely 1-celled.—About 40 species, Medit. region, Trop. and S. Afr., Temp. Asia, Trop. and S. Temp. Amer. *R. tinctorum* is the dye-plant called madder, the long, fleshy roots of which are ground to powder. Madder is said to be furnish a good green fodder if cut the second year when in flower.

tinctòrum, Linn. (*R. tinctòria,* Salisb.). Madder. A scandent herbaceous perennial: lvs. 2–4 in. long, sessile or very short-petioled, mostly lanceolate, not cordate, in whorls of 4–6: cymes terminal, panicled, spreading, leafy.

F. W. Barclay.
F. Tracy Hubbard.†

RÙBUS (Latin name, ultimately connected with *ruber,* red). Including *Bossèkia, Rubàcer, Oreobàtus, Batidæa,* and others, but excluding *Dalibarda. Rosàceæ.* Bramble. Blackberries, Dewberries, Raspberries, and Thimbleberries. Low and diffuse mostly woody plants, usually producing canes, grown for the edible fruits, some of the species for ground-cover, and others for the more or less ornamental character of habit, foliage, and bloom.

Trailing, decumbent, ascending, or erect plants, the tips of long growths usually recurving even if otherwise erect, glabrous, hairy or variously glandular, mostly thorny or prickly: sts. usually short-lived and pithy (sometimes semi-herbaceous): lvs. simple or compound, alternate, the compounding on the pinnate order and the leaflets largely 3 (several in many of the tropical and oriental species): fls. mostly white or rose-colored, usually in corymbs or racemes but sometimes solitary; calyx 5-parted (rarely 3–5-parted), the lobes persistent; petals 5, usually obovate; stamens many, inserted on the torus-rim; pistils many (or sometimes few), closely packed on the torus, usually becoming drupelets but sometimes dry when ripe, the style nearly terminal.—A most variable and perplexing genus, containing perhaps 400 fairly well-marked species and numberless intermediate forms. More than 3,000 species-names have been applied. The genus is particularly strong in Europe, where great numbers of specific names have been made (see Weihe & Nees, Rubi Germanici, 1822–7; Focke, Synopsis Ruborum Germaniæ, 1877; Babbington, British Rubi, 1869; Focke, in Ascherson & Graebner, Synopsis der Mitteleuropäischen Flora, 1902; Rogers, Handbook of British Rubi, 1900, and many other publications). Focke in 1877 described 72 species inhabiting Germany. In 1902 he admitted 87 full species to the mid-European flora. There is also a large extension of the genus in the Himalayan region, about 50 species being recognized (J. D. Hooker admits 41 species in the Flora of British India). The species extend eastward into China and Japan. Hemsley, in his Flora of China, admits 41 species. In Japan, Franchet and Savatier admit 22 species. In the North American Flora, Rydberg admits 112 species, in 1913, counting those in Mexico and southward and excluding certain species that are referred to other genera. Students of the American forms should consult the recent writings of Blanchard, Brainerd, Bicknell, and Rydberg. There is no agreement as to the number of species in N. Amer. or elsewhere, and recently other genera have been segregated. Rubus is widely distributed in the northern hemisphere, particularly in temperate and warm-temperate parts. Some of the species are alpine and arctic. In tropical climates the genus is relatively poorly represented. Oliver admits only 4 in the Flora of Tropical Africa. Only 2 species are described in Grisebach's

3486. An English raspberry-blackberry hybrid. (×⅜)

Flora of the British West Indies. Baker admits 3 species in the Flora of Mauritius and the Seychelles. Hillebrand describes 3 species in Flora of the Hawaiian Islands. The southern hemisphere has few species. Bentham's Flora Australiensis has but 5 species. Cheeseman's Manual of the New Zealand Flora mentions only 4 indigenous species. There are also 5 species described in Harvey and Sonder's work (Flora Capensis) on the flora of the Cape of Good Hope region. In his Species Ruborum (Bibl. Bot. parts 72 and 83. 1910–14), Focke describes 429 or more species from all around the world.

The genus Rubus tempts the species-maker. The lines of demarcation are obscure or indefinite, the variables are numberless, the botanical characters differ widely on old and young canes and even on spring and autumn foliage of the same cane, and the plants respond readily to conditions. There are marked shade-forms and sun-forms, moisture-forms and dry-land forms, apparently only environmental modifications of prevailing types. The tendency, therefore, on the one hand is to recognize a very few stem-types as species (Bentham reduced all the British rubi of the blackberry

type to one species, *R. fruticosus*), and on the other hand to make species of the marked departures (Rogers makes more than 100 species and many varieties of the "Rubi fruticosi" of Britain). The herbarium usually provides few checks; the student needs constantly to supplement his specimens with careful observations in the field under many varying conditions, if he is to arrive at an independent judgment on the group. We do not yet know how far the older herbarium definition corresponds with phylogenetic facts. There is indication that rubi hybridize freely, particularly in the blackberry group, and artificial hybrids are produced easily; but to assume hybridity from the herbarium specimen alone is inconclusive, particularly when we have now learned that intermediateness is not a proof of hybridity and that hybrids may even show little departure from one or the other parent. If to the variableness of plants in the wild is to be added the variation under cultivation, the difficulties are intensified if one endeavors to name and separate very closely; and if very many species are to be made, then it may be practically impossible to identify the horticultural forms with any of the minutely defined wild species. This difficulty is likely to be little taken into account in the usual study of wild material, and yet it is an obligation of the systematist to serve the horticulturist; it would be a pity if the feral and domesticated forms were not studied harmoniously. If one is to abandon the older practice of describing the main stem-types, then the logical procedure is to name and describe all the marked forms with a Latin name. This procedure, however, relegates the group to the knowledge of the close specialist and confuses the subject for others. Whether in certain groups of Rubus, particularly in the blackberry or Eubatus section, we are dealing with a range of hybrids between relatively few species or whether we have a wide range of plastic material out of which marked forms and incipient species are developing by mutation or otherwise, is the question of primary importance to the systematic study of the genus. The long-established habit of species-making naturally leads to the assumption that specific types occur in all genera and that the variations are to be explained on the theory of intermediateness or aberrance; but this hypothesis is yet to be demonstrated. Of course, the difficulties in cultivated Eubatus are not insolvable by careful study in herbarium, garden, and field.

3487. Rubus Chamæmorus.—The cloudberry (×⅔). No. 1.

With these points of view before us, the reader will scarcely expect to find in this account an evaluation of all the species-names that have been given to American rubi in recent years. This task may be undertaken at another time, but it would be of little avail when considering merely the horticultural forms. In assembling the American cultivated blackberries into one group in the following account and the cultivated dewberries into another, it is not intended to pass on the merits, from the systematic point of view, of any of the several described species; but in the present state of the case, it is impossible to refer all cultivated forms to the species-names now current, nor is it the purpose of the Cyclopedia to describe all wild species. There is no practicable alternative but to group the horticultural forms at least until such time as the subject is cleared up; and this is done under Nos. 60 and 61. The history of these domesticated groups affords little aid in determining botanical origins, both because the records are themselves imperfect and because the American species had not then been studied critically; the problem must therefore be worked out mostly as a current systematic study.

Rubus is closely allied to Rosa, from which it differs chiefly in the structure of the flower. In Rosa, the torus or hypanthium is hollow and contains the dry fruits or achenes. In Rubus the torus is convex, conical or elongated, and bears the mostly soft or pulpy fruits on its surface. Rubi are chiefly shrubs with stems (canes) that die after one or two years, but some of them have herbaceous tops. In raspberries and blackberries, the canes bear the second year and then die or become very weak. The fruit is an aggregate of carpels. The drupelets are usually more or less coherent at maturity, the collective body forming the "fruit" or "berry" of horticulturists. In the rasperries, the coherent drupelets separate from the torus at maturity, causing the berry to be hollow or concave on the under side. In the blackberries, the coherent drupelets adhere to the torus, which separates at maturity and forms the "core" of the berry. Usually the tops are not long-lived, and commercial plantations require frequent renewal.

The horticultural and controlled hybrids in Rubus are now many. Raspberry-blackberry crosses have been frequently effected, but they appear to have little popular interest. The illustration (Fig. 3486) shows a hybrid between Fontenay raspberry (*R. idæus*) and "the common blackberry" of England as shown by Veitch at London in 1897 (G.C. Oct. 2, 1897, from which the illustration is reduced). The fruits were described as of a purplish black color with gray bloom, produced abundantly.

Relatively few of the rubi have horticultural merit, although some of them are of great importance. As pomological subjects they are more important in North America than elsewhere. Here are grown not only raspberries, which are popular elsewhere, but also great quantities of improved blackberries, a fruit that is less known as a regular cultivated product in other countries. Although the European raspberry, *R. idæus*, is grown in North America, it is mostly unreliable, and the leading commercial sorts are produced from the native *R. occidentalis* and *R. strigosus* and from hybrids of the two. Various Japanese species also produce fruits of value, but none of them has attained much importance in North America.

Numbers of the species are useful as ornamental subjects, particularly the Rocky Mountain *R. deliciosus*, the brier rose (*R. rosæfolius* var. *coronarius*), wineberry (*R. phœnicolasius*), and *R. cratægifolius*. For its graceful finely cut foliage, and sometimes for its fruit, *R. laciniatus* is frequently grown, particularly in the milder climates where it is practically an evergreen. Some of the unimproved wild species are offered by dealers in native plants as worthy subjects for free borders and rock-gardens. The beauty of most shrubby rubi depends largely on the removal of the canes after they have bloomed once. After flowering, the cane becomes weak or may die outright. It should be removed to the ground. In the meantime other canes have arisen from the root, and these will bloom the following year. That is, the stems of rubi are usually more or less perfectly biennial: the first year they make their growth in stature; the second year they throw out side branches on which the flowers are borne; after fruiting, the entire cane becomes weak or dies. Removing

these canes not only contributes to conserve the vigor of the plant, but it also adds to its appearance of tidiness. These remarks apply particularly to the cultivation of raspberries, blackberries, and dewberries. For other accounts, see *Blackberry*, *Dewberry*, *Himalaya Berry*, *Loganberry*, *Lowberry*, and *Raspberry*, at their respective entries.

In recent years, many of the Chinese species of Rubus, mostly in the subgenera Malachobatus and Ideobatus, have been introduced to cultivation for ornament, some of them with promise of providing desirable edible fruits. Many of them make long vine-like canes and are excellent for training to posts, pillars, on pergolas and arbors. The foliage is often very ornamental and several of them have white or bluish white canes that render them useful for winter effect. Some of the species are evergreen. These oriental rubuses are known in cultivation mostly in England, but are being tested in this country, particularly at the Arnold Arboretum, Boston; at the latter place, none of the species has proved to be perfectly hardy. The following species have survived, although mostly much killed back each winter: *R. flosculosus*, *R. Lambertianus*, *R. lasiostylus*, *R. Giraldianus*, *R. mesogæus*, *R. innominatus*, *R. adenophorus*; *R. conduplicatus* and *R. teledapos* stood the winter of 1915–16.

The species of Rubus require no special place or care in cultivation except to provide in a general way the conditions as to moisture and exposure under which the plants grow in the wild. They are plants of wide adaptability. Propagation is by dividing the clumps in some cases, but better by the use of the natural stolons; or if artificial practices must be employed, root-cuttings 2 or 3 inches long may be used for many species. They are grown readily from seeds.

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philadelphicus, 60.
phœnicolasius, 33.
pictus, 24.
Playfairianus, 13.
Playfairii, 13.
polytrichus, 7.
Potaninii, 5.
procumbens, 61.
pubescens, 2.
quinqueflorus, 38.
Randii, 60.
recurvans, 60.
reflexus, 24.
Roezlii, 9.
roribaccus, 61.
rosæfolius, 48.
rosæflorus, 48.
Rossbergianus, 60.
sagatus, 34.
sativus, 60.
Savatieri, 28.
sempervirens, 62.
simplex, 6.
sinensis, 48.
sorbifolius, 49.
spectabilis, 32, 57.
stellatus, 4.
Strawberry-raspberry, 49.
strigosus, 44.
Swinhoii, 15.
teledapos, 41.
thibetanus, 53.
thyrsanthus, 56.
trianthus, 29.
tricolor, 7.
trifidus, 8.
triflorus, 2.
trivialis, 63.
ulmifolius, 58.
ursinus, 64.
Veitchii, 53.
villosus, 61.
vitifolius, 64.
vulgaris, 59.
Wilsonii, 39.
xanthocarpus, 5.

A. *Species herbaceous or essentially so, small, the flowering shoots arising from the crown of the plant.*

Section I. CHAMÆMORUS. Stamens numerous: fr. juicy: fls. dicœcious, borne singly on upright leafy stalks: lvs. simple, lobed. The cloudberry or bake-apple-berry of arctic or subarctic regions, and much prized for its frs., belongs here. No. 1.

Section II. CYLACTIS. Fls. perfect or polygamous, singly or several together at the ends of the shoots: lvs. ternate or pediform (5-parted), or sometimes only lobed. Nos. 2–6.

AA. *Species shrubby: flowering shoots arising from woody canes of 2 or more years' growth, the plants small or large but usually large.*

B. *Plant spineless.*

Section III. DALIBARDASTRUM. The species here described are prostrate and spineless, woody, brown-hairy: lvs. simple, evergreen, cordate: fl.-sts. erect, the fls. large and white. No. 7.

Section IV. ANOPLOBATUS (*batus* is Greek for bramble). Upright rather soft-wooded shrubs, usually with shreddy bark, large, lobed lvs., large erect fls., and broad torus. Nos. 8–11.

BB. *Plant spine-bearing (exceptions in some blackberries).*

Section V. MALACHOBATUS. Climbing or prostrate shrubs with entire or palmately lobed seldom compound lvs. and mostly not showy fls.; stipules broad, fugacious. Nos. 12–24.

Section VI. IDÆOBATUS. Raspberries, with the coherent drupelets separating from the torus; upright or ascending shrubs, with simple or ternate lvs., small lfts., and drooping fls. in mostly short clusters; stipules linear to lanceolate. Nos. 25–55.

Section VII. EUBATUS. Blackberries and dewberries, with the drupelets adhering to the torus when ripe; stipules linear. Nos. 56–66.

Section I. CHAMÆMORUS.

1. **Chamæmòrus,** Linn. CLOUDBERRY. BAKEAPPLE-BERRY. YELLOW BERRY. MOLKA. SALMONBERRY improperly (see No. 32). Fig. 3487. Creeping: branches herbaceous, covering the ground, pubescent or almost glabrous: lvs. round-cordate or reniform, shallowly 3–5-lobed, finely dentate: fls. large and white, in solitary terminal peduncles: fr. large, globular, red or yellowish, composed of few soft drupelets, edible. Entirely across the continent in high northern and arctic regions, and reaching as far south, in the E., as the high land of Maine and N. H. and eastern end of L. I.; also in Eu. and Asia.—The cloudberry is an inhabitant of peat-bogs and cool places. It is much prized for its fr., which is gathered from the wild in large quantities. It is sometimes planted farther south as a rock-garden plant. *R. árcticus*, Linn., a pink-fld. species with trifoliolate lvs., occurs in nearly the same range, and produces small edible berries; this species belongs to Section II.

Section II. CYLACTIS.

2. **pubéscens,** Raf. (*R. americànus*, Brit. *R. triflòrus*, Rich.). Sts. slender and trailing, 1–2 ft. long, herbaceous, without prickles, glabrous or nearly so: lvs. thin and soft, light green, with 3 or 5 ovate or rhombic-ovate, coarsely serrate lfts.: fls. 1–3 on each peduncle, small and white, the calyx reflexed: fr. small, reddish. Cold swamps, N. J. west and north.—Offered as a rock-garden plant for moist places.

3. **pedàtus,** Smith. Low creeping unarmed herbaceous coptis-like perennial, rarely cult., probably adapted to cool woods or rock-gardens: lvs. pedately 3–5-foliolate, with thin obovate or rhombic-obovate irregularly cut lfts. which are glabrous or only sparsely

hairy on veins beneath: fls. solitary and terminal on short shoots, white, about 1 in. across. N. Calif. and Idaho to Alaska; reported in Japan.—By Focke referred to the subgenus Dalibarda; if kept in a distinct genus, the plant becomes *Dalibarda pedata*, Steph. Interesting as a rock-garden plant.

4. **stellàtus,** Smith, produces an edible fr. prized in Alaska, where it is native, as well as in Yukon and Kamchatka: st. simple and herbaceous, only a few inches long, 1-fld.: lvs. cordate, 3-lobed or 3-parted, reniform in outline, pubescent on both sides or glabrate in age, simply or doubly serrate: fls. solitary and terminal, rose-colored: fr. red, globose, with 20 or more drupelets, said to be known locally as a dewberry.

5. **xanthocárpus,** Bur. & Franch. (*R. Potaníni*, Regel). Trailing, the sts. dying back every year, the sts. pilose and weak-spiny: lvs. pinnately 3-foliolate, the lfts. ovate, acute or obtuse, strongly and unequally dentate, the terminal one twice larger than the others: fls. solitary or twin in the axils of the upper lvs., the peduncle and calyx weak-prickly, the petals white: fr. large, ovate, bright yellow, fragrant, and palatable, the calyx persistent. China; discovered in 1885 in the Province of Kansu, 40° north latitude, and later found in provinces Szechuan and Yunnan.—Intro. into the U. S. in 1898 by the Dept. of Agric. through N. E. Hansen, to be tried for its edible raspberry-like fr. It is said to provide a good cover; fairly hardy in Minn; it appears not to have found favor in this country and its value is doubtful.

6. **símplex,** Focke. Small plant, 1–2 ft., making a roundish densely branched bush: sts. simple, puberulous, sparingly bristly: lfts. 3, hairy above, puberulous on the veins beneath, unequally mucronate-serrate, 2–4 in. long, the lateral ones short-stalked, the terminal on a stalk ¾–1 in. long: fls. axillary, few, short-pedicelled, white, over ¾in. across; petals scarcely exceeding the triangular acuminate sepals: fr. edible, orange-red. Cent. China. H.I. 20:1948.—Probably useful as a subject for rock-gardens.

Section III. Dalibardastrum.

7. **trícolor,** Focke (*R. polýtrichus*, Franch., not Prog.). A distinct dwarf species with prostrate spineless brown-yellowish-hairy sts., growing several feet in a season under moist shady conditions: lvs. simple, about 3 in. long, cordate, evergreen, sharply toothed, dark green above but with rows of hairs between the chief veins, white-tomentose beneath and with brown bristle-hairs on the rib and chief veins: fls. white, 1 in. across, on erect fl.-sts.: fr. rather large, bright red. W. China, up to 10,000 ft.—Probably worthy as a wild-garden and rock-garden subject.

3488. Rubus deliciosus, from the Rocky Mountains. (No. 9.)

Section IV. Anoplobatus.

A. *Lvs. mostly 7-lobed.*

8. **trífidus,** Thunb. Fire Raspberry. Strong-growing and erect, 7–10 ft. tall: lvs. large, palmately ribbed, 3–5- or even 7-cleft, serrate: fls. subsolitary, the peduncles villous: berry of medium size, scarlet, with pointed

3489. Clump of Rubus odoratus (flower ×½). No. 10.

drupelets. Japan.—Sparingly intro. and prized for its bright autumn foliage (whence the name "fire raspberry").

AA. *Lvs. 5- or less-lobed.*

B. *Peduncles mostly 1-fld.*

9. **deliciòsus,** James (*R. Roèzlii*, Regel. *Bossèkia deliciòsa*, A. Nels. *Oreobàtus deliciòsus*, Rydb.). Rocky Mountain Flowering Raspberry. Fig. 3488. Compact, bushy grower, reaching 5 ft.: lvs. large, orbicular or reniform, shallowly 3–5-lobed, unequally serrate, somewhat glandular: fls. borne in great profusion, pure white, 1–2 in. across, in early summer and continuing for a long season: berry hemispherical, purplish or wine-color, with larger, soft drupelets like those of a red raspberry, edible but not esteemed for eating. Cañons in the mountains of Colo., reaching 8,000 ft. elevation. B.M. 6062. G.C. II. 15:537. R.H. 1882, p. 356; 1903, p. 447. F.S. 23:2404. Gn. 18:358; 29, p. 336; 34, p. 231; 45, p. 74; 46, p. 293; 73, p. 64. Gt. 47:1451; 52, pp. 355, 356. Gng. 3:325. G.M. 41:508; 45:143. G. 2:491; 8:650; 36:411, 777.—The finest of native flowering raspberries, and deserving to be widely known. Hardy in Mass. The fls. resemble single roses.

BB. *Peduncles several- to many-fld.*

10. **odoràtus,** Linn. (*R. grandifòlius*, Salisb. *Bossèkia odoràta*, Greene. *Rubàcer odoràtum*, Rydb.). Flowering Raspberry. Mulberry (erroneously). Fig. 3489. Strong-growing plant, with the shreddy canes reaching 3–6 ft.: lvs. very large, pubescent beneath, 3–5-lobed, the lobes triangular-acuminate with broad triangular teeth and sharp-serrate: fls. 1–2 in. across, rose-purple, several to many in the cluster, the sepals with a long point, the peduncles and pedicels glandular-pubescent: berry flattish and broad (¾in. across), rather dry, light red, edible but not valued. Nova Scotia to Mich. and Ala. Gn. 34, p. 230. B.M. 323. J.H. III. 31:133. F.E. 22:557. Var. **columbiànus,** Millsp. (*Rubàcer columbiànum*, Rydb.), native in W. Va., has lanceolate incised-dentate or doubly dentate lobes. Var. **álbidus,** growing with the type, has whitish fls. and lighter-colored bark.—*R. odoratus* prefers rich shady woods and banks. It makes a bold subject in a foliage mass, and its fls. are nearly as large as many single roses, although the color is less bright. It spreads rapidly from the root and overtops weaker plants.

11. **parviflòrus,** Nutt. (*R. nutkànus*, Moç. *R. làcer*, Kuntze. *Bossèkia parviflòra*, Greene. *Rubàcer parvi-*

flòrum, Rydb.). Differs from the last in having white fls. in few-fld. clusters and less glandular peduncles. N. Mich. to the Pacific Coast and southward in the Rockies; the western representative of *R. odoratus*. B.M. 3453. B.R. 1368. Gn. 45, p. 75; 59, p. 61; 62, p. 249; 67, p. 255.

Section V. Malachobatus.

A. *Lvs. compound (in R. Henryi 3-lobed lvs. sometimes occurring).*

12. **Hénryi,** Hemsl. & Kuntze (*R. bambusàrum*, Focke). Evergreen, with trailing shoots 10–15 ft. long, with few spines and gray-tomentose when young: lvs. 3-lobed and of 3 lfts. often on same branch, rarely of 5, the lfts. long-lanceolate, 3 in. or more long, minutely and more or less distantly toothed, tomentose beneath: fls. small, pink, in terminal racemes 2–3 in. long: fr. ½in. or less diam., shining black, not unpleasant in flavor. W. China, 4,000–7,000 ft. altitude. G.C. III. 42:251; 51:148. G. 28:630.—A handsome plant for pillars and pergolas, because of its graceful growth and interesting foliage. It has been considerably advertised abroad.

13. **Plàyfairii,** Hemsl. (*R. Playfairiànus*, Hort.). A rambling or diffuse shrub, evergreen, with thin wire-like sts. which bear small curved spines and are cobwebby when young: lvs. of 3–5 linear-lanceolate or lanceolate serrate lfts., the terminal one 5–7 in. long, all bright green above and gray-felty beneath, the stipules ½in. long and cut: fls. ½in. across, in irregular clusters, the petals shorter than calyx-lobes: fr. black, of fair or moderate flavor. China. G.C. III. 51:166.—Makes a handsome plant when trained up on stakes.

AA. *Lvs. not compound, although sometimes lobed*

B. *Infl. terminal and racemose, simple; peduncles solitary.*

14. **malifòlius,** Focke. Sts. prostrate or climbing, woody, with few short curved prickles: lvs. simple, oval or oblong-elliptic, coriaceous, 2–5 in. long, broadly but shallowly toothed: fls. 1 in. across, in short terminal racemes: fr. rather large, black, flavor unpleasant. W. and Cent. China.—Said to be an elegant species with handsome fls. Named for its apple-like lvs.

15. **hupehénsis,** Oliver. Deciduous, with prostrate terete sts. somewhat gray-flocculent when young, with very short curved prickles: lvs. simple, oblong-lanceolate, about 3–4 in. long, acuminate, rounded at base, serrate, gray-tomentose beneath, short-petioled: fls. 3–7, in a terminal short raceme. Cent. and W. China. H.I. 19:1868. A related species is **R. Swinhòii,** Hance, which is evergreen: lvs. ovate: fr. black, rather bitter. China. G.C. III. 51:166, under this name, appears to represent *R. hupehensis*.

BB. *Infl. variously paniculate or thyrsoid, the peduncles mostly fascicled (except perhaps in No. 20).*

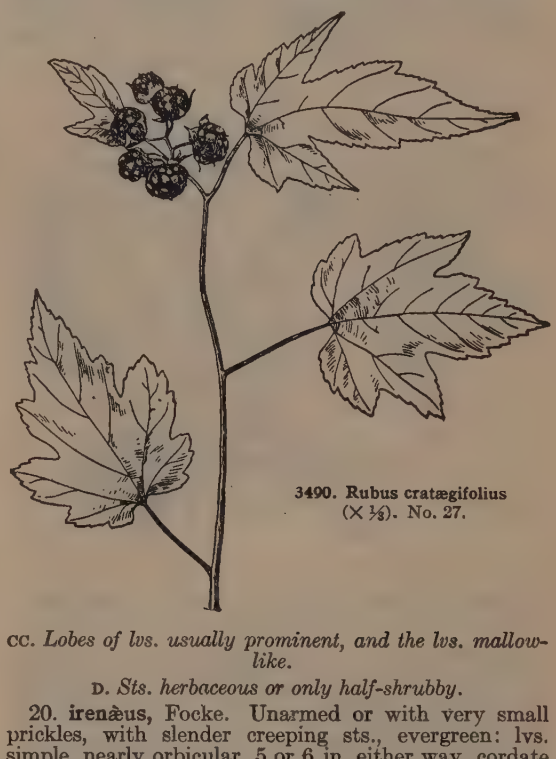
C. *Lobes of lvs. none or usually not prominent (partial exception in No. 19), the lvs. not mallow-like.*

16. **chroösépalus,** Focke. Strong-growing shrub, with slender sts. which bear few spines: lvs. simple, cordate-ovate, 4 in. long and nearly as broad, linden-like, glabrous above, tomentose beneath: fls. in large loose panicles, apetalous, the reflexed sepals colored inside: fr. small, black. Cent. China. G.C. III. 51:166. —Advertised abroad; evergreen probably in mild climates, but sometimes described as deciduous. Useful on posts and pergolas for its habit and foliage.

17. **ichangénsis,** Hemsl. & Kuntze (*R. eugènius*, Focke). Sts. long and slender, with few small prickles, evergreen: lvs. simple (the older ones sometimes more or less 3-lobed), broad-lanceolate, cordate at base, 3–4 in. long, light green on both surfaces, remotely toothed, long-petioled: fls. very small, in small panicles: fr. small, red, of good flavor. Cent. and W. China, to 7,000 ft. altitude. G.C. III. 48:275.—The lvs. have a metallic luster.

18. **Párkeri,** Hance. Slender evergreen, with long scandent softly glandular-hairy sts. which bear short curved spines: lvs. simple, broad-lanceolate or ovate-lanceolate, 3–5 in. long, cordate at base, irregular or angled on the sides, rugose, dark green above, velvety-pubescent beneath: fr. black. China. G.C. III. 51:166.

19. **Lambertiànus,** Ser. Sts. long and slender, quadrangular, with few hooked spines, evergreen: lvs. simple, 3–5-lobed and more or less angled, 3–4 in. long, bright green but becoming colored in autumn, glabrous above, slightly hairy and light green beneath: fls. small, whitish, in terminal clusters: fr. red, and apparently sometimes yellow. China. G.C. III. 48:276; 51:166. Var. **glàber,** Bean. Differs in having terete sts., uniformly yellow fr., and lvs. and sts. glabrous or nearly so.



3490. Rubus cratægifolius (× ⅛). No. 27.

CC. *Lobes of lvs. usually prominent, and the lvs. mallow-like.*

D. *Sts. herbaceous or only half-shrubby.*

20. **irenæus,** Focke. Unarmed or with very small prickles, with slender creeping sts., evergreen: lvs. simple, nearly orbicular, 5 or 6 in. either way, cordate at base, slightly 3–5-lobed, white-tomentose and rusty along the nerves beneath, glabrous and metallic green above: fls. ½in. or more across, the petals roundish, white, exceeding the sepals: fr. yellow. Cent. China, 4,000–8,000 ft. altitude.—Probably useful in mild climates and moist places for covering slopes.

DD. *Sts. shrubby.*

21. **omeiénsis,** Rolfe (*R. clémens*, Focke). Unarmed shrub with branches arching and 10–20 ft. long: lvs. palmately lobed, 4–5 in. across, hairy beneath: fls. small, rose-colored, in long and narrow panicles: fr. black. It makes long straggling growths lying on the ground and rooting freely: unarmed: lvs. shortly 5-lobed or obscurely 7-lobed, 7–9 in. across either way, glabrous above and hoary beneath: fls. small, with purplish petals. W. China; bears the name of Mt. Omei.

22. **flagellifiòrus,** Focke (*R. flagellifórmis*, Hort., not Smith). Evergreen or nearly so, of attractive habit, 8 ft. or more, the sts. and under surface of lvs. dun-tomentose, the spines few: lvs. simple, cordate, acumi-

nate, irregularly serrate, 4–5 in. long, deep metallic green on upper surface: fls. white, on growths of 6–8 in. long: fr. medium in size, glossy black. Cent. and W. China, 4,000–6,000 ft. R.B. 33, p. 360.—Useful on posts and pergolas.

23. **moluccànus,** Linn. A large raspberry-like plant in many forms, common in India and Malaya, and to be expected as an intro. plant in many warm countries. Very robust, the tomentose canes and branches red-hairy and with short curved scattered prickles: lvs. simple, very variable, large, usually hairy, gray- or yellow-woolly beneath, mostly broad-ovate or orbicular and deep-cordate, shallowly 3–5-lobed, irregularly serrate: fls. white, in contracted terminal clusters: fr. in shades of red, succulent. Gn. 63, p. 408. G.M. 46, p. 323. —Probably not in the American trade.

3491. Rubus spectabilis of western America.—The salmonberry. (No. 32.)

24. **refléxus,** Ker. Tall stout climber sometimes confused with *R. moluccanus:* prickles few and scattered: young growth, petioles, and under surface of lvs. bearing cinnamon-colored pubescence: lvs. simple but sometimes prominently 3–5-lobed, broad-ovate or ovate-oblong in outline, base cordate, margins toothed, prominently nerved beneath, the terminal lobe long: fls. white or pink, ¾in. or less diam., nearly sessile in small few-fld. declined clusters: fr. small, globular, red-purple or black. China. B.R. 461. B.M. 7716. Var. **pictus,** W. Wats., has the lvs. velvety green, and gray-variegated above and soft pale cinnamon-brown beneath: handsome. G.C. III. 33:309 (as *R. moluccanus*). R.B. 29:237.

Section VI. Idæobatus. Raspberries.

A. *Lvs. simple; often 3-lobed on strong shoots.*

25. **corchorifòlius,** Linn. f. Nearly or quite erect, 4–6 ft., the terete sts. downy and bearing small straight spines: lvs. simple, cordate-ovate, mostly 3-lobed on the verdurous shoots, 4–7 in. long, dull green above and pubescent beneath, the margins coarsely toothed, midrib and petiole with hooked prickles: fls. white, solitary, on short lateral twigs: fr. bright red, large, said to be excellent in quality. Cent. and W. China, to 7,000 ft. altitude. Japan. G.C. III. 51:149.—There are several forms or very closely related species.

26. **palmàtus,** Thunb. Spreading, often slender-stemmed plant growing 4–5 ft. tall, with many short, but stout nearly straight spines: lvs. rather small, 2–3 in. long as a rule, narrow-ovate-acuminate or sometimes nearly triangular-ovate-acuminate, rather deeply 3–5-lobed and the middle lobe long and acuminate, the margins very sharp-serrate: fls. white, nearly or quite ¾in. across, with broadly ovate petals: fr. small (red?), of little value. China, Japan. B.M. 7801.—Sparingly intro. as an ornamental plant, but little known here. The Mayberry, intro. by Luther Burbank, is said to be a hybrid between this species and the Cuthbert raspberry (*R. strigosus*). The Mayberry is described as producing a large yellow edible berry, ripening in advance of the strawberry. *R. palmatus* is doubtfully referable to *R. microphyllus,* Linn. f.

27. **cratægifòlius,** Bunge. Fig. 3490. Strong, erect or diffuse much-spreading plant (3–5 ft.), with terete reddish glabrous canes that bear few and small straight spines: lvs. oblong-ovate to cordate-ovate, acuminate, 3–5-lobed, and the margin coarsely serrate and notched: fls. white, in small clusters terminating slender leafy shoots, about ½in. across: fr. small, orange-red, of no value. China, Japan.—An excellent plant for holding banks and for covering waste places, and giving fine deep reds in the fall. Perfectly hardy in Cent. N. Y.

28. **Savatièri,** Bailey (*R. morifòlius,* Sieb.; Franch & Savat. Enum. Pl. Jap., 1875, not Muell., 1858. *R. cratægifòlius* var. *morifòlius,* Focke). Differs from *R. cratægifolius* by its more numerous and stronger prickles, the lvs. villous beneath and deeply cordate at base, shorter petioles and shorter and thicker pedicels. Japan.—Offered by dealers in Japanese plants, who speak of its pretty fr. ripening in July.

29. **triánthus,** Focke. Wide-spreading deciduous shrub, glabrous: sts. erect, and much branched, blue-white, prickly, 4–6 ft.: lvs. simple, more or less 3-lobed, 3–6 in. long, ovate to triangular: fls. pink-white, small: fr. dark red, of 10–30 carpels. Cent. China.

30. **conduplicàtus,** Duthie, perhaps the same as *R. trianthus,* but described as differing in the pale green (not white) under surfaces of lvs., smaller fls., prickles on st. stronger and more curved. China.—A scandent glandless shrub, with simple petiolate lvs. which are ovate-lanceolate and acuminate and sometimes obscurely 3-lobed, the margins unequally incised-serrate: fls. 3–4, terminal, white.

31. **Koehneànus,** Focke (*R. incìsus,* Hort., not Thunb. *R. morifòlius,* Hort., not Sieb.). Nearly erect shrub, 3–4 ft. high, the branches with purplish bloom and unarmed or sparingly prickly: lvs. simple, varying from almost entire to 3–5-lobed, 5 in. or less long, and nearly as broad, mostly deep-cordate at base, green above and white-pubescent beneath, the lobes more or less acute, petioles somewhat prickly: fls. few, in loose terminal corymbs, white, the petals about ⅓in. long: fr. small and globose, orange. Japan. B.M. 8246. Gt. 53, p. 555 (as *R. incisus*).

AA. *Lvs. ternately compound, running to 5-foliolate forms, often on the pedate order.*

B. *Fls. large, solitary or few together.*

32. **spectábilis,** Pursh (*Parmèna spectábilis,* Greene). Salmonberry. Fig. 3491. Strong-growing, reaching 5–15 ft., glabrous: spines few or often none, weak: lvs. of 3 ovate-acuminate lfts., which are doubly serrate-toothed and sometimes indistinctly lobed, long-stalked, thin, glabrous or becoming so beneath: fls. solitary or in 2's, large, red or purple: fr. large, somewhat conical, salmon-color or wine-red, edible, the drupelets bearing the persistent styles. Calif. and Idaho to Alaska. B.R. 1424. L.B.C. 17:1602. F.S. 21:2260. Mn. 4, p. 57. —Sometimes cult. for its showy fls. and frs. Canes perennial. Var. **Ménziesii,** Wats. (*R. franciscànus,* Rydb.), has lvs. densely pubescent or silky underneath.

BB. *Fls. medium-sized or small, mostly clustered.*

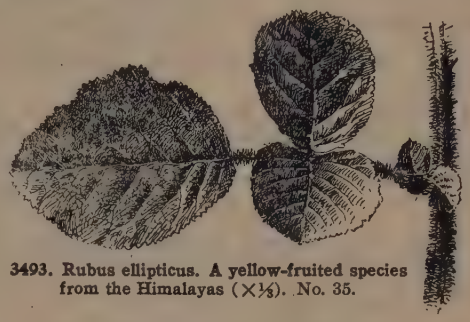
C. *Plant profusely red-hairy.*

33. **phœnicolàsius,** Maxim. WINEBERRY. Fig. 3492. Canes long and recurving, furnished with straight, weak prickles and densely clothed with red-brown glandular hairs, prop. by "tips:" lfts. usually 3, broad-ovate to round-ovate, apiculate-toothed and sometimes indistinctly lobed at top, white-tomentose beneath: fls. in dense, small, shaggy-haired clusters which spring from the uppermost axils and form a large, loose, leafy panicle; petals shorter than the long, bristly calyx-lobes, the latter enlarging after flowering and inclosing the growing frs. in a bur but spreading apart as the fr. matures: fr. usually small and soft, cherry-red, acid or usually insipid. Japan and China. B.M. 6479. G.C. II. 26:365; III. 11:269; 28:137. J.H. III. 29:210. Gt. 52, p. 565. G. 19:235. A.G. 12:205; 15:435. Gng. 3:263.—Interesting as an ornamental plant, and also recommended for its fr. In the N. it often kills to the ground, but the strong young recurving canes and white-bottomed foliage make it a handsome plant. Sparingly run wild in the E. U. S.

34. **adenóphorus,** Rolfe (*R. sagàtus,* Focke). Resembles *R. phœnicolasius:* sts. stout, with short red prickles, the exposed parts dark red, densely covered, as are the sepals and petioles, with purple stalked glands: lvs. ternate or the upper ones simple, the lfts. unequal (rarely 5), the terminal largest and cordate-ovate, the lateral subsessile, all dull green above, hairy on both sides: fls. 6–10, in short terminal clusters, rose-colored, the broadly clawed petals about ¼in. long: fr. about ½in. across, edible, the drupelets red with black tips. China.—The erect red sts. are ornamental in winter and the foliage is ornamental in summer.

35. **ellípticus,** Smith (*R. flàvus,* Hamilt. *R. Gowreephûl,* Roxbg.). Fig. 3493. Tall and erect or nearly so (6–10 ft.), the canes stout and densely beset with straight red-brown or crimson hairs and bearing a few stout, short, nearly straight prickles: lfts. 3, the terminal one much the largest, ovate to orbicular-ovate, not lobed, evenly doubly serrate, thickish, soft pubescent and strongly veined and prickly on the midrib beneath: fls. white, ½in. or less across, in small, many-fld. clusters: berry the size of a common raspberry, yellow, of good quality. Himalayas.—Grown in S. Fla., where it is said to be the only raspberry that perfects its fr. Advertised in Calif. as Golden Evergreen raspberry, and recommended for pergolas and covering sheds. Naturalized in Jamaica.

3492. Rubus phœnicolasius (×½). No. 33.



3493. Rubus ellipticus. A yellow-fruited species from the Himalayas (×⅓). No. 35.

CC. *Plant not red-hairy all over.*

D. *Fr. red or reddish at maturity (not described in Nos 39, 42), sometimes golden (running into yellow and white forms).*

E. *Infl. usually 1- to 6-fld.*

36. **maciléntus,** Camb. Shrub, to 5 ft., the branches bearing strong straight or hooked prickles, the plant glandless and nearly glabrous: lvs. glabrous, with many hooked prickles, the lfts. 3, of which the terminal one is 2 in. or less long and ovate-oblong, the lateral ones small, all doubly toothed: fls. white, usually 3 together on end of short lateral growths: fr. orange, yellow, or red, glabrous, inclosed in the calyx. Himalayan region.

37. **lasiostỳlus,** Focke. A species apparently of variable forms, having bluish white bristly strong arching sts.: lvs. pinnate, small, silvery white beneath, the lfts. 3–5 and coarsely unequally double-serrate and sometimes 3-lobed: fls. magenta-red, of good size, the petals erect and clawed: fr. rose-color but woolly, sweet but said to be useless for eating. China. G.C. III. 51:167. G. 28:631.

38. **biflòrus,** Hamilt. Strong shrub prized in cult. for its glaucous-white canes: reaches 8–10 ft., with arching canes that bear stout, recurved prickles: lfts. 3–5, ovate or oval, incise-serrate, whitish beneath: fls. large and white, 1–3 on drooping pedicels: berry golden yellow or amber-colored, size of the common raspberry, the calyx at first erect, but finally spreading. Temp. Himalaya. B.M. 4678. R.H. 1855:5. Gn. 54, p. 456. Var. **quinqueflòrus,** Focke. A striking plant with sts. reaching 12 ft. high and 4–5 in. circum. at base, covered with a waxy white bloom and therefore very showy, the spines stiff and ½in. long: pinnate lvs. about 1 ft. long, the lfts. about 5 and white beneath: panicles terminal and axillary and about 5-fld., the fls. white and ¾in. across: fr. golden yellow, good. W. China. Gn. 76, p. 624.—A promising fr.-bearing as well as ornamental plant.

39. **Wilsonii,** Duthie. Scandent shrub with terete very spiny brown-purple glaucescent sts., the branches quadrangular and red-purple and more or less winged between the nodes: lvs. pinnate, of 3–5 ovate more or less cordate strongly double serrate lfts. which are glabrous and deep green above and paler beneath and sparsely prickly on the ribs underneath: fls. purple, in axillary and terminal few-fld. fascicles (terminal clusters 4–5-fld., axillary 2–3-fld.), the petals about ⅓in. broad and long. Cent. China.

EE. *Infl. many-fld., mostly clustered, dense or aggregated.*

40. **innominàtus,** S. Moore. Raspberry-like in appearance, with strong upright very soft-pubescent and sparingly prickly sts. 6–8 ft. high: lvs. pinnate,

large (often 9 in. long), dark green, grayish white beneath and thickly covered with glands, with 3 or 5 (usually 3) ovate lfts., the terminal one much larger than the others and often 3-lobed: fls. small, pink, in panicles 18 in. long in Sept.: fr. orange-red, edible. Cent. and W. China. G.C. III. 38:291. R.B. 33, p. 360.—**R. Kuntzeànus,** Hemsl., is distinguished by its glandless lvs.; perhaps not specifically separate; the plants in cult. as *R. innominatus* apparently belong to this species.

41. **telédapos,** Focke. Arching or procumbent, with few strong incurved prickles: lvs. ternate or somewhat quinate, opaque above but densely pubescent when young, white-tomentose beneath; lateral lfts. obliquely ovate-lanceolate, acute, coarsely serrate; terminal lft. ovate or ovate-lanceolate, acuminate, sometimes obscurely lobed, coarsely incised-serrate above: fls. many, in a leafless terminal raceme or in few-fld. axillary clusters, rose-colored or purple: fr. red. W. China.

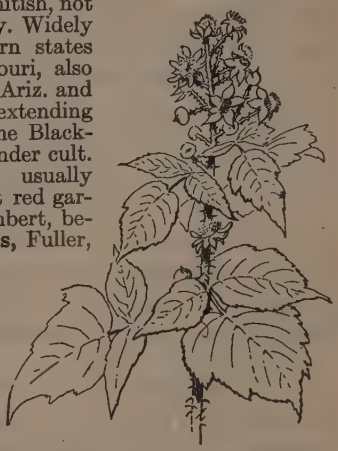
42. **mesogæus,** Focke. Sts. weak or scandent, densely tomentose-pubescent, with small weak prickles: lvs. ternate, slender-petioled; lfts. rhomboid-elliptic or angled-ovate or oblique-ovate, all unequally coarsely serrate, the terminal stalked, broad-ovate, sometimes lobed-dentate: fls. several to many, small, white or rose-colored, the petals obovate and clawed: fr. small, red(?). China.

43. **idæus,** Linn. EUROPEAN RASPBERRY. An erect, mostly stiff grower, prop. by suckers, the canes light-colored and bearing nearly straight slender prickles: lfts. ovate, white beneath, irregularly toothed and notched, usually somewhat plicate or wrinkled: fl.-clusters mostly long and interrupted, most of the peduncles dividing into 2 or 3 pedicels, the pedicels, as also the flowering shoots, petioles, and midribs, finely pubescent, but not glandular, and sparsely furnished with firm recurved prickles: fls. small, white; calyx pubescent: fr. oblong or conical, dark red, yellow or whitish, produced more or less continuously throughout the season. Eu. and Asia.—Named for Mt. Ida, in Greece. Early intro. into this country, but now nearly driven from cult. by the hardier native species. The Antwerps, Fontenay, and Fastolf belong here. *Rubus idæus* is not known to be native to N. Amer., but it is said to be sparingly escaped from cult.

44. **strigòsus,** Michx. (*R. idæus,* Linn., var. *strigòsus,* Maxim. *R. idæus,* subsp. *strigòsus,* Focke). RED RASPBERRY. Fig. 3355, p. 2913. Much like the last, but distinguished by a more slender and open habit,

3494. The Caroline raspberry, a form of Rubus neglectus (×⅓). No. 45.

stiff prickles on the bearing canes which are brown and somewhat glaucous, thinner leaves, and gland-tipped hairs or bristles upon the flowering shoots, petioles, and calyx, the latter less pubescent or hirsute: fl.-clusters more open or scattered: fr. bright light red, or rarely yellow or whitish, not produced continuously. Widely spread in the northern states as far west as Missouri, also in the mountains to Ariz. and northward to Alaska, extending farther north than the Black-cap; also in Asia.—Under cult. the glandular hairs usually disappear. The light red garden berries, like Cuthbert, belong here. Var. **álbus,** Fuller, has amber-white frs. This plant belongs to a variable group, and other species have been separated from it, as: *R. caroliniànus,* Rydb., from N. C., with young sts. puberulent and densely retrorsely glandular-hispid; *R. Egglestonii,* Blanch. (*R. idæus* var. *anómalus,* Fern.), from Vt., perhaps an aberrant form, with lvs. of floral branches mostly simple and reniform and somewhat rounded-3-lobed; and others.



3495. Rubus occidentalis. The original of the cultivated black raspberries (×⅓). No. 46.

45. **negléctus,** Peck. PURPLE-CANE RASPBERRIES. Fig. 3494. A large and variable race of hybrids between *R. strigosus* and *R. occidentalis* occurs both naturally (*Rubus neglectus,* Peck, 22d Rep. Reg. N. Y. State Univ. 53, 1869) and in the garden (Bailey, Amer. Gard. 11:721, 1890). These plants prop. either by "tips" or suckers, usually by the latter. The fl.-clusters are open and straggling, and the fr. ranges in color from yellow to purple. As a rule, the fr. is aggregated at the end of the cluster, but is scattering below. The Purple-Cane type of raspberry belongs here. Prominent varieties are Shaffer, Philadelphia (now nearly out of cult.), Gladstone, and probably Caroline.

DD. *Fr. black at maturity (yellow-fruited forms are known).*

46. **occidentàlis,** Linn. COMMON BLACKCAP. Figs. 3495, 3496. Strong, erect bush, the canes finally recurving and rooting at the tips, furnished with straight spines, glaucous, not bristly; lfts. broadly ovate, dull green above and white beneath, finely and sharply serrate and notched, the petioles usually bearing short prickles: fls. in small, dense, prickly clusters with sometimes a few scattering pedicels, the petals shorter than the long-pointed whitish woolly sepals: fr. rather small, hemispherical, firm or even hard, black or occasionally amber-white, dry and sweet. Plentiful in fields and clearings in the northeastern states and Canada to Ore. and Brit. Col. and southward to Ga. in the mountains, and to Mo.—In cult. known in many forms, as Ohio, Gregg, etc. Var. **pállidus,** Bailey, has amber-yellow fr.; sometimes found in the wild.

47. **leucodérmis,** Douglas (*R. occidentàlis* var. *leucodérmis,* Card). Branches often yellow-tinged: lfts. more coarsely dentate-serrate, sometimes nearly incise-serrate, more gradually acuminate, yellowish green above, the prickles strong and more hooked and those of the infl. flattened laterally: fr. reddish black or black. Rocky Mts. and west to the Coast Range.

AAA. *Lvs. long-pinnate, usually with 3 or more pairs of narrow lfts.*

48. **rosæfòlius,** Smith (*R. floribúndus* and *R. sinénsis,* Hort. *R. rosæflòrus,* Roxbg.). Erect and tall-growing,

evergreen in warm countries, glabrous or somewhat pubescent-hirsute: lvs. odd-pinnate, the lateral lfts. 2–7 pairs, all the lfts. ovate-lanceolate or lance-oblong, acuminate, strongly many-veined and very sharp-serrate, more or less silky-hairy beneath: fls. solitary or in few-fld. clusters, white, 1½–2 in. across, showy: fr.

3496. Gregg raspberry, a cultivated form of Rubus occidentalis (×¼). No. 46.

erect, bright red, long thimble-shaped, usually about 1–1½ in. high, very showy, edible but insipid. Widely distributed in tropical countries, but native to the Himalayan region and eastward to China and Japan; naturalized in W. Indies. B.M. 6970. F.S. 17:1714. A.G. 20:82, 87. Var. **coronàrius,** Sims (*R. grandiflòrus,* Hort.), is a double form, sometimes cult. as the "Brier Rose" and "Bridal Rose" (B.M. 1783. G.C. II. 11:77. G.Z. 26, p. 266). The double-fld. form is often grown under glass and in pots.

49. **illecebròsus,** Focke (*R. sorbifòlius,* Hort., not Maxim.). Strawberry-Raspberry, Figs. 3497, 3498, from Japan, is a dwarf glabrous but prickly undershrub with pretty pinnate foliage, and white fls. 1¾ in. across, and scarlet fr. Gn. 64, p. 412. A.G. 24:603. A beautiful plant and worthy of general cult. In the N. it usually kills to the ground each winter, but it throws up shoots 2–4 ft., and these bloom from summer until frost, usually ripening fr. at the same time. The fr. has some value for eating, but it is probable that it will never be greatly developed in this direction. *R. illecebrosus* is suckering: sts. angular, glabrous, prickly: lfts. 5–7, oblong-lanceolate, acuminate, duplicate serrate, pilose on the veins beneath, otherwise nearly glabrous: fls. terminal and axillary, solitary or few, bracted. How much of the cult. material belongs to this species and to No. 48 is to be determined.

50. **coreànus,** Miq. Of upright or erect growth, with straight prickles on the sts. and hooked prickles on the petioles, self-supporting, 6–7 ft. or more high, the sts. hoary, bluish white and the young growths dark brown: lvs. pinnate, 7–9 in. long, usually of 7 or 9 ovate serrate pointed light green lfts.: fls. rose or purple, in large terminal panicles: fr. said to be of no value. China, Korea. G.C. III. 51:149.

51. **amábilis,** Focke. Shrub, 6 ft., slightly prickly or unarmed above: lvs. pinnate, with about 9 ovate or ovate-lanceolate, deeply double-serrate lfts. 2 in. or less long, the petiole and rachis weak-prickly, the stipules small and linear: fls. solitary, terminal, large (about 2 in. across), white: fr. large and red, of good flavor. W. China.

52. **flosculòsus,** Focke. Erect, about 7 ft., the dark brown sts. bearing stiff prickles: lvs. pinnate, silvery white beneath, with 5–7 lfts. which are distant, lanceolate or narrowly rhomb-lanceolate, serrate, white-tomentose beneath: fls. about 12, small, pale purple, in a panicle, appearing in Sept.: fr. small (size of a pea), dark red becoming black. Cent. and W. China, 4,000–6,000 ft.

53. **thibetànus,** Franch. (*R. Veìtchii,* Rolfe). A curious deciduous rubus, said by Focke to represent perhaps the type of a well-marked section in the genus: shrub with terete prickly branches and graceful fern-like foliage: sts. at first erect, but arching with age, blue-white: lvs. 6–9 in. long, pinnate, with 5–11 elliptic or ovate coarsely toothed lfts., puberulous or silky-hairy above and white beneath, the terminal lft. ovate-lanceolate or rhomboid and 2–3 in. long and sometimes almost pinnatifid: fls. rose-purple, in terminal few-fld. prickly and pubescent panicles, the orbicular-obovate petals small: fr. globose, red or blue-black, of moderate size. W. China. G.C. III. 51:149.

54. **nìveus,** Thunb. Very strong-growing, the sts. reaching 12 ft. and 3 in. circum. with many stiff brown hairs and small spines, arching at the ends: lvs. pinnate, with 3–11 lfts. variable in shape but mostly rhomb-oblong or ovate-oblong, coarsely serrate, whitish-tomentose beneath, the lateral ones scarcely stalked: fls. small, white, many in terminal and axillary panicles: fr. dull black, of medium size. Cent. and W. China, 3,000–8,000 ft. altitude.

55. **Giraldiànus,** Focke. Said to be an elegant bush reaching 8–9 ft. in height, the sts. white, branching and gracefully curving above, terete, glabrous, prickly: lfts. usually 7, the terminal ovate-lanceolate, the lateral oblong-lanceolate, unequally coarsely serrate, glabrous above, tomentose beneath: fls. in terminal panicles, 4–5 in. long, small, white: fr. black. N. and Cent. China. Gn. 76, p. 624. G.C. III. 51:147 (as an unnamed species).

Section VII. Eubatus. Blackberries and Dewberries.

A. *Blackberries: plant usually erect or essentially so (strong canes often recurving and very long ones often repent).*

B. *Species exotic, with mostly perennial canes, and fls. usually borne on the ends of the main shoots.*

56. **thyrsánthus,** Focke. A vigorous species, with suberect or decumbent canes which are prostrate when very long, the strong prolonged sts. angled and

3497. Rubus illecebrosus. One of the best flowering rubuses. (No. 49.)

grooved, thorny with flattened declined or curved prickles, mostly thinly hairy or pubescent: petioles and midribs recurved prickly; lfts. 3 or 5, thick, green above and white-tomentose beneath, round-elliptic or round-ovate, the terminal one broad-elliptic or ovate, abruptly pointed, sharply and mostly doubly serrate-dentate: infl. thyrsoid-paniculate, narrow, short or elongated, sometimes compound, densely pubescent or tomentose, leafy; fls. about medium size, white, the small reflexed sepals white-tomentose: fr. black.—Germany, and probably scattered by cult., regarded by Focke as one form of the collective species *R. thyrsoideus*, Wimm. Inserted here because the plant grown in this country as the Himalaya berry (p. 1492) is perhaps referable to it.

57. **Linkiànus,** Ser. St. angled with many very strong and sharp hooked prickles and mostly finely pubescent: petioles and midribs strongly prickly; lfts. 3–5, oval or elliptic and acute, strongly and mostly doubly toothed, green and nearly or quite glabrous above but white-tomentose beneath: infl. short-paniculate, beset with strong prickles and often more or less leafy, pubescent or tomentose: fls. mostly double, white, the petals obovate and about ⅓–½in. long: fr. black.—Species founded on garden specimens, the native country being unknown. It is said to be sometimes escaped from cult. and occurs now and then on ballast. A similar plant (not double-fid.) occurs under apparently feral conditions from Md. to Fla., and from this race the Tree blackberry or Topsy, a very thorny variety intro. some years ago as a fr.-plant, seems to have come. This American plant has been confused with *R. cuneifolius*, but differs in its very different foliage. This group is much in need of careful study; Focke regards it as one of the forms of *R. thyrsanthus*. The plant sometimes grown as *R. fruticosus flore alboplena* and *R. spectabilis*, Hort. (not Pursh), probably belongs here or with the following.

58. **ulmifòlius,** Schott (*R. fruticòsus flòreròseoplèna*, Hort. *R. bellidiflòrus*, C. Koch). Sts. or canes curving-prostrate or scandent; prickles stout, compressed, dilated at base, straight or on the branches deflexed or falcate: lvs. of 3 or 5 lfts., the petiole armed, stipules linear; lfts. coriaceous, small, unequally sharply serrate, glabrous and somewhat rugose above, tomentose beneath, the terminal one obovate or cuneate-obovate to nearly orbicular: infl. elongated, leafy at base, tomentose and prickly; fls. of medium size, with reflexed unarmed tomentose sepals and red broad-obovate or suborbicular petals, sometimes double: fr. black. Eu.; sometimes grown for its evergreen foliage and in the form with double red or pink fls.

3498. Rubus illecebrosus. Sometimes known as strawberry-raspberry. (×½)

3499. Rubus laciniatus (×⅓). No. 59.

59. **laciniàtus,** Willd. (*R. fruticòsus* var. *laciniàtus*, Hort.). Cut-leaved or Evergreen Blackberry. Fig. 3499. A tall, straggling bush with permanent or perennial canes in mild climates, and lvs. more or less evergreen, the sts. provided with recurved prickles: lfts. 3, broadly ovate in general outline, cut into several or many oblong or almost linear sharply toothed divisions, the ribs prickly below and the petioles strongly so: fls. in terminal panicles, white or blush, the calyx and pedicels pubescent or even tomentose: fr. usually thimble-shaped, late, black, often excellent. Gn. 21, p. 57; 45, p. 78. G.M. 49:765.—This blackberry is probably native to Eu., where it has been long known in gardens. It is apparently only a cut-lvd. form of the European *R. vulgaris*, Weihe & Nees. It is now widely scattered, and seems to thrive particularly well in Hawaii and other Pacific islands and on the Pacific slope. By some it is supposed to be native to the South Sea Isls. (see Bull. 64, Utah Exp. Sta.). It is probable that the plant has been intro. into the W. from those sources, but such fact does not prove its original nativity. It has aroused considerable attention in Ore. and other parts of the W., and has been known as the Oregon Everbearing blackberry. In mild climates the lower parts of the canes often live from year to year until they become as thick as one's wrist; and in such climates the lvs. persist for the greater part of the winter. The plant has long been grown for ornament in the eastern states, but it has not attracted attention as a fr.-plant in this region. The fruits are of fair size and quality, and ripen from midsummer or late summer to Oct. The plant is a good ornamental subject, although it is likely to cause trouble by sprouting at the root.

BB. *Species-group of native American origin, with essentially biennial canes: fl.-clusters from lateral shoots as well as terminal.*

60. **Cultivated American blackberry.** A large group of confused or at least undetermined origin, developed within 50 to 75 years from native American species: mostly erect and thorny plants, the canes commonly tall and more or less recurving at the ends: lfts. 3–5, from ovate-acuminate to rarely nearly

broad-lanceolate, usually pubescent and hairy on the ribs beneath: infl. on elongated raceme-like cluster of which the center or terminal fl. is commonly the oldest (the long-cluster blackberries), or nearly as broad as long, due both to shorter axis and longer lower pedicels (short-cluster blackberries), sometimes with small lvs. intermixed (leafy-cluster blackberries), the rachis and pedicels usually glandular-pubescent but in some forms

3500. Rubus allegheniensis (×⅓). No. 60.

nearly or quite glabrous: fr. various, from long and thimble-shaped to ovoid or nearly globular.—The more or less well-recognized wild native species-types, variously defined and re-defined, from which some or all of the prevailing pomological blackberries are probably derived, are as follows: **R. argûtus,** Link, an erect or stout species with very prickly stiff sts., lvs. relatively small or medium-sized with short-pointed lfts. and thorny stalks and ribs, mostly not glandular short infl., a prevailing group widely distributed from Canada to N. C. and Iowa; with this group are probably to be associated *R. annicolus, R. Andrewsianus, R. floricomus,* Blanchard, and perhaps *R. pergratus* and *R. orarius,* Blanchard.—**R. flóridus,** Tratt., a tall species with branches often decumbent or strongly recurving and stout curved prickles: lfts. mostly narrow and acuminate, somewhat pubescent beneath: infl. loose and leafy, with few fls.: fr. elongated, the drupelets small. Va., south and west. With this, *R. betulifolius,* Small, and *R. lucidus,* Rydb., are probably to be associated.—**R. frondôsus,** Bigel., of medium height, mostly erect but sometimes recurving, the prickles straight only slightly curved: lfts. broad, becoming glabrate above, velvety-pubescent beneath: infl. short, villous, with a few simple lvs. or bracts. Canada to Va. and Kans. To be associated with this group are *R. recurvans, R. arundelanus, R. philadelphicus, R. Rossbergianus,* Blanchard. *R. Brainerdii,* Rydb.—**R. allegheniénsis,** Porter (Fig. 3500; also Fig. 578, Vol. I). Of medium height, erect but more or less recurving, the mostly stout prickles moderately curved: lfts. ovate, often cordate, glandular-pubescent beneath: infl. mostly elongated and not leafy, glandular-hairy. Canada to N. C. and Ill. With this group are to be associated *R. nigrobaccus,* Bailey, *R. sativus,* Brainerd, *R. glandicaulis,* Blanchard.

The wild thornless blackberry, *R. canadensis,* Linn. (*R. Millspaughii,* Brit.), is a tall mostly weak-caned entirely thornless species apparently not represented in domestication, the frequent so-called thornless forms of cult. blackberries being apparently unarmed offshoots of normally thorny kinds; this readily distinguished species, with narrow thin mostly glabrous lfts., is native in Canada and the northern states and in the higher lands to N. C.; here are to be associated *R. Randii,* Rydb., and perhaps *R. elegantulus* and *R. amicalis,* Blanchard.

The sand blackberry, *R. cuneifolius,* Pursh, growing in dry fields from Conn. to Fla. and La., appears not to be in cult. or to have contributed to the admixture of the garden blackberries. (Fig. 581, Vol. I.) It is a stiff and thorny plant, usually not over 3–4 ft. tall, the prickles many, mostly hooked, and very strong, the young growths white-tomentose: lfts. on bearing canes mostly small and thick, wedge-oblong to wedge-obovate, obtuse or nearly so, densely white-tomentose beneath, the margins sharp-toothed: fl.-clusters 4–10-fld., short, more or less leafy and thorny, the fl.-buds globular and pubescent: fr. medium in size, firm, often sweet and good. See discussion under *R. Linkianus,* No. 57.

AA. *Dewberries: plant trailing or strongly decumbent (often trained to stakes or on trellises under cult.).*

B. *The pomological dewberries of E. American origin.*

61. **Cultivated American dewberry.** A variable group of American origin, from the native species: trailing or prostrate plants, the weak slender canes lying on the ground or sometimes making low mounds, mostly prickly or thorny: lfts. usually 3: infl. short and mostly interrupted or leafy, or the fls. axillary, pubescent or glabrous: fr. blackberry-like.—The native sources of the dewberries are to be sought in the following more or less marked species-segregations; **R. procúmbens,** Muhl. (*R. villòsus,* Ait., not Thunb.) (Figs. 3501, 3502), of the northeastern states and south to Va., is the prevailing dewberry of open fields away from the Coastal Plain, with canes usually several feet long and usually bearing stout recurved prickles: lfts. usually narrowed at the base, nearly or quite glabrous: fls. in the upper axils. Var. *roribaccus* (*R. villosus* var. *roribaccus,* Bailey) is the Lucretia dewberry type.—**R. invîsus,** Brit. (Figs. 3503, 3504; also Fig. 1250, Vol. II). Probably has the range of *R. procumbens:* canes strong and terete, somewhat ascending and often making mounds or piles of canes and herbage, not very prickly: lfts. large, those on the sterile shoots with large simple serratures: infl. dichotomous. *R. geophi-*

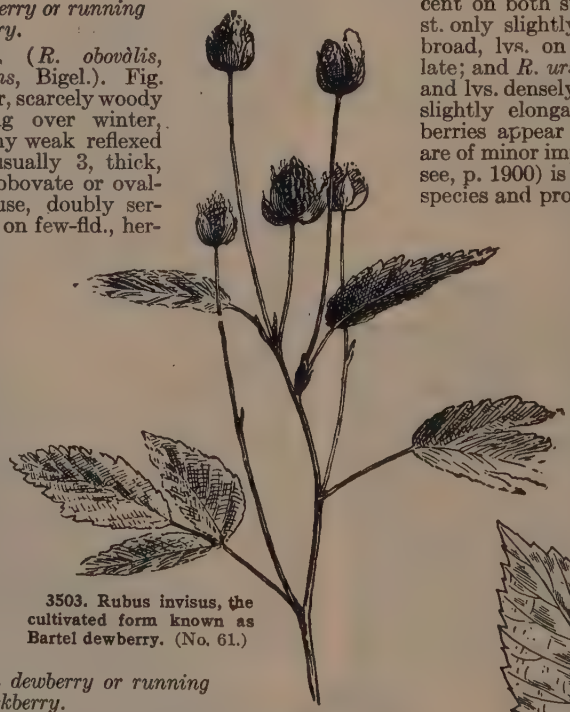
3501. Rubus procumbens, a common northern wild dewberry (×⅓). No. 61.

3502. Rubus procumbens, fruiting branch (×½). No. 61.

lus, Blanchard, is to be placed in this group.—**R. Baileyànus,** Brit. (*R. villosus* var. *humifusus*, Torr. & Gray). More slender, little prickly: lfts. mostly broad at base, pubescent beneath: lvs. or bracts in the infl. simple. Northeastern states. *R. arenicolus*, Blanchard, is probably to be associated with this.—**R. Énslenii,** Tratt, Nantucket and L. I. southward, on the Coastal Plain and perhaps westward, is a soft-caned weak plant with small loose black fr. that is probably little if at all involved in the origin of the horticultural dewberries.

BB. *The swamp dewberry or running blackberry.*

62. **híspidus,** Linn. (*R. obovàlis*, Michx. *R. sempérvirens*, Bigel.). Fig. 3505. Sts. very slender, scarcely woody but usually persisting over winter, creeping, bearing many weak reflexed small bristles: lfts. usually 3, thick, shining above, wedge-obovate or oval-obovate, usually obtuse, doubly serrate: fls. small, white, on few-fld., herbaceous nearly or quite leafless peduncles arising from the creeping canes: fr. small and of few drupelets, red to red-black, sour. Swamps or low sandy soils, Nova Scotia to Ga. and Kans.—Of no value for fr., but sometimes offered by dealers for covering the ground in moist places. The lvs. usually persist through the winter, and in sunny places they assume a fine bronzy hue.



3503. Rubus invisus, the cultivated form known as Bartel dewberry. (No. 61.)

BBB. *The southern dewberry or running blackberry.*

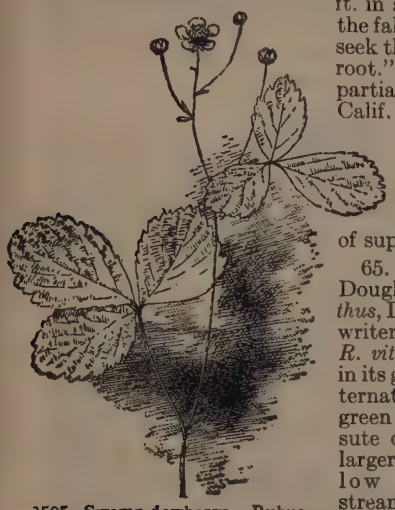
63. **triviàlis,** Michx. Southern Dewberry. A variable and perplexing species, the difficulties being increased by the fact that the same plant may bear 3 kinds of lvs.: the large, broad blackberry-like lvs. on the young verdurous sterile shoots; the smaller lvs. on the canes that are to bear fr. and which often persist over winter and remain at flowering-time; the small lvs. that appear with or somewhat before the fls. It is seldom that the lvs. of sterile and flowering shoots of the same plant are preserved in herbaria. Canes very long, usually wholly prostrate (sometimes 10–15 ft.), thickly armed with prickles and sometimes bearing reddish bristles: lfts. usually 3, narrow-ovate to oblong, short-pointed, rather shallowly and sometimes bluntly toothed, the petiole and midribs usually prickly: fls. of medium size, mostly on simple, more or less prickly peduncles: fr. usually oblong, sometimes excellent but oftener dry and seedy. From Va. to Fla. and Texas, and in cult. in two or three forms for its fr.—This is the common wild dewberry or running blackberry of the southern states, often a serious pest in old fields, ranging as far north as Va. and west to Okla. What are apparently forms of this species have been intro. for cult. for the fr. in the southern states.

BBBB. *The western dewberries, with mostly pubescent lvs., and fls. often imperfect: species variable.*

64. **vitifòlius,** Cham. & Schlecht. (*R. ursìnus*, Cham. & Schlecht. *R. ursìnus* var. *vitifòlius*, Focke). California Dewberry. Widely trailing evergreen, some of the sts. perhaps erect, with slender prickles: lfts. 3 or 5, about 2 in. long, ovate, doubly serrate, some of the upper ones simple or lobed, those on the vigorous shoots usually 3-foliolate: fls. white, the petals of staminate fls. about ½in. long and of the pistillate ⅓in. or less: fr. black, mostly oblong, sweet, the drupelets pubescent. Calif., along streams and moist places.—A perplexing species, by some separated into two: *R. vitifolius*, with lvs. sparingly pubescent on both surfaces and glabrate with age, the st. only slightly hairy, fr. distinctly longer than broad, lvs. on vigorous shoots often unifoliolate; and *R. ursinus*, Cham. & Schlecht., with st. and lvs. densely pubescent beneath and fr. only slightly elongate. Certain horticultural dewberries appear to be of this species, but they are of minor importance. The loganberry (which see, p. 1900) is said to be a hybrid between this species and probably *R. idæus*, but the botanical origin of it is by no means clear. The Phenomenal is said also to have sprung from *R. vitifolius* through hybridization (p. 1900). The Mammoth blackberry of California is said to be a cross between *R. vitifolius* and the wild blackberry of Texas (*R. argutus?*). See Pacific Rural Press, Sept. 4, 1897, for description and portrait. The account says that the Mammoth "produces berries of immense size, supposed to be the largest

3504. Leaf of Rubus invisus, from strong shoot, showing the simple dentation (×½). No. 61.

blackberry ever grown, berries 2⅜ in. in length being frequently found. . . . The canes of the Mammoth are very peculiar, being very large and thickly covered with small, short spines. The canes start early in March, grow thick and stout until about 5 ft. high; they then take on a running habit and grow from 25–30 ft. in a season. Late in the fall the tips or stolons seek the ground and take root." The Mammoth is partially evergreen in Calif. The fr. is said to be more acid than the old Lawton blackberry, but "when perfectly ripe is sweet and of superior flavor."



3505. Swamp dewberry.—Rubus hispidus (×½). No. 62.

65. **macropétalus,** Douglas (*R. myriacánthus,* Douglas). By many writers combined with *R. vitifolius,* but differs in its glabrous fr., always ternate lvs. which are green and sparingly hirsute on both sides, and larger fls.: it grows in low woods and on stream-banks from N. Calif. to Idaho and Brit. Col.: sts. trailing or scandent, slightly hairy or glabrate, with weak prickles, and prickles on the petioles and midveins: terminal lft. broad-ovate, subcordate, doubly serrate, often somewhat lobed, acute or acuminate; lateral lfts. ovate: infl. slightly glandular, weak-prickly; fls. white; petals of staminate fls. about ½in. long and those of the pistillate somewhat shorter: fr. half-globular or slightly elongate, black, sweet, about ½in. long.

BBBBB. *The exotic dewberry, with long prickly glaucous canes and large very sharp-toothed lfts.*

66. **dumetòrum,** Weihe. Fig. 3506. Canes long and slender, terete, often 10–25 ft. long, trailing or half-prostrate, glaucous, thickly beset with rather small somewhat curved spines: lfts. usually 3, mostly broad-ovate pointed to acuminate, irregularly sharp-toothed, becoming bronzy and brown in autumn: fls. small, white, the calyx white-tomentose, on short pedicels in a cluster terminating leafy growths of the season: fr. of a few large black drupelets. Eu.—Intro. for the covering of banks and stony places, for which it is highly recommended. Its autumn color is attractive. Hardy in New England. L. H. B.

RUDBÉCKIA (after the two Professors Rudbeck, father and son). *Compósitæ.* Cone-Flower. Very attractive summer-blooming perennials or biennials, usually with yellow flowers.

Leaves usually alternate, the blades undivided or in some species much cut, as in the common Golden Glow: fls. both tubular and ray-like, the former usually purplish, the latter always yellow; involucre hemispheric, its bracts imbricated in 2–4 series; receptacle conic or very rarely convex, with chaffy concave scales subtending the disk-fls.; disk-fls. perfect, fertile, their corollas 5-lobed: achenes 4-angled, obtuse or truncate at the apex; pappus none or of 2–4 short teeth.—There are about 31 species, not counting Echinacea, all of N. Amer. Of these scarcely a dozen are of horticultural importance. Under Rudbeckia are often included in nursery catalogues certain plants here referred to Echinacea and Lepachys. These three genera form an interesting floricultural group. Rudbeckia and Lepachys are typically yellow-fld. genera, while Echinacea is predominately rose-purple-fld. The chaff of the receptacle is usually persistent in Rudbeckia and deciduous in Lepachys. Among the hardy herbaceous species, there are several with striking habit and distinct foliage. There is a wide range of color in the rays of wild plants and many new races are yet to be perpetuated. Some of these with variations in the shape, color, length, color of disk-fls., and so on may serve as the basis of many fine forms. The season of bloom could doubtless be extended. The only full double form, apparently, is the Golden Glow, one of the best perennials of recent intro. Its origin is uncertain, but it appears to be a form of *R. laciniata.* About 1894 John Lewis Childs found it among some plants sent by correspondents. See Gng. 6:370. For structure of the Rudbeckia inflorescence or head, see Vol. III, Fig. 1535.

The cone-flowers are of easy cultivation in almost any soil and situation, from a semi-shady position to one in full sun. Most of the species are found inhabiting moist locations, but thrive well in the garden under the ordinary methods of cultivation, although *R. laciniata* and its double form, Golden Glow, do much better if abundantly supplied with moisture. *R. hirta,* the black-eyed Susan,—sometimes called by the children out West "nigger-heads,"—will thrive in the driest hottest situation, where many others would fail. The best known as a garden plant, and probably the showiest, is Golden Glow. If cut back severely when through blooming and well watered, it often produces a second crop of flowers. Autumn Glory will be well liked when better known. It is fine for massing and has a much longer blooming period than Golden Glow, commencing earlier and continuing until frost. It resembles *R. nitida,* an improved form of which, known as Autumn Sun, with bright primrose-yellow flowers, is a splendid acquisition. It grows 5 to 6 feet high, blooming from August to October. *R. triloba* is one of the very best, and, while a biennial, perpetuates itself through self-sown plants. It forms a dense twiggy bush somewhat over 3 feet high and nearly as broad if kept moderately well watered, and much smaller if in a dry situation. These plants may be used with effect as a border to a large bed of hybrid delphiniums, as the latter will tower above them and bloom in their young state. By the time the delphiniums are cut down for their second flowering, the rudbeckias hide their untidiness and are in their prime. The flowers are somewhat like those of the ordinary field black-eyed Susan, but smaller, and much more numerous. While doing best in full sun, they also do remark-

506. Rubus dumetorum, an Old-World dewberry (×⅓). No. 66.

ably well in semi-shade, as under overhanging shrubs or in shady corners such as the north side of a house would afford. They like a good open soil. When grown in the open with one stake to the center or main stem, and a string run loosely around the whole plant—being, in fact, a string hoop—catching the larger outer branches to prevent breakage by the wind at the connection with the main stem, they make a very handsome compact plant. If well soaked at the roots, they may be taken up when in full bloom, and potted in a 10-inch pot, placed in a dark sheltered place over night, and then used for decorative purposes. They remain in good form for a month in a room or on the porch if not in a draft. They may also be taken up carefully and all the soil washed from the roots, and the roots placed in a large vase filled with water, where they present a bouquet arranged as Nature intended. An effective fall-flowering group may be formed by using the lighter-colored flower forms of *Hibiscus syriacus*—such as Totus albus, Lady Stanley, and elegantissima—for a center or background, and interspersing groups of the taller rudbeckias (except Golden Glow, which is too tall and spreading) and boltonias next to them. In front of these place *R. speciosa* and *R. triloba*, with the blue form of *Aconitum Napellus*, and for a border use *R. bicolor* var. *superba*, placed well to the front to be pulled up when its bloom is past. This group will give color from July until frost. The allied *Echinacea purpurea* and *E. angustifolia* are well adapted for grouping in open bays in shrubby borders, as their flowers are extremely durable and seem in harmony with such surroundings. Rudbeckias are easily increased by seeds, cuttings, or division. (W. C. Egan.)

3507. Rudbeckia triloba. (×¼)

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Newmanii, 7.
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vomerensis, 5.

A. *Base of upper lvs. cordate-clasping.*

1. **amplexicaûlis,** Vahl. Annual, 1–2 ft. high: rays ½in. long or more, yellow, often with a brown-purple base; disk brownish, finally somewhat cylindrical. Low grounds, La. and Texas. B.B. 3:418.

AA. *Base of upper lvs. not cordate-clasping.*

B. *Color of disk brown or dark purple: shape of disk never cylindrical.*

C. *Lower lvs. deeply 3-cut.*

D. *Duration biennial: disk black-purple.*

2. **trîloba,** Linn. Fig. 3507. Biennial, 2–5 ft. high, bright green: lvs. thin, usually toothed, the lower ones 3-lobed: rays 8–10, deep yellow, base sometimes orange or brown-purple: chaff awned. Moist soil, N. J. to Mich. S. Ga. to La. and Mo. B.B. 3:415. B.R. 525. G.W. 1, p. 187.—Blooms the first year from seed.

DD. *Duration perennial: disk dull brownish.*

3. **subtomentòsa,** Pursh. Perennial, 2–5 ft. high, ashy gray and densely hairy: lvs. thick: rays 15–20, yellow, sometimes with a darker base: chaff blunt. Prairies, Ill. to Texas. B.B. 3:415.

CC. *Lower lvs. not deeply 3-cut.*

D. *Plants bristly hairy.*

E. *Rays ½–¾in. long.*

4. **bícolor,** Nutt. Annual, 1–2 ft. high: lvs. 1–2 in. long: rays yellow, with a blackish purple base or all yellow. Pine woods or sandy soil, Ark., Texas, and east to Ga. Var. **supérba,** Hort. Haage & Schmidt, has heads 2 in. across: rays yellow above, purplish brown below. Gt. 47, p. 220. S.H. 2, p. 169. J.H. III. 63:247.

EE. *Rays 1–2 in. long.*

5. **hírta,** Linn. Black-eyed Susan. Yellow Daisy. Biennial or annual, 1–3 ft. high, simple or branched, hispid: lvs. 2–5 in. long: rays golden yellow, sometimes orange at base. Dry and open ground; common over wide range and often rather a troublesome weed. B.B. 3:416. Gn. 49:154.—*R. conspícua,* Hort., is probably only a garden form with long narrow orange-yellow ray-florets and a black disk. Var. **vomerénsis,** Hort., differs from the type in having larger fl.-heads with broad ray-fls. which are light canary to golden yellow.

DD. *Plants nearly glabrous.*

E. *Lvs. mostly entire.*

6. **fúlgida,** Ait. Perennial, 1–2 ft. high: lvs. more or less hairy on both sides, the lower ones 3-nerved: rays 12–14, 1 in. long. Dry soil, Pa. to Mo., south to La. and Texas. B.M. 1996. Mn. 6:221. Var. **compácta,**

3508. Rudbeckia laciniata. (× nearly ½)

Hort., is a dwarf compact-growing form. Var. **variábilis,** Hort., is a form growing about 3 ft. high, with numerous rigid sts.: fls.-heads with yellow and brown ray-florets and dark purple disk-florets.

EE. *Lvs. irregularly serrate.*

7. **speciòsa,** Wenderoth. Perennial, 1–3 ft. high: rays 12–20, becoming 1½ in. long. Moist soil, Pa. to Mich., Ark., and Ala. G.C. II. 16:373 (heads 3–4 in. across, rays more than 30, in 2 series). Gn.W. 24:207.

3509. Rudbeckia laciniata, Golden Glow. (×¼)

G. 3:427 (as *R. Newmanii*).—*R. Néwmanii,* Loud., is generally considered a synonym of this species.

BB. *Color of disk greenish or yellowish.*

C. *Lvs. entire or barely dentate.*

D. *Height 2–4 ft.: lvs. bright green.*

8. **nítida,** Nutt. This and the next are southern perennials, with lvs. entire or barely dentate: rays drooping, pure yellow, several or numerous; disk finally columnar, 1–2 in. long. Wet ground, Ga. to Fla. and Texas. Gn. 47:201.

DD. *Height 4–9 ft.: lvs. glaucous.*

9. **máxima,** Nutt. Closely allied to *R. nitida* and differing as indicated in the key. Moist pine woods and plains, Ark., La., Texas. Gn. 47:418. G. 30:281.

CC. *Lvs.* (*upper st.-lvs.*) *3-cleft.*

10. **laciniàta,** Linn. (*R. ámpla,* A. Nels.). Fig. 3508. Perennial, 2–7 ft. high: lower st.-lvs. 3–5-parted, upper ones 3-cleft: rays yellow, few or several, soon drooping; disk cylindric in fr. Moist ground, Canada to Fla., west to Mont. and New Mex. G.F. 2:281 (adapted in Fig. 3508). **Golden Glow** is a full double form, 2½–3½ in. across. Fig. 3509. Gng. 5:5, 117; 6:370. A.F. 12:274, 275. Gn. 50, p. 411; 62, p. 305. G.C. III. 20:339.

CCC. *Lvs., especially the lower ones, sometimes 2-cleft, very rarely entire.*

11. **califórnica,** Gray. A pubescent, rather rough, simple-stemmed perennial, with the dentate lvs. usually 2-lobed at the base: heads solitary, long-peduncled, composed of numerous rays which frequently exceed 2 in. diam., making a showy fl. nearly 5 in. wide. Pacific coast. J.H. III. 42:281.—One of the best moderate-sized rudbeckias.

R. angustifòlia, Linn., is Echinacea angustifolia.—*R. Drúmmondii,* Paxt. (Obeliscaria Drummondii, Maund.). Perennial, herbaceous: sts. slender: lvs. pinnate, the lobes linear-lanceolate, slightly jagged, acute: rays large, oblong, obtuse, reflexed, bright orange, deeply stained with dark brown at their base. N. Amer.(?).—Botanically unknown, probably some species of Lepachys. P.M. 6:51. B. 5:201.—*R. pinnàta,* Vent., is Lepachys pinnata.—*R. purpùrea,* Linn., is Echinacea purpurea.

WILHELM MILLER.
N. TAYLOR.

RÚDGEA (named in honor of Edward Rudge, an English botanist). *Rubiàceæ.* Shrubs or small trees, glabrous or pubescent, suitable for the warmhouse and perhaps hardy in the extreme southern U. S.: lvs. opposite, subsessile or petioled, leathery: fls. medium to rather large, paniculate, sessile or pedicelled, rarely capitate; calyx-tube ovoid or obconical, limb short, 5-rarely 4-cleft or -parted, persistent; corolla smooth or villous, limb 5- rarely 4-lobed, erect or spreading; stamens 5, rarely 4; disk various; ovary 2-celled: fr. small, dry or succulent, with 2 nutlets which are dorsally plano-convex and smooth or sulcate and longitudinally sulcate on their ventral face.—About 115 species, Trop. Amer. *R. leucocéphala,* Schumann (*R. macrophýlla,* Benth. *Psychòtria leucocéphala,* Brongn.). Lvs. large, subsessile, obovate-oblong: fls. cream-colored, sessile, in fascicles densely clustered in globose heads; corolla-segms. obtuse; peduncles short. Brazil. B.M. 5653. F.S. 17:1720, 1721. G.C. II. 12:81. H.U. 6, p. 257. J.F. 3:292, 293.

F. TRACY HUBBARD.

RUE: *Ruta graveolens.* **R. Anemone:** *Syndesmon.* **R., Goat's:** *Galega officinalis.*

RUÉLLIA (after Jean de la Ruelle, a French botanist). Syn. *Stephanophỳsum. Acanthàceæ.* Villous, pubescent or rarely glabrous herbs or shrubs, a few species grown under glass and also outdoors mainly in the South.

Leaves opposite, entire or rarely dentate: fls. shades of blue or purple to violet, white, rose to red and rarely yellow to orange, sessile to long-peduncled, axillary, solitary or fascicled or cymose paniculate; calyx deeply 5-cleft or 5-parted, segms. linear or lanceolate; corolla-tube straight incurved or abruptly inflexed, the limb spreading, the lobes ovate or rounded; stamens 4, didynamous: caps. oblong-linear or clavate.—About 200 species, chiefly Trop. S. Amer., a few in N. Amer. and extra-Trop. S. Amer., some in Trop. and S. Afr., Temp. Asia and in Austral.

A. *Blossoms sessile or nearly so.*

B. *Lvs. green.*

C. *Fls. blue, 1½–2 in. long.*

ciliòsa, Pursh. A hardy perennial herb, about 1½ ft. high, erect or prostrate, hirsute or pubescent: lvs. hairy, ciliate, usually oblong, sessile or short-petioled, 1½–3 in. long: fls. solitary or clustered, axillary, blue, 1½–2 in. long. Aug., Sept. In dry, light soil, N. J., south and west. B.B. 3:203.—Prop. by seeds or division.

Harveyàna, Stapf. Perennial: sts. rather slender, trailing or ascending, 4-angled above: lvs. petioled, green, oblong or elliptic-oblong: fls. produced one at a time in the upper axils, sessile, pale lilac with a white throat and tube; sepals very unequal, 4 linear-subulate, the fifth wide-lanceolate; corolla-lobes elliptic-rounded; ovary glabrous: caps. oblong-lanceolate, not stipitate. Mex. B.M. 8485.

cc. *Fls. rosy, 2–6 in. long.*

macrántha, Mart. It forms a compact, many-stemmed shrub, 1–6 ft. high, with ovate-lanceolate lvs. 4–6 in. long: fls. large, bell-shaped, with tubular base, purplish rose with purple veins, solitary in lf.-axils. Brazil. B.M. 7872. G.C. III. 17:45; 30:467; 43:27. R.H. 1881:410. Gn.W. 5:341; 10:21. Gt. 61, p. 534. G.W. 2, p. 297.—G. W. Oliver says in his "Plant Culture" that *R. macrantha* is of easy cult. and is one of the best greenhouse flowering plants for amateurs. Cuttings rooted in Sept. furnish fair-sized flowering plants in Jan. These, if desired, may be planted out in late spring, when they will have formed large specimens, which may be lifted and potted.

bb. *Lvs. marked with white.*

c. *Fls. white, often veined with lilac.*

Devosiàna, Hort. A low-growing tender Brazilian species, with lanceolate lvs. marked on the upper surface with white along the nerves and having the lower surface entirely purple: fls. rather small, usually white with blue stripe, axillary; corolla-tube suddenly dilated and bent at the middle. B.M. 8406.

3510. Ruellia formosa. (×½)

cc. *Fls. carmine or rose.*

Makoyàna, Hort. A compact bushy plant resembling *R. Devosiana,* Hort., in foliage, but differing in the color of the fls. (bright carmine) and by their somewhat larger size. Brazil. R.B. 21:109. R. H. 1896 : 576.—Prefers shade. It is said that the color of the foliage is better when soot is mixed with the soil.

aa. *Blossoms on long peduncles.*

b. *Fls. blue or purple.*

tuberòsa, Linn. A perennial herb, 2–3 ft. high, with oval or ovate lvs. 2–3 in. long and blue fls. 1½–2 in. long, in terminal, nearly naked panicles: stigmas single: caps. 12–16-seeded. S. W. U. S.; cult. in Fla.

Lorentziàna, Griseb. Glandular herb, little branched, the sts. quadrangular: lvs. decussate-opposite, channeled below, oval, subcordate or attenuate at base, acuminate: infl. terminal in a lax leafy panicle; fls. long-peduncled, usually in 3's, bluish purple; sepals free, linear; corolla funnelform, 5-lobed, rounded, the inferior emarginate; ovary oblong: caps. cylindrical-conical. Uruguay. R.H. 1902:136.

bb. *Fls. red.*

c. *Peduncles much branched.*

amœ̀na, Nees (*Stephanophỳsum longifòlium,* Pohl). A half-hardy perennial, about 1½ ft. high: lvs. oblong-lanceolate or oblong, narrowed at both ends; margins repand-denticulate or simply repand: fls. bright red, in axillary sprays in summer. Brazil. F.M. 1880:419.

cc. *Peduncles but little branched.*

formòsa, Andr. Fig. 3510. A low-growing, tender, herbaceous perennial: lvs. ovate, rounded at the base, hairy on both sides: fls. on straight, axillary peduncles; corolla scarlet, showy, 1½ in. long, the upper 2 lobes joined for half their length. Summer. Brazil. B.M. 1400.—Cult. in Calif.

R. solitària, Vell., is offered in the European trade, but its identity is doubtful, as R. solitaria, Vell., has been referred by some to R. Schnaeriana, Lindau, by others to R. calvescens, Lindau.—*R. vàrians,* Vent., is Dædalacanthus nervosus.

F. W. Barclay.
F. Tracy Hubbard.†

RULÍNGIA (after J. Ph. Ruling, a botanist of Göttingen). *Sterculiàceæ.* Shrubs or subshrubs with stellate tomentum or hairs, useful as greenhouse plants and for the rockery in warm climates, as the southern United States.

Leaves entire, toothed or lobed; stipules narrow and deciduous: fls. mostly white, small, in lf.-opposed or terminal, rarely axillary cymes; calyx 5-lobed; petals 5, broad and concave or convolute at base, with a small, broad, or linear ligula at the top; stamens 5 without anthers, linear-lanceolate and alternate with the petals, 5 perfect and opposite the petals; ovary sessile, 5-celled: fr. tomentose or beset with prickles or soft setæ, loculicidally valvate.—About 20 species, all Australian except one from Madagascar.

a. *Lvs. 1–3 in. long.*

pannòsa, R. Br. Eventually a shrub, several feet high, but flowering freely at a young age: lvs. scabrous-pubescent above, densely velvety hirsute below, on older plants ovate-lanceolate to lanceolate, on young plants broader and often 3–4-lobed: cymes shortly pedunculate; fls. white. B. M. 2191.—The plant offered in Calif. as *Pomaderris apetala* is said to belong here Prized by some for the fleecy coating of its lvs.

aa. *Lvs. usually less than 1 in. long.*

parvifòra, Endl. A low shrub, with branches ½–1½ ft. long, ascending or prostrate: lvs. ovate or ovate-lanceolate, obtuse, deeply crenate, mostly lobed: fls. pinkish, in shortly pedunculate cymes.—Cult. in Calif., where it is spoken of in high terms as a rock-plant on account of its trailing habit and myriads of small pink fls. borne in spring.

F. W. Barclay.
F. Tracy Hubbard.†

RÙMEX (the Latin name, of unknown origin). *Polygonàceæ.* Dock. Sorrel. Herbs, mostly perennial with strong roots, usually weedy, but some of them afford leaves for "greens," and others are useful for bold effects.

Rumex is closely allied to Fagopyrum, the buckwheats, Rheum, the rhubarbs, and Polygonum, the jointweeds. The rumexes are mostly leafy-stemmed plants, with small fls. in panicles, the pedicels usually in whorls and jointed: fls. perfect or imperfect, with 6-parted calyx (no petals), the 3 inner lobes larger and generally one or all of them bearing a grain or tubercle near the center; these more or less enlarged inner calyx-lobes or sepals are called "valves" in fr.; stamens 6; stigmas 3: fr. a 3-sided often margined or winged achene.—Species probably considerably more than 100, in many parts of the world, some of them on dry land and some in swamps; a few species are widespread weeds in temperate climates, being among the commonest of intro. plants about old buildings and in waste places. They have little horticultural value. Prop. readily by seeds. In the larger species the sts. are grooved and hollow. Most of them are erect-growing plants. See *Dock* and *Sorrel.*

a. *Docks: lvs. not hastate: fls. perfect, or at least not truly diœcious (sometimes polygamo-diœcious).*

b. *Wings of calyx bearing one or more tubercles.*

Patiéntia, Linn. Herb Patience. Spinage Dock. Tall strong erect nearly simple perennial, reaching 5 ft.

when in fl., glabrous: root-lvs. (Fig. 1336, Vol. II) elliptic-ovate, tapering both ways, the margins undulate, the blade 8–12 in. long; st.-lvs. ovate-lanceolate, long-acuminate, more or less rounded at the base: infl. long and compound (often 2 ft. long), dense in fr.: wings cordate, about ¼in. across, veiny, entire, one of them bearing a small tubercle near the base. Eu., but naturalized in many places.—An excellent plant for greens, the strong root-lvs. being used in early spring.

crìspus, Linn. Curly Dock. Yellow Dock. Tall, often 3–3½ ft.: lvs. long-lanceolate, wavy-margined, rounded at the base: valves entire, the tubercles usually 3, the infl. not leafy. Naturalized from Eu., and now one of the common docks about yards and in old fields. —Not cult., but the lvs. sometimes used for greens.

obtusifòlius, Linn. Bitter Dock. A common weed: lvs. much broader, very obtuse or even cordate at base, obtuse at apex, not wavy-margined: valves long-toothed, the tubercle usually 1, the infl. somewhat leafy below. Eu.

BB. *Wings of calyx not tubercle-bearing.*

venòsus, Pursh. Perennial, 1½ ft. or less tall, glabrous, branched: lvs. oblong-ovate or ovate-lanceolate, usually tapering at both ends, entire, the stipular sheaths (ochreæ) funnelform and prominent: valves of fr. large and thin, entire, 1 in. or more across, red-veined and showy, the pedicels hanging in fr. Mo., north and west.—Once offered as an ornamental plant because of the very showy wide-winged fruiting calices.

hymenosépalus, Torr. Canaigre. Raiz Colorada. Erect, reaching 3 ft., glabrous, the root of clustered fusiform tubers: lvs. oblong-lanceolate, sometimes 1 ft. long, narrow at either end, short-petioled, entire, gray-green, somewhat mottled beneath: fls. perfect, large, in crowded panicles, green: fruiting calyx-lobes ⅔in. across, brown, entire, veiny, the pedicels drooping. Okla. and Texas to Calif. B.M. 7433.—The plant has some ornamental value, but is of economic importance as a tannin-producing plant, although the supply is insufficient to maintain an industry. The tannin is secured from the dahlia-like roots. For literature on the economic uses of the plant, consult reports of experiment stations in Ariz., Calif., and elsewhere, and Wooton & Standley, Flora of New Mexico (Smithsonian Institution).

occidentàlis, Wats. Stout perennial, reaching 3 ft., glabrous: lvs. lanceolate to ovate-lanceolate, more or less wavy-margined, obtuse or nearly so, the base subcordate, long-stalked: valves of the fr. subtriangular, somewhat toothed, veiny, brown, ⅓in. across. Labrador to Alaska, descending along the Rocky Mts. and reaching Texas and New Mex.—Once intro. as an ornamental subject, because of its profuse and somewhat showy fruiting calices.

Hydrolápathum, Huds. Great Water-Dock of Great Britain and elsewhere in Eu., a stout perennial 4–6 ft. high, with very large lvs., sometimes planted for bold effects along water-courses: lvs. broadly oblong-lanceolate to lanceolate, sometimes 2 ft. long, tapering below but the base often somewhat rounded, acute at apex, the margins crenulate: panicle very large, with rather crowded mostly leafless whorls, the fruiting pedicels jointed near the base and equaling or exceeding the sepals: valves broad, nearly entire, all tubercle-bearing.

AA. *Sorrels: lvs. mostly (at least the radical ones) hastate or sagittate: fls. imperfect, the plants sometimes dicœcious.*

B. *Plant annual.*

ròseus, Linn. One to 2 ft., with spreading and branched sts., glabrous and somewhat glaucous: lvs. small, deltoid-ovate, entire, short-pointed, truncate-cuneate or almost cordate at base: racemes short and leafless or nearly so, the pedicels drooping in fr.: valves cordate-orbicular, ½–¾in. across, thin, rosy-veined, without callosities. Egypt to Persia.—Rarely cult. as an ornamental for its showy fruiting calices.

BB. *Plant perennial (R. Acetosella sometimes annual).*

Acetòsa, Linn. Garden Sorrel. St. strong and erect (3 ft. or more tall in fr.), furrowed, the plant glabrous: root-lvs. thin and light green, oblong and obtuse, with sharp auricles at the base (Fig. 1337, Vol. II), the petioles slender; st.-lvs. relatively narrow, acuminate: infl. large and ample, the larger part of the fls. sterile (plant sometimes dicœcious): valves entire or very nearly so, not over ⅓in. across, cordate-ovate, each with a callosity near the base, the outer small scales reflexed. Eu. and Asia, and naturalized in some places in this country. —Useful for early spring greens, but later in foliage than *R. Patientia.*

Acetosélla, Linn. Common Field or Sheep Sorrel. Common in all old fields, where it is taken to indicate sterile or at least unproductive soil: lvs. oblong, from a hastate-lobed base: fls. reddish, in erect racemes. Eu. —Not cult., but the sour root-lvs. are sometimes used for greens.

scutàtus, Linn. French Sorrel. Lower, with many branching prostrate or ascending sts., glaucous: lvs. somewhat fleshy, the radical ones long-stalked and cordate-ovate-obtuse, the st.-lvs. short-stalked and hastate-fiddleform and acute or sometimes 3-lobed: valves thin, cordate, without callosities. Eu., Asia.—Grown in several varieties in Eu., and sometimes cult. in this country for greens. It is a summer sorrel. L. H. B.

RÚNGIA (named for F. F. Runge). *Acanthàceæ.* Creeping, diffuse or erect herbs, glabrous or villous; warmhouse plants: lvs. entire: spikes cone-like; bracts in 4 ranks (whereof 2 alternate are sterile), much larger than the calyx, broad with prominently scarious margins; calyx 5-parted, segms. acuminate; corolla-tube short, straight, limb 2-lipped, posterior lip entire or 2-toothed, anterior often longer, spreading and 3-cleft; staminodia none; disk annular or short-cup-shaped: caps. ovoid or oblong.—About 30 species in the warmer parts of the Old World. *R. eriostàchya,* Hua. St. pubescent: lvs. ovate-lanceolate, 2–3 in. long: fls. white and yellow in crowded spikes; the bracts and calices covered with long white hairs. Trop. Afr.

RUPÍCOLA (Greek *rock* and *grower,* presumably referring to its place of growth). *Epacridàceæ.* Shrub: lvs. small, short-petioled: fls. solitary in the lf.-axils, borne on bracteate pedicels which are shorter than the fls.; calyx-lobes 5; corolla 5-cleft, with a very short tube and with spreading divisions which cover themselves in the bud in the form of a quincunx; ovary 5-celled, with numerous seeds.—One species, New S. Wales. The genus is closely allied to Epacris. *R. sprengelioìdes,* Maiden. Shrub 2½ ft. high with twiggy branches: lvs. linear-lanceolate ⅔–1 in. long, rigid: fls. solitary, axillary, forming a raceme-like leafy infl. with a barren apex; corolla subrotate, almost ⅓in. across, milky white; segms. ovate. B.M. 8438.

RÚSCUS (an old Latin name). *Liliàceæ.* Butcher's Broom. Erect shrubs with branched partially woody stems, hardy in southern Europe and the southernmost United States.

Leaves minute, bract-like, on lf.-like branches (cladodia) which are alternate, leathery, persistent, and sessile: fls. small, fascicled in the middle of the upper, rarely lower surface of the cladodia, dicœcious: berry globose, pulpy, and indehiscent.—Three to 5 species, Eu., Madeira, and Caucasus. The foliage of this plant (Fig. 3511) is composed of lf.-like branches or cladophylls, as in the florists' smilax. Dried, bleached, and

colored sprays (mostly dyed red) are now much used in florists' decorations.

aculeàtus, Linn. Shrub, 1½–3½ ft. high: phyllodia ovate-lanceolate, ½–1½ in. long, tapering into a spiny point: fls. 1–2, short-pedicelled: berry red, ½in. thick. Spring. Gn. 34, p. 231. R.H. 1984, p. 545.—Cult. in Fla. and S. Calif.

R. andrógynus, Linn.=Semele androgyna, Kunth.—*R. Hypoglóssum,* Linn., has been highly commended in Germany as a decorative subject. This species and *R. Hypophýllum,* Linn., are both natives of S. Eu., where they have been studied by several botanists, some of whom distinguish them by various characters, while others unite them into a single species. J. G. Baker considers R. Hypoglossum a variety of R. Hypophyllum, differing in having the costa under the cluster of fls. in the form of a large leafy bract lacking entirely the texture of the phyllocladium. In B.M. 2049, R. Hypophyllum is shown with minute white fls. and handsome red berries nearly ½in. thick.—*R. racemòsus,* Linn.=Danaë racemosa, Moench.

F. Tracy Hubbard.†

3511. Ruscus aculeatus.

RUSH: *Juncus.* **Flowering R.:** *Butomus.* **R. Lily:** *Sisyrinchium.*

RUSSÈLIA (in honor of Alexander Russell). *Scrophulariàceæ.* Shrubs with angled, usually slender and often pendulous branches, grown in the warmhouse for their showy flowers. Leaves opposite or verticillate, usually small, reduced to scales on the branches: fls. in bracteate dichotomous cymes, either laxly or densely many-fld., sometimes reduced to a single fl., red; calyx deeply 5-cleft or 5-parted, segms. strongly imbricate; corolla-tube cylindrical, limb somewhat 2-lipped, 5-cleft, the lobes all rounded; stamens 4, didynamous: caps. subglobose, septicidally dehiscent, valves 2-cleft.—About 20 species, Mex. and Cent. Amer. A synopsis of Russelia by B. L. Robinson, with a key to the species, will be found in Proc. Amer. Acad. Arts. & Sci., vol. 35, No. 16, March, 1900.

Russelias are of easy cultivation. *R. juncea* and its varieties make excellent basket-plants, being almost continuously in bloom. Propagated by cuttings.

A. *Peduncles 1–3-fld.*

júncea, Zucc. (*R. scopària,* Hort.). Coral Plant. Fig. 3512. A tender shrubby plant, with smooth, somewhat rush-like branches, nodding or pendulous at the top: lvs. linear-lanceolate or ovate, small, becoming minute bracts on the branches: raceme very loose, remotely fld.: peduncles elongated. B.R. 1773. P.M. 4:79. G.W. 5, p. 379. Var. *semperflòrens,* Hort., has been mentioned. Gt. 1:5.

Lemoìnei, Hort. (*R. júncea* var. *Lemoìnei,* Hort.), is a garden hybrid between *R. juncea* and *R. sarmentosa,* said to be more floriferous, especially during the winter, than the parents.

elegantíssima, Hort. (*R. júncea* var. *elegantíssima,* Hort.), is another product of the same cross as the above and said to have similar characters.

AA. *Peduncles many-fld.*

sarmentòsa, Jacq. (*R. multiflòra,* Sims). A tender shrub, becoming 4–6 ft. high: lvs. opposite, ovate, acuminate, serrately crenate: fls. verticillate, many in a terminal raceme, bright red, erect or drooping, about ½in. long. B.M. 1528. P.M. 16:163. R.H. 1852:281. R.B. 25:61.

F. Tracy Hubbard.†

RUSTS. The plant rusts are fungi constituting the large and well-defined order Uredinales, which contains approximately 3,000 species distributed in about forty genera. They are all obligatory parasites, mostly on angiosperms, few on gymnosperms, and a small number on ferns.

Relations between host and parasite.

The mycelium of the rust fungi (see *Fungi*) lives symbiotically within the tissues of the host. It is generally confined to the intercellular spaces, but short branches or haustoria penetrate the cells and absorb nutriment from them. Usually not more than one or two haustoria are found within a single cell and only a small proportion of the host cells are thus invaded, although the mycelium itself is abundant in the intercellular spaces.

The extent to which the mycelium spreads within the tissues of the host and its duration of life vary greatly with different species of rusts. In most of the species which inhabit annual parts of plants, as leaves and stems, the mycelium resulting from individual infections is localized within a more or less restricted area, as in case of hollyhock rust, carnation rust, and wheat rust, and generally persists as long as the infected parts remain alive. That plants thus infected nevertheless become completely covered with rust spots is attributable to the large number of separate infections which occur and not to the spreading of the mycelium through the whole plant. When biennial or perennial parts are locally infected, the mycelium often persists for two years, as in the rust of the red cedar, *Gymnosporangium globosum* and *G. juniperi-virginianæ,* or becomes perennial, as in the rust of juniper, *Gymnosporangium clavariæforme,* and the blister rust on stems of pines, *Peridermium cerebrum.* Many rusts have mycelia which extend throughout the tissues of the host. This type of mycelial distribution is characteristic of the orange rust of the species of brambles, *Gymnoconia interstitialis,* and of a number of rusts infecting herbaceous perennial plants, as the rust of Canada thistle, *Puccinia suaveolens* and the pea rust (*Uromyces pisi*) on the cypress spurge (*Euphorbia Cyparissias*). In such cases the mycelium of the fungus remains dormant in the rhizomes or in the roots and in spring grows out into the developing shoots which are usually characterized by spindling growth with long internodes and small and somewhat deformed leaves. Shoots which are normally trailing or prostrate and branches which are naturally horizontal tend to become erect. This effect is sometimes observed in annual plants also, as in the case of *Euphorbia maculata* infected by *Uromyces euphorbiæ.* Blackberry canes growing out from roots infected by *Gymnoconia,* besides having the characteristic growth described above, are free from thorns.

3512. Russelia juncea. (×⅓)

In spite of the intimate association of rust fungi with their hosts, very little apparent injury results to the

plants during the vegetative growth of the parasites. Deformations of various kinds are common in plants attacked by these fungi. Aside from those described above there is in many cases a marked stimulation to abnormal growth which results in the formation of galls, as the well-known cedar apples, or in enlarged and distorted flowers, fruits, and branches, or in the production of witches' brooms. The greater number of rusts, however, do not cause any abnormal deformation of their hosts, and the presence of the fungus is usually not evident until the time of spore-production, although it may be assumed, and is sometimes apparent, that the plants have been weakened or retarded in growth, particularly when the mycelium is widely dispersed in the tissue. At the time of spore-production, the injury to the host becomes unmistakable. The spores are produced in pustules beneath the epidermis. This is finally ruptured and the spores break forth forming the characteristic orange, brown, or black spots and patches to which these fungi owe their name. The injury is brought about both by the withdrawal of nutriment from the host cells and by the extensive destruction of the epidermis of the host and the resulting loss of water from the tissues beneath. The magnitude of the injury differs with the extent to which the plant is infected. Plants which are severely infected often lose their leaves, which wither and die prematurely. In annual or biennial plants this injury hastens the death of the plants, as in the hollyhock and the cereals, or, as in greenhouse carnations, impairs their vigor to such a degree that the plants are of little commercial value. In perennial plants like asparagus, the yearly injury of the assimilating parts results in the slow weakening of the roots through malnutrition and finally in the death of the plants. Apple trees are frequently defoliated as a result of infection by the cedar rust (Gymnosporangium). In plants grown for crops, whether flowers, fruits, or other parts are sought, these injuries diminish the yield, but in ornamentals the mere presence of the rust pustules over the surface greatly detracts from the appearance of the plants.

Specialization among rust fungi.

Rust fungi do not attack various plants indiscriminately. In general, each morphologically distinguishable species is confined to one or to a relatively small group of closely related host plants. Nevertheless, the degree of adaptation to particular hosts varies much with different species of fungi. Some species are truly plurivorous. A striking example of this habit is furnished by the hollyhock rust (*Puccinia malvacearum*) which inhabits about forty species belonging to many different genera of the subfamily Malveæ, and passes readily from one host to another. Many rusts which are apparently plurivorous have been found on closer investigation to be divisible into a number of so-called biological or physiological races, each of which is restricted to a comparatively small group of host plants. This type is illustrated by the common cereal rust (*Puccinia graminis*). This occurs on all the common cultivated cereals and on about 180 species of wild grasses. The forms on the different hosts are not morphologically distinguishable but culture experiments with this rust on the cereals and the common grasses have shown that it falls into a number of biologic races each of which is more or less restricted to a small group of host plants, and cannot readily be transferred to plants outside of that group. Thus the form on oat infects also orchard grass and a few other grasses, but not wheat, barley, or rye; the form on rye infects also barley and some other grasses, but not wheat; and the form on wheat infects less readily barley, oat, rye, and some other grasses. This type of specialization is very common and occurs in many species which have a wide range of host plants. The separation into physiological races is not always sharp and clear-cut and often a transfer of a race from one host to another can be accomplished by so-called bridging species of host plants, i. e., species which act as a common host to two races of rust. It appears also that the degree of specialization of different forms is not the same in different geographical regions. It is readily seen that the matter of specialization of rusts is one of considerable economic significance. In the case of truly plurivorous species of rusts, many wild plants may be the source of infection for cultivated plants. Thus the hollyhock is easily infected from *Malva rotundifolia* and other wild mallows; but, in the case of species which, like the cereal rust, have become differentiated into a number of physiological races, there is comparatively little danger of infection from wild plants since the rust on each host has become more or less strictly adapted to its particular host. Thus, for example, different members of the pink family are inhabited by the carnation rust (*Uromyces caryophyllinus*) but each genus has its own physiological race which does not infect the members of other genera of the family. The specialization of rusts to particular hosts has also another economic bearing. When a given rust is restricted to one or more species of a genus but does not infect the others, these are said to be immune. Just as there are immune species, there may be immune varieties within a species, as the phrases "disease-resistant cowpeas," or "rust-resistant carnations," indicate. This fact, that the cultivated varieties of a given species show varying degrees of resistance, furnishes the basis for the breeding of immune varieties, which is one of the most promising means of overcoming the danger from attacks of rust.

Remedial measures.

Of the various groups of fungi, the rusts are the most difficult to combat. For most forms, especially those infecting cereals and other agricultural crops, no satisfactory methods of control have been developed since the usual methods of disease-prevention are either unprofitable or not applicable here. Even with horticultural crops, direct remedial measures have proved successful only in few cases, as with the apple rust, which can be successfully controlled by spraying with bordeaux mixture. Various mixtures, such as copper sulfate (one pound to fifteen gallons of water) and potassium sulfide (one ounce to one gallon), have been recommended and tried for carnation rust, but the growers are far from being in accord as to the effectiveness of these remedies. Environmental conditions have much to do with the prevalence of rust. Thus the severity of outbreaks of asparagus rust and probably of other rusts also is dependent on the amount of dew. In greenhouses it has also been found that the environment has much to do with the presence of rust on carnations and chrysanthemums, and that the maintenance of the best cultural conditions is one of the surest means of controlling rust on these plants. This method of control is, however, applicable in the field only in a restricted degree.

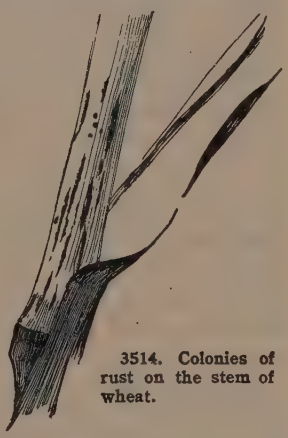
While the methods of direct control of rusts have not on the whole proved very successful, the indirect method by the breeding of resistant varieties seems to offer the most promising solution of the problem. Although the so-called rustproof varieties of plants have not generally proved to be entirely resistant, yet different degrees of resistance have long been noticed by growers, and varieties particularly susceptible to rust have been gradually eliminated. The history of the carnation rust in the United States probably furnishes an illustration of this process. Twenty years ago horticultural literature was replete with discussions of the carnation rust which caused much agitation among growers. At that time much was written of "rustproof" varieties, and mention is frequently made of varieties thrown out on account of rust. At the present time the rust once regarded as the "most dreaded of the carnation diseases" attracts but little attention, and within

the last few years has been scarcely mentioned in florists' journals. That a part of this result at least is due to the gradual elimination of susceptible varieties can scarcely be doubted, but the fact should not be overlooked that the seriousness of the early rust invasion may have been exaggerated, for even then conservative men felt impelled to warn against the agitated state of mind which caused growers to see rust in every discolored leaf. (McBride, Am. Flo. 8 p. 930, 1893; Herr, ibid. p. 980.)

Botanical features.

Botanically the rusts are of great interest because their life-cycle consists typically of two distinct generations. These are technically known as the gametophytic generation and the sporophytic generation, but for simplicity they may be designated respectively as the æcidial stage and the telial stage, terms derived from the names of the principal spore-producing structures which characterize the two phases. Each of these generations may produce one or more spore forms. The life-cycle of a rust is best understood by means of an example. One of the most familiar is the wheat rust.

3513. The cluster-cup stage of the wheat rust fungus growing on barberry leaf.



3514. Colonies of rust on the stem of wheat.

If barberry bushes in the neighborhood of wheat-fields are examined in spring (May and June), there will usually be found on some of the leaves yellowish spots. Within the discolored area, on the under side of the leaf, there are a number of small cup-like openings with fringed margins. (Fig. 3513.) These are termed æcidia and from them yellow æcidiospores, which can be seen scattered like dust around the cups, are discharged. About the same time or a little earlier, flask-like pycnidia break through the epidermis on the upper side of the leaf. These discharge minute spore-like bodies whose function is not known. They do not infect either the wheat or the barberry. The æcidiospores are incapable of reinfecting the barberry. They can infect only the wheat and a few other grasses susceptible to this particular biologic race. On the wheat the germ-tubes of the æcidiospores penetrate the stomata of the leaf and stem and produce local colonies of mycelium which gives rise to uredospores (Fig. 3514). These are one-celled spores which are produced in many generations and which serve to propagate and spread the fungus during the summer. To them the rusty appearance of infected grain-fields is due. They can reinfect only wheat and the other graminaceous hosts of the fungus but not the barberry. Toward autumn the same mycelium which produces uredospores during the summer gives rise to teleutospores. These occur as black streaks and patches on the stems and leaves, upon which they remain during the winter. In spring the teleutospores germinate in place and produce short germ-tubes termed promycelia from which four minute sporidia are abjointed. The sporidia are borne away by the wind and when they alight on the barberry the æcidia are again produced. The sporidia do not reinfect grain.

Puccinia graminis represents the complete life-cycle of a rust of the most complex type. Rusts of this character, which alternate regularly between two hosts, are said to be heterœcious. Those which produce æcidiospores on the same host on which the other spore forms are borne, are said to be autœcious. Not all rusts have the entire complement of spore forms, one or more of which may be dropped from the cycle. Thus, neglecting the pycnospores which, so far as known, have no significance in the life of a rust fungus, the red cedar rust (Gymnosporangium) has æcidiospores on the apple and teleutospores on the red cedar; the hollyhock rust (*P. malvacearum*) has only teleutospores which germinate immediately or which may survive the winter and reinfect plants in spring; the blackberry rust (Gymnoconia) has only æcidiospores which germinate like teleutospores. Many rusts, like some of the grain rusts, are able to maintain themselves by means of uredospores which are capable of enduring the winter. This method of persistence through unfavorable seasons must be considered as a special and accidental adaptation to particular conditions, for it is not likely that any form of rust has become permanently reduced to the uredospore stage since this is merely a propagative spore-form of little morphological significance. Continuous uredospore production is likely to occur where plants are kept uninterruptedly in a growing condition like carnations in greenhouses, or fig trees and species of Vitis in tropical and subtropical regions. Under such conditions teleutospores are produced with comparative rarity.

Some common rusts.

The following are some of the common rusts on horticultural plants:

Uromyces caryophyllinus, the common carnation rust, occurs on several members of the pink family but is known in America chiefly in its uredo stage on the carnation upon which teleutospores also are sometimes found. Different physiological races occur on various members of the pink family, some of the European forms on tunica and on saponaria have æcidia on *Euphorbia Gerardiana*, but in America the æcidial stage of the race on dianthus is not known. The presence of the fungus is indicated by the appearance of lead-colored pustules which appear first on the lower leaves and stems of the plants. The pustules soon rupture and discharge sooty powder made up of uredospores. These are blown or carried by spray to other plants. For germination of the spores a thin film of moisture such as that produced by dew is necessary. Avoidance of conditions which favor the germination of spores will tend to decrease the rust, but only such remedial measures as have been mentioned above can be suggested.

Uromyces appendiculatus, on bean, cowpea and related genera. Sometimes causes damage but not common. Æcidia and uredospores on the leaves, teleutospores mostly on the stems, on which they remain during the winter. The infected material should be destroyed.

Uromyces pisi produces its uredospores and teleutospores on the pea. The sporidia produced by the teleutospores infect the dormant buds of the subterranean shoots of *Euphorbia Cyparissias* in which the mycelium becomes perennial. From the infected rhizomes deformed shoots arise, on the leaves of which æcidia are borne.

Puccinia asparagi has all its spore-forms on *Asparagus officinalis*. This is the most serious parasite of the garden asparagus. It was first noticed as a menace in the eastern United States in 1896. It has since spread over the entire country. As a result of its ravages the system of asparagus-growing has been greatly modified in some regions while in other sections the commercial cultivation of asparagus has been practically abandoned. The palmetto varieties appear to be somewhat resistant to the disease. Sprays of sulfur-soda soap, and of bordeaux mixture, and dusting with sulfur in dry regions have proved more or less successful. Ornamental species grown in the United States are not affected by this rust.

Puccinia graminis, the black rust of cereals and grasses, while of great importance agriculturally is of interest to horticulturists only for the reason that the æcidial stage sometimes disfigures the leaves of *Berberis vulgaris* planted for ornamental purposes.

Puccinia malvacearum, the hollyhock rust, has only teleutospores which are produced in successive generations. The teleutospores produced during the summer germinate immediately and rapidly spread the rust. In regions where the winter is not too severe, those produced late in the season sometimes survive the winter, but in the northern states the fungus lives through the winter in the mycelial stage in the stems and petioles of *Malva rotundifolia*, on which developing sori can be found during the entire season. Destruction

of wild hosts and of diseased portions of plants is a partly successful method of control.

Puccinia chrysanthemi, the chrysanthemum rust, is known in the United States chiefly in the uredospore stage on chrysanthemums of which only some varieties appear to be susceptible. The rust rarely produces serious damage, and is readily controlled by the elimination of susceptible varieties.

Gymnosporangium juniperi-virginianæ, cedar rust, apple rust. The telial stage produces the galls known as cedar apples on the red cedar. After rains in spring the teleutospores ooze out from the galls in the form of horn-like gelatinous masses, an inch or more in length. They germinate in place and the sporidia infect the leaves and fruits of the apple on which the æcidial stage is produced. No appreciable damage is caused to the cedar, but apple trees are sometimes defoliated by this rust and the damage to orchards is often extensive where cedar trees are abundant. Removal of cedar trees prevents the occurrence of this rust on the apple. The fungus can be controlled also by spraying with bordeaux mixture.

Gymnosporangium globosum, another species much like the foregoing, is the common cause of apple rust in the East.

Cronartium ribicola has uredospores and teleutospores on various species of currants, but is chiefly of importance on account of the destructiveness of its æcidial stage to the white pine and other five-leaved pines. Introduced from Europe probably about 1906. Local in northeastern United States at present.

Coleosporium solidaginis occurs on aster, solidago, and other Compositæ. It is chiefly of interest because it also attacks the cultivated aster (*Callistephus hortensis*) causing considerable damage. The æcidial stage occurs on pines. The intervention of this stage is, however, not essential for the maintenance of the fungus since the uredo sori persist through the winter on the rosette leaves of solidago and other Compositæ.

Melampsora tremulæ is the common orange rust of poplars in the United States. Several races exist which have æcidia on larix, pine, and other plants. Numerous other species or subspecies of Melampsora occur on willows. The injury caused by these is not great.

Gymnoconia interstitialis, of the blackberry, has but one spore form, the æcidiospores which germinate like teleutospores. The rust is exceedingly common on the blackberry and raspberry covering the whole under surface of the leaves with blisters which burst and display the brilliant orange spore-powder. The mycelium is perennial and permeates the entire host. No satisfactory remedy has been suggested.

Uredo fici, an unattached uredo-form which is common on fig trees, causing a rusty brown appearance and premature falling of the leaves. Where figs are grown for fruit, considerable damage results to the crop from the loss of leaves. Common also in the tropics.

HEINRICH HASSELBRING.

RÙTA (classical name of rue). *Rutàceæ*. Perennial, glandular, punctate herbs, hardy or half-hardy North, quite hardy South but of no great horticultural value.

Plants often woody at the base, with terete branched sts.: lvs. alternate, simple, 3-foliate, pinnately cut or compound: fls. in leafy-bracted terminal corymbs or panicles, numerous, yellow or greenish; calyx short, persistent, 4–5-lobed or parted; petals 4–5, limb arched, often dentate or ciliate; stamens 8–10; ovary sessile: caps. 4–5-lobed, the lobes indehiscent or dehiscent at the apex.—About 40 species mostly in the Medit. region and a few in W. and Cent. Asia.

gravèolens, Linn. RUE. HERB OF GRACE. Fig. 3515. A hardy perennial, woody at the base, 1½–2 ft. high: lvs. fragrant, much divided; lobes oblong, the terminal obovate: fls. yellow. July.—Prop. by division and seeds. An old medicinal plant, with a very strong aromatic odor; sometimes spontaneous in this country.

Patavìna, Linn. (*Haplophýllum Patavìum*, Hort.). A hardy perennial herb 4–6 in. high: lvs. glabrous, the lower oblong-spatulate, narrowed at the base, the others trisected and laciniate: corymb dense; pedicels somewhat longer than the fls.; fls. golden yellow. June, July.

F. W. BARCLAY.
F. TRACY HUBBARD.†

RUTABAGA: *Brassica.*

RYE: *Secale.* **R., Wild:** *Elymus.*

RYNCHÓSPORA (Greek, *snout* and *seed*, alluding to the beaked achene). Also spelled *Rhynchospora*. *Cyperàceæ*. Chiefly perennials, with more or less triangular and leafy culms; suitable for bog or lowland planting, but rare in cultivation.

Inflorescence terminal or axillary: spikelets panicled or variously clustered, ovate, globular or spindle-shaped; scales open or barely concave; perianth of bristles; stamens mostly 3: achene lenticular, globular or flat, crowned with a conspicuous tubercle or beak.—About 300 species, distributed in the tropical and subtropical regions, many in Temp. N. Amer. and a few in Temp. Eu. and Asia.

álba, Vahl. Culm slender, about 6–24 in. high, triangular above: lvs. narrowly linear, almost bristle-form: spikelets lanceolate, white or whitish, densely crowded into a head-like terminal corymb. Bogs, Newfoundland to Alaska southward to Fla., Ky., the Great Lake region and N. Calif., also in Eurasia and Porto Rico.

fúsca, Ait. f. Loosely stoloniferous, culm 8–24 in. high: lvs. bristle-form: spikelets ovoid-fusiform, chestnut-color, clustered in 1–4 loose heads, overtopped by the slender bracts. Boggy places, Newfoundland to Ont., southward to Del. and Mich., also in Eu.

F. TRACY HUBBARD.

3515. Ruta graveolens. (Flower slightly enlarged.)

CI. Well-filled mixed border, with lilacs predominating.

S

SÀBAL (possibly a native name in South America, but the author of the genus does not explain). *Palmàceæ*, tribe *Córypheæ*. Spineless palms, low, tall, or almost stemless.

Trunk slender or robust, ringed or nearly smooth, creeping or erect, ascending at the base, clothed above with dead lf.-sheaths: lvs. terminal, orbicular or cuneate at the base, flabellately multifid; segms. linear, bifid, filamentous on the margins, induplicate in the bud; rachis short or long; ligule short, adnate to the rachis; petiole concave above, the margins smooth, acute; sheath short: spadices large, elongated, decompound, at first erect, the branches and branchlets slender, recurving, pendent; spathes sheathing the branches and peduncles tubular, oblique at the throat: bracts and bractlets minute: fls. small, glabrous, white or green: frs. small, globose, black, the short style basal. — Species probably 20, if Inodes is not separated. Fla. to Venezuela, and in Mex. Here belongs the palmetto or cabbage palm of the southern states. The best botanical account of the genus is Beccari's, Le Palmæ Americane della tribu delle Coryphеæ, pp. 10–83 (1907). Most of the species can be cult. in the temperate house, but any that may come into the trade from S. Amer. would require stove conditions. *S. Palmetto* can be grown outdoors from Charleston southward. *S. texana* and *S. exul* are handsomer species, and hardy in parts of Texas.

3516. Sabal Palmetto, the cabbage palmetto of the southern states.

The arboreous species of Sabal have been separated by Cook (Bull. Torr. Bot. Club, 28:529) as Inodes. These species also differ in their foliage. "The leaves of Sabal are adapted for standing erect and avoid resistance to the wind by being split down the middle. The leaves of Inodes which are held horizontal from an erect axis have attained the unique adaptation of a decurved midrib which braces the sloping sides of the leaf and effectively prevents the breaking above the ligule."

The cabbage palmetto (*S. Palmetto*) grows in groups of a few specimens to several hundreds or even thousands in the rich black soil on the banks of the St. Johns and Ocklawaha rivers of Florida, forming a glorious sight. They are found northward to South Carolina, but they attain their fullest development in Florida, where they always form an important feature of the landscape. Generally they grow in dense groups, but they are more beautiful in all their parts where they have room enough to spread. In southern Florida underneath the crown of leaves is often found a dense wreath of ferns (*Polypodium aureum*), which heightens the charm of these palms considerably. On the St. Johns the trunk is often covered with the trumpet creeper (*Campsis radicans*), or it is hidden by the dense foliage of the cross-vine (*Bignonia capreolata*), both of which form a beautiful ornament, especially when in flower. These suggestions of nature are often followed by planters who have a feeling for nature-like landscape effects. The cabbage palmetto thrives even in the poor sandy soil, and it is greatly improved by cultivation. Even good-sized trees are not difficult to transplant if the whole stem is carefully dug out and all of the roots and leaves are cut off. If the stem has been set at least 3 feet deep and the soil is kept well watered after planting, the palmetto is almost sure to live. In addition to the palmetto, all of the sabals mentioned in this work are cultivated by the undersigned on high pine land in southern Florida. Under these conditions the sabals have proved a great success, as also all species of Phœnix and all Cocos of the australis type, while the species of Washingtonia, Erythea,

Livistona, and Trachycarpus have been an entire failure. *S. Blackburniana* is, in the judgment of some, the finest of all the fan-leaved palms that can be grown in Florida. All the species that form trunks are objects of great beauty when well grown. They need to be well fertilized, or the lower leaves will suffer and finally die, thus detracting much from the elegance of the specimen. They all grow naturally in rich black soil, but they all thrive exceedingly well in the sandy pine-woods soil if well fertilized and watered; in fact, they can hardly be fertilized too much, and the more nitrogenous manure and water they get the faster they grow. When transplanted they must be set deep. In planting palms make a hollow about 6 feet in diameter and about 2 feet deep in the center. This center, which receives the plant, is the deepest point, while the ground all around is slightly sloping. Care must be taken to remove the sand after heavy rains or the crown will soon be buried and the little plant dies. As the palm first forms the

3517. Sabal glabra.

trunk in the soil and as the growth is rather rapid, this precaution is not necessary after the plant has attained a few feet in size. (H. Nehrling.)

A. *Trunk evident, usually tall.*

B. *Foliage very glaucous.*

uresàna, Trel. (*Inòdes uresàna,* Cook). Trunk 15–35 ft. high and upward of 1 ft. diam.: lvs. glabrous, very glaucous; petiole stout, concavo-convex, unarmed, about 40 in. long, nearly 1 in. wide and nearly ⅜in. thick; blade about 40 in. long and wide, multifid, with coarse straw-colored fibers from the sinuses, the center arcuately recurved: fr. of a single developed carpel, depressed globose, ¾in. or less in diam., edible, green, or when dry dingy brown and somewhat glossy, the mesocarp then cottony; endocarp whitish straw-color, glossy within; seed polished, dark chestnut-brown, labyrinthiform-rugose, much depressed. Sonora, Mex., in the vicinity of Ures; intro. to cult. in S. Calif. R.H. 1910, p. 59. Described and figured in vol. 12 (1901) of Rept. Mo. Bot. Gard.—"From the two arboreous palmettos of the United States, *S. uresana* differs markedly in its pale, very glaucous foliage, and in the size of its fruit, which is of thrice the diameter of that of *S. Palmetto*, and usually a third larger than in *S. mexicana*, with the former of which species it agrees in having but one of the three carpels developed and fertile while in *S. mexicana* two or even all three are not infrequently developed. Considering the extent to which this section of Mexico has been visited by collectors of seeds it would be remarkable if this attractive plant should not prove to be already in cultivation in European gardens."

BB. *Foliage green or essentially so, at least above.*

mauritiæfórmis, Griseb. & Wendl.; also spelled *mauritiiformis*. Trunk middle-sized, but occasionally attaining 60–80 ft.: lvs. finally 12 ft. across; blade suborbicular, longer than the petiole, glaucous beneath, multifid to the middle, with loose fibers between the bifid lobes: spadix very long and much branched, appearing below the lvs.: fr. globose or inverted pear-shaped, about 1½ in. long. W. Indies.—The name *mauritiæformis* does not appear in the American trade, but *S. glaucescens*, Lodd. and Hort., probably belongs here, according to Grisebach. Nehrling writes: "*S. glaucescens* of the trade rivals *S. Blackburniana* in beauty and rapidity of growth. Its lvs., though smaller, have a beautiful bluish green color."

Palmétto, Lodd. (*Inòdes Palmètto,* Cook). Cabbage Palmetto. Fig. 3516. St. erect, 20–80 ft. high: lvs. 5–8 ft. long, cordate in outline, recurved at the summit, shorter than the petiole; segms. deeply cleft: spadix spreading, shorter than the lvs.: drupe black, ⅓–½in. long. N. C. to Fla. and Bahamas. S.S. 10:507. A.F. 12:628.—*S. Mocinii*, Hort., is referred to *S. Palmetto* by Voss, but Nehrling describes it as a stemless plant from Mex., more beautiful than the dwarf palmetto, bearing immense lvs. on strong stalks, the lvs. attaining a height of 6–8 ft. Others think *S. Mocinii* is the same as *S. Blackburniana*. *S. Palmetto* has been confused in the European trade with *S. texana*. Very commonly planted as a shade and avenue tree in the southern states.

Blackburniàna, Glazeb. (*S. umbraculifera,* Mart. *Inòdes Blackburniàna,* Cook). St. 30–40 ft. high, thickened at the middle: blade ample, orbicular, glaucous, rather rigid, shorter than the petiole; lobes about 40, ensiform, bifid, filamentous, rather rigid: spadix more branched than in any other species: fr. inverted pear-shaped, about 1½ in. long. W. Indies. G.F. 4:307. G.C. II. 2:777. Loudon's Gard. Mag. 5:52–7, with several figures. R.B. 35, p. 189.

causiàrum, Becc. (*Inòdes causiàrum,* Cook). Porto Rico Hat-Palm. Yaray. Trunk to 40 or 50 ft. and 2 ft. thick, columnar or nearly so, light gray or nearly white: lf.-bases splitting into fibers and more or less remaining as long ribbons: lvs. about 12 ft. long, the blade and petiole about equal in length but both surpassed by the infl., the petiole keeled near the end above: fr. ⅓–½in. diam., grayish, with a finely rugose or nearly smooth chestnut-brown seed.

texàna, Becc. (*S. mexicàna,* Auth., not Mart. *Inòdes texàna,* Cook). Robust palm, to 50 ft. and 2½ ft. diam. of trunk which is bright reddish brown: lvs. 5–7 ft. across, shining and yellowish green, the segms. often parted and filamentose, the petiole stout and equaling or exceeding the blade: terminal branchlets of infl. slender: seed about ½in. broad, with a prominent micropyle. S. Texas. S.S. 10:508.

exúl, Bailey (*Inòdes exúl,* Cook). A strong vigorous tree with large crown of vivid green lvs., and green trunk due to the color retained in the sheathing lf.-bases: lvs. otherwise much like those of *S. texana:* branchlets of infl. thickened: fr. solitary, with large seed not wrinkled above nor hollowed below.—Described from handsome trees planted at Victoria, Texas, probably native of Mex. Hardy and promising.

prínceps, Hort. Large species with a stout trunk which is covered with the persistent bases of the old lvs.: lvs. very large, about 5 ft. long; blade divided into about 100 segms., chartaceous, green; segms. all

rather shortly cleft at the apex, about 3 ft. long by 1½ in. broad, acuminate, pointed: fruiting spadices pendent, about 6 ft. long, forming a very dense panicle: spathe tubular-funnelform, striate, obliquely truncate: fr. black, shining, globose. Habitat unknown; cult. in S. Calif.—Resembles *S. Blackburniana.*

AA. *Trunk none or creeping.*

glàbra, Sarg. (*S. Adánsonii,* Guerns. *S. mìnus* or *mìnor,* Pers. *Córypha mìnor,* Jacq. not Linn.). DWARF PALMETTO. BLUE PALM. Fig. 3517. St. short, buried in the earth so that the palm appears stemless: lvs. 2–3 ft. long; blade circular in its outline, somewhat longer than the petiole, glaucous; segms. slightly cleft at the apex: spadix erect, much longer than the lvs., 3–6 ft.: drupe ⅓in. thick, black. Southern states. B.M. 1434. —Often cult. outdoors in the southern states. There are different forms, apparently unknown to the trade.

megacárpa, Small (*S. Etònia,* Swingle). SCRUB PALMETTO. Low shrub, the sts. elongated, creeping, and contorted: lvs. standing 4–5 ft. high, the sharp-edged petioles exceeding the nearly orbicular blades which are 1½–2½ ft. across, deeply cleft at apex and segms., longer than body, filamentose: infl. 2–2½ ft. long, ascending but becoming prostrate, branching: perianth yellowish white: fr. nearly globose, ½–¾in. diam. Fla.

The following are mostly trade names, but at present they can be only imperfectly described: *S. cærulêscens,* Bull. A native of Colombia intro. in 1875. Apparently only the juvenile state has been described. Lvs. elongate, linear-lanceolate, plicate, with a bluish or glaucous green color which is very strongly marked on the under surface. Nehrling writes that he cannot distinguish at present his specimens of S. cærulescens from S. glaucescens.—*S. dealbàta,* Hort. "This species," writes Nehrling, "reminds one of S. Mocinii, although it is smaller in all its parts. The lvs. are numerous, glaucous green and of a fine fan-shaped form. Compared with the sabals that form a trunk, these stemless species have little beauty, though they look well as foliage plants in company with Cycas revoluta and Dioon edule." The name "dealbata" means whitened, but it appears to be unrecognized in botanical literature in connection with Sabal.—*S. Ghiesbréchtii,* Hort., is S. Palmetto, at least so far as some gardens are concerned, but Beccari considers it an European name applied to cult. plants of S. Palmetto.—*S. glaùca,* Hort. Pitcher & Manda, 1895, may possibly be meant for S. glaucescens.—*S. havanénsis,* Lodd., according to Nehrling, "is a more upright grower than S. Blackburniana, has a slender st. and the lf.-stalks are longer and thinner. The lvs. have a bluish green color while young, changing to a fine dark green when they get older." Habitat unknown and the name has no botanical standing. —*S. Hoògendorpii,* Hort., is Livistona Hoogendorpii.—*S. javánica,* Hort., Pitcher & Manda, is possibly meant for S. havanensis, since Sabal is an American genus and is not known in Java.—*S. longifòlia,* Hort., according to Nehrling "has very numerous, long and slender lvs. which are bright green above and silvery below."—*S. longipedunculàta,* Hort., according to Nehrling, "is a stemless plant with smaller lvs. than those of S. Mocinii and very long and slender stalks." Reasoner adds that the lvs. are glaucous green. The last two are known only by these trade names, and are not certainly referable to any maintained species. L. H. B.†

SABÀTIA (named after Liberatus Sabbati, an Italian botanist of the eighteenth century); also spelled *Sabbatia. Gentianàceæ.* Hardy annual or biennial (rarely perennial by stolons) herbs, making showy garden or border plants, although little grown.

Leaves opposite, sessile or clasping: fls. showy, rose-pink or -purple or white, in cymose panicles terminating the branches; calyx 5–12-parted, the lobes slender; corolla rotate, 5–12-parted, usually with a yellow eye: caps. globose or ovoid, 2-valved.—About 18 or 20 species, N. Amer. and Cuba, mostly on the coastal plain. Sabatias require a light sweet soil. Seed may be sown in fall or early spring. The plants are easily transplanted. Some of them grow in brackish places.

A. *Fls. 5-parted, rarely 6–7-parted.*

brachiàta, Ell. St. slightly angled, 1–2 ft. high: lvs. linear to linear-oblong, obtuse, obscurely 3-nerved at the base: fls. showy, light rose to white, 1–1½ in. across, in thyrsiform panicles, the lateral peduncles bearing usually 3-fld. cymes; calyx-lobes linear, shorter or nearly equaling corolla. Ind. to N. C. and south.

lanceolàta, Torr. & Gray. St. simple, 1–3 ft. high: lvs. about 1 in. long, shorter than internodes, ovate-lanceolate or ovate, acute, 3–5-nerved, the floral reduced to subulate bracts: fls. about 1 in. across, white, fading yellowish; calyx-lobe more than half length of corolla. May–Sept. Pine-barrens, N. J. to Fla.

angulàris, Pursh. St. somewhat 4-wing-angled, 1½–2 ft. high: lvs. ovate, 3–5-nerved: fls. fragrant, showy, light rose to white, 1–2 in. across, in much-branched pyramidal or somewhat corymbose cymes; calyx-lobes linear, much shorter than the corolla. Rich, light soil in open fields. W. Canada to Fla.

AA. *Fls. 8–12-parted.*

dodecándra, BSP. (*S. chloroìdes,* Pursh). Apparently perennial, usually in brackish marshes near the coast from Long Island southward: to 2 ft. high: lvs. oblong to oblong-lanceolate, blunt or somewhat acute: calyx-lobes herbaceous, 3–5-nerved; corolla rose-colored or white with yellow spot at base of each oblong-spatulate or oblanceolate segm. **S. Kennedyàna,** Fern., is the New England representative, of fresh pond-shores, earlier-flowering: freely stoloniferous, to 2½ ft.: basal lvs. oblanceolate-acuminate; st.-lvs. shorter, firm, lance-acuminate and subulate: calyx-lobes not herbaceous, linear-subulate; corolla-lobes cuneate-obovate, rounded or emarginate at summit, with much broader yellow spot. L. H. B.†

SÀBIA (from its Bengal name, *Sabja-lat*). *Sabiàceæ.* A genus of about 20 species of woody vines or sarmentose shrubs native to India, China, and Japan, with alternate petioled entire deciduous lvs. and axillary, solitary, or cymose, rather small and dull-colored, greenish, purplish, brownish, or yellow fls. followed by small blue drupe-like frs. Fls. perfect, 5-, rarely 4-merous; petals short, semi-orbicular to ovate; petals oval to oblong; stamens shorter than petals; ovary superior, 2-celled, each cell with 2 ovules: drupes usually reniform, blue, solitary or 2 and slightly cohering at the base, 1-seeded; stone reticulate.—Only the following recently intro. species is in cult., but little is yet known of its cultural requirements; at the Arnold Arboretum it is growing well under ordinary conditions and has proved hardy. Prop. is by seeds and probably by cuttings. **S. Schumanniàna,** Diels. Climbing shrub, to 10 ft., glabrous: branchlets green: lvs. petioled, oblong-lanceolate, rarely elliptic, acuminate, broadly cuneate at the base, bright green, reticulate beneath, ½–4 in. long: fls. greenish to greenish-purple, cup-shaped, ⅓in. across, in slender-stalked, nodding, usually few-fld. cymes; peduncle filiform, 1–1½ in. long: fr. reniform, ¼in. broad; stone slightly compressed, reticulate. W. China.—The drooping blue frs., if freely produced under cult., apparently constitute the chief ornamental feature of this species.

ALFRED REHDER.

SACCHÁRUM (*saccharon,* old Greek name for sugar). *Gramìneæ.* The sugar-cane group, little grown for ornament, although making bold specimens.

Tall grasses with stout culm and ample panicles, the branches many-jointed: spikelets small, slender, 1-fld., surrounded by long silky hairs.—Species 12, in tropical regions, mostly of the Old World. Differs from Erianthus in having awnless spikelets. The most important species is the sugar-cane, which is extensively cult. in tropical and subtropical countries for the production of sugar. Prop. by cuttings of the st. Native country unknown, but probably E. Asia. Cult. from time immemorial by cuttings, for which reason many varieties have lost the power to flower or at least to produce fertile seed. Rum is produced from the fermented molasses.

officinàrum, Linn. SUGAR-CANE. St. 8–20 ft. high, 1–2 in. thick. Dept. Agric., Div. Agrost., Bull. 20:18 G.W. 8:261 (under the name *S. officinale*).—The different cult. varieties are distinguished by color and height of st.

spontàneum, Linn. Less tall and stout than sugar-cane, freely blooming, found in the Medit. region, where it is sometimes cult. as a hedge-plant, and throughout the tropics of the Old World. A variety of this, *S. ægyptiacum*, is shown in Gn. 11, p.78; 16, p. 323.

ciliàre, Anders. Lvs. very narrow, channeled, glaucous, the lower erect. Intro. from India.—Said to make large clumps and to be hardy at Santa Barbara, Calif., but not known to bloom there. A. S. HITCHCOCK.

SACCOLÀBIUM (name refers to the saccate labellum). *Orchidàceæ*. Epiphytic herbs with erect leafy stems increasing in length by continued growth at the apex, grown in warm glasshouses.

Leaves distichous, leathery and fleshy, usually channeled: infl. lateral, in the cultivated species a long, densely fld. cylindrical raceme; fls. medium or small; sepals subequal, free, spreading, the lateral pair not decurrent on the base of the column; petals similar, sometimes wider; labellum united with the base of the column, spurred, the mouth of the spur open; pollinia on a filiform stipe.—About 20 or more species. Can be prop. by offsets and by cut-backs. Fresh stock is constantly imported.

This interesting genus embraces a number of pretty and distinct species from Borneo, Cochin-China, India, Java, and Philippines. They are closely allied to the genera Aërides, Phalænopsis and Vanda, and require somewhat similar treatment, but do not always acclimatize themselves as readily to artificial cultivation unless given a location with more or less natural surroundings, although some of the more free-growing species, like *S. ampullaceum*, *S. curvifolium*, *S. cæleste*, and *S. Hendersonianum*, can usually be grown successfully in the cattleya or cypripedium department. The large-growing species with thick succulent leaves require a warm moist atmosphere where the winter temperature can be retained at 65° to 70° F. by night and about 75° during the day, and in the summer or growing season 10° in advance of this. All succeed best when suspended from the roof in pans, baskets or on blocks where they can have free circulation of air about them at all times, receive indirect benefit of the sun's influence, which will harden their tissue, and where the compost may readily and frequently dry out, during the resting period especially. Grown otherwise the more succulent species, such as *S. giganteum* (a Vanda), make soft weak tissue, which is susceptible to wet-spot, a usually fatal disease. Clean chopped sphagnum, freely interspersed with broken pieces of charcoal, is the most satisfactory growing material, and this should not be pressed in so firmly as entirely to exclude access of air to the roots, but the plants must always be firmly secured with pieces of charcoal, potsherds or other similar material, or securely fastened with copper wire to keep them in position, otherwise being more or less top-heavy they are liable to work loose, under which conditions they cannot become properly established. Shading should be applied to the glass from February until November to break the sun's direct rays, but during the remainder of the year when the solar light is weak its direct influence will be found beneficial. In bright weather in the growing season the plants need a liberal supply of water, both at the roots and over the foliage, but during the resting period and in wet inclement weather, water and syringing must be carefully and sparingly administered. Judgment in this respect is very essential to the successful culture of these plants. The supply of saccolabiums is kept up by fresh importation. These cultural directions apply also to the genus Rhynchostylis. (Robert M. Grey.)

A. *Fls. rose-colored.*

Hendersoniànum, Reichb. f. Dwarf: lvs. 4–6 in. long, strap-shaped, subacute, distichous on the sts. but spreading in various directions: raceme upright, about as long as the lvs.; fls. forming a cylindrical mass, bright rose, ⅔in. across; dorsal sepals orbicular, concave, lateral ones larger, obovate-oblong; petals obovate; labellum a blunt, straight spur with 3 teeth at the mouth, white. Borneo. B.M. 6222.

ampullàceum, Lindl. Fig. 3518. Dwarf: st. 6–8 in. high, with 2 rows of lvs.: lvs. strap-shaped, channeled, apex truncate and dentate: racemes nearly erect, 4–6 in. high; fls. deep rose-color; sepals and petals ovate, veined, spreading out flat; labellum linear-falcate, one-half as long as the petals; spur slender, straight. May, June. N. India. B.M. 5595. P.M. 13:49. J.H. III. 32:463. Var. **moulmeinénse,** Hort., is a geographical variety with stronger growth and larger fls.

AA. *Fls. orange or scarlet-orange.*

curvifòlium, Lindl. Sts. short: lvs. linear, 8–10 in. long, 2-toothed at the apex: racemes somewhat drooping, 6 in. long, dense; fls. 1 in. across, bright orange-scarlet; sepals and petals ovate to obovate, spreading;

3518. Saccolabium ampullaceum. (×½)

labellum orange, blade linear, truncate, spur obtuse. May, June. Burma, Java. B.M. 5326 (as *S. miniatum*). I.H. 13:493.

cèrinum, Reichb. f. St. short, thick: lvs. strap-shaped, obtusely 2-lobed: raceme dense, half drooping; fls. orange, with a paler spur; sepals oblong; petals ovate. Sunda Isls.

AAA. *Fls. white, spotted with blue.*

cœléste, Reichb. f. Plant rarely 1 ft. high, with decurved lvs. and erect, densely fld. racemes 6–9 in. long: fls. white, with the front of the lip and the tips of the segms. sky-blue; sepals and petals cuneate, oblong, obtuse; labellum rhomboid, spur compressed, curved. July, Aug. Siam. J.H. III. 28:87; 46:25.

S. bellìnum, Reichb. f. Sts. short: lvs. 7–12 in. long.: fls. fleshy, 1¼ in. across; sepals and petals spreading, somewhat incurved, similar, obovate-oblong, yellow, blackish-purple-blotched; lip subglobose saccate and with a lunate blade, the former white, purple-spotted, the blade 2-lobed, pubescent above, fimbriate-denticulate, white, with the disk orange-yellow, purple-spotted. Burma. G.C. III. 39:419. J.H. III. 48:423.—*S. Blùmei*, Lindl.=Rhynchostylis retusa.—*S. dasypògon*, Lindl. Allied to S. bellinum. Sepals and petals yellow; lip white with purple markings. Nepal.—*S. frágrans*, Par. & Reichb. f. Fls. numerous, white, violet-scented; lip mauve-purple. Burma.—*S. Fürstenbergiànum*, Schlecht. Infl. branched; fls. rose-red with paler spur and white column. Siam. O. 1912:68.—*S. gigantèum*, Lindl.=Vanda densiflora.—*S. glomeràtum*, Rolfe. Sts. trailing, often 1–3 ft. long: racemes densely many-fld.; fls. small, yellow, spotted and striped with brownish red. Borneo. G.C. III. 54:317.—*S. grácile*, Lindl. "A very elegant little species, with slender growths and long decurved racemes of many small white fls." Ceylon.—*S. guttàtum*, Lindl.=Rhynchostylis retusa.—*S. Harrisonidnum*, Hook.=Rhynchostylis violacea var. Harrisonianum.—*S. illùstre*, Hort., probably=Vanda densiflora var. illustre.—*S. penangiànum*, Hook. f. A small plant, only a few inches high: fls. with light yellow sepals; side lobes of lip and wings of column narrowly margined with purple. Malay Penins.—*P. platycalcaràtum*, Rolfe. Dwarf herb: fls. very small, with sepals and petals yellow, spotted with brown. Burma.—*S. præmórsum*, Lindl.=Rhynchostylis retusa.—*S. Regnièri*, Hort. Plant small: fls. in short racemes, orange-colored.—*S. retùsum*, Voight=Rhynchostylis retusa.—*S. Rheèdii*, Wight=Rhynchostylis retusa.—*S. rubéscens*, Rolfe. Sts. a foot tall: lvs. oblong, 5–6 in. long, 1–1¼ in. broad: racemes 3–5 in. long, many-fld.; fls. ¾in. long, light rosy purple; dorsal sepal elliptic, obtuse, ⅛in. long, lateral sepals ovate; petals elliptic, obtuse, ⅛in. long; lip 3-lobed. Annam. B.M. 8121.—*S. sarcochiloides*, Schlecht. Racemes spreading, short; fls. small, lasting only a day, white; sepals and petals with violet-red spots on base; lip with orange-yellow side lobes. Philippines.—*S. violàceum*, Reichb. f.=Rhynchostylis violacea.

GEORGE V. NASH.†

SACCOLÒMA (from Greek for *sac* and *edge*, referring to the indusia). *Polypodiàceæ*. A group of tropical ferns, somewhat related to Davallia. They are pinnately divided, often of large size, and with scaly petioles; petioles and pinnæ not jointed to their points of attachment: indusia attached along one side at the base.

inæquàle, Mett. (*Davállia brasiliènsis*, Hook.). A large stove fern with creeping rootstock: lvs. as much as 6 ft. long, twice-pinnate or more. Common in the American tropics.

R. C. BENEDICT.

SADLÈRIA (named after Joseph Sadler). *Polypodiàceæ*. Arborescent ferns suitable only for the warm-house: about 3–4½ ft. tall: lvs. large, tufted, double-pinnate, all similar: sori continuous. close to the mid-rib on each side: receptacle elevated; the involucre narrow, of the form of sorus, leathery, at first wrapped over the sorus, later spreading.—About 5 species, Hawaiian Isl. *S. cyatheòides*, Kaulf. About 3–4 ft. high: the stipe strong, erect, 6–18 in. long, naked except at the base and there clothed with long-linear scales: fronds 4–6 ft. long, 9–18 in. broad; pinnæ 8–12 in. long, ½–¾in. broad, cut down to the rachis into very many, connected, linear pinnules, ⅜–½in. long, acute or bluntish. Hawaii. G.C. II. 7:761. G.Z. 22, p. 122.

SAGE (*Salvia officinalis*). A sweet-herb, used for seasoning, and somewhat in domestic medicine.

For at least three centuries this shrubby fibrous-rooted perennial from southern Europe has been widely cultivated in kitchen-gardens for its aromatic whitish green wrinkled oval leaves. These are arranged oppositely on ascending or decumbent branching stems which seldom exceed 18 inches in height. In early summer the upper parts of these bear generally blue, though sometimes pink or white flowers, followed by almost black spheroidal seeds borne in the open cups. The name Salvia is derived from *salvo*, to save, in reference to the plant's use in ancient medicine; the name sage, from its supposed power to make people wise by strengthening the memory. In modern medicine it is but little used. In domestic practice, however, it is credited with tonic, sudorific, carminative, anthelmintic, and stomachic properties, and is frequently used as a gargle for aphthous affections of the mouth and pharynx. Its pleasant, though powerful-smelling, bitterish leaves are used for flavoring sausages and some kinds of cheese, for seasoning soups and stews, but mainly for dressings with luscious strong meats such as pork, goose, and duck. Among culinary herbs it ranks first in America, being more widely cultivated than any other except parsley, which is more largely employed for garnishing than as a flavoring agent. When possible the young leaves should be used fresh, for unless carefully dried they lose much of their aroma, which is due to a volatile oil and which even with careful curing rapidly dissipates. For best results the shoots should be gathered before flower-stems develop, because they are then richer and because later cuttings may be made. For drying upon a commercial scale, since this plan is thought to involve too much labor, the plants are cut in August if seed has been sown early, and the stumps, if not too short, produce again in late autumn; or if grown as a secondary crop, which is the common way, they are cut only once—namely, in autumn. Plants grown from cuttings (see below) will often produce three crops in a season. Upon a small scale, a warm airy room is best for drying, the plants being either laid loosely upon racks or the floor, or hung from the ceiling and walls. Upon a larger scale, a fruit-evaporator with a steady current of warm air at about 100° F. may be used. After drying, the leaves are rubbed to a powder and stored in air-tight vessels.

Sage does best in an open sunny aspect and a well-drained mellow loam of medium texture, rich in humus and nitrogenous matter. Stable-manure or a fertilizer containing potash, phosphoric acid, and nitrogen should be applied before the plowing, if done in the spring. Fall plowing is generally preferred when sage alone is to occupy the land. In each case plowing should be as deep as the surface soil will profitably permit. Thorough fining of the soil must precede, and clean cultivation follow planting, the plants being set in drills about 15 inches apart and 10 inches asunder for manual cultivation, or 18 to 21 inches apart and 10 inches asunder for power cultivation. The former method is, as a rule, more profitable though more laborious. After harvesting (see above) if the bed is to be permanent, northern plantations should be mulched with marsh-hay or other material free from weed seeds. For garden practice it is common to divide the clumps biennially, since the plants become straggling if left longer. Upon a commercial scale, however, it is better to rely upon cuttings or seedlings.

Propagation may be by seed, cuttings, layers, or division. Seed, the vitality of which lasts three years, may be drilled thinly in flats in greenhouse, hotbed, or coldframe in early spring; or out-of-doors as soon as the ground becomes dry enough, in specially prepared beds of fine soil, covering them about ½ inch deep. In the former case the plants must be pricked out and hardened off to render them stocky and hardy before transplanting; in the latter, they are taken directly to the field. This operation may be performed from mid-June until late July, the plants being not less than 2 to 3 inches tall. The former method, which is considered the better, is the common commercial practice. Cuttings may be of mature or of immature wood. With each, shade and moisture are essential to success. Mature wood cuttings, made in early spring, should be ready for the field in less than six weeks; immature, taken from outside shoots just before they would form blossom-heads, are left in the cutting-bed until the following year. Such plants are usually more prolific than those grown from mature wood or from spring seedlings, and are, therefore, best when sage alone is to occupy the land. But when it is to follow some early vegetable, mature wood cuttings or seedling plants will probably be found best, though little or nothing can be cut before September. As practised by market-gardeners in the vicinity of New York, each of the above methods has its advocates, but practically all agree upon the plowing and harrowing of the ground in June or

July after harvesting an early crop, such as beets, cabbage or peas. About twice in the three weeks after setting the plants, the field is raked to destroy sprouting weeds and to keep the surface loose, after which, if well done, but slight hoeing is necessary. In September, when the plants crowd each other, each alternate plant or row of plants is cut for sale and the remainder allowed to fill the space. At the first cutting each plant should make about two marketable bunches; at the second at least three. This practice not only insures plants full of leaves at each cutting but at least doubles the quantity in the end.

In America the green broad-leaved varieties are in far greater demand than the colored and the narrow-leaved kinds. The best variety known to the writer is Holt Mammoth, which is exceptionally prolific of large leaves. It is said to produce no seed. M. G. KAINS.

SAGÈNIA. A generic name for a group of tropical ferns here referred to Tectaria, from which there is no valid distinction. For *S. decurrens* see *Tectaria decurrens.*

SAGERÈTIA (after Augustin Sageret, French botanist, 1763–1851). *Rhamnàceæ.* A genus of about 15 species of armed or unarmed often scandent shrubs native to the warmer parts of Asia, in Amer. from N. C. to Mex., with opposite or nearly opposite, entire or serrulate, small, deciduous or persistent lvs. and with minute whitish fls. in terminal or axillary spikes or panicles, followed by small berry-like, mostly purple frs. Fls. perfect, 5-merous; the hooded petals and the stamens not exceeding the sepals; disk cup-shaped, 5-lobed; ovary superior, 2–3-celled with a short 2–3-lobed style: fr. a small globose drupe with 2–3 leathery nutlets.—These plants are little known in cult. *S. theezans* has been recently intro. by the Dept. of Agric.; according to F. N. Meyer it may be useful as a hedge-plant and its fls. have a delightful fragrance which attracts numerous insects; it is apparently not hardy N., while *S. pycnophylla* has proved hardy at the Arnold Arboretum. The American *S. minutiflora* is not recorded as being in cult., but may possibly have been planted in collections in the southern states. The frs. of some species are sweet and edible. Prop. is by seeds and probably by cuttings like berchemia which it resembles in habit and general appearance. **S. theèzans,** Brongn. Spinescent shrub, to 6 ft., with slender spreading branches: lvs. persistent, or subpersistent, short-petioled, ovate or oval, obtusish, subcordate or rounded at the base, minutely serrulate, lustrous above, glabrous or at first slightly villous beneath, ⅛–1 in. long: fls. sessile in villous spikes ½–1 in. long or sometimes longer and forming terminal panicles leafy at the base; sepals slightly pubescent outside: fr. purplish black, about ⅛in. across. Fls. in autumn; fr. in spring. China. **S. pycnophýlla,** Schneid. Similar to the preceding species: lvs. smaller, ⅓–½in. long, rarely nearly ¾in. long, sometimes acutish: fls. white, glabrous, in slender glabrous spikes ½–1½ in. long, usually only 1–4 at the ends of the branchlets. W. China. **S. minutiflòra,** Trel. (*S. Michaùxii,* Brongn.). Spinescent, straggling or trailing shrub: lvs. short-petioled, leathery, ovate to ovate-oblong, acute, serrulate, pubescent while young, glabrous and lustrous at maturity, ½–1½ in. long: fls. $\frac{1}{10}$in. across, in terminal and axillary slender sometimes panicled spikes: fr. ⅓in. across, often gibbous, purple. Fls. in autumn: fr. in spring. N. C. to Fla. and Ala. ALFRED REHDER.

SAGÌNA (Latin, *fatness;* perhaps alluding to the forage value). *Caryophyllàceæ.* PEARLWORT. Annual or perennial tufted herbs, sometimes used for edging.

Leaves awl-shaped: fls. small, usually comparatively long-stemmed; sepals 4–5; petals 4–5, entire or slightly emarginate, minute or none; stamens equal in number to the sepals or twice as many; ovary 1-loculed, many-seeded; styles of the same number as the sepals and alternate with them.—About 50 species, natives of the temperate and colder regions of the world.

subulàta, Wimm. (*S. pilífera,* Hort. *Spérgula pilífera,* Hort. *Spérgula subulàta,* Sw.). PEARLWORT. An evergreen, hardy, densely tufted little plant, covering the ground like a sheet of moss: lvs. very small, stiff, aristate on the margin, linear: sts. branching and creeping: fls. white, studded all over the plant on long, very slender peduncles. July–Sept. Corsica. R.H. 1896, p. 435. R.B. 20:153. Var. **aùrea** has lvs. marked with yellow. A good rock-plant in shady places. Cult. similar to arenaria. Prop. by division.

F. W. BARCLAY.

SAGITTÀRIA (*sagitta* is Latin for arrow, referring to the arrow-shaped leaves). *Alismàceæ.* ARROWHEAD. Perennial hardy herbs useful for foliage effects in bogs and shallow ponds and also for their white buttercup-like flowers.

Plants of mostly erect habit, aquatic, the lvs. and scapes arising from more or less tuberous or knotted rootstocks: lvs. typically arrow-shaped, with long basal lobes, but sometimes long and linear: fls. imperfect, monœcious (staminate fls. usually in the uppermost whorls) or dioecious, with 3 white broad petals and 3 small greenish sepals, the stamens and pistils numerous, the latter ripening into small achenes; infl. composed of successive whorls of 3 stalked fls. Sometimes the lvs. are floating. The number of species admitted is variable, but Buchenau in the last treatment of the genus in Engler's Das Pflanzenreich, hft. 16 (iv. 15, 1903) describes 31. Temperate and tropical regions of the world though lacking in Afr. and Austral.

3519. Common arrowhead.—Sagittaria latifolia; often known as S. variabilis. (×½)

Sagittarias are mostly used for colonizing in the open, but *S. montevidensis*—now the most popular species—is grown in indoor aquaria or plunged in open ponds in the summer. The arrowheads are perennials of easy culture, although likely to be infested with aphis. Propagation is by division, or sometimes by seeds.

A. *Sepals of pistillate fls. (usually in the lower whorls) erect after flowering, and the pedicels of these fls. thick: carpels not glandular.*

montevidénsis, Cham. & Schlecht. GIANT ARROWHEAD. Very large, sometimes growing 6 ft. tall, with lf.-blades 1–2 ft. long: lvs. arrow-shaped, with long, diverging, sharp basal lobes: fls. very large (2 to nearly 3 in. across), the rounded petals white with a purple blotch at the base. Argentina to Brazil, Chile, and Peru. B.M. 6755. Gn. 27:8. G. 17:273. G.W. 4, p. 68. G.Z. 30:241. I.H. 31:543.—First known as a cult. plant from seeds sent to England in 1883 from Buenos Ayres by John Ball. It is now a popular plant for aquaria

and lily-ponds. Tender to frost. It is sparingly naturalized in the southern parts of the U. S., on both the Atlantic and Pacific sides.

AA. *Sepals of pistillate fls. reflexed after flowering: pedicels of these fls. slender: carpels somewhat glandular.*

B. *Bracts at base of whorls united, as if only 1.*

subulàta, Buch. (*S. nàtans,* in part. *S. pusílla,* Nutt.). Slender and simple, usually only a few inches high: lvs. linear or narrowly oblanceolate, rigid: fls. few, usually in 1 whorl, white, ½–¾in. across, the filaments broad. N. Y. to Ala., along the coast.—Offered by dealers in native plants. A plant once sold as *S. natans* is said to have come from the Amazon Valley; from this the form known as "New Era" was derived; and a cross of the latter with "*S. lanceolata*" (*S. lancifolia?*), native in La., gave the form "Francis M." *S. natans,* Pallas, the accepted species under this name, is native in N. Eu. and Siberia.

BB. *Bracts 3, at base of the whorls.*

C. *Lvs. usually distinctly sagittate.*

latifòlia, Willd. (*S. variábilis,* Engelm.). Fig. 3519. Very variable in stature and shape of lvs., ranging from a few inches to 3–4 ft. tall: lvs. mostly broad-sagittate with long basal lobes, but running into very narrow forms: fls. clear white, about 1 in. across, usually monœcious, the filaments slender: achene winged, with a lateral or oblique beak. Common everywhere in margins of ponds and lakes, and offered by dealers in native plants for colonizing in bog-gardens and in lily-ponds. There is a double-fld. form known as *S. variábilis fl.-pl.,* Hort., which probably belongs here. G. 29:31.

sagittifòlia, Linn. OLD-WORLD ARROWHEAD. Rhizome thick and tuberous, stolon-bearing: lvs. broad and sagittate, very variable in form and size: scapes erect, simple or branched, overtopping the lvs.: bracts narrow-ovate, free or slightly connate at base, shorter than the pedicels: petals large, white; filaments glabrous: achene nearly or quite orbicular and in this respect differing from the allied American species. Throughout Eu. and Asia.—By some authors the American *S. latifolia* and others are considered to be con-specific. Var. **flòre-plèno,** Hort. (*S. japónica,* Hort. *S. japónica fl.-pl.,* Hort.), is a form with double fls. common in cult. G.C. III. 30:171. Gn. 74, p. 67. G.M. 44:779. G.W. 3, p. 621. J.H. III. 43:219.—*S. chinensis* of most trade-lists is apparently one of the many forms of this species. There appears to be another *S. chinensis* in the trade, with lanceolate lvs., the botanical position of which is undetermined.

CC. *Lvs. usually oblong or linear and not sagittate.*

D. *Filaments slender, tapering upward, cobwebby.*

lancifòlia, Linn. Erect and somewhat rigid, glabrous, the scape sometimes reaching 5 ft.: lvs. lanceolate to narrow-oblong to nearly linear, nerved from the thick midrib: fls. white, in several whorls. Swamps, Del. to the tropics.

DD. *Filaments abruptly broadened, pubescent.*

gramínea, Michx. Erect and simple, glabrous, 2 ft. or less high: lvs. reduced to phyllodia, flat, broad-linear to lance-elliptic, pointed: fls. small, white, in 2 or 3 whorls. Newfoundland to Gulf.

S. macrophýlla has appeared in trade-lists as "a variety with large foliage and tall lax spikes of white fls." Its botanical position is uncertain as there are two distinct things of this name, one a valid species, the other a large-lvd. form of S. sagittifolia.

F. TRACY HUBBARD.†

SAGUÈRUS (East Indian name). *Palmàceæ.* An older name for Arenga, but discarded by the "nomina rejicienda" of the Vienna rules. *Aréngа mindorénsis,* Becc. (*Saguèrus mindorénsis,* O. F. Cook), has recently been intro. by the U. S. Dept. Agric. from the Philippines. It is described as a palm 5–10 ft. high, and probably of decided ornamental value for greenhouses and probably also in S. Calif. and S. Fla. Yet little known in this country.

SÀGUS RÚFFIA: *Raphia.*

ST. JOHN'S-WORT: *Hypericum.*

SAINTPAÙLIA (from the discoverer of the plant, Baron Walter von Saint Paul). *Gesneriàceæ.* Hairy often stemless perennial herbs, used for greenhouse flowering, the blossoms providing an attractive blue.

3520. Saintpaulia ionantha.—A young plant just coming into bloom. (×½)

Leaves long-petioled, ovate: peduncles radical (or axillary in the caulescent species), 1–5 in. high, bearing several (or 1) fls. in a loose cyme: calyx small, deeply 5-lobed; corolla wide-campanulate, tube short, the lobes elliptic, blue; perfect stamens 2; ovary hairy: caps. oblong, loculicidally 2-valved; seeds small, ellipsoid.—Four species, Trop. Afr.

The end of March is a good time to propagate saintpaulias, when the ripened leaves should be cut off with about an inch of the stalk attached, and inserted in the sand-bed, covering only a small part of the leaf-blade. The sand should not be kept too wet during the process of rooting. Their propagation from seed and general culture is similar to that of gloxinia. The plants may be flowered the entire year or given a period of rest by partly withholding water. (G. W. Oliver.)

ionántha, Wendl. AFRICAN VIOLET. USAMBARA VIOLET. Fig. 3520. Stemless, hairy: lvs. many, 1½ in. long, ovate or subcordate, thin, regularly crenate, clad on both surfaces with many short and a few very long white hairs: peduncles 1–4 in. long, 1–6-fld.: calyx-lobes linear; corolla-lobes not very equal: caps. narrow-oblong. Trop. Afr. Gt. 42:1391 and p. 323. Gn. 47:133; 74, p. 103; 79, p. 13. G.M. 37:62; 55:97. G.C. III. 13:685. Gn.W. 25:345. G.W. 10, p. 343. R.H. 1893, p. 321. Var. **grandiflòra,** Hort., has much larger fls. than the type, the fls. intense violet. Var. **variegàta,** Hort., has the lvs. variegated with light yellow turning to white.

kewénsis, C. B. Clarke. Lvs. entire, with numerous long white hairs: calyx-lobes oblong-linear: caps. 2 or 3 times as broad as the preceding and more shaggy, white-hairy. Trop. Afr. B.M. 7408. R.B. 20:109 (both as *S. ionantha*).—Very closely related to *S. ionantha* and confused with it.

S. pusílla, Engler, and *S. Goetzeàna,* Engler, of German East Africa, appear not to be in cult.

F. TRACY HUBBARD.

SALAD PLANTS are those with soft and edible leaves or stems, or both, that may be used raw or in the preparation of uncooked dishes.

The principal salad plant in America is lettuce, which is used exclusively, but not always expertly, for salads. For full directions for growing lettuce in the garden and under glass, see *Lettuce* and *Forcing*. Next to lettuce the best-known salad plant in this country

3521. Staminate catkin of Salix discolor. (Natural size.)

3522. Pistillate catkin of Salix discolor. (Natural size.)

is probably endive, which is excellent, especially when well-blanched plants are to be had in the winter. Chicory is much like endive, as regards its treatment either in the garden or in the salad-dish. Like endive, it is frequently seen in the larger city markets. The common dandelion should be mentioned in this category. When forced and blanched it makes a salad fit for the most cultivated epicure. For ordinary home cultivation and use, however, the common garden cress (*Lepidium sativum*, not water-cress, nor upland cress) ranks next to lettuce in value. Its rapid growth and high flavor equally recommend it. This plant is said to be a great favorite in English gardens and forcing-houses, where it is grown in mixture with white mustard and is pulled very young and eaten roots and all. Corn salad is another plant sometimes grown in gardens and used for salad-making. It is most acceptable to those who do not relish the pungency of mustard and cress. Chives is used by many persons as an ingredient of lettuce and other salads; also young onions. Many other plants are used in various places and by various persons for salads.

Besides the salad plants proper, many vegetables are used in a cooked or raw condition for salads. Such are cabbage, cauliflower, brussels sprouts, potatoes, lima beans, beets, Jerusalem artichoke, and the like. With salad plants may also be included pot-herbs, or "greens." The plants especially to be mentioned in this category are swiss chard, beet-tops, spinach, kale, endive, witloof and mustard. Many other plants find occasional or local favor. See *Greens*.

The only general cultural directions which can be given for salad plants are that blanching is often desirable and a quick unchecked growth is always a requisite. An abundance of rapidly available fertilizer and plenty of water are therefore to be insisted on. A warm light soil, in the best mechanical condition, is necessary for the same reasons.

F. A. WAUGH.

SALICÓRNIA (Latin, *salt* and *horn;* saline plants with horn-like branches). *Chenopodiàceæ*. GLASSWORT. MARSH SAMPHIRE. A group of about 12 widely scattered species of leafless seashore herbs, hardy or tender, annual or perennial. This and other chenopods which grow in large quantities in the Medit. region were formerly used in making soap and glass, as they yield a large percentage of soda. The ashes of such plants were known to the trade as barilla. The species have probably never been regularly in cult. and have no horticultural interest.

SALISBÙRIA: *Ginkgo*.

SÀLIX (ancient Latin name of willow). *Salicàceæ*. WILLOW. Dicœcious trees and shrubs, planted for the foliage and interesting habit, for shade, screens, and cover; flowers in catkins, mostly in spring and in many species very early.

Erect, or some arctic and alpine species prostrate, glabrous, pubescent or tomentose: lvs. simple, alternate, mostly elongated and pointed, the stipules persistent and prominent or caducous: buds with a single bud-scale: fls. in lax scaly spikes (aments or catkins), each fl. subtended by a single entire scale and nearly or quite destitute of perianth; the staminate fl. with 1, 2, or 3–6 stamens; the pistillate fl. of a single pistil composed of 2 carpels and 2 more or less divided stigmas; at maturity the pistil dehisces, setting free the small appendaged seeds.—Species and species-like hybrids probably 300, widely spread in the northern hemisphere and a few in the southern hemisphere; no native species are reported in New Zeal. and Austral. In temperate regions, they are mostly plants of water-courses, shores, and swamps; but a good number run into the far N. and the high elevations where conditions of moisture are maintained. The wood is light, soft, and porous. For the staminate and pistillate fls of willow, see Fig. 1528, Vol. III. The catkins or "pussies" are also shown in Figs. 3521 and 3522 herewith. In rare cases, a willow may be moncecious.

Many hybrids have been described based on specimens found in nature that presented characters intermediate between recognized species. Artificial hybrids have also been made between many species. The dicœcious habit of the species seems to facilitate cross-pollination, and it is probable that the intermediate forms so frequently met with and designated in the monographs as varieties are natural hybrids. Upward of one hundred hybrid willows have been described as

3523. White willow on a stream, holding the bank from washing. (See No. 7.)

growing in Europe. Although as many or even more species occur in America, fewer hybrids have been detected here. The hybrids described as growing in America are for the most part between native species and those introduced from Europe. Because of the hybridity and the fact that the sexes are separated, the genus Salix is considered to be very critical and difficult for the systematist.

The rôle that the willow plays in the north temperate regions is to a certain extent analogous to that of the eucalyptus in subtropical regions; it flourishes in wet ground and absorbs and transpires immense quantities of water. It has been used to plant around cesspools for sanitary effect. But while most of the species occur spontaneously in wet ground or along stream-banks, the willows may be cultivated in various situations. The white willow (*S. alba*) has been used very effectively to fix stream-banks against erosion. (Figs. 3523, 3524.) Its root-system is very extensive and when well established withstands the effect of heavy rapid streams as well as wave-action. *S. arctica* and several allied species are among the few woody plants extending into extreme arctic regions. The arctic species are among the most diminutive of woody plants. As one goes south the species increase in size. Some of the species of North Temperate, Tropical and South Temperate zones are large trees. The arborescent species all form wood very rapidly. Specimens of white willow which may not be of great age look venerable from their great thickness of trunk and size of top. The wood is light in weight and color, finely and evenly porous. The wood has been extensively used in manufacture of gunpowder. It has also been used for many other purposes. Certain species have been extensively cultivated for many years in Europe for materials with which to manufacture baskets. *S. viminalis* appears to be the favorite species for this purpose. Basket willow is now extensively planted in central New York, and considerable manufacturing of this material is under way. It is probable that the Chinese and Japanese willows recently described will yield useful forms for American planting; in Plantæ Wilsonianæ, III, pt. 1, describing Chinese plants, Schneider admits regularly 183 species.

As ornamental trees the willows present little variety. The bright yellow catkins of some species are attractive in spring. They are considerably used as "nurse trees"

3524. Same tree as in Fig. 3523, in summer dress.

for slower-growing trees that require partial shade while young. The red and yellow branches of certain willows are very bright and cheering in winter. The weeping forms are very popular, but they are often planted with little sense of fitness. The cultural remarks under Populus will apply to willows.

The species of willows are readily propagated by cuttings. It has been suggested that the brittleness at base of twigs of some species, notably the black willow (*S. nigra*), is an adaptation to facilitate the natural distribution of the species. Certain it is that twigs broken from the tree by the wind are carried down streams and, becoming anchored in the muddy banks, grow readily. It is one of the most aggressive trees in occupying such places. Willows may also be propagated by seed. The

3525. Old roadside trees of Salix alba.

seeds are very small and contain a green and short-lived embryo. A very short exposure of the seeds to the air will so dry them out that they will not germinate. The safest way to secure seedlings is to plant the seeds as soon as the capsule opens.

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KEY TO THE SPECIES.

A. *Species of the usual upright kinds.*
B. *Scales of ament green, deciduous: mostly trees.*
C. *Stamens more than 3.*
D. *Foliage persistent* ..... **1. Bonplandiana**
DD. *Foliage not persistent.*
E. *Buds small.*
F. *Lvs. green beneath* ..... **2. nigra**
FF. *Lvs. glaucous beneath* ..... **3. amygdaloides**
EE. *Buds large: lvs. very shiny above* ..... **4. lucida**
5. pentandra
CC. *Stamens 2 or 3.*
D. *Large trees* ..... **6. fragilis**
7. alba
8. vitellina
9. babylonica
10. Salamonii
11. blanda
12. elegantissima
13. Safsaf
DD. *Shrubs* ..... **14. longifolia**
15. argophylla
16. balsamifera

BB. *Scales of ament black above, persistent: mostly shrubs.*
C. *Stamens 2.*
D. *Caps. hairy*.....17. Caprea
18. discolor
19. rostrata
20. humilis
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29. incana
CC. *Stamen 1*.....30. purpurea
31. sitchensis
AA. *Species of the arctic-alpine kinds: dwarf often prostrate shrubs*.....32. Cottetii
33. herbacea
34. myrsinites
35. pyrenaica
36. repens
37. reticulata
38. retusa

1. **Bonplandiàna,** Kunth. A branching shrub or low tree with coriaceous lvs. 5–6 in. long, dark green above and glaucous beneath: aments usually precocious in the axils of mature lvs. Native of Mex. and the S. W. U. S.

2. **nìgra,** Marsh. Black Willow. Fig. 3526. Tree, 30–40 ft. high: bark flaky, often becoming shaggy: twigs brittle at base: buds small: lvs. lanceolate, green both sides, finely and evenly serrate: aments 1–2 in. long; scales oblong, deciduous; stamens 3–6; ovary ovate-conical, glabrous; style short but distinct. E. N. Amer. Var. **falcàta,** Pursh. Lvs. elongated, narrow and falcate.

3. **amygdaloìdes,** Anders. Peach-Leaf Willow. Tree, 30–40 ft. high: bark longitudinally furrowed, less inclined to be flaky: lvs. broader, glaucous beneath, on rather long, compressed petioles: aments loosely fld.; ovary lanceolate-conical; style very short. Cent. and W. N. Amer.

4. **lùcida,** Muhl. Shrub or low bushy tree, 6–15 ft. high: branches yellowish brown and highly polished: buds large, flattened, and recurved at the apex: lvs. large, broadly lanceolate-acuminate, serrate, dark green, shining above: aments large, appearing with the lvs.; scale pale green, deciduous; stamens 4–5; ovary pedicelled, rather obtuse, glabrous. E. N. Amer.—A beautiful plant, deserving of more extensive cult.

5. **pentándra,** Linn. (*S. laurifòlia,* Hort. *S. Humboldtiàna,* Hort. not Willd.). Bay-Leaf or Laurel-Leaf Willow. Shrub or small tree, 8–20 ft. high: branches chestnut-color: lvs. large, elliptic to broadly oblanceolate, acuminate, shining and dark green above, paler beneath: aments appearing after many of the lvs. are fully developed, not conspicuous. Eu. and Asia.

6. **frágilis,** Linn. (*S. víridis,* Fries., *S. Russelliàna,* Smith). Brittle Willow. Fig. 3526. Tree, 50–60 ft. high, excurrent in habit and of very rapid growth: branches brown, obliquely ascending: buds medium size, pointed: lvs. large, lanceolate-acuminate, glabrous or slightly hairy when young, scarcely paler beneath, glandular serrate: aments appearing with the lvs. (the staminate tree rare in Amer.), seldom bearing good seed, slender; scales deciduous. Eu., N. Asia. Gn. 19, p. 517; 55, p. 89.—Frequently cult. and also growing spontaneously in many places. A company of promoters induced many American farmers to plant hedges of this willow some 50 years ago. Many of these occur now throughout the country, the trees being 40–50 ft. high. A stake cut from a tree and driven in the ground will soon establish itself and grow into a tree. Var. **decípiens,** Hoffm. Twigs yellow: buds black in winter: lvs. smaller and brighter green. Probably a hybrid with another species.

3526. Leaves of willow. *1*, Salix petiolaris; *2*, S. candida; *3*, S. purpurea; *4*, S. myrtilloides; *5*, S. nigra; *6*, S. fragilis. (×½)

7. **álba,** Linn. White Willow. Fig. 3527; also Figs. 3523–3525. Large tree, with short and thick trunk, not excurrent in habit: branches yellowish brown: lvs. ashy gray and silky throughout, giving a white appearance to the whole tree, 2–4 in. long, elliptical. Eu. Gn. 55, p. 87; 61, p. 7.—Heretofore associated with the next species, from which it differs in color of twigs and vesture and color of lvs., as also in its general habit. It is only occasionally seen in Amer. Var. **splèndens,** Anderss. (*S. álba* var. *argéntea,* Wimm. *S. regàlis,* Hort.). Lvs. densely silky on both sides, nearly silvery-white while young. The forms of this species not easily distinguishable from one another, can be readily distinguished from the following species.

8. **vitellìna,** Linn. (*S. blánda,* Anderss.). Yellow Willow. Becoming a very large and venerable appearing tree, the rather short trunk often 4 ft. or more in diam. It is often pollarded. The crown is deliquescent and rounded in outline. Branches yellow: lvs. silky-hairy when young, glabrous when mature, glaucous beneath, the whiteness intensified after the lvs. fall: aments appearing with the lvs. Abundant in E. N. Amer. Mn. 8, p. 25 (erroneously as *S. alba*).—Displaying many variations, the most obvious of which are: Var. **aùrea,** Salisb. (var. *aurantìaca,* Hort.), branches golden yellow, especially just before the lvs. appear in spring. Var. **britzénsis,** Hort., bark red. These as well as other choice varieties are grafted. Var. **péndula,** Hort. (*S. aùrea péndula,* Hort. *S. álba* var. *vitellìna péndula,* Rehd. *S. babylónica aùrea* and *S. babylónica ramùlis aùreis,* Hort.). Tree of weeping habit, similar to *S. babylonica,* with yellow branches. M.D.G. 1898:88. Gn. 55, pp. 15, 22. S.H. 2:361, 371.

9. **babylónica,** Linn. (*S. péndula,* Moench). Napoleon's Willow. Fig. 3527. A tree of weeping habit, 30–40 ft. high, with long slender olive-green or purplish branches: buds small, acute: lvs. 2–6 in. long, attenuate at base and apex: aments appearing with the lvs., slender, the pistillate green, 1 in. long, caps. small. China. Gn. 1, p. 371; 34, p. 527; 39, p. 73; 55, p. 92. S.H. 1:261. F.E. 19:574. G.W. 2, p. 31.—Long known in cult. and often grown in cemeteries. Tender N. Var. **annulàris,** Forbes, lvs. twisted back so as to form a sort of ring.

10. **Salamònii,** Carr. (*S. babylónica* var. *Salamònii,* Carr.; sometimes erroneously spelled *Salomonii* or *Salmonii*). Hybrid between *S. alba* and *S. babylonica.* Similar to *S. babylonica,* but less pendulous: tree with ascending branches and pendulous branchlets: lvs. similar to those of *S. babylonica,* but sparingly silky-pubescent on both sides: pistillate catkins with more pubescent

axis and long-ciliate scabs. Originated in France. M.D.G. 1898:89. Gn. 55, p. 19. S.H. 2:373.—Probably *S. sepulcràlis*, Simonkai, belongs here.

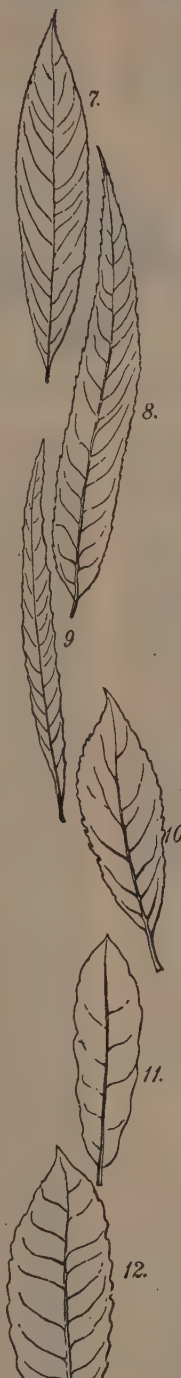
11. **blánda,** Anderss. (*S. Pétzoldii*, Hort. *S. babylónica* var. *doloròsa*, Rowen; possibly also *S. pendulìna*). Wisconsin Weeping Willow. A hybrid of *S. babylonica* and *S. fragilis*. Tree with spreading limbs and pendulous branches; branches brownish green or brown: lvs. lanceolate or narrow-lanceolate, long-acuminate, serrulate, glabrous, dark green above, glaucous beneath, 3–6 in. long and ⅓–¾in. broad: fls. with the lvs.; stamens 2; ovary short-stalked, glabrous, with one gland at the base, half as long as the pedicel. Of garden origin.

12. **elegantíssima,** Koch (*S. Sièboldii*, Hort.). Thurlow's Weeping Willow. Tree with more spreading habit and larger crown than *S. babylonica:* branches long and pendent, yellowish green, sometimes blotched with brown: appears to be more hardy than *S. babylonica*. Origin unknown. M.D.G. 1898:88. Gn. 55, p. 24. S.H. 2:363.—Said to be of Japanese origin; probably only a form of *S. blanda*.

13. **Sáfsaf,** Forsk. Egyptian Willow. A tree in general appearance like *S. alba* or *S. babylonica*. Several varieties have been described. The mature lvs. are bright green above and glaucous beneath, 3–5 in. long and over ½in. wide. N. E. Afr., where it is frequently cult. along highways.—Intro. into Italy many years ago.

14. **longifòlia,** Muhl. (*S. rùbra*, Rich., not Huds. *S. intèrior*, Rowlee. *S. fluviátilis*, Sarg., and other recent authors in part, not Nutt.). Fig. 3527. Varying in stature from a low shrub to a small tree, usually growing along streams and lake-shores: twigs smooth and brown to densely tomentose and gray: buds plano-convex, with an obtuse and rounded apex, very small: lvs. nearly or quite smooth, sparsely canescent to extremely canescent, sessile, linear-elliptical, remotely dentate, the teeth narrow, sometimes quite spinulose: stipules conspicuous, ear-shaped, obscurely denticulate, deciduous: aments of late spring on short lateral peduncles, which bear 4–6 lvs., those borne later in the season on much longer leafy branches, very loosely fld.: fls. fascicled in clusters of 2–5 on the axis, a distinct interval between the fascicles, first appearing in May and often bearing a second set of aments in early summer; scales usually glabrous or somewhat hairy toward the base, narrowly oblong, yellowish, deciduous after flowering; filaments crisp-hairy below, smooth above: caps. sessile, clothed when young with appressed silvery hairs, becoming nearly smooth at maturity; stigmas short, sessile. Cent. N. Amer.—The pistillate ament, lax at anthesis, becomes more so as the caps. mature, and by this character the species can easily be distinguished from related species.

15. **argophýlla,** Nutt. (*S. longifòlia* var. *argophýlla*, Anders. *S. fluviátilis* var. *argophýlla*, Sarg. *S. Hindsiàna*, Benth.). Tree or large shrub, 12–18 ft. high, forming dense thickets but not growing in clumps: branches nearly glabrous and exceedingly tough: bark turning from brown to bright yellow or orange just before blooming, making a thicket of it a most conspicuous object: lvs. narrowly lanceolate, closely sessile, entirely or rarely minutely and remotely denticulate, clothed equally on both sides with an appressed silky pubescence, which more or less conceals the veins; stipules obsolete: scales oblong and obtuse in the staminate ament, narrower and more acute in the pistillate; lower half of the filament densely crispy hairy: caps. lanceolate, covered with straight appressed silky hairs, closely sessile; stigmas sessile; mature caps. often nearly glabrous.—Occasionally the lvs. remain upon the plant over winter, the young shoots appearing in their axils in spring. Ament surpassed in length by its leafy peduncles; appearing in May in Ore. and N. Calif. and flowering intermittently all summer. This species is distinguished by its narrowly lanceolate, entire lvs., obsolete stipules, small and rather narrow aments, erose scales, and hairy caps. *S. argophylla* occurs on the Pacific slope from S. Calif. to Brit. Col. It is a western representative of the long-lvd. willows. Not advertised, but a beautiful species common along streams and irrigation ditches.



3527. Leaves of willows. *7*, Salix alba; *8*, S. babylonica; *9*, S. longifolia; *10*, S. rostrata; *11*, S. tristis; *12*, S. discolor. (×½)

16. **balsamífera,** Barr. Fig. 3528. A much-branched clean-looking shrub, with shining colored twigs, sometimes almost tree-like: glabrous: lvs. short-oval to lance-oblong, rounded and sometimes somewhat cordate at base, glandular-serrulate, thinnish and fragrant, dark green above and pale or glaucous and also prominently reticulate beneath: fertile aments becoming lax and open, the slender pedicels of the carpels much longer than the glands, the style short. Along the northern borders of the U. S. and far northward; an attractive species. G.F. 6:29 (reduced in Fig. 3528).

17. **Cáprea,** Linn. Goat Willow. Fig. 3529. A small tree, 12–25 ft. high, with upright branches: lvs. large, 2–5 in. long, 1–3 in. wide, rounded or subcordate at base, rugose, very variable: aments appearing before the lvs., large and showy, especially the staminate ones. Eu., Asia.—The typical form often occurs in yards where it has sprouted from the stock upon which the more popular but scarcely more ornamental variety, *pendula*, has been grafted. Var. **péndula,** Hort. Kilmarnock Willow. Dwarfed form, grafted on stock about 4 ft. high, and forming a weeping shrub. Often planted in yards. *S. multinérvis* is supposed to be a hybrid, and probably belongs with *S. Caprea*. *S. Cáprea* var. *tricolor*, Hort., is said by F. W. Kelsey to be a round-headed tree, with "tricolored foliage;" probably a form of *S. aurita*. *S. palmæfòlia*, Hort., is said by F. W. Kelsey to be of vigorous growth, with large, deep green lvs. and reddish purple young wood.

18. **díscolor,** Muhl. Pussy Willow. Figs. 3521, 3522, 3527. A shrub or short-trunked tree, 10–20 ft. high: buds very large and nearly black: lvs. smooth and bright green above, whitish beneath, irregularly crenate-serrate: aments appear early in spring, before the lvs., closely sessile, enveloped in long, silky hairs. E. N. Amer.—Worthy of more extended cult. and thriving in dry ground.

19. **rostràta,** Rich. (*P. Bebbiàna*, Sarg.). Fig. 3527. A small tree, 10–20 ft. high, with short but distinct trunk: buds of medium size, conical, brown: lvs. dull green and downy above, prominently veined and hairy beneath: aments appearing with the lvs., the staminate beautiful golden when in flower; scales narrow

and shorter than the pedicels: caps. long-rostrate. E. N. Amer.—Prefers dry soil and can be used to good advantage against walls and in rockeries.

20. **hùmilis,** Marsh. Prairie Willow. A shrub, 3–8 ft. high, varying much in stature, and in size and shape of lvs.: branches hairy: lvs. oblanceolate to oblong, nearly entire, more or less revolute: aments densely and many-fld. E. N. Amer.—Grows in driest situations.

21. **trístis,** Ait. Dwarf Willow. Fig. 3527. A diffuse shrub, 1–1½ ft., with long deep-set root: branches gray, slender: lvs. small, 1 in. long, linear-lanceolate, very short-petioled: aments small and rather few-fld.; stamens orange-red. E. N. Amer.

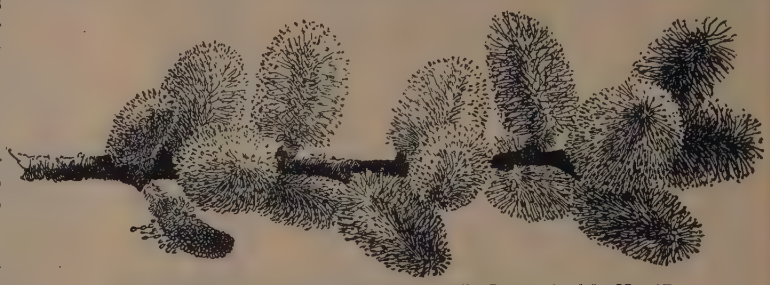
22. **serícea,** Marsh. Silky Willow. A shrub usually 4–8 ft. high, diffusely spreading from base: branches often reddish: buds obtuse and rounded at apex, cylindrical: lvs. very silky beneath, sometimes becoming less so at maturity: aments densely fld., appearing with the lvs.; stamens often orange-red: caps. short-pedicelled, ovate-oblong, nearly truncate at apex. N. E. N. Amer.

23. **petiolàris,** Smith, not Hort. Fig. 3526. A low shrub, 3–5 ft. high: branches slender, the whole plant much slenderer than *S. sericea*, with which it frequently grows: buds smaller and more pointed: lvs. only slightly silky when young, soon glabrous, more evidently toothed: aments rather loosely fld.: caps. rostrate and pointed, distinctly pedicelled. Cent. and N. E. N. Amer.—*S. petiolaris* of the trade is *S. incana*.

24. **viminàlis,** Linn. Osier Willow. A shrub or small tree, 10–20 ft. high: branches slender and straight: lvs. linear-lanceolate, beautifully silvery, 4–10 in. long; margins revolute, entire: aments appearing before the lvs., golden yellow. Eu., Asia.—Most often seen in plantations for basket material, for the production of which the plants are cut near the ground every year. Willow-culture in experienced hands is often profitable. (For details, see Simpson, Osier Culture, Bull. 19, Div. of For., U. S. Dept. Agric. 1898.) This species does not thrive in this country as well as in Eu.

3528. Salix balsamifera. (×½)

25. **cándida,** Fluegge. Hoary Willow. Fig. 3526. A shrub, 2–5 ft. high: young branches hoary, becoming smooth and red with age: buds reddish, rounded at the apex: lvs. lanceolate or linear-lanceolate, 2–4 in. long, dark green and wrinkled above, covered below with dense white tomentum, revolute: aments sessile, appearing before the lvs.; staminate of reddish anthers: caps. densely white-woolly, with red style and stigmas. N. Amer.—This species hybridizes freely with *S. cordata*, and several natural hybrids have been described.



3529. Staminate catkins of goat willow.—Salix Caprea (×½). No. 17.

26. **myrtilloìdes,** Linn. Fig. 3526. A shrub, 2–5 ft. high, with rather slender brown twigs: lvs. oblong or elliptic-obovate, usually obtuse at both ends, entire and smooth, reticulate-veined: aments rather few-fld.: caps. reddish, glabrous. N. E. N. Amer. and Eu. Usually grows in cold peat-bogs.—Probably not in cult. The plant sold under this name is probably some form of *S. purpurea*, which *S. myrtilloides* closely resembles in general appearance.

27. **cordàta,** Muhl. (*S. rigida*, Muhl.). Heart-leaved Willow. Fig. 3530. A large shrub or small tree, 10–30 ft. high: branches stout: buds large, flattened against the branch: lvs. oblong-lanceolate, green on both sides, finely serrate, glabrous and rather rigid at maturity: aments rather slender, appearing with the lvs.: caps. glabrous, greenish or brownish. N. Amer.—This is a variable species and undoubtedly some of the forms included in it are hybrids; several supposed natural hybrids have been described. Var. **péndula,** Hort., is a decumbent form.

28. **irroràta,** Anders. Colorado Willow. A dense diffuse shrub, 8–12 ft. high: branches stout, covered with a white bloom: buds large: lvs. linear-lanceolate, 3–4 in. long, ½in. wide, green above, glaucous beneath, undulate serrate: aments all appearing before the lvs., sessile, very densely fld.; staminate golden yellow: caps. glabrous, nearly sessile. Rocky Mts.

29. **incàna,** Schrank (*S. petiolàris*, and *S. rosmarinifòlia* of American gardeners, but not of botanists). Shrub or small round-topped tree, with long, slender branches: lvs. linear, revolute, 2–5 in. long, very narrow, green above, white-tomentose beneath: aments long and slender, appearing with the lvs.: caps. glabrous; filaments of stamens more or less connate. Eu.—This species is frequently grafted upon hardy stock (*S. Caprea*) when sold from nurseries.

30. **purpùrea,** Linn. (*S. Forbyàna*, Smith. *Vètrix purpùrea*, Rafin.). Purple Osier. Fig. 3526. A shrub or small tree, spreading at base, with long, flexible branches: lvs. oblanceolate, serrulate, glabrous, veiny, 3–6 in. long, often appearing opposite: aments sessile, slender; pistillate recurved; scales purple; stamen 1: caps. small, ovate. Eu.—Planted as an ornamental shrub and escaped in many places. Also grown as a basket-willow. Var. **péndula,** Dipp. (*S. nìgra péndula*, Hort. *S. amerì. càna péndula*, Hort.). Branches pendent. Gng. 4:243.

31. sitchénsis, Sans. SITKA WILLOW. A shrub, 10–12 ft. high and more: lvs. obovate, glabrous, clothed beneath with silky hairs which have a beautiful satiny luster: aments appearing with lvs., long, cylindrical and graceful, also satiny. N. W. N. Amer.—This willow, which, so far as known, has not been used as an ornamental plant, is one that would be at once novel and beautiful. The characteristic luster of the lvs. is preserved in plants in cult.

3530. Leaves of Salix cordata showing stipules. (×½)

32. Cottètii, Kerner. A low shrub differing from *S. retusa* mainly in the larger size of the whole plant as well as its lvs. Cent. Eu. G.W. 9, p. 542.

33. herbàcea, Linn. A very dwarf species usually not more than an inch or so in height, forming dense mats: lvs. orbicular, serrate, usually emarginate at both base and apex. Alpine regions of Amer. and Eurasia, White Mts., N. H.

34. myrsinìtes, Linn. (*S. Jácquinii,* Host). An alpine shrub a foot or less high, either erect or more or less creeping: lvs. short-petioled, lanceolate, coriaceous, shining, green both sides. Arctic and alpine regions.

35. pyrenàica, Gouan. A dwarf caulescent shrub usually more or less depressed in habit, with slender brown shining twigs: lvs. membranous, about 1 in. long and half as wide, entire, ciliate on the margin. In the alpine regions of the Pyrenees.

36. rèpens, Linn. A shrub of variable stature and vesture: lvs. oval to linear, entire or remotely serrulate, shining above, silver-silky or glabrous beneath, stipules wanting. N. Eu. and Asia. Var. **argéntea** has silvery-silky lvs. G.L. 22:325.

37. reticulàta, Linn. A depressed shrub with few oval or orbicular lvs. glaucous beneath, green above, rugose-reticulate: aments slender, borne on a long peduncle. Arctic regions of both hemispheres.

38. retùsa, Linn. (*S. serpyllifòlia,* Scop.). A depressed shrub: lvs. characteristically "parallel"-veined, obtuse or slightly retuse at the apex, entire, less than ½in. wide. Alpine regions of Eu. and Asia.

S. agilàia, Hort.=S. daphnoides.—*S. amygdàlina,* Linn. (S. triandra, Linn.). Usually shrubby, to 12 ft.: branchlets glabrous, rarely slightly silky: lvs. lanceolate, glabrous, pale green or bluish below, to 5 in. long: fls. shortly before or with the lvs.; stamens 3; ovary long-stalked, glabrous. Eu.—*S. Bàkeri,* Seemen, is probably a form of S. lasiolepis.—*S. Bóckii,* Von Seemen. An ornamental dwarf species: lvs. oblong or oval, ¼–½in. long, mucronate, dark green and glabrescent above, silvery with silky appressed hairs beneath: aments 1–2 in. long, produced in Oct. and Nov. before the fall of the lvs. China.—*S. chrysócoma,* Dode, is a hybrid between S. babylonica and S. vitellina.—*S. daphnoìdes,* Vill. Ten to 20 ft. high: twigs violet: lvs. narrow-oblong or linear-lanceolate, very acuminate, 3–6 in. long.—*S. Hánkensonii,* Dode. Apparently a natural hybrid between a species of the group of S. nigra and one of the group of S. babylonica.—*S. heterándra,* Dode. Possibly hybrid between a species of the S. purpurea group and one allied to S. pentandra. Shrub: lvs. lanceolate-obovate or narrowly lanceolate, 3–4 in. long, remotely serrate, glabrous, light green above, whitish-glaucous beneath: male aments about 1¾ in. long: Caucasus.—*S. hypoleùca,* Seemen. Shrub, to 10 ft.: lvs. elliptic to lanceolate, acute, glabrous at maturity, glaucous below, 1–2 in. long: aments with the lvs. 1–2 in. long. Cent. W. China.—*S. japónica,* Thunb. (S. babylonica var. japonica, Anderss.). Shrub, to 6 ft.: lvs. ovate-oblong to lanceolate, remotely serrate, glabrous, grayish green beneath, to 3 in. long: aments slender, 2½–3½ in. long; ovary glabrous. Japan.—*S. lasiólepis,* Benth. ARROYO WILLOW. Shrub or tree, 8–25 ft. high: lvs. oblong, suborbicular, obovate or linear acute, obscurely serrulate, 1½–5 in. long: aments appearing before the lvs., sessile, densely silky-tomentose in the bud, suberect: caps. glabrous or puberulent, short-pedicelled. Calif.—*S. lispocládus,* Dode. Lvs. ovate-lanceolate, about 2½ in. long, serrate, light green and shining above, whitish glaucous beneath: male aments appearing late. Caucasus.—*S. magnífica,* Hemsl. Shrub, to 20 ft.: lvs. oval to obovate, shortly and obtusely acuminate, glabrous, pale beneath, to 8 in. long and to 5 in. wide; petiole purplish: staminate aments to 7 in., pistillate to 11 in. long. W. China. A remarkable willow, but tender N. J. H.S. 39, p. 137, fig. 148.—*S. Matsudàna,* Koidzumi (S. babylonica var. pekinensis, Henry). Tree, to 40 ft.: branchlets ascending or pendulous, greenish: lvs. narrowly lanceolate, serrulate, glabrous, 2–4 in. long: aments with the lvs., about ½in. long. N. E. Asia.—*S. Medèmii,* Boiss., of the Armenia-Persia region is an upright species 12 ft. and more high with oblong somewhat serrate lvs. abruptly pointed.—*S. Médwedewii,* Dode. Shrub or small tree: lvs. very narrow, up to 4 in. long: female aments appearing late, cylindric, 1¼ in. long. Caucasus.—*P. óxica,* Dode. Lvs. large, glaucescent, giving the tree a bluish appearance. Cent. Asia.—*S. pérsica,* Boiss. Similar to P. babylonica. Trunk pale ashy gray or brownish: lvs. very shortly stalked, somewhat falcate, long-acuminate, serrulate. Persia.—*S. Rehderiàna,* Schneid. Shrub, to 10 ft.: branchlets sparingly hairy or glabrous: lvs. lanceolate, crenulate, whitish and silky beneath, with yellow midrib, 2–5 in. long: aments precocious, about 1 in. long; anthers purple at first; ovaries glabrous. W. China.—*S. renècia* is a hybrid, of which S. cinerea is a parent.—*S. Tóminii,* Dode. Tree with spreading branches: lvs. obovate to lanceolate, 3½–4 in. long or more, remotely serrate: male aments at first conical and rosy at apex, afterward ovate-cylindric, ¾in. long. W. Asia.—*S. triándra,* Linn.=S. amygdalina.—*S. Wallichiàna,* Anderss. Shrub or small tree: lvs. ovate- to oblong-lanceolate, entire, silky beneath like the young branchlets, 2–3 in. long: staminate aments 1 in. long, pistillate 3–5 in.: caps slender, silky. Himayalas, Cent. and W. China.—*S. zygostèmon,* Hook. f. & Thom. Probably a natural hybrid between S. purpurea and S. Medemii.—*S. Wéntworthii,* Hort., is described as a tall upright rapid-growing willow with bright red bark: botanical position to be determined.

W. W. ROWLEE.

SALPICHRÒA (Greek, *tube* and *skin;* in reference to the form and texture of the flower). Syn. *Salpichròma. Solanàceæ.* Shrubs, subshrubs, or herbs, sometimes grown in the warmhouse and now used for outdoor planting in southern California.

Leaves often small, entire, long-petioled: fls. white or yellow, 2–3 in. long (Section Eusalpichroa) or only about ½in. long (Section Perizoma); calyx tubular or short, 5-cleft or -parted, the lobes linear; corolla tubular or urn-shaped, without a crown in the throat; lobes 5, acute, often short induplicate-valvate: berry ovoid or oblong, 2-celled; seeds numerous, compressed.—About 10 species, extra-trop. S. Amer. The species described below is said to have the advantage of being an exceedingly rapid climber, covering walls within one season with a thick mass of foliage and will thrive in alkali soil and under intense heat. The small white berries are sold everywhere in Paraguay as "cock's eggs." It grows with astonishing rapidity from the fleshy roots, which, however, are destroyed by frost. If black scale secures a foothold, it is well to cut the plant down to the roots.

rhomboídea, Miers (*Salpichròma rhomboídeum,* Miers). A half-hardy climber, somewhat woody, with green, flexuous branches: lvs. small (blade ½–¾in. long), ovate-rhomboid: fls. small, usually less than ½in. long, solitary, nodding, white; corolla short, constricted at the middle and at the throat, and bearing on the inside a fleshy, woolly ring: berry ovate-oblong, yellowish or white, edible, but of poor flavor. Argentina. G.C III. 24:450. R. H. 1897:531. Gn. 35, p. 367. F.E. 32:448.—The plant appears to be offered as *Withania origanifolia,* although the genus Withania itself has good standing.

F. W. BARCLAY.

3531. Salpiglossis sinuata. (×½)

SALPIGLÓSSIS (Greek, *tube* and *tongue;* alluding to the form of the corolla and the appearance of the style). *Solanàceæ.* Viscous-pubescent half-hardy annual, biennial, or perennial herbs, chiefly used for garden flowers, but sometimes also grown in the greenhouse; of rich and attractive colors.

Plants about 18 in. high, erect, covered with short glandular hairs: lvs. entire, wavy-margined, dentate or pinnatifid: fls. long-stemmed, large, funnel-shaped, ranging in color from various shades of purple and blue through numerous reds and yellows to creamy white, and usually beautifully marbled and penciled with several colors; calyx tubular, 5-cleft, corolla funnel-form, widely bell-shaped at the throat; lobes 5, plicate, emarginate; stamens 4, didynamous: caps. oblong or ovoid; valves 2-cleft.—About 8 species, natives of Chile.

The usual species in cultivation is *S. sinuata*, which was formerly divided into about 6 species mainly on the color of the flowers. *S. sinuata* has greatly improved in size of flowers and range of color until it is at the present time amongst the very finest half-hardy annuals. The varieties of salpiglossis require the general treatment given half-hardy annuals. They prefer a deep light rich soil not given to sudden extremes of moisture and dryness. The seeds may be sown indoors by the middle of March or later, or may be sown outdoors in early spring. Care must be taken that the early sown plants do not become stunted before being planted out. They bloom for several weeks in late summer. The flowers are useful for cutting and last well. The plant is also excellent as a greenhouse annual for late winter bloom. Seeds for this purpose may be sown in late summer. (F. W. Barclay.)

3532. Salsify or vegetable oyster. (×⅙)

sinuàta, Ruiz and Pav. (*S. variábilis,* Hort. *S. Barclayàna,* Sweet. *S. hýbrida,* Hort. *S. grandiflòra,* Hort.). Fig. 3531. Hardy annual, 1–2 ft. high, suberect, branched, sticky-pubescent, with fls. 2 in. long and wide, ranging from straw-color and yellow through scarlet nearly to blue, with great variation in venation and markings: lower lvs. petiolate, elliptic-oblong, wavy-toothed or pinnately cut; upper lvs. more nearly entire: bracts sessile, entire. Vars. **azûrea, aûrea, coccínea, pûmila, nàna,** Hort., are offered. V. 23:129. Gn. 29:166; 40, p. 75. R.H. 1849:361. G. 14:269. Gn.W. 22:659; 25:586. J.F. 4:395. Var. **superbíssima,** Hort., has a more columnar manner of growth with a thick, unbranched stem. G.C. III. 22:363. A.G. 18:860.

S. atropurpùrea, Graham. St. procumbent at base, then erect, about 2 ft. high: lvs. scattered, various in shape, lanceolate-elliptical, elliptical, or ovate-elliptical, flaccid, sinuated, the segms. generally blunt and entire: fls. deep rich purple on rather long pedicels. Chile. B.M. 2811. Included in S. sinuata by many authorities.—*S. straminea,* Hook. (S. picta, Sweet. S. straminea var. picta, Hook.). Included in S. sinuata by many authorities from which it differs in the color of the corolla, which is whitish tinted yellow at the throat and often purple-veined. The top of the style of S. straminea is toothless while that of S. sinuata is toothed. Chile. B.M. 3365. Probably not in the trade.

F. Tracy Hubbard.†

SALPÍNGA (Greek, *trumpet,* referring to the shape of the calyx). *Melastomàceæ.* Erect glabrous branching herbs, including the warmhouse foliage plant known to the trade as *Bertolonia margaritacea.*

Leaves often unequal, oblong or lanceolate, long-petioled, under surface plum-colored: fls. spicate, on terminal, simple or dichotomously branched peduncles, secund, sessile or pedicellate; calyx glabrous, tube tubular or campanulate, 10-ribbed, the lobes short, tuberculate outside; petals 5, oblong or obovate; stamens 10; ovary free, oblong, 3-celled: caps. 3-edged, included in the terete, thickened, ribbed calyx.—Four species, Guiana, Brazil, and Peru.

margaritàcea, Triana (*Bertolònia margaritàcea,* Hort. Bull. *Gravèsia guttàta* var. *margaritàcea,* Nichols.). Tender perennial herb: st. 1½–4 in. high, erect, obtusely 4-angled, simple: lvs. long-petiolate, thin-membranaceous, ovate, base rounded or frequently distinctly emarginate-cordate, upper surface dark dull green, white-spotted between the veins, lower surface pale green, reddish or bright rose: cymes terminal, slender-branched, the branches red, rather long; fls. white or sometimes whitish rose; calyx-tube purplish, 10-ribbed, the ribs red; segms. green with pink tips; petals erect or erect-spreading, acute or rather obtuse: caps. pale, obscurely 3-sided. Brazil. F.S. 16:1697.

S. longifòlia, Triana (Bertolonia longifolia, Cham.). St. short, herbaceous: lvs. oblong, rarely ovate-oblong, base rounded or slightly cordate, upper surface bright green, glabrous, lower surface paler, scurfy-pubescent: cymes terminal; fls. white: caps. pale, 3-sided. Brazil.—*S. secùnda,* Schrank & Mart. St. subshrubby, erect: lvs. narrow-ovate or ovate-oblong, base rather obtuse or short-alternate, upper surface light green, lower surface paler: cymes terminal and axillary; fls. unknown: caps. pale red-brown, narrowly oblong, subcylindrical. Brazil.

F. Tracy Hubbard.

SALSIFY (formerly sometimes spelled *salsafy*) is *Tragopogon porrifolius,* one of the Compositæ. Fig. 3532. A garden esculent, grown for the fleshy root. This root has the flavor of oysters, hence the plant is sometimes called vegetable oyster and oyster plant.

Salsify is perfectly hardy. The seeds (which are really fruits) are sown in early spring, about as soon as the soil can be prepared, in drills where the plants are to stand. The drills may be 2 to 3 feet apart, if tilled by light horse-tools, or half that distance if tilled only by hand. In the rows, the plants are thinned to stand 3 to 6 inches apart. The plant requires the entire season, in the North, in which to grow. The roots may be allowed to remain in the ground until spring, for freezing does not harm them. In fact, they are usually better for being left in the ground, because they do not shrivel and become tough as they often do in storage. If they are kept cool and moist in storage, however, the quality is as good as when the roots remain in the ground. At least a part of the crop should be stored, for the table or the market during winter and early spring.

The plant is biennial. The second spring, a strong stalk 2 to 3 feet tall is sent up from the crown of the root, and in spring or early summer an abundance of light purple flower-heads are produced. The flowers, or heads, close about noon. The leaves are long, linear, and grass-like. The roots are small, well-grown specimens being about 1 foot long and unbranched, and about 2 inches in diameter at the top. The skin is grayish white. Salsify is easy to grow, and it has no serious pests. It is a vegetable of secondary importance commercially, although it should be in every home-garden, particularly in the North, where it thrives best. Eight to ten pounds of seed is sown to the acre. There are few varieties, and these have no marked characteristics except in size. The Mammoth Sandwich Island and Improved French are probably the best varieties. Salsify is native to southern Europe. In some places it has escaped as a weed. See *Tragopogon.*

Black salsify is Scorzonera; Spanish salsify is Scolymus.

L. H. B.

SÁLSOLA (Latin, *salsus*, salty; the plants grow in salty places). *Chenopodiàceæ*. Weedy annual and perennial branching herbaceous plants of some 50 species of very wide distribution, mostly on seashores and in saline soils, of no horticultural interest. Lvs. narrow, usually awl-shaped or long-pointed, commonly fleshy: fls. very small, sessile in the axils (Fig. 3533), perfect, provided with 2 bractlets; calyx 5-parted, the segms. winged on the back; petals 0; stamens usually 5; styles 2: fr. a flattened utricle, with a horizontal seed. Of interest because it includes the Russian thistle, *S. Kàli*, Linn., var. *tenuifòlia*, Mey. (*S. péstifer*, Nels.), now a widespread weed along railway rights of way and very abundant in the prairie and plains regions; of relatively recent intro. from Eurasia. With good tillage and short rotations it is not to be feared; when young or growing, it may have some value as forage. It is a bushy annual (Fig. 3534), and when broken off in autumn forms one of the tumble-weeds, and is carried long distances before the wind.

3533. Sprig of Russian thistle. (Natural size)

SÁLVIA (Latin name used as far back as Pliny, meaning to be well or healthy, referring to the medicinal properties of some species). *Labiàtæ*. SAGE. Herbs, subshrubs, and shrubs, certain of which are of economic use, such as sage and clary, while others are grown for ornament both indoors and out.

Leaves entire, dentate-incised or pinnatisect; the floral lvs. are frequently changed to bracts, rarely similar to the cauline lvs.: floral whorls 2– to many-fld., variously arranged, spicate, racemose, paniculate or rarely all axillary: fls. variously colored, rarely yellow, and various-sized from large and showy to minute; calyx ovoid, tubular or campanulate, 2-lipped; corolla-tube included or exserted, limb 2-lipped; perfect stamens 2, the connective linear, transversely articulate with the filament: nutlets ovoid-3-edged or rather compressed, smooth.—Upward of 500 species widely distributed in the temperate and warmer regions of both hemispheres. Salvia was monographed in 1848 by Bentham in DC. Prod., vol. 12, and an index to the 407 species therein described is found in Buek's Genera, Species et Synonyma, etc., pars iii. In 1876, Hemsley gave an account in The Garden (9:430–4) of 65 species which had been in cult. up to that time. See also A Synopsis of the Mexican and Central American Species of Salvia, by M. L. Fernald (Proc. Am. Acad. Arts Sci., vol. 35, 1900, and Contrib. Gray Herb. Harvard Univ. N. S. No. 19). In the work just cited 209 species are described and there is an elaborate key. Within the generic limits of Salvia the variation is astonishing. The color of the fls. ranges from scarlet through purple and violet to azure-blue, white and even pale yellow, but there seems to be no good pure yellow. Fig. 3535 indicates something of the range in form of corolla and calyx. Some fls. gape wide open, others are nearly tubular. In some the upper lip is longer than the lower, in other cases the lower lip is longer than the upper. The lower lip is always 3-lobed, but frequently it does not appear to be so, for the lateral lobes are much reduced while the midlobe is greatly enlarged, often deeply lobed, and becomes the showy part of the fl. The calyx is small and green in some, large, colored, and showy in others. In many cases, as *S. leucantha*, the corolla and calyx are of different colors. The bracts range from minute and deciduous to a larger size and more attractive color than the fls. There are usually about 6 fls. in a whorl, sometimes 2, sometimes many. In spite of these and many other wide variations, few attempts have been made to split up Salvia into many genera, presumably from the feeling that the structure of the stamens makes the Salvias a natural, not an artificial group.

Cultivation of salvias. (Wilhelm Miller.)

Three salvias are cultivated for their leaves, which are used in seasoning and also in medicine. These are the common sage, *S. officinalis;* clary, *S. Sclarea;* and *S. Horminum.* For commercial cultivation of *S. officinalis*, see *Sage*.

Clary is a perennial plant, but is cultivated as an annual or biennial. The plants run to seed the second year, after which it is better to pull up the old plants. The seed may be sown in spring, in drills 12 to 20 inches apart or in a seed-bed, from which the seedlings are pricked out in May. In August the first leaves may be gathered and the plants will continue to yield until June or July of the following year.

Clary (*S. Sclarea*) and its near relative, *S. Horminum*, are plants of exceptional interest. They are cultivated for their culinary and medicinal value and also for ornament, but their ornamental value lies not in the flowers (which are usually insignificant) but in the colored bracts or floral leaves at the tops of the branches. The various varieties are known as the Purple-top clary, Red-top clary or White-top clary; also Red sage and Purple sage. The two species (*S. Sclarea* and *S. Horminum*) seem to be much confused in the catalogues.

Among the salvias grown for ornament there are two large cultural groups, the hardy and the tender. The hardy species are mostly border plants, blooming in spring and early summer. The tender species are generally used for summer bedding, sometimes for conservatory decoration in winter. Many of them bloom in summer and late fall, especially when they are treated as half-hardy annuals.

3534. Plant of Russian thistle.

As regards color of flowers, there are also two important groups, the scarlet-flowered, and the kinds with blue, purple, violet, white, or variegated flowers. Of the scarlet kinds, *S. splendens* is the most called for; of the blue-flowered kinds, *S. patens* is the most popular of the bedding class, and *S. pratensis* the most sought of the hardy class. *S. patens* probably has the largest flowers of any of the blue-flowered kinds in cultivation.

The most widely used of all salvias cultivated for ornament is *Salvia splendens*, or scarlet sage. This is

one of the most brilliant red-flowered bedding plants in cultivation. It is generally grown in large masses. It does best in full sunshine, but may be used in shady places to light up dark woody recesses. It should have a dark background of some kind by way of contrast. A well-managed mass of scarlet sage may be maintained in full splendor from the middle of July to frost. It is propagated by either cuttings or seed. It is rather troublesome to keep cuttings or plants over winter, as they are particularly liable to attacks of aphis and red-spider. It is, therefore, important to get seed of an early-blooming variety of compact habit, and to sow the seed early indoors or in a frame in time to get good plants to set outdoors in May. A good raceme is over a foot long, with 30 or more flowers in a raceme, and 2 to 6 flowers in a whorl, each flower being 2 inches or more long. Some varieties have erect racemes, others pendulous, and there are white varieties, together with some intermediate colors. A poorly managed bed of scarlet sage gives a few flowers in September and is cut off in a short time by frost. Wet seasons delay the bloom, and, if the soil is too rich in nitrogen, the plants will make too much growth and the flowers will be late and relatively few. The same principles of cultivation apply to other tender salvias used for bedding. Florists sometimes lift a few plants of scarlet sage before frost, pot them and find that they make attractive plants under glass for a month or two. One advantage that *S. splendens* has over many other red-flowered salvias is that its calyx is as brilliant scarlet as the corolla.

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KEY TO SUBGENERA AND SECTIONS.

A. *Corolla without a hairy ring inside.*
  B. *Anterior portion of connectives deflexed, linear, longitudinally connate or closely approximate.* Subgenus III. JUNGIA.
    Section 7. CALOSPHACE. Species 27–46.
  BB. *Anterior portion of connectives deflexed, abruptly dilated, connected at the callous extremity.* Subgenus II. SCLAREA.
    C. *Calyx ovoid, the upper lip concave, 2-grooved, teeth 3, very short and connivent.*
      Section 6. PLETHIOSPHACE. Species 18–26.
    CC. *Calyx tubular or campanulate.*
      D. *Upper lip of calyx truncate, the teeth small and remote; upper lip of corolla erect and concave.* Section 4. HORMINUM. Species 12.
      DD. *Upper lip of calyx 3-toothed, the teeth straight, scarcely connivent, the middle one often very small.*
        Section 5. ÆTHIOPIS. Species 13–17.
AA. *Corolla with a hairy ring inside.*
  B. *Anterior portion of connectives connected, connate or approximate.* Subgenus I. SALVIA.
    C. *Calyx-teeth scarcely altered in fr., the upper lip of calyx subentire, somewhat 3-toothed.*
      D. *Upper lip of corolla erect, almost straight, concave.* Section 1. EUSPHACE. Species 1–4.
      DD. *Upper lip of corolla bent or falcate, compressed.*
        Section 3. DRYMOSPHACE. Species 7–11.
    CC. *Calyx-teeth membranaceous-dilated in fr., the upper lip of calyx 3-cleft or 3-toothed; upper lip of corolla erect or weakly bent, not or scarcely compressed.*
      Section 2. HYMENOSPHACE. Species 5, 6.
  BB. *Anterior portion of connectives remote.* Subgenus IV. LEONIA.
    C. *Connectives very short, deflexed and subulate anteriorly.* Section 12. HEMISPHACE. Species 52.
    CC. *Connectives directed forward, bearing fertile anther-cells anteriorly.*
      D. *Floral lvs. deciduous; bracts minute.*
        E. *Upper lip of calyx entire or minutely 3-toothed.*
          Section 11. NOTIOSPHACE. Species 51.
        EE. *Upper lip of calyx truncate, 3-toothed.*
          Section 10. HETEROSPHACE. Species 49, 50.
      DD. *Floral lvs. persistent and imbricated.*
        E. *Lvs. and bracts spiny.*
          Section 8. ECHINOSPHACE. Species 47.
        EE. *Lvs. and bracts not spiny.*
          Section 9. PYCNOSPHACE. Species 48.

Subgenus I. SALVIA.

All Old-World species.

Section 1. EUSPHACE.

Shrubs or subshrubs, rarely herbs.

A. *Lvs. all entire.*
  B. *Calyx viscous-pubescent*.....1. **Candelabrum**
  BB. *Calyx villous or pubescent but not viscous.*
    C. *Base of the oblong lvs. narrow-rotundate*.....2. **officinalis**
    CC. *Base of the ovate lvs. broad-rotundate or cordate*.....3. **grandiflora**
AA. *Lvs., at least the lower, pinnatisect*.....4. **ringens**

1. **Candelàbrum,** Boiss. Subshrub, half-hardy: st. shrubby at base, villous: lvs. entire, petiolate, oblong, both surfaces villous, canescent-tomentose beneath: panicle elongated, lax; the floral whorls remote, 3–5-fld.; calyx pedicellate, campanulate, somewhat 2-lipped, 5-toothed, viscous-pubescent; corolla with the upper lip yellowish, whitish streaked, the lower violet. July. S. Spain. B.M. 5017. F.S. 13:1344.

2. **officinàlis,** Linn. SAGE. Hardy, white-woolly subshrub, 6–12 in. high: sts. shrubby, the flowering branches tomentose-pubescent: lvs. entire, 1–1½ in. long, petiolate, oblong, base narrowed or rotund, the lower white-tomentose or lanate beneath or on both surfaces; the floral lvs. sessile, ovate, acuminate at the base, membranaceous, striate: racemes subsimple; floral whorls few, many-fld., distinct; calyx campanulate, membranaceous-colored, striate, pubescent or villous, the teeth subulate-acuminate; corolla purple, blue or white. Medit. region. June.—A common and variable species. Var. **albiflòra,** Alef., has lvs. 3–4 times as long as broad: fls. white. Var. **aùrea,** Hort., is a compact rather dwarf form about 1 ft. high, with golden yellow foliage. Var. **aùrea variegàta,** Hort., is offered in the trade. Var. **crìspa,** Alef., has broad, crisped and variegated lvs. Var. **icterina,**

Alef., has green-and-gold lvs. Var. **latifòlia,** Alef., has lvs. twice as long as broad; one of the common cult. forms. Var. **Mílleri,** Alef., has rather red and spotted lvs. Var. **purpuráscens,** Alef., has somewhat reddish foliage and is said to be preferred in England for kitchen use on account of its strong and pleasant taste. Var. **rubrifìòra,** Alef., has lvs. 3–4 times as long as broad, and red fls. Var. **salicifòlia,** Alef., has lvs. 4–7 times as long as broad. Var. **sturnìna,** Alef., has green-and-white lvs. Var. **trícolor,** Vilm. (*S. trícolor*, Hort., not Lem.), has lvs. of three colors, gray-green, veined with yellowish white and flesh-pink, later becoming velvety rose-red or deep red.

Var. **ténuior,** Alef., has lvs. about 3–4 times as long as broad and blue fls. This is the form commonly cult. as a kitchen herb.

3. **grandifìòra,** Etling. Shrub, 2 ft. or more high: st. woody, white-lanate: the flowering branches tomentose: lvs. entire, petiolate, ovate, acute, the base broad-rotund or cordate, pubescent, the lower ones lanate beneath; floral lvs. herbaceous or the uppermost membranaceous, ovate, acute: racemes subsimple; floral whorls 6–10-fld., distinct; calyx campanulate, colored, striate hispid; corolla blue. June, July. Asia Minor.—Rare in cult. The name is sometimes used in horticulture for plants which belong under *S. azurea* var. *grandiflora* or *S. splendens* var. *grandiflora.*

4. **rìngens,** Sibth. & Smith. Hardy shrub, 1–2 ft. high: sts. glabrous or spreading, pilose at base, viscous-pubescent above: lvs. petiolate, irregularly pinnatisect, the segms. unequal, ovate-oblong, base rotundate, both surfaces villous, scarcely canescent beneath, the petioles long-ciliate; floral lvs. membranaceous, deciduous: raceme simple; floral whorls about 6-fld., lax, remote; calyx nodding, tubular-campanulate, striate, villous-viscous, the teeth rather acute; corolla reddish purple or light blue, the tube recurved-ascending, the throat very broad. Summer. Greece. Gt. 2:226.

3535. Types of Salvia. At the left S. carduacea; unique for its fringed flowers. Next is S. leucantha, example of kinds in which the flower does not gape widely. The two at the right, S. hians and S. Sessei, are interesting for the size and lobing of the middle lobe of the lower lip. (All ×⅓)

Section 2. Hymenosphace.

Shrubs or subshrubs, rarely herbs. Oriental and S. African species.

A. *Lvs. ovate-subrotund.* ..... 5. **aurea**
AA. *Lvs. hastate-triangular* ..... 6. **canariensis**

5. **aûrea,** Linn. Shrub, 3 ft. or more high, white-tomentose: lvs. ½–1 in. long, petiolate, ovate-subrotund, obtuse, entire or sinuate, leathery, hoary; floral lvs. sessile, villous, persistent: racemes dense, 2–4 in. long, somewhat branched; floral whorls 2-fld., approximate; calyx broad-campanulate, villous, the lips membranous dilated, veined, and colored, the lobes ovate-rotundate; corolla very beautiful, golden yellow, the galea somewhat falcate. July. S. Afr. B.M. 182. G.C. II. 26:745.—Intro. into Calif. According to one grower the fls. are at first sulfur-yellow turning very quickly to a rusty color.

6. **canariénsis,** Linn. Shrub, about 6 ft. high: st. shrubby, white-lanate: lvs. petiolate, lanceolate, hastate-triangular, subglabrous; floral lvs. ovate-lanceolate, membranaceous and colored: racemes branched; floral whorls approximate, distinct, about 6-fld.; calyx incurved-campanulate, the lips dilated membranaceous, colored; corolla purplish, the galea somewhat falcate. Canary Isls.—Probably not in common cult.

Section 3. Drymosphace.

Herbs, usually tall and glutinous.

A. *Corolla yellow.*
B. *Plant about 3 ft. high: lvs. ovate-oblong* ..... 7. **glutinosa**
BB. *Plant 6–12 in. high: lvs. ovate-trilobed or triangular* ..... 8. **nipponica**
AA. *Corolla blue or purplish.*
B. *Raceme simple, spike-like: lvs. purple beneath* ..... 9. **yunnanensis**
BB. *Raceme more or less branched.*
C. *Floral whorls 6-fld.* ..... 10. **hians**
CC. *Floral whorls about 2-fld.* ..... 11. **Przewalskii**

See *S. flava,* G. Forest, in supplementary list, which probably belongs to this section.

7. **glutinòsa,** Linn. (*S. nubícola,* Wall.). Perennial, about 3 ft. high: st. herbaceous, erect, glutinous-pilose, divaricately branched: lvs. petiolate, the lowest 7–8 in. long, the upper smaller, ovate-oblong, acuminate, dentate, the base cordate-sagittate; floral lvs. ovate, acuminate: racemes simple; floral whorls distant, laxly few-fld.; calyx tubular; corolla pale yellow, often 1½ in. long, the tube exserted with its throat broadened. July. Eu. and Asia.

8. **nippónica,** Miq. Herb, 6–12 in. high, slightly branched: sts. ascending-erect: lvs. petiolate, opposite, ovate-trilobed or triangular from a truncate cordate-hastate base, the basal lobes horizontal-spreading, the midlobe ovate, larger or equal, all short-acuminate, dentate-crenate, sparsely hirtellus-pubescent above and especially so on the nerves beneath; cauline lvs. 1–3½ in. long; floral lvs. ovate, entire: racemes rather lax, 2–4 in. long; floral whorls frequently 4-fld.; calyx obconic- or subcampanulate-tubular, pilose, glandular-punctate; corolla whitish glandular, puncticulate when dry, tube half exserted. Japan.

9. **yunnanénsis,** C. H. Wright. Perennial herb, about 1 ft. high: rhizomes creeping, bearing fusiform tubers: lvs. 1½–3 x ¾–1 in., the radical frequently very long and slender-petioled, oblong, crenate, green above, purple beneath: spikes simple; floral whorls 4–6-fld.; calyx glandular; corolla cobalt-blue, 1 in. long, pubescent outside. China.

10. **hìans,** Royle (*S. himalàyaca,* Hort.). Fig. 3535. Hardy perennial, about 2 ft. high: st. herbaceous, erect, villous: lvs. long-petiolate, ovate, base broadly cordate-sagittate or truncate; floral lvs. ovate, acuminate: racemes somewhat branched; floral whorls 6–fld.; calyx campanulate, striate, bluish, glutinous; corolla

showy, blue, tube exserted, broad, the limb short, gaping, the upper lip falcate. June. Cashmere. B.M. 6517. B.R. 27:39. R.H. 1845:145. Gt. 35:1221. Var. **plectranthifòlia,** Paxt., has fls. which are rather smaller, less hairy and deeper violet than the type.

11. **Przewâlskii,** Maxim. Sts. ascending, 3–5 ft. high, herbaceous, pubescent, glandular above: radical lvs. long-petioled, crenate-dentate, hoary-tomentose beneath, acute, cordate-oblong; cauline lvs. acute, hastate-cordate; floral lvs. ovate, acute: racemes composite, spike-like; floral whorls distant, about 2-fld.; calyx campanulate, striate, glandular, the teeth acute, short-triangular; corolla violet, the tube long-exserted. June. China.

Subgenus II. SCLAREA.

All Old-World, herbaceous species.

Section 4. HORMINUM.

Annual herbs.

12. **Horminum**

12. **Hormìnum,** Linn. Annual, about 1½ ft. high: st. herbaceous, erect, villous: lvs. petiolate, oval-oblong, base rotund or cuneate, obtuse, crenate, villous; floral lvs. very broad, acute, persistent, the upper ones variously colored: racemes simple; floral whorls distant, about 6-fld.; calyx tubular, pubescent; corolla light lilac or pale violet to reddish violet or purple. June–Aug. S. Eu. Var. **álba,** Hort., has white floral lvs. Var. **purpùrea,** Hort., misspelled *purpureum* (*S. Hormìnum* var. *rùbra,* Hort.), has bright carmine-red to brilliant purple-red floral lvs. darker veined. Var. **violàcea,** Hort. (*S. Bluebeard,* Hort.), has light violet-blue floral lvs. somewhat larger and darker veined. Var. **vulgàris,** Hort., has violet-blue floral lvs., with darker veins.

Section 5. ÆTHIOPIS.

A. *Lvs. or lobes of the lvs. oblong-lanceolate or linear* ..... 17. **Montbretii**
AA. *Lvs. or lobes of the lvs. broad-ovate.*
B. *The lvs. hoary-tomentose* ..... 13. **Sclarea**
BB. *The lvs. green, the white wool lax.*
C. *Floral lvs. all floriferous* ..... 14. **æthiopis**
CC. *Floral lvs., the uppermost, sterile.*
D. *Plant about 2 ft. high: panicle strongly branched* ..... 15. **argentea**
DD. *Plant scarcely 1 ft. high: panicle slightly branched* ..... 16. **verbascifolia**

13. **Sclàrea,** Linn. (*S. bracteàta,* Sims, not Soland., in Russ. *S. Simsiàna,* R. & S.). CLARY. Biennial, 2–3 ft. high: st. herbaceous, stout, erect, villous: lvs. often 8–9 x 4–5 in., petiolate, broad-ovate, erose-crenate, base cordate, hoary, the uppermost clasping; floral lvs. very broad, acuminate, concave, membranaceous, colored, their base white, their tips rose: racemes paniculate; floral whorls distant, about 6-fld.; calyx campanulate, striate, pubescent-hispid, the teeth rather spiny-acuminate; corolla whitish blue, the tube included. Aug. S. Eu. B.M. 2320. B.R. 1003. G.C. III. 44:268. Gn. 64, p. 249. G.M. 57:173. Var. **turkestânica,** Hort. (*S. turkestánica,* Hort. *S. turkestaniàna,* Hort.), grows 3 ft. high, has quadrangular sts. tinged with pink, basal lvs. on long petioles and long spikes, 2½ ft. high, of large white fls., tinged with pink. There is a form offered in the trade under the name of *S. turkestánica supérba,* Hort., which has "dense branched pyramids of silky foliage and conspicuous rosy bracts, and white fls." **S. bracteàta,** Soland., in Russ., is a valid species belonging to Section 1. It is a subshrub about 1–1½ ft. high, with purplish fls. and a native of Asia Minor and Syria. Probably not in cult.

14. **æthiòpis,** Linn. Perennial, 6–12 in. or more high: st. herbaceous, erect, white-lanate: lower lvs. petiolate, narrow at base; cauline lvs. cordate-clasping; all incise-dentate, densely white-lanate on both surfaces; floral lvs. very broad, acuminate, persistent, concave, lanate: racemes paniculate; floral whorls distinct, 6–10-fld.; calyx campanulate, leathery, lanate, plicate-striate, the teeth all subulate-spinose; corolla white, the upper lip often reddish, tube contracted at the middle; connectives not toothed. S. Eu., N. Afr., and the Orient.—Probably not common in cult. *S. æthiopis,* Brot., not Linn., equals *S. argentea,* which see.

15. **argéntea,** Linn. (*S. pátula,* Desf.). Biennial, 2–4 ft. high: sts. herbaceous, erect, villous: lvs. radical and lower cauline, 6–8 x 4–6 in., broad-ovate, sinuate-lobate, the lobes erose-crenate, lanate; floral lvs. very broad, acuminate, concave, persistent: panicles divaricate-branched; floral whorls remote, 6–10-fld., the uppermost abortive; calyx campanulate, striate, the teeth all subspinose; corolla showy, rose-white, whitish, purplish or yellowish, the galea or upper lip much longer than the lower. June. Medit. region of Eu. and Afr. F.C. 3:112. Gn. 73, p. 517.—For some reason this species is considered a hardy perennial by American seedsmen. The foliage is white-woolly, making it a very decorative plant.

3536. Salvia pratensis. (×¼)

16. **verbascifòlia,** Bieb. (*S. microstègia,* Boiss. & Bal.). Perennial: st. herbaceous, erect, viscous-villous: lower lvs. petiolate, broadly ovate, base cordate, sinuate-lobate, erose, thick, very wrinkled, scarcely lanate above, white tomentose-lanate beneath; floral lvs. very broad, acuminate, concave, persistent, villous: panicles twiggy branched; floral whorls 2–6-fld., approximate, distinct, the uppermost abortive; calyx campanulate, striate, viscous-villous; corolla white, beset with blue hairs, galea very large and falcate. Caucasus region. Var. **kúrdica,** Hort., is offered in the trade.

17. **Montbrètii,** Benth. Perennial subshrub, low: sts. erect, the base white-lanate, the top viscous-villous: lvs. lanceolate, the lower petiolate, the upper clasping, crenulate or obscurely pinnatifid-dentate, laxly white-lanate above, densely so beneath; floral lvs. very broad, lanate beneath: racemes simple; floral whorls 6–10-fld.; calyx oblong-tubular, viscous-pubescent; corolla blue. Asia Minor and Syria.

Section 6. PLETHIOSPHACE.

A. *Corolla 1 in. or more long.*
B. *Pedicels longer than the calyx.*
C. *Lower lvs. incise-palmatifid* ..... 18. **bicolor**
CC. *Lower lvs. oblong-ovate or ovate-lanceolate, sinuate-serrate* ..... 19. **dichroa**
BB. *Pedicels shorter than the calyx.*
C. *Sts. subsimple, 1–3 ft. high* ..... 20. **pratensis**
CC. *Sts. 4–6 ft. high: panicles branched, very large* ..... 21. **virgata**
AA. *Corolla ½in. or less long, rarely as much as ¾in.*
B. *Lvs. incise-pinnatifid* ..... 26. **controversa**
BB. *Lvs. entire, crenate or erose-dentate.*
C. *Racemes erect and strict.*
D. *The lvs. all oblong-lanceolate or narrowly oblong.*
E. *Under surface of lvs. canescent* ..... 22. **sylvestris**

EE. *Under surface of lvs. pubescent but not canescent*.....23. **nemorosa**
DD. *The lvs., at least the lower ones, broad-ovate or ovate-oblong.*
E. *Plant scarcely 2 ft. high: corolla scarcely ½in. long*....25. **Verbenaca**
EE. *Plant 4–6 ft. high: corolla usually about ¾in. long*...21. **virgata**
CC. *Racemes nodding at the top*.....24. **nutans**

18. **bícolor,** Lam. Biennial, sometimes perennial (?), hardy: sts. herbaceous, erect, 2–3 ft. high, scarcely branched: lvs., the lowest petiolate, broad-ovate, incise-dentate, pinnatifid or palmate-lobate; the upper sessile, lanceolate, all cordate at base and glutinose-pubescent; floral lvs. ovate-lanceolate, acuminate, reflexed: racemes 1½–2 ft. long, many-fld.; floral whorls distinct, about 6-fld.; calyx campanulate, striate, glutinose-hispid, the teeth subulate-acuminate; upper lip of corolla hooded, bluish violet dotted with yellow, the lower one white, but said to fade quickly to a rusty brown. May–July. Spain and N. Afr. B.M. 1774. G.M. 40:487. P.M. 9:271.

19. **díchroa,** Hook. f. Half-hardy perennial: sts. 2–3 ft. or more high, quadrangular with obtuse thickened yellowish angles, which are retrorsely ciliate: radical lvs. petioled, 6–8 in. long, oblong-ovate or ovate-lanceolate, obtusely and very irregularly sinuate-serrate, pubescent; upper cauline lvs. sessile-oblong or elliptic-oblong; floral lvs. ovate, long-acuminate, reflexed: raceme 1 ft. or more long, many-fld.; floral whorls 2–3-fld.; calyx subcampanulate, glandular-pubescent, strongly ribbed, green; corolla 1–1½ in. long, upper lip bright blue, arcuate, pubescent, lower lip 3-lobed, the lateral lobes pale blue, the midlobe orbicular, pendulous, white. Aug. Atlas Mts. of N. Afr. B.M. 6004. G.C. III. 40:177. Gn. 72, p. 78.—By some authorities this is considered the same as *S. bicolor*.

20. **praténsis,** Linn. Fig. 3536. Hardy perennial, 2 ft. or more high: root sometimes tuberous: sts. herbaceous, erect, subsimple, pubescent: lvs., especially in the southern varieties, more or less blood-red maculate; radical lvs. petiolate, oblong-ovate, obtuse, crenate or incised, base cordate, bullate-rugose, glabrous above, pubescent beneath along the petiole and nerves; cauline lvs. few, sessile; floral lvs. cordate-ovate: racemes viscous, subsimple; floral whorls 6-fld., distant; calyx subsessile, campanulate, viscous-villous; corolla bright blue, rarely reddish or white, large, 1 in. long. June–Aug. Eu. Var. **álba,** Hort., has pure white fls. Var. **albiflòra,** Hort., is a white-fld. form; perhaps this and the preceding are the same. Var. **atroviolàcea,** Hort., has dark violet fls. Var. **Baumgártenii,** Hort. (*S. Baumgártenii,* Heuff.), has violet fls. Var. **lupinoìdes,** Hort. (*S. lupinoìdes,* Hort.), is said to grow 2 ft. high and to have bluish purple and white fls. Var. **ròsea,** Hort. (*S. salvatòri,* Hort.), has rosy purple fls. Var. **rubicúnda,** Hort. (*S. rubicúnda,* Wender.), has rose-red fls. Var. **supérba,** Hort., is offered in the trade. Var. **Tenòrii,** Hort. (*S. Tenòrii,* Spreng.), is said to grow 2 ft. high and to have deep blue fls. Var. **variegàta,** Hort. (*S. variegàta,* Waldst. & Kit.), has light blue fls. with the midlobe of the lower lip white.

21. **virgàta,** Ait. (*S. gigantèa,* Desf.). Hardy perennial, 2 ft. or more high: sts. herbaceous, erect, branched, pubescent-villous: radical lvs. petiolate, broad-ovate, base cordate; lower cauline lvs. short-petioled, broad ovate-oblong, base rotund or cordate, upper ones sessile and smaller, the uppermost cordate, clasping; all the lvs. erose-crenate, rather glabrous above, pubescent or hispid on the nerves beneath; floral lvs. ovate-acuminate somewhat reflexed: racemes branched, elongated, few-fld.; floral whorls 6-fld., distant; calyx short-pedicelled, campanulate, striate, villous-viscous; corolla light blue, the tube included. S. E. Eu. and the Orient. Var. **álba,** Hort., a white form, is offered in the trade.

22. **sylvéstris,** Linn. Hardy perennial, 6 in. to 3 ft. high: sts. herbaceous, paniculate above: lvs. often small, scarcely 2 in., sometimes 3–4 in. or more long, the lower petiolate, the upper sessile, all oblong-lanceolate, crenate, base rounded or frequently cordate, glabrous above, paler, pubescent or canescent beneath; floral lvs. orbiculate, acuminate, colored: racemes elongated, somewhat branched; floral whorls 6–10-fld., distinct; calyx ovate-tubular; corolla purple-violet. Aug. Eu. and Asia. Var. **álba,** Hort. (*S. sylvéstris* var. *flòre-álbo,* Hort.), is a white-fld. form.

23. **nemorôsa,** Crantz (*S. virgàta,* Hort., not Ait. *S. virgàta nemorôsa,* Hort.). Fig. 3537. Perennial, 2–3 ft. high, much branched: radical lvs. short-petioled, cauline sessile, lanceolate, 2½–3 in. long, the upper lvs. gradually reduced in size, glabrous and dull green above, pale and finely pubescent beneath: fls. small, in very long slender spikes terminating all the branches, up to 16 in. long; floral whorls approximate, 6-fld.; corolla bright violet or purple. June–Oct. Eu. and W. Asia. G.M. 56:714. R.H. 1913, p. 471.—The fls. are sometimes described as being bronzy purple. Var. **álba,** Hort., is said to grow 18 in. high and to have short spikes of white fls. This may be the same as *S. sylvestris* var. *alba,* as *S. nemorosa,* Linn., is a synonym of *S. sylvestris*.

24. **nûtans,** Linn. Hardy perennial, 2–3 ft. high: sts. herbaceous, subsimple, pubescent to nearly naked: lvs. few, the lower long-petioled, ovate-oblong, 4–5 in. long, double-crenate, the base subcordate; floral lvs. minute, orbicular: racemes short, 1–1½ in. long, paniculate, long-peduncled, nodding after anthesis; floral whorls about 6-fld., approximate; calyx reflexed, pubescent; corolla violet, the galea straight and spreading. July. S. E. Eu. B.M. 2436.

25. **Verbenàca,** Linn., also spelled *verbenàcea.* (*S. Spièlmanni,* Willd.). Hardy perennial, 1–2 ft. high: sts. herbaceous, erect, pubescent or villous: lvs. often 3–4 in. long, broad-ovate or oblong, crenate, glabrous; the lower long-petioled, base narrowed; the upper broader, sessile, base cordate, floral lvs. ovate-rotund, acuminate, villous, persistent: racemes elongated, simple or somewhat branched; floral whorls remote, about 6-fld.; calyx ovate, hirsute; corolla blue, rarely white, galea straight or somewhat falcate. June–Sept. Eu. and Orient. Var. **clandestìna,** Briquet (*S. clandestìna,* Linn.), is a smaller and more slender form than the type, with narrower lvs. and more purple fls. and the upper lip of the corolla is longer arched. Eu.—*S. spelmìna,* Hort., is a name appearing in American trade-lists for a plant which grows 2 ft. high and with deep blue fls. in July. Presumably an error for *Spielmanni*.

3537. Salvia nemorosa. (×⅛)

26. **controvérsa,** Ten. St. herbaceous, pubescent or villous: lvs. oblong, incisely pinnatifid, the lobes oblong-linear, very obtuse, incise-crenate, bullate-rugose, the margin revolute, both surfaces somewhat pilose; floral lvs. ovate-rotundate acuminate: racemes branched, long, white-villous; floral whorls 6–10-fld., the lower remote, the upper approximate; calyx ovate, very long

hirsute-lanate, the teeth minute; corolla small, sometimes minute. Medit. region.—Not common in cult.

Subgenus III. JUNGIA.

All American species.

Section 7. CALOSPHACE.

Herbs, subshrubs or shrubs.

A. *Lvs. rugose: corolla-tube slightly exserted, straight, ventricose or broadened above, the lips subequal or the upper longer.*

Subsection ERIANTHÆ.

(See also Nos. 36, 39, 43 and 44.)

31. **leucantha**

AA. *Lvs. seldom rugose (rugose in Nos. 36, 39, 43, and 44).*
B. *Corolla about ½in., occasionally a little longer.*

Subsection BRACHYANTHÆ.

C. *The lvs. cordiform*.....30. **amarissima**.
CC. *The lvs. linear, lanceolate, or ovate-lanceolate.*
D. *Calyx densely white or violet-lanate*.....28. **farinacea**
DD. *Calyx pubescent or slightly tomentose but not densely lanate.*
E. *Floral lvs. lanceolate-linear: floral whorls about 6-fld.*....27. **azurea**
EE. *Floral lvs. broad-ovate: floral whorls 10–20-fld.*.....29. **uliginosa**
BB. *Corolla ¾–6 in. long.*

Subsection LONGIFLORÆ.

C. *Base of some or all the lvs. hastate or angulate-cordate.*
D. *Under surface of lf. hispid or pubescent*.....45. **patens**
DD. *Under surface of lf. soft-villous and reddish or whitish*.....46. **cacaliæfolia**
CC. *Base of lvs. sometimes cordate, but not angulately so.*
D. *Calyx inflated-campanulate*....33. **Sessei**
DD. *Calyx not inflated, usually tubular-campanulate.*
E. *Lvs. membranaceous*.....32. **splendens**
EE. *Lvs. more or less coriaceous.*
F. *Tube of corolla not ventricose.*
G. *Base of lvs. narrowed*...42. **Goudotii**
GG. *Base of lvs. rounded or cordate.*
H. *Calyx glabrous, the teeth acute*.....43. **coccinea**
HH. *Calyx soft-pubescent, the teeth long setaceous-acuminate*...44. **longistyla**
FF. *Tube of corolla ventricose.*
G. *Corolla usually bluish, purplish, or violet.*
H. *The lvs. cuneate or narrowed at base*...39. **albo-cærulea**
HH. *The lvs. round, round-truncate, or cordate at base.*
I. *Under surface of lf. glabrous*.....40. **ianthina**
II. *Under surface of lf. pubescent*.....41. **cyanea**
GG. *Corolla usually scarlet or crimson, sometimes turning purple with age (cf. No. 33).*
H. *Lvs. ⅜–1 in. long.*
I. *Blade of lf. ovate or broad-oblong*.....34. **Grahamii**
II. *Blade of lf. narrow-oblong to linear-lanceolate*.....35. **Greggii**
HH. *Lvs. more than 1 in. long.*

I. *Lower surface of lf. pubescent*.....36. **fulgens**
37. **gesneræflora**

II. *Lower surface of lf. glabrous*.....38. **involucrata**

Subsection BRACHYANTHÆ.

27. **azùrea,** Lam. (*S. acuminàta*, Michx., not Cav.). Perennial, 1–6 ft. high: sts. herbaceous, erect, glabrous: lvs. petiolate, oblong-lanceolate or linear, rather obtuse or acute, base long-narrowed, somewhat serrate, both surfaces green and glabrous; floral lvs. lanceolate-linear, deciduous: racemes simple, elongated; floral whorls distant, about 6-fld.; calyx green or bluish, subsessile, tubular, striate, the 3 teeth broad, rather acute; corolla blue. Aug. S. C. to Fla. and Texas. B.M. 1728. Var. **grandiflòra,** Benth. (*S. Pitcheri*, Torr.), which differs in being cinereous-puberulent, in its denser infl. and tomentulose-sericeous calyx. G.C. II. 14:685. Gn. 19:600; 61, p. 309. G.Z. 26:121.—Probably the plant formerly offered as *S. Pitcheri* var. *angustifòlia*, Hort., belongs here. It is quite probable that some of the material in the trade as *S. azurea* var. *grandiflora* is in reality *S. farinacea*. Var. **grandiflòra álba,** Hort. (*S. azùrea* var. *álba grandiflòra*, Hort.), is a white-fld. form of the variety.

28. **farinàcea,** Benth. Perennial, 2–3 ft. high: st. herbaceous, erect, tomentose: lvs. petiolate, ovate-oblong, or lanceolate, rather obtuse, irregularly serrate-crenate, rather glabrous, both surfaces green or the lower canescent; floral lvs. small, deciduous: racemes elongated, simple; floral whorls many-fld., subsecund, remote or the uppermost approximate; calyx subsessile, tubular, purplish colored, densely white-lanate; corolla purple or violet, the tube scarcely exserted. Summer. Texas, where it is reported as growing in rich soil. Gn. 9:430; 28, p. 59; 78, p. 226. R.H. 1873:90.—A showy frequently cultivated species, the fls. quite attractive, the darker corollas being set off by the mealy lighter violet-white calices. Var. **álba,** Hort., is a white-fld. form with the midlobe of the lower corolla-lip obcordate, 2-lobed.

29. **uliginòsa,** Benth. Sts. herbaceous, erect, 2–6 ft. high, virgate, branched, glabrous or villous: lvs. 2–4 in. long, petiolate, oblong-lanceolate, acute, serrate, base narrowed, glabrous or pubescent; floral lvs. membranaceous, broad-ovate, acuminate, deciduous: racemes dense, long-peduncled, somewhat branched; floral whorls many-fld.; calyx campanulate, variable, sometimes colored; corolla blue or white, tube somewhat or nearly included. Brazil, Argentina, and Uruguay. B.M. 8544. Gn. 77, p. 484. G.M. 56:711. R.H. 1912, p. 469.

30. **amaríssima,** Ort. Perennial, about 2 ft. high: sts. herbaceous, erect, branched, pilose-hispid: lvs. petiolate, ovate-cordate, crenate, canescent below; floral lvs. ovate, acuminate, deciduous: racemes simple, densely fld.; floral whorls distinct, subremote, about 10-fld.; calyx tubular-campanulate, striate-villous, the 3 teeth rather acute; corolla blue. Aug. Mex. B.R. 347.—Probably rare in cult.

Subsection ERIANTHÆ.

31. **leucántha,** Cav. Fig. 3535. Shrub, about 1½–2 ft. high: st. shrubby, with elongated branches which are subterete, and white-lanate, the wool finally caducous: lvs. short-petioled, lanceolate-linear, acute, crenate, base rotundate, pubescent and rugose above, white-lanate beneath; floral lvs. ovate, acuminate, deciduous: raceme elongated, often purplish, 6–10 in. long; floral whorls many-fld., the lower remote; calyx subsessile, ovate, densely lavender- or violet-lanate; corolla white, white-lanate outside. June. Mex. B.M. 4318. Gn. 21:328.—Probably not very common in cultivation, at least in N. Amer.

Subsection Longifloræ.

Nobiles.

32. spléndens, Ker-Gawl. (*S. cólorans,* Hort. *S. brasiliénsis,* Spreng.). Scarlet Sage. Figs. 3538, 3539. Tender shrub or subshrub, treated as an annual, about 3 ft. high: st. shrubby with glabrous branches: lvs. petiolate, ovate, acuminate, crenate-serrate, base cuneate, rotundate or cordate, both surfaces glabrous; floral lvs. ovate, acuminate, colored: racemes terminal, spikelike, 6 in. or more long; floral whorls about 2-fld. (2- rarely 6-fld.), about 30 fls. in a raceme; calyx campanulate, membranaceous, scarlet, glabrous or villous, teeth 3, broad-ovate, acute; corolla scarlet, glabrous. Autumn. Brazil. B. R. 687. L.B.C. 11:1089. Var. **álba,** Hort., has creamy white fls. Var. **atropurpûrea,** Hort., a form with dark violet-purple fls. Var. **atrosanguínea,** Hort., has deep crimson fls. Var. **bícolor,** Hort., with large spikes of scarlet-and-white fls. Var. **Brunánti,** Hort., dwarfer than the type in habit and brighter scarlet fls. G.C. II. 14:781; III. 6:653. Gn. 21:328 (good). A. F. 5:331. Var. **compácta,** Hort., dwarfer habit, racemes thicker and more numerous, fls. brilliant scarlet. Var. **compácta álba,** Hort., a whitish variant of the preceding variety. Var. **compácta erécta,** Hort., a dwarf form with dark scarlet fls. Var. **grandiflòra,** Hort., is a tall-growing large-fld. form. G.M. 43:853. R.B. 27:12. The following variants of this variety are offered: Var. *grandiflòra erécta,* Hort. Var. *grandiflòra nàna,* Hort. Var. *grandiflòra péndula,* Hort. Var. *grandiflòra prostràta,* Hort. Var. **Issánchon,** Hort. (*S. brasiliénsis* var. *Issánchon,* Hort.), has the calyx white, striped red and a rose-white corolla, habit similar to var. *compacta.* Var. **nàna,** Hort., is a dwarf form, rather early flowering, the fls. bright red. Var. **purpûrea,** Hort., is offered in the trade. Var. **pyramidàlis,** Hort., is offered in the trade. F.E. 31:325. Var. **ròseo-carmínea,** Hort., is offered in the trade. Var. **semperflòrens,** Hort., is characterized as an early and continuous-flowering form. Var. **Souchétii,** Planch. (*S. Souchétii,* Hort.), is probably the same as var. *compacta.* There is a white-fld. variant of this variety known in the trade as *S. Souchétii* var. *álba,* Hort. Var. **violàcea,** Hort., is offered in the trade.—**S. nàna,** HBK., is a valid species belonging to Section 7. It is herbaceous, with a perpendicular, thickened tuberous root, almost stemless, with subsessile radical lvs. forming a rosette, and blue fls. Mex. Probably not in cult.

3538. Salvia splendens. (×½)

Inflatæ.

33. **Séssei,** Benth. (*S. Roèzlii,* Scheidw.). Fig. 3535. Subshrub, about 1½ ft. high: sts. shrubby with rather glabrous branches: lvs. 2–3 in. long, somewhat leathery, petiolate, broad-ovate or ovate-oblong, acuminate, base rounded cuneate or narrow, both surfaces glabrous or pubescent; floral lvs. smaller, the uppermost minute, deciduous: panicle short, lax; floral whorls few-fld.; calyx inflated-campanulate, scarlet, glabrous; corolla scarlet, almost 2 in. long, pubescent. Summer. Mex. F.S. 14:1407.

Fulgentes.

34. **Gràhamii,** Benth. Shrub, 2–3 ft. high: st. shrubby with glabrous or very slightly pubescent branches: lvs. petiolate, oval, obtuse, base rounded or cuneate, irregularly crenate in the center, subglabrous; floral lvs. ovate, acuminate, ciliate, deciduous: racemes elongated, more than 1 ft. long; floral whorls 2-fld.; calyx tubular, striate-nerved, pubescent, frequently colored; corolla deep crimson or when older purple, the midlobe of the lower lip, which is large and obcordate, has two small white spots. Summer. Mex. B.R. 1370. L.B.C. 18:1798. G.W. 15, p. 48.

35. **Gréggii,** Gray. Shrub, 1–3 ft. high: sts. glabrous or obscurely farinaceous; the branches slender: lvs. coriaceous, 1-ribbed, almost veinless, oblong, entire, base narrowed to a short petiole: racemes 2–3 in. long, 6–8-fld.; calyx narrowly campanulate, slightly pubescent or glandular; corolla red or purplish red, about 1 in. long, the tube strongly ventricose-gibbous, the throat abruptly contracted, the lower lip large and showy. Autumn. Texas and Mex. B.M. 6812. Var. **álba,** Hort., is a white-fld. form.

36. **fúlgens,** Cav. (*S. cardinàlis,* HBK.). Cardinal Salvia. Mexican Red Salvia. Perennial shrub, 2–3 ft. high: the numerous branches almost glabrous or pilose-hirsute: lvs. petiolate, 1–3 in. long, ovate, acute, crenate-serrate, base cordate, pubescent above, white-tomentose or lanate beneath; floral lvs. sessile, ovate, deciduous: racemes 6–12 in. long; floral whorls 6-fld., rather distant; calyx pedicelled, tubular-campanulate, pubescent; corolla showy scarlet, about 2 in. long, villous. July. Mex. B.R. 1356. L.B.C. 20: 1910.—The fls. are darker red than those of *S. splendens* and the calyx is said to be dull colored and conspicuously striate. Apparently not very frequently cult. Var. **Boucheàna,** Benth. (*S. Boucheàna,* Kunth), has the lvs. narrowly deltoid-ovate, truncate or subcordate at the base. Mex.

37. **gesneræflòra,** Lindl. & Paxt. (*S. gesneriæfòlia,* Lem.). Perennial herb about 2 ft. high (possibly sometimes a subshrub): the branches numerous and glandular-pilose: lvs. ovate-cordate, short-acuminate, crenulate-dentate, puberulent-ciliate and rugose-plicate above, densely long-pubescent-canescent beneath: floral whorls 5–6-fld., with very short pedicels; calyx green, tubular-dilated; corolla scarlet, 2 in. or more long, the tube globose-inflated, throat slightly constricted, short-pubescent. Said to flower in April and again in Nov. Colombia. F.S. 20:2131. I.H. 1:32. J.F. 2:179. J.H. III. 48:191.—Considered by many to be only a variety or form of *S. fulgens* which it closely resembles.

38. **involucràta,** Cav. Half-hardy subshrub, several feet high: sts. shrubby; the branches elongated: lvs. petiolate, 2–3 in. long, ovate, acuminate, crenate-serrate at the middle, the base rotund-cuneate, glabrous; floral lvs. bract-like, sessile, broad-ovate, acuminate, colored, deciduous after anthesis: racemes spicate, in fl. subglobose, at length 4–6 in. long; floral whorls about 6-fld., approximate; calyx tubular-campanulate, striate, viscous, often colored, the teeth setaceous-acuminate; corolla rose, tube ventricose, generally long-exserted, sometimes short, galea villous. Aug. Mex. and Cent. Amer. B.M. 2872. B.R. 1205. R.H. 1858, p. 239. H.F. II. 2:204.—The floral lvs. are large, showy, and rather a rose-purple, the fls. frequently shading toward purple. Var. **Béthellii,** Hort. (*S. Béthellii,* Hort.), is a horticultural form with large, cordate-oval lvs. and bright rosy crimson or puce fls. borne in large terminal whorled spikes. F.M. 1881:464. G.C. II. 15:49. Var. **Deschampsiàna,** Verl., grows 3 ft. or more high: lvs. cordate-acuminate: fls. in ovate spicate terminal clusters: bracts ovate, caducous, they and the calyx bright red; corolla bright rose. French garden origin. R.H. 1869:134, desc.

Cyaneæ.

39. **álbo-cærùlea,** Lind. Subshrub, about 3 ft. high: sts. erect: lvs. petiolate, oblong-lanceolate, long-acuminate, 4–6 in. lŏng, crenate-serrate, decurrent into the petiole, nearly glabrous above, softly pubescent beneath: racemes simple, 6–12 in. long; floral whorls 4– to many-fld.; calyx green, campanulate-tubular, glandular-pubescent; corolla-tube and upper lip cream-colored, lower lip rich indigo-blue sometimes tinged with violet or purple. Summer. Mex. F.S. 13:1340. Gt. 7:96.—Rare in cult.

40. **iánthina,** Otto & Dietr. (*S. Hóveyi,* Hort.). Perennial, about 2 ft. high: sts. herbaceous, erect, puberulous: lvs. ovate-subcordate, acuminate, crenate, rugose, paler beneath; floral lvs. ovate, acuminate, colored: infl. terminal; floral whorls 6-fld., clustered; corolla large, intense purple-violet. June. Habitat uncertain, probably Mex. or Peru. F.S. 9:884. R.H. 1854:61. G.C. II. 15:145.

41. **cyànea,** Benth. St. shrubby: branches 4-angled, hoary-pubescent or glabrous: lvs. petiolate, ovate, acuminate, serrate-crenate, pubescent, or frequently canescent beneath; floral lvs. ovate, acuminate, membranaceous, deciduous: racemes simple; floral whorls laxly 6–10-fld., subsecund; calyx tubular, bluish, glandular-villous; corolla blue, the tube exserted and ventricose. Mex. and Cent. Amer.

Tubulifloræ.

42. **Goudòtii,** Benth. (*S. lantanæfòlia,* Hort., not Mart. & Gal.). Shrub, about 2 ft. high, with the branches red-puberulent or glabrous: lvs. about 3 in. long, ovate or ovate-lanceolate, acuminate, serrate-crenate, base narrowed, both surfaces pubescent; floral lvs. lanceolate-subulate, deciduous: racemes simple; floral whorls 6–10-fld., subsecund; calyx tubular-campanulate, the teeth ovate, ciliate-margined; corolla red, more than 1 in. long. Colombia. R.B. 25:121.

43. **coccínea,** Linn. (*S. ròsea,* Vahl). Annual or sometimes perennial and subshrubby: st. herbaceous, erect, 1–2 ft. high, canescent-pubescent: lvs. petiolate, 1–2 in. long, ovate, acute, crenate, base cordate, pubescent above, hoary-tomentose beneath; floral lvs. ovate, acuminate, deciduous: racemes simple; floral whorls remote, 6–10-fld.; calyx tubular-campanulate, striate, often purplish, the teeth acute; corolla scarlet, glabrous. July. S. C. to Fla. and Texas, Mex., W. Indies, Trop. Amer., and cult. and occasionally escaped in India and Austral.—Probably all of the material grown as this is not true to name, possibly the larger part of it is in reality *S. splendens.* Var. **bícolor,** Hort., has the upper lip white, the lower lip brilliant carmine-red. Var. **láctea,** Hort., has white fls. Var. **màjor,** Regel (*S. filamentòsa,* Tausch. *S. Roemeriàna,* Hort., not Scheele), becomes a subshrub up to 4½ ft. high, is apt to be less canescent-pubescent and has larger bright scarlet-red fls. June to late autumn. Gt. 7:232. Var. **nàna,** Hort., is a dwarf much-branched form. Var. **nàna carmínea,** Hort., is offered in the trade. Var. **nàna compácta,** Hort., is a dwarfer and more bushy form than the variety proper.

Var. **pseùdo-coccínea,** Gray (*S. pseùdo-coccínea,* Jacq.), grows 2–4 ft. high, and has the st., petioles, and often the margins of the floral lvs. conspicuously beset with hirsute hairs. Mex. and Cent. Amer. B.M. 2864.

3539. Salvia splendens. No. 32.

J.F. 2:35. Var. **punícea,** Hort. (*S. coccínea* var. *spléndens,* Hort. *S. supérba,* Hort.), differs from the type in being larger, slenderer and later-flowering and in having fls. of a brighter red, more velvety and more closely placed. Var. **punícea nàna,** Hort., differs from the variety proper in being dwarfer and the twigs more branched. Var. **ròsea nàna,** Hort., is offered in the trade. Var. **spléndens,** Hort., equals var. *punícea,* Hort.

44. **longístyla,** Benth. (*S. aristulàta,* Mart. & Gal.). Plants reaching a height of 14–15 ft.: sts. herbaceous(?), erect, tomentose-villous: lvs. petiolate, broad-ovate, 3–5½ x 2–4½ in., acuminate, crenate, the base broad-cordate, rugose, both surfaces soft pubescent-villous; floral lvs. ovate, long-acuminate, ciliate, deciduous: racemes 15–25 in. long; floral whorls 6–16-fld.; calyx elongate-tubular, base striate, soft-pubescent, the teeth long setaceous-acuminate; corolla red-pink, long-exserted, rather more than 1 in. long. Mex. B.M. 8590.

Hastatæ.

45. **pàtens,** Cav. Half-hardy perennial, 1–2½ ft. high: sts. herbaceous, erect, pilose: lvs. petiolate, ovate-

deltoid, crenate, base hastate or in the upper lvs. rotund, both surfaces hispid; floral lvs. lanceolate-linear: floral whorls few, remote, with large fls.; calyx campanulate, villous, the teeth setaceous-acuminate; corolla blue, 2 in. or more long, the tube broad. Sept. Mountains of Mex. B.M. 3808. B.R. 25:23. B. 3:109. F. 1840:222. F.S. 5:503. P.M. 6:1. R.B. 26:85. R.H. 1909:156. H.U. 1, p. 39.—The most commonly cult. blue salvia. Var. **álba,** Hort., differs only in having white fls. F.S. 5:503. Var. **compácta nàna,** Hort., is offered in the trade. Var. **lilácina,** Hort., has lilac-blue fls.

46. **cacaliæfòlia,** Benth. Tender perennial: sts. herbaceous, erect, about 3 ft. high, pubescent: lvs. petiolate, broad-deltoid, the base angulate, broad subhastate-cordate, rather thick, pubescent above, reddish or whitish and soft-villous beneath; floral lvs. small: racemes branched; floral whorls 2-fld.; calyx campanulate, pilose, the teeth aristate-acuminate; corolla deep blue, pubescent, the tube very broad. June. Mex. B.M. 5274. F.S. 22:2318. Gn. 21:328.

Subgenus IV. LEONIA.

Section 8. Echinosphace.

47. **carduàcea,** Benth. Fig. 3535. Perennial, 1 ft. or more high: sts. herbaceous, erect, subsimple, white-lanate: lvs. petiolate, pinnatifid, laxly lanate beneath, the lobes ovate, sinuate-dentate, with spiny, acuminate teeth; floral lvs. and bracts imbricate, very spiny: floral whorls remote, densely many-fld.; calyx inflated, lanate; corolla lilac, the midlobe of the lower lip fimbriate. July. Calif. B.M. 4874. G.C. II. 19:56. Gn. 65, p. 365; 70, p. 238. A.G. 25:589.—A unique species on account of its thistle-like foliage.

Section 9. Pycnosphace.

48. **columbàriæ,** Benth. Half-hardy annual: st. erect, slightly branched, 6–12 in. high: lvs. deeply pinnatifid, wrinkled, rather glabrous, the lobes oblong-linear, obtuse, erose-dentate or incised; floral lvs. bract-like: floral whorls solitary or 2, capitate, far remote from the cauline lvs., densely many-fld., hemispherical; bracts broad-ovate, membranaceous, acuminate; calyx ovate, pubescent; corolla blue, the midlobe of the lower lip crenulate. Summer. Calif. and adjacent Mex. B.M. 6595 (fls. lilac).—Not showy and apparently not in common cult.

Section 10. Heterosphace.

A. *Lvs. lyrate*.....49. **lyrata**
AA. *Lvs. pinnatifid, they or the terminal lft. roundish or reniform-cordate*.....50. **Roemeriana**

49. **lyràta,** Linn. Hardy perennial with a thickened root: sts. herbaceous, erect, 8–24 in. high, subsimple, pilose: radical lvs. 2–3 in. long, lyrate, erose-dentate, both surfaces hispidulous; cauline lvs. few, oblong-lanceolate, the base long-narrowed; floral lvs. oblong-linear: racemes subsimple, interrupted; floral whorls 6-fld., lax, distant; calyx tubular-campanulate, nodding, pilose; corolla blue-purple, about 1 in. long. May and June. Conn. to Ill., south to Fla. and Texas.—Not frequent in cult.

50. **Roemeriàna,** Scheele (*S. porphyrántha,* Decne. *S. porphyràta,* Hook.). Perennial, 1–2 ft. high: sts. sparsely long, spreading, hirsute: lvs. or terminal lft. roundish or reniform-cordate, coarsely repand-toothed or crenately incised; lower lvs. usually with 2 or 3 similar but smaller (subsessile or slender-petiolulate) lfts.; floral lvs. mostly shorter than the pedicels: raceme loose and elongated; floral whorls few-fld.; calyx somewhat pubescent; corolla deep scarlet, puberulent, about 1 in. or more long, tubular-funnelform. July. Texas and Mex. B.M. 4939. F.S. 11:1080. R.H. 1854:301.

Section 11. Notiosphace.

51. **japónica,** Thunb. Perennial subshrub, about 1½ ft. high: sts. herbaceous, erect, branched, glabrous: lvs. 3–4 in. or more long, petiolate, pinnatisect, the segms. ovate, acuminate, the base narrowed, incise-dentate or pinnatifid, glabrous; floral lvs. lanceolate: racemes 4–5 in. long, many-fld., subsimple; floral whorls distinct, about 6-fld.; calyx tubular-campanulate, glabrous, striate; corolla dark lilac or blue(?), the tube scarcely exserted. Japan. Var. **álba,** Hort., is a white-fld. form.

Section 12. Hemisphace.

52. **verticillàta,** Linn. Perennial, 2–3 ft. high: sts. herbaceous, erect, pilose-hispid: lvs., the base cordate, lyrate, the uppermost lobe the largest, ovate-rotund or entire, sinuate-crenate, both surfaces hispid or lanate; floral lvs. deflexed and bract-like: racemes branched, often a foot or more long; floral whorls 20–40-fld., remote; calyx villous, corolla lilac-blue, the tube included. July and Aug. Eu., Asia Minor and Caucasus region.

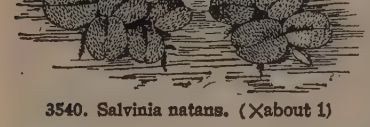
The following species have been in cult. or are not sufficiently known to be classified: *S. amèna,* Sims=S. lamiifolia.—*S. angustifòlia,* Cav. (Sec. 7). Perennial herb, about 2 ft. high, with subsessile oblong-linear lvs.: calyx often bluish; corolla blue. Mex. B.R. 1554.—*S. arbòrea,* Hort., is offered in the American trade, as like the scarlet sage, but growing in a tree-like form. Possibly only a variant of S. splendens.—*S. asperàta,* Falc. (Sec. 5). Stout herb, about 2 ft. high, with broad subcordate-ovate lvs.: corolla yellowish white. Himalaya. B.M. 4884.—*S. austrìaca,* Linn. (Sec. 6). Perennial herb, about 2–3 ft. high, with broad-ovate lvs.: corolla yellowish, the upper lip spotted red. S. Eu. B. R. 1019.—*S. bolivìana,* Planch. (Sec. 7). Subshrub about 4 ft. high, with ovate-cordate lvs.: calyx dull purple or green and purple; corolla bright scarlet, 3 in. long. Bolivia. B.M. 6714. F.S. 11:1148.—*S. Cámertonii,* Regel (Sec. 7). Subshrub, 3–5 ft. high, with ovate or cordate-ovate lvs.: corolla brownish purple, 1 in. long. Probably Mex. Gt. 4:180. Considered by some as probably the same as S. elegans.—*S. camphoràta,* Hort., is offered in the trade.—*S. candidìssima,* Vahl (S. odorata, Willd.) (Sec. 5). Subshrub or herb, about 3 ft. high, with ovate, lanceolate or orbicular lvs.: corolla white. Orient.—*S. canéscens,* Mey. (Sec. 5). Sts. herbaceous, 2 ft. high, white-lanate at base: lvs. lanceolate-oblong, entire or sinuate-lobate: corolla purple. Caucasus. B.R. 24:36.—*S. Celovìana,* Hort. Shrubby, with dark bronze-green foliage: corolla reddish violet. Hardy in S.W. England and Ireland. Botanically unknown.—*S. ceratophýlla,* Linn. (Sec. 5). Sts. herbaceous, white-lanate at base: lvs. deeply pinnatifid, 7–8 in. long, with linear lobes, both surfaces lanate: corolla about 1 in. long, yellowish white. Orient and Asia Minor. F.C. 1:5.—*S. chamædryoìdes,* Cav. (Sec. 7). Subshrub about 1 ft. high, with ovate-oblong lvs. which are hoary-tomentose beneath: calyx often purplish; corolla blue, the lower lip very broad. Mex. B.M. 808. L.B.C. 6:576.—*S. confertiflòra,* Pohl (Sec. 7). Subshrub, about 3 ft. high, with ovate-oblong lvs., base cuneate: racemes elongated, up to 2 ft.; floral whorls numerous, many-fld.; calyx reddish; corolla small, not gaping, reddish inside, yellowish or reddish outside, covered with yellow wool. Brazil. B.M. 3899. H.U. 3, p. 203.—*S. confùsa,* Benth. (S. interrupta, Hort., not Schousb.) (Sec. 1). Hardy shrub, about 4 ft. high, with tomentose-pubescent branches: lvs. interrupted pinnatisect, white-lanate beneath: calyx colored, striate and pubescent; corolla whitish. S. Eu.—*S. díscolor,* HBK. (S. mexicana minor, Hort.) (Sec. 7). Shrub, 2–3 ft. or more high, with ovate-lanceolate lvs.: spikes 8–9 in. long; calyx striate; corolla shining violet. Mountains of Peru. B.M. 6772. G.C. II. 19:341.—*S. élegans,* Vahl (Sec. 7). Perennial herb, 3–4 ft. high with ovate acuminate serrate lvs. hispidulous pubescent or tomentose above, glabrous beneath: corolla blood-red, more than 1 in. long. Mex. and Guatemala. B.M. 6448.—*S. eriócalyx,* Bert. (Sec. 7). Shrub with divaricate hoary-pubescent branches: lvs. oblong-lanceolate: racemes simple and short: calyx densely lanate, frequently reddish; corolla white. Japan. R.H. 1844:1.—*S. flàva,* G. Forest. Plant, 8–20 in. high: sts. ascending, erect, more or less pilose above: basal lvs. long-petiolate, 1¾–6½ x 1–3¼ in., hastate-triangular or hastate-ovate, more or less pilose on both surfaces, crenate, double crenate, or crenate-serrate: racemes composite; floral whorls 4–8, subremote, generally 4-fld.; calyx pilose; corolla canary-yellow with purple markings, about 2½ in. long; galea slightly lanuginose. W. China.—*S. Forskòhlei,* Linn. (Sec. 3). Hardy perennial, 1½ ft. high: st. herbaceous, somewhat viscous-villous: lvs. broad-ovate: corolla violet. Orient. B.M. 988.—*S. Gardneriàna,* Hort., is offered in the trade.—*S. globòsa,* Hort. Biennial: lvs. in a flattened rosette 16–18 in. long, 10–12 in. broad, deeply cut, clothed with a silvery white tomentum: fl.-st. 3 ft. or more high, much branched, the branches forming a sphere: fls. large, white. Asia Minor. R.B. 37: 28.—*S. Greìgii,* Hort., is offered in the trade as a wooded shrub 2½–3 ft. high: fls. a soft shade of cerise, produced all summer. G.M. 57:713.—*S. Heèrii,* Regel (Sec. 7, probably). Subshrub, 2–5 ft. high, with cordate-ovate or lanceolate lvs.: corolla scarlet. Peru. Gt. 4:115.—*S. índica,* Linn. (Sec. 5). Perennial herb, about 3 ft. high, with broad or oblong-ovate lvs., the floral ones ovate-cordate, reflexed: corolla yellow spotted with purple. Syria. B.M. 395.—*S. interrúpta,* Schousb. (Sec. 1). Hardy subshrub, 3–4 ft. high, with

irregularly pinnatisect lvs., the extreme segm. much larger than the others: corolla showy, dark violet-purple with a white throat. Morocco. B.M. 5860.—*S. lamiifòlia*, Jacq. (S. amœna, Sims) (Sec. 7). Shrub, about 2 ft. high, with ovate, serrate-crenate lvs.: corolla blue, the upper lip covered with whitish blue wool. W. Indies. B.M. 1294. B.R. 446. L.B.C. 4:377.—*S. lavenduloides*, HBK. (S. lavenduliformis, Neum.) (Sec. 7). Perennial herb, with very short-petioled, oblong-lanceolate lvs.: spikes 2–3 ft. long; corolla pale blue, small. Mex. R.H. 1845:445.—*S. leonuroides*, Glox. (S. formosa, L'Her.) (Sec. 7). Shrub, about 3 ft. high, with ovate or rhomboid lvs.: the floral whorls in the axils of the cauline lvs. not racemose; corolla scarlet. Peru and Brazil. B.M. 376.—*S. macrostàchya*, HBK. (Sec. 7). Shrub, about 6 ft. high, with subrotund-ovate lvs., their base deeply cordate, the auricles rounded; the floral lvs. large, green: corolla blue, the lower lip longer than the galea. Peru. B.M. 7372. —*S. oaxacàna*, Fern. (Sec. 7). Shrub, much branched: lvs. ovate, pale green and strongly rugose above, white-tomentose beneath: floral whorls mostly 2-fld.; corolla cardinal-red, nearly 1¾ in. long. Mex.—*S. oppositiflòra*, Ruiz & Pav. (Sec. 7). Half-hardy subshrub, about 2 ft. high, with ovate, pubescent lvs.: floral whorls 2-fld., secund, calyx striate; corolla scarlet. F.S. 4:345. P.M. 15:53. Gt. 4:212.—*S. princeps*, Hort. (Sec. 7). Subshrub, 3–6 ft. high: lvs. large, ovate-serrate, with the principal veins prominent: spikes large, terminating the branches; calyx colored; corolla brilliant carmine-rose, slightly ventricose, lfts. small. Mex. R.B. 33:257. Resembles S. splendens. —*S. prunelloides*, HBK. (S. brunellodes, Voss) (Sec. 7). Several herbaceous sts. from a perennial base: lvs. ovate-oblong, both surfaces green: corolla blue. Mex. P.M. 11:175. Var. *purpùrea*, Hort., has the fls. purplish red.—*S. rùtilans*, Carr. (Sec. 7). A plant with a small green calyx and usually 2-fld. floral whorls. Probably a horticultural form of S. splendens. R.H. 1873:250. G.C. II. 15:117(?).—*S. scabiosæfòlia*, Lam. (S. Habliziana, Willd.) (Sec. 1). Perennial herb, 1–1½ ft. high, with pinnatisect lvs.: segms. 3–5-jugate, frequently in pairs or 3's: corolla white. Tauria. B.M. 1429 and 5209.—*S. scapiformis*, Hance (Sec. 11). Perennial herb: lvs. radical, broadly ovate or oblong-cordate: scapes 6–10 in. high; the floral whorls numerous; corolla amethystine. Formosa. B.M. 6980.—*S. Sieheàna*, Hort., is described as perennial, and having large light lilac fls.—*S. Soùliei*, Duthie. Perennial, about 2 ft. high: sts. herbaceous: lvs. dark green, triangular, rugose: fls. numerous, tubular-lipped, delicate shade of blue. China.—*S. strictiflòra*, Hook. (Sec. 7). Shrub, about 2 ft. high, with ovate, pale green, slightly fleshy lvs.: fls. stiffly erect, tubular and golden red. Peru. B.M. 3135. P.M. 11:247.—*S. taraxacifòlia*, Coss. & Bal. (Sec. 1). Subshrub, 6–18 in. high, with lvs. 2–4 in. long, pinnatisect, terminal lobe 1–1½ in. long, ovate and irregularly sinuate-toothed, all white-tomentose beneath: corolla pale pink with a yellowish disk to the lower lip and a purple-speckled palate. Morocco. B.M. 5991.—*S. tricolor*, Lem. (Sec. 7). Half-hardy shrub, about 2 ft. high, with small ovate lvs. rounded-obtuse at the apex, with a terminal tooth: corolla white, the lower part of the large lower lip reddish. Mex. I.H. 4:120. F.S. 12:1237.

F. Tracy Hubbard.

SALVÍNIA (Antonio Maria Salvini, 1633–1729, Italian scientist). *Marsiliàceæ*. An interesting plant for the small home aquarium. Salvinia is a genus of fern-allies found mostly in the tropics and comprising about a dozen species, only one of which, *S. natans*, Linn. (Fig. 3540), is cultivated.

Plants floating, with slender sts. bearing apparently 2-ranked, oblong lvs. 4–6 lines or even 1 in. long: upper surface of lvs. covered with papillæ or minute warts; lower densely matted with brown pellucid hairs. The plant is supposed to have no true roots. What look like roots are believed to be finely dissected lvs.; one of these occurs with each pair of the foliage-lvs. Many aquatic plants have these 2 types of foliage, e. g., the water buttercup, *Ranunculus aquatilis*. Salvinia looks much like a flowering plant but it is a spore plant and has 2 kinds of spores, large ones and minute ones. These spores are produced in small oval bodies known as sporocarps, i. e. "spore-fruits." Of each cluster of sporocarps, 1 or 2 contain 10 or more sessile macrosporangia, each of which contains a solitary macrospore. The other sporocarps in the cluster contain numerous microsporangia, each of which contains numerous microspores.



3540. Salvinia natans. (×about 1)

The plant is of easy culture in summer, but many persons have lost it over winter by not understanding its habits. It is an annual and often dies in the winter after ripening a crop of spores. Secure a broad pan, fill it half full of loam and then fill the pan with water. After the water has cleared place the salvinias on the surface. In the winter watch for the formation of the spore-capsules. These grow in masses near the top of the clusters of root-like leaves. After the plants die the spore-capsules will remain in the soil. The plant often passes the winter in greenhouses in a growing condition, producing no spores.

R. C. Benedict.†

SAMANÈA (a corruption of its native Spanish name of *zaman*). *Leguminòsæ*. Spineless or rarely spiny trees or shrubs of the American tropics, where one or two of them are much planted for shade.

3541. Samanea Saman.

Leaves several- or rarely many-pinnate; lfts. 1- to many-pinnate: fls. in globose heads: pods straight or somewhat curved, rigid, more or less constricted, flat, thickened or subterete, leathery or fleshy, indehiscent or rarely but slightly so; septate between the seeds. Distinguished from Enterolobium by the nearly straight pods and from Pithecolobium by its indehiscent septate pods.—About 30 species.

A. *Lvs. 2–4-pinnate; lfts. 2–8-pinnate.*

Samán, Merrill (*Mimòsa Samán*, Jacq. *Pithecolòbium Samán*, Benth. *Enterolòbium Samán*, Prain). Rain Tree. Zaman. Saman. Figs. 3541, 3542. A large tree, reaching a height of 60–80 ft., with wide-spreading branches; branchlets velvety pubescent: lvs. 2–4-pinnate; lfts. 2–8-pinnate, oblique, ovate-oblong or suborbicular, up to 1½ in. long, shining above, pubescent beneath: peduncle 4–5 in. long: fls. in heads, in short pedicels; calyx ¼in. long, pubescent; corolla about ½in. long, yellowish; silky, villous; stamens 20, light crimson, shortly connected: pod sessile, straight, thick-margined, leathery-fleshy, glabrous, indehiscent, 6–8 in. long, ½–1 in. broad, flattened or subterete. A native of Cent. Amer. and the W. Indies, but now widely distributed in the tropics as an ornamental shade tree. Blanco, Fl. Filip. 309. Jacq. Fragm. 9. G.C. III. 11:557.—The lfts. fold together on the approach of rain. A rapid grower. The pods contain a rich sugar-pulp and are eagerly eaten by cattle and horses. The seeds are of little food value as they are not digested and often cause slight digestive troubles. The pods when eaten by cows are said to increase the quality of their milk.

AA. *Lvs. 5–12-pinnate; lfts. 20–30-pinnate.*

arbòreum, Ricker (*Mimòsa arbòrea*, Linn. *Mimòsa filicifòlia*, Lam. *Pithecolòbium filicifòlium*, Benth. *Pithecolòbium arbòreum*, Urban). A magnificent tree, 50–75 ft. tall, ferruginous-tomentose: lvs. 8–12-pinnate; lfts. 20–30-pinnate, oblique, falcate-oblong, obtuse, ¼–⅓in. long, glabrescent: peduncles axillary or above the axils, 2–3 in. long: fls. white, sessile in globose heads, often pubescent; calyx 1 line long, corolla ¼in. long: pod red, tomentose when young, becoming glabrous, terete, fleshy, constricted between the seed, slightly curved or twisted, 2–3 in. long, ⅓–½in. broad, finally somewhat dehiscent; seeds black. Trop. Amer.

P. L. Ricker.

SAMBÙCUS (old Latin name for the elder, also spelled *Sabucus*). *Caprifoliàceæ.* ELDER. Ornamental mostly woody plants grown for their handsome foliage, showy clusters of white flowers, and the attractive red or black berries.

Deciduous shrubs or small trees, with stout very pithy branches, rarely perennial herbs: lvs. opposite, odd-pinnate, with serrate lfts., with or without stipules and stipels: fls. small, usually perfect, white, in terminal compound cymes or panicles, usually 5-merous, rarely 3- or 4-merous; calyx-lobes minute; corolla rotate with short tube and oval to oblong-lanceolate lobes; stamens with short filaments; ovary inferior, 3–5-celled; style short, 3–5-lobed: fr. a drupe with 3–5 1-seeded nutlets.—About 20 species in the temperate and subtropical regions of both hemispheres. Some species, particularly *S. nigra* and *S. canadensis*, possess medicinal properties; the fr. of these species and also that of *S. cærulea* is used in cookery, also elderberry wine is made from it. The hard wood, the large pithy shoots which are easily hollowed and the pith are put to various uses. Monograph of the genus by Count Schwerin in M.D. 1909, pp. 1–56.

The elders are large and rather coarse shrubs, rarely tree-like, or perennials spreading by suckers, with pinnate foliage and large flat or panicled clusters of white or creamy white small flowers followed by red or black, rarely glaucous or in some varieties green or yellow fruits. They are well adapted for mass planting and are very effective as well in bloom as in fruit in their proper places. They prefer rich and humid soil and most species are hardy North; *S. cærulea* and its var. *neo-mexicana* are hardy at least as far north as Massachusetts. Propagation is by seeds which germinate readily and by hardwood and greenwood cuttings, also by root-cuttings; the perennial species and also *S. canadensis* by suckers.

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3542. Samanea Saman. (×¼)

A. *St. woody.*

B. *Berries black or dark purple, rarely green or white: pith white: cymes flat.*

C. *Fr. not glaucous.*

1. **nìgra,** Linn. EUROPEAN ELDER. Large shrub or tree, to 30 ft., with deeply furrowed bark: all parts when bruised exhaling a disagreeable odor: branches gray, strongly lenticellate: lvs. dark green, usually pubescent beneath while young; lfts. 3–7, usually 5, short-stalked, elliptic, acute, serrate, 2–6 in. long: cymes 5-rayed, to 5 in. across: fr. black, lustrous, 3-celled, ¼–⅓in. across. May, June: fr. Aug., Sept. Eu., W. Afr., W. Asia. S.E.B. 4:637. R.F.G. 12:780. H.W. 3, p. 132. G.C. III. 10:405. Many varieties: Var. **pyramidàta,** Lav. (var. *pyramidàlis*, Dipp.). Habit columnar. Var. **péndula,** Dipp. Pendulous or prostrate. Var. **nàna,** Schwerin. Forming a globose bush about 3 ft. high; weak-growing. Var. **rotundifòlia,** Endl. Lfts. 3, rarely 5, broadly ovate to suborbicular. Var. **laciniàta,** Willd. (*S. laciniàta*, Mill.). Lfts. regularly and finely dissected. R.F.G. 12:780. A handsome and distinct form. Var. **heterophýlla,** Endl. (var. *linearis*, Kirchn.). Lfts. irregularly cut and erose and partly reduced to the midrib; slow-growing form. Var. **latisécta,** Hesse. Lvs. broadly lobed. Var. **álbo-variegàta,** Endl. Lvs. variegated with white. J.H.S. 33, p. 360, fig. 47. G.W. 11, p. 474. Var. **pulverulénta,** Sweet. Lvs. finely dotted and sprinkled with white. Var. **aùrea,** Sweet. Lvs. golden yellow. G.W. 2, p. 565. Var. **víridis,** Ait. (var. *chlorocárpa*, Hayne. Var. *virèscens*, Sweet). Fr. pale green, striped whitish. M.D. 1908:8, fig. 2.

2. **canadénsis,** Linn. AMERICAN or SWEET ELDER. Fig. 3543. Shrub, to 12 ft., stoloniferous: branches pale yellowish gray, slightly lenticellate: lvs. bright green; lfts. usually 7, short-stalked, elliptic to lanceolate, acute or acuminate, sharply serrate, sometimes pubescent on the veins beneath, 2–5 in. long: cymes 5-rayed, to 10 in. across: fr. purplish black, usually 4-celled. June, July; fr. in Sept. Nova Scotia and Man. to Fla. and Texas. B.B. (ed. 2) 3:268. G. 27:541. M.D.G. 1899:169. Var. **submóllis,** Rehd. Lvs. grayish green and soft-pubescent beneath. Ill. to Ark. and Texas. Var. **máxima,** Hesse. Lvs. larger: cymes to 18 in. across. Very vigorous grower. G.W. 11, p. 397. G.M. 51:451. Var. **acutíloba,** Ellwanger & Barry (var. *laciniàta*, Cowell). Lvs. much dissected, the lower lfts. pinnatifid, the upper ones incisely serrate and narrowly lanceolate. A very handsome and distinct form. F.S.R. 1, p. 151. Var. **aùrea,** Cowell (var. *delicatíssima*, Schwerin). Lvs. golden yellow: berries cherry-red. F.E. 22:433. Var. **chlorocárpa,** Rehd. Fr. greenish: lvs. pale yellowish green.—The handsomest and most effective of the elders in bloom, also attractive when weighed down with its large clusters of purplish black berries.

CC. *Fr. glaucous.*

3. **cærùlea,** Raf. (*S. glaùca*, Nutt.). Large shrub or small tree, occasionally to 50 ft.: branchlets rather slender, bloomy when young: lfts. 5–7, oblong, long-acuminate, coarsely serrate, the lower lfts. often 3-parted or pinnate, bright green, glabrous, 2–6 in. long: fls. yellowish white, in flat cymes 4–6 in. wide: fr. subglobose, ¼in. thick, blue-black, whitened by a thick bloom. June, July; fr. in Aug. and Sept. Brit. Col. to Calif., east to Mont. and Utah. S.S. 5:222. G.W. 8:116. Var. **velùtina,** Schwerin (*S. velùtina*, Durand). Young branchlets and lvs. covered with a dense and short whitish pubescence. Calif. Var. **neo-mexicàna,** Rehd. (*S. glaùca* var. *neo-mexicàna*, A. Nels. *S. intermèdia*, Carr.). Lfts. 3–5, narrow-lanceolate, grayish green, slightly pubescent beneath. New Mex., Ariz. M.D. 1909:8, fig. 1.—This species is similar to *S. canadensis*, but habit looser and taller, very striking with its large clusters of bluish white frs.; the typical

form and var. *neo-mexicana* have proved hardy as far north as Mass.

BB. *Berries red, rarely yellow: pith light brown: cymes convex or paniculate.*

4. **racemòsa,** Linn. RED-BERRIED ELDER. Shrub, to 12 ft.: branches light brown; young branchlets glabrous or nearly so, 2–3½ in. long: infl. ovate or oblong, dense: lfts. 5–7, ovate or elliptic to ovate-lanceolate, glabrous, 2–3 in. long: fls. yellowish white: fr. scarlet, ¼in. across, 3-seeded; nutlets yellowish white, minutely rugose. April, May; fr. in June, July. Eu. to E. Asia. H.W. 3, p. 133. R.F.G. 12:781. Var. **nàna,** Carr. Dwarf compact form. Var. **plumòsa,** Carr. Lfts. incisely serrate to about the middle, teeth long and

3543. Sambucus canadensis. (×⅛)

narrow, purplish when unfolding. Var. **plumòso-aùrea** Weezelenburg (var. *serratifòlia aùrea,* Barbier). Foliage like that of the preceding form, but golden yellow. Var. **ornàta,** Carr. (var. *pteridifòlia,* Carr.). The first lvs. of the shoot are like those of var. *plumosa,* the later ones more finely dissected like var. *laciniata.* Var. **laciniàta,** W. Koch (var. *serratifòlia,* Hort.). Lfts. regularly and deeply dissected, green when unfolding. R.F.G. 12:781. Var. **tenuifòlia,** Carr. Lvs. finely and deeply dissected with very narrow segms., purplish when unfolding. Var. **purpùrea,** Sweet (*S. rosiflòra,* Carr.). Fls. purplish or pink outside, purple in bud. G. 3:175. Var. **flavéscens,** Sweet (var. *xanthocárpa,* Zabel). Fr. yellow with orange cheek. M.D. 1909:8, fig. 6.—This species, like the following, is not conspicuous in bloom, but the clusters of scarlet fr. are very attractive in June and July. The cut-leaved forms are very graceful.

5. **pùbens,** Michx. (*S. pubéscens,* Pers. *S. racemòsa* var. *pùbens,* Koehne. *S. racemòsa* var. *pubéscens,* Dipp., not Miq.). Shrub, to 12 or sometimes to 25 ft.: branchlets and lvs. on both sides finely pubescent while young, sometimes nearly glabrous at maturity; lfts. 5–7, ovate-oblong to oblong-lanceolate, acute, serrate, pubescent beneath, rarely nearly glabrous: infl. ovate or pyramidal, looser and broader at the base than that of the preceding species, to 4 in. long: berries scarlet; nutlets minutely rugose. May: fr. in June, July. New Bruns. to Alaska, south to Ga., Colo. and Brit. Col. B.B. (ed. 2) 3:268. Var. **dissécta,** Brit. (*S. racemòsa* var. *laciniàta,* Rob. & Fern., not W. Koch). Lfts. deeply and regularly dissected. Var. **leucocárpa,** Bernh. (var. *albicócca,* Brit. Var. *xanthocárpa,* Cock.). Fr. whitish or amber-yellow. Var. **arboréscens,** Dipp. Tree-like; less pubescent.

AA. *St. herbaceous: plant stoloniferous: cymes flat: fr. red.*

6. **Schweriniàna,** Rehd. Herbaceous or suffruticose, stoloniferous, glabrous, 3–5 ft.: lfts. 5–7, oblong-lanceolate, the lower ones short-stalked, the upper ones adnate and decurrent, acuminate, very unequal at the base, serrate, 3–5 in. long: cymes flat, long-stalked, 5-rayed, puberulous: fr. salmon-red, 3-seeded, ⅙in. thick; nutlets broadly ovoid, smooth. W. China.—Handsome with its clusters of bright red fruit; it spreads rapidly by suckers and may become a weed difficult to eradicate, therefore it should not be planted where it is likely to become troublesome.

S. callicárpa, Greene (S. leiosperma, Leiberg. S. racemosa var. callicarpa, Jepson). Allied to S. pubens: shrub to 10 ft.: lfts. oblong to lanceolate, pubescent on the veins beneath while young: infl. broadly pyramidal or hemispherical: nutlets smooth. Alaska to Calif., Japan. M.D. 1909:8, fig. 5. G.F. 10:175. Mn. 2:21 (as S. pubens). —*S. chinênsis,* Lindl.=S. javanica.—*S. Ébulus,* Linn. Herbaceous, stoloniferous, to 5 ft.: lfts. 5–9, elliptic-lanceolate, serrate, pubescent; stipules large: cymes flat, 3-rayed; fls. white or pinkish, anthers purple, fragrant: fr. black, ¼in. across. Eu., Afr., W. Asia. R.F.G. 12:779. S.E.B. 4:638.—*S. Fontenàysii,* Carr. (S. cærulea × S. nigra). Intermediate between the parents: lvs. bluish green: cymes large: fr. black, bloomy. Garden origin.—*S. javánica,* Reinw. (S. chinensis, Lindl. S. Thunbergiana, Blume). Suffruticose, to 6 ft.: lfts. 5–7, elliptic-lanceolate, the upper ones sometimes decurrent, long-acuminate, sparingly pubescent while young, to 8 in. long: cymes flat, 5–6 in. across, with scattered large aborted fleshy fls.: fr. ovoid, red. Japan, China to Malay Archipelago.—*S. leiospérma,* Leiberg=S. callicarpa.—*S. melanocárpa,* Gray. Allied to S. pubens. Shrub, to 12 ft.: lfts. oblong-lanceolate, pubescent beneath while young, 4–5 in. long: infl. ovate: fr. ¼in. thick, black, rarely reddish brown. Brit. Col. to Calif. G.F. 10:135. M.D. 1909:8, fig. 4. I.T. 5:173.—*S. mexicàna,* D.C. (S. canadensis var. mexicana, Sarg.). Tree, to 30 ft.: lvs. 5–9-foliolate, sometimes bipinnate; lfts. ovate-lanceolate, long-acuminate, pubescent on both sides while young, later only below, 2–6 in. long: cymes flat, 6–8 in. across: fr. nearly black, ribbed, ¼in. across. W. Texas to S. Calif., Mex. S.S. 5:221. In Mex. planted sometimes near houses as a shade-tree and for its fr. —*S. microbótrys,* Rydb. Allied to S. pubens. Shrub, to 6 ft., glabrous lfts. ovate-lanceolate, long-acuminate, to 5 in. long: infl. small, nearly hemispherical, about 2 in. long: fr. scarlet. Calif. to Colo. and Nev.—*S. Sieboldiàna,* Graebn. (S. racemosa var. Sieboldiana. Miq.). Closely related to S. racemosa: lfts. oblong-ovate to lanceolate, smooth, not rugulose above, more finely serrate, to 4 or occasionally to 8 in. long: fls. and frs. smaller. Japan, China. S.I.F. 2:74 (as S. racemosa).—*S. Simpsonii,* Rehd. Allied to S. canadensis. Small tree, to 15 ft., with deeply furrowed bark: lfts. usually 5, elliptic to elliptic-oblong, lustrous above, glabrous, 1½–3 in. long: cymes with 4 or 5 rays, the central ray as long or longer than the lateral rays: ovary 5-celled. Fls. S.T.S. 2:175.—*S. Thunbergiàna,* Blume=S. javanica. The plant cult. under this name is S. racemosa or possibly sometimes S. Sieboldiana.

ALFRED REHDER.

SAMPHIRE (*Crithmum maritimum,* which see) is the name corrupted from *sampier,* itself a corruption of the French *Saint Pierre* (St. Peter), given to a succulent-stemmed half-hardy perennial, well known as sea-fennel, parsley-pert, and St. Peter's herb upon rocky coasts above high tide in Great Britain. It belongs to the family *Umbelliferæ.* The plants, which attain a height of 1 to 2 feet, have somewhat linear glaucous-green fleshy leaves, ½ inch long, small white or yellowish flowers, which appear in umbels during July, and oblong yellowish fennel-like smallish seeds of light weight, which ripen in early autumn and lose their germinating power within a year. For more than three centuries the crisp and aromatic leaves and young stems gathered in August or September have been used in salads and vinegar pickles. Samphire rarely reaches perfection in gardens far from the seacoast, unless

CII. Sambucus canadensis, the American sweet or summer-flowering elder.

grown upon sandy or gravelly soil, and watered frequently and plentifully with weak salt- and soda-solutions. It may be propagated by root-division, but better by sowing the seed as soon as ripe, the plants being thinned to stand from 1 to 1½ feet asunder in rows 2 to 2½ feet apart.

Golden samphire (*Inula crithmifolia*), a native of the marshes and seacoast of Great Britain, is an erect hardy perennial, 1 to 1½ feet tall, with small, fleshy leaves and yellow flowers in small, umbel-like clusters. Though grown and used like true samphire, for which it is often sold, it lacks the pleasing, aromatic taste of the genuine. It belongs to the family *Compositæ*.

For marsh samphire, see *Salicornia*. M. G. KAINS.

SAMUÈLA (Sam Farlow Trelease, who participated in field-studies of the species). *Liliàceæ*, tribe *Yúcceæ*. Yucca-like large plants.

Short-trunked mostly unbranched soft-pulped trees, resembling the baccate yuccas except in their gamophyllous perianth which in one species has a long slender tube resembling a tuberose. As in *Yucca Treculeana*, but to a greater extent, the bracts of the ample panicle are long and add much to its attractiveness.—Two species, one Texan and the other of the Mexican tableland. Hardy only in the S. where, as in Calif. and along the Riviera, they are said to be beginning to be cult. Monograph by Wm. Trelease in Rept. Mo. Bot. Gard., vol. 13, pp. 116–19.

Faxoniàna, Trel. Lvs. in a dense round head, 2–3 in. wide and 3 ft. long, nearly smooth, deeply concave, pungent, with long coarse curving white marginal fibers: infl. loosely branched, 3 ft. or more long; fls. white, 2–4 in. across, with conical tube about ⅜in. long: fr. 1 by mostly 2–3 in. S. W. Texas. Rep. Mo. Bot. Gard. 4:4, 5; 13:73–5, 82, 85. S.S. 10:499.

carnerosàna, Trel. Infl. 5–6 ft. high, compactly branched, with very large white bracts; fls. white, 3–4 in. across, with cylindrical tube ½–1 in. long: fr. 1½ x 2–3 in. E. Mex. Rep. Mo. Bot. Gard. 13:76–9, 80, 85, 87, and frontispiece to p. 27. WILLIAM TRELEASE.

SANCHÈZIA (after Jos. Sanchez, professor of botany at Cadiz). *Acanthàceæ*. Showy warmhouse plants, grown for flowers and foliage.

Strong erect herbs or half-shrubby plants: lvs. large, opposite, entire or slightly toothed: fls. orange, red, or purple, united into heads or spikes at the ends of the branches, or rarely paniculate; calyx deeply 5-parted, segms. oblong; tube of the corolla long, cylindrical, somewhat ventricose above the middle, limb of 5 equal, short, rotund lobes; perfect stamens 2, inserted below the middle of the tube, with 2 aborted stamens between them; anther 2-celled, the cells mucronate in front; style long, with one division small, spurlike; ovary on a thick disk, 2-loculed, with 4 ovules in each cell.—About 11 species in Peru, Colombia, and Brazil.

nóbilis, Hook. Plants stout, erect, smooth, except the infl.: st. 4-angled: lvs. 3–9 in. long, oblong-ovate to oblong-lanceolate, obtusely toothed, narrowed into winged petioles, connate: fls. 2 in. long, yellow, in heads subtended by bright red bracts, the heads forming a panicle. Ecuador. B.M. 5594. F.S. 23:2437. G.W. 10, p. 610. G.Z. 11:16. H.F. II. 9:346. Var. **glaucophýlla,** Lem. (var. *variegàta*, Hort.). Lvs. variegated with pale yellow or white along the veins. F. 1867, p. 154. I.H. 14:528 (as *S. nobilis*); 16:580.—A hothouse plant which is very attractive when well grown, but which becomes straggling and weedy if neglected. Grown mostly for its foliage. **S. parvibracteàta,** Sprague & Hutch. Allied to *S. nobilis*, from which it differs in having wingless petioles, smaller bracts with fewer (3–5) fls. and longer staminodes. Corolla yellow. Trop. Amer.

HEINRICH HASSELBRING.

SANDERSÒNIA (named after John Sanderson). *Liliàceæ*. Herb, suitable for the greenhouse: sts. suberect, simple, leafy: lvs. linear-lanceolate: fls. showy, orange, solitary in the axils, without bracts; perianth persistent, urn-shaped to globose, somewhat inflated; stamens 6; ovary sessile: fr. unknown.—One species, S. Afr. Treatment the same as for gloriosas.

aurantìaca, Hook. Rootstock tuberous: st. simple, 1–2 ft. high, leafy to the apex: lvs. sessile, alternate, linear or lanceolate, 2–4 in. long: perianth bright yellow, ¾–1 in. long. Nov. Natal. B.M. 4716. R.H. 1868, p. 311. J.F. 4:408.

SANGUINÀRIA (Latin, *blood;* referring to the yellowish red juice of the plant). *Papaveràceæ*. BLOODROOT. Low spring-blooming perennial used for borders and for rock-gardens.

3544. Bloodroot.—Sanguinaria canadensis. (×½)

Rootstock several inches long, about ½in. thick, horizontal: lvs. radical, cordate or reniform, usually only 1 from each root-bud, on petioles about 8 in. long: fls. white, often tinged with pink, 1–3 in. across, mostly solitary, on scapes about 8 in. long, appearing just preceding the full-grown lvs.; sepals 2, fugacious; petals 8–12, in 2 or 3 rows, oblong or obovate, early deciduous: caps. 1 in. long, oblong, 2-valved.—A single species common in woods of E. N. Amer., running into several forms (see Fedde in Engler's Pflanzenreich, iv, 104).

The bloodroot is a showy spring flower usually found in woodland, but not a true shade-loving plant, since its growth is made, to a great extent, before the foliage of the trees expands. In cultivation it prefers a rather light soil, but will grow anywhere. It will do as well in sunlight as in shade and will even grow amongst grass, if care be taken not to mow down the leaves until it has perfected the root growth and buds for the following season. The roots are best transplanted after the leaves have ripened, August-dug and -planted roots being best, but they may be moved when the plants are in flower. The roots are offered at such low prices by collectors that the plant should be used to a much greater extent for spring gardening.

canadénsis, Linn. BLOODROOT. RED PUCCOON. Fig. 3544. Described above. April, May. B.M. 162. G.F. 8:215. G.C. III. 51:284. G. 31:447; 34:329. Gn.M. 3:134. Var. **màjor,** Hort., is merely a form with large fls. J.H. III. 52:457. Var. **plèna,** Hort., has more numerous narrower petals. F. W. BARCLAY.

SANGUISÓRBA (Latin, *blood* and *drink up*, from reputed styptic properties in folk-medicine). *Rosàceæ.* Chiefly perennial herbs, grown as salad plants and also sometimes used in the hardy border.

Leaves unequally pinnate; stipules adherent to the petiole: fls. small, often polygamous or dicœcious, crowded in a dense head or spike at the summit of a long, naked peduncle; calyx-tube persistent, with 4 broad petal-like spreading deciduous lobes; petals none; stamens 4–12: achene (commonly solitary) inclosed in the 4-angled dry and thickish calyx-tube.—About 35 species, natives of the North Temperate Zone. See *Poterium.*

mìnor, Scop. (*Potèrium Sanguisórba,* Linn.). Burnet. Perennial, growing in clumps, glabrous or sparsely hairy: lvs. long, odd-pinnate, narrow, the small lfts. 6–10 pairs and orbicular to oblong and deep-toothed: sts. 1–2½ ft. tall, terminating in small globular or oblong heads: lower fls. in the head staminate, the others perfect, the stigmas purple, tufted and exserted. Eu., Asia, and naturalized in this country.—Sometimes grown in the herb-garden for the fresh young lvs., which are used in salads. It is also an interesting plant for the hardy border. Also recommended as a pasture plant, particularly for sheep. It thrives in dry soils.

canadénsis, Linn. Taller, larger in every way than the above: lfts. oblong to almost triangular-oblong, truncate or cordate at the base, long-stalked, obtuse, sharp-toothed: fl.-heads cylindrical, 2–6 in. long, the fls. all perfect, whitish. Low grounds, Mich., east and south.—An interesting plant, worthy a place in the hardy border, and sometimes sold for that purpose. It produces much foliage. Grows 5–6 ft. tall.

S. atrosanguínea, Hort., is a form listed in the trade as having wiry sts. 3 ft. high bearing heads of rich crimson fls. Possibly the European S. officinalis, Linn.

F. Tracy Hubbard.†

SANÍCULA (name said to be from *sanare,* to heal; or perhaps from *San Nicolas*). *Umbellíferæ.* Sanicle. Black Snakeroot. Perennial rather tall glabrous herbs, useful sometimes as a ground-cover.

Leaves few, palmately lobed or parted, those from the base long-petioled: umbels irregular or compound; fls. greenish or yellowish, capitate in the umblets, perfect and with staminate ones intermixed; involucre and involucels few-lvd.: fr. globular, carpels not separating spontaneously, ribless, thickly clothed with hooked prickles.—About 39 species (Wolff, Das Pflanzenreich, hft. 61), temperate regions of the world. The sanicles have no particular horticultural merit, being rather weedy in habit; but they are useful in wild-gardens and for colonizing in woods.

A. *Fls. yellow.*

Ménziesii, Hook. & Arn. St. solitary, 1–2½ ft. high, branching: lvs. round-cordate, 2–3 in. across, very deeply 3–5-lobed: fr. about 1 line long, becoming distinctly pedicellate. Calif. and northward.

AA. *Fls. purple (rarely yellowish).*

bipinnatífida, Douglas. About 1 ft. high, with a pair of opposite lvs. at the base and 1–3 above, long-petioled, triangular to oblong in outline, 2–3 in. long, pinnately 3–5-lobed: fr. sessile. Calif. to Brit. Col.

AAA. *Fls. greenish white.*

marilándica, Linn. St. stout, 1½–4 ft. high: lvs. bluish green, the basal long-petioled, the upper sessile, 5–7-parted: fr. sessile. Atlantic to Brit. Col. Common in woods.

F. Tracy Hubbard.†

SANSEVIÈRIA (after Raimond de Sangro, Prince of Sanseviero, born at Naples 1710. The spelling Sanseviera is not the earliest). *Liliàceæ.* Bowstring Hemp. Herbaceous perennials, essentially tender foliage plants, although beautiful in flower, adapted to the coolhouse. They are grown for the stiff erect lvs., which are usually variegated.

Rhizome short, thick, sometimes stoloniferous: lvs. in a basal rosette, thick cartilaginous, frequently elongated, rather flat or terete: scape simple, tall, stout: fls. greenish white, medium-sized or long, clustered in an often dense raceme; perianth-tube slender, sometimes very long; stamens 6; ovary free, 3-celled.—Trop. and S. Afr. and India; the most recent treatment is by N. E. Brown in Kew Bulletin, 1915, where 54 species are described. The genus is important in yielding fiber.

Sansevierias are easily propagated by division or they may be raised from leaf-cuttings about 3 inches long. These cuttings form roots in sandy soil after about one month, after which a long stolon-like bud is formed, which produces the new plant at some distance from the cutting. Sansevierias are well adapted to house decoration, since they do not require much sunlight. A rather heavy soil suits them best.

A. *Lvs. flat or nearly so.*

thyrsiflòra, Thunb. (*S. guineénsis,* Willd.). Lvs. 2–4 to a growth, from a stout creeping rootstock, erect and smooth, to 1½ ft. long and 3½ in. broad, lanceolate, acute or obtuse, on both sides marked with pale green transverse bands which become obscure with age, tapering into a channelled petiole: fls. greenish white, fragrant. Trop. Afr. B.M. 1179 (properly 1180).

AA. *Lvs. concave.*

zeylánica, Willd. Lvs. 1–3 ft. long, 8–15 in a cluster, sword-shaped, subterete, variegated with transverse markings of a grayish white: scape longer than the lvs.: bracts many: fls. whitish green, 1½ in. long. India. B.R. 160. Var. **Lauréntii,** Hort. (*S. Lauréntii,* Wildem.) has a band of creamy yellow ¼–½in. or more wide along the lf.-margins in addition to the regular variegation. Trop. Afr. G.W. 13, p. 125. R.B. 30:169.

AAA. *Lvs. cylindrical.*

cylíndrica, Bojer. Lvs. often 3–4 ft. long, 8–10 in a tuft, terete, solid within, dark green, often banded with paler lines, acuminate, occasionally furrowed: scape with infl. shorter than the lvs.: raceme about 1 ft. long; fls. creamy white, tinged with pink. Trop. Afr. B.M. 5093. G.C. III. 16:222. R.H. 1861, p. 448, 450.

The following species have been grown in various botanical gardens but are not known to be in general cult. unless otherwise specified. *S. æthiòpica,* Thunb. Succulent, stemless subshrub: lvs. somewhat rosulate, suberect or erect-spreading, 5–16 in. long, thick, linear-lanceolate, acute, running out into white awl-like tips 2–3 in. long, concave-channeled, back strongly convex, sometimes transversely dark green-banded, margins red or white, somewhat glaucous: infl. 16–30 in. long; fls. white. S. Afr. B.M. 8487.—*S. arboréscens,* Cornu, has sts. reaching a height of 4 ft., furnished entirely with short spreading lvs. E. Trop. Afr.—*S. conspícua,* N. E. Br., is a stemless herb: lvs. 3–5, lanceolate, 9–24 in. long, green on both surfaces, with dark lines above and rusty brown margins: fls. white, E. Trop. Afr.—*S. Córnui,* Gér. & Labr., is stemless, the lvs. not bordered and only a little striped at the base and on the outside. Senegambia; properly S. senegambica, Baker.—*S. Cràigii,* Hort., is offered in the American trade as a form with variegated lvs.—*S. fasciàta,* Cornu, is stemless: lvs. flat, leathery, 2½ ft. long, 5 in. broad in the middle, bright green, striped and bordered with brown. Congo.—*S. glaùca,* Hort., not Haw., resembles S. zeylanica, but the lvs. are somewhat shorter and not striate. Cochin-China.—*S. grándis,* Hook. f. Stemless: lvs. few, rosulate, obovate-oblong, the largest 3–4 ft. long, 6 in. broad, dull green with broad bands of much darker green: scape 2 ft. high, bearing a densely fld. terminal spike-like panicle 2–3 ft. long: fls. pure white, about 2 in. across. Trop. Afr. B.M. 7877. It produces a very strong, silky fiber.—*S. intermèdia,* N. E. Br., is very similar to S. cylindrica, but the lvs. are channeled, the edges of the channel being acute below and obtusely rounded above. E. Trop. Afr.—*S. libèrica,* Gér. & Labr. Lvs. more than 3 ft. long, bordered with ivory-white, not striped. W. Trop. Afr.—*S. metállica,* Gér. & Labr., is closely allied to what is called S. guineensis having shorter and somewhat broader lvs., which have a metallic tint and fewer markings.—*S.ròrida,* N. E. Br. (Sanseverina rorida, Lanza), is almost stemless: lvs. 2-ranked, erect-spreading, horn-shaped, terete beneath, deeply channeled above: scape flexuous, longer than the lvs.: panicle elongated with many short reflexed branches: fls. small. Italian Somaliland.—*S. Stùckyi,* Godefr., is stemless: lvs. quite cylindric except a small furrow on the upper surface. E. Afr.—*S. zanzibárica,* Gér. & Labr., is short-stemmed: lvs. in a distichous rosette, subterete, without furrows, very rigid, up to 5–6 ft. long. Zanzibar.

F. Tracy Hubbard.

SÁNTALUM (from the Persian *Chandal* which in turn is derived from the Sanscrit *Chandana*, the name of the tree). *Santalàceæ*. Evergreen glabrous trees or shrubs, and one species, *S. album*, yields the sandalwood: lvs. opposite, rarely alternate, coriaceous: fls. axillary or in terminal trichotomous paniculate cymes, dicœcious; perianth campanulate or ovoid, lobes 4, rarely 5, valvate with a tuft of hair on their face; stamens 5–4, short; disk of scales between the stamens; ovary at first free, finally half-inferior: drupe subglobose.—About 10 species, India, Malaya, Austral, and Pacific Islands. Plants more or less parasitic.

álbum, Linn. SANDALWOOD. A small evergreen glabrous tree: lvs. opposite, 1½–2 in. long, thin, elliptic-ovate or ovate-lanceolate, acute or subacute, narrowed into a slender petiole: panicles terminal and lateral; pedicels about equaling the perianth-tube: fls. at first straw-colored, then blood-red, inodorous even when bruised: drupe globose, size of a cherry, black when ripe. Deccan Penin. B.M. 3235. G.C. III. 49:20.—The wood is white or citron-colored, sweet-scented when dry, and is esteemed in India as a perfume.

SANTOLÌNA (derivation of name doubtful). Often, but incorrectly spelled *Sanctolina*. *Compósitæ*. Shrubs or rarely herbs, natives of Eu. and Asia, mostly in the Medit. region, sometimes grown in the open for ornament.

Leaves alternate, aromatic; margins tuberculously dentate or pinnately lobed, often finely divided: fl.-heads yellow or rarely white, of disk-fls. only, many-fld.; involucre mostly campanulate, squarrose, imbricated, appressed.—About 8 species.

Santolina is valuable for its distinct foliage and is used in the South for specimen planting and in the North for summer bedding and borders. Cuttings for the latter purpose are usually taken in the spring from plants wintered in a frame but may be taken before frost in the fall. They are easily rooted in sand.

Chamæcyparíssus, Linn. (*S. incàna*, Lam.). LAVENDER COTTON. A hardy half-shrubby, much-branched plant, 1½–2 ft. high, with evergreen, silvery gray lvs., having tiny ovate-oblong lfts. and small globular heads of yellow fls., borne in summer: heads solitary, terminal about ¾in. diam.: branches and lvs. canescent. Medit. region. Gn. 78, p. 21. Var. **incàna** differs but little from the type: involucre pubescent.

S. alpina, Linn., is Anthemis montana, Linn., which makes a pretty ground-cover and has yellow fls., but appears not to be in the trade. Gn. 75, p. 595.—*S. viridis*, Willd. An erect shrub: branches leafless: lvs. in 4 vertical ranks, toothed: involucral scales lanceolate. S. Eu. G. 36:25.

F. W. BARCLAY.

SANVITÀLIA (after a noble Italian family). *Compósitæ*. Usually low, much-branched herbs grown for their attractive yellow flowers.

Leaves opposite, petioled, mostly entire: heads of fls. small, solitary, with yellow or sometimes white rays; involucre short and broad, of dry or partly herbaceous bracts; receptacle from flat to subulate-conical, at least in fr.; its chaffy bracts concave or partly conduplicate: achenes all or only the outer ones thick-walled, those of the rays usually 3-angled, with the angles produced into rigid, spreading awns or horns, those of the disk often flat and winged.—About 4 species, natives of the S. W. U. S. and Mex. May be grown as an annual in the open, but if given protection it will sometimes flower the second year. Sanvitalias are of easy culture but prefer a light or sandy soil in full sunlight.

procúmbens, Lam. A hardy floriferous annual, growing about 6 in. high, trailing in habit: lvs. ovate, about 1 in. long: fl.-heads with dark purple disk and yellow rays, resembling small rudbeckias, less than 1 in. across, numerous: achenes of the disk flattened and often winged and 1–2 aristellate. Summer to very late autumn. Mex. B.R. 707. R.H. 1860, p. 127. Var. **flòre-plèno**, Hort. A double-fld. variety coming true from seed, and as vigorous as the type. R.H. 1866, p. 70.—Worthy of more extended use as a low border annual.

F. W. BARCLAY.

SAP, a term applied to the juices of living plants.

Sap is composed of water containing mineral salts absorbed from the soil, and organic substances chiefly constructed within living cells. The water taken from the soil by the roots or other absorbing organs may contain potassium, sodium, magnesium, calcium, iron, and nitrates, phosphates, sulfates, and chlorids. The different processes and the different reactions that take place in separate tracts of tissue are responsible for the fact that the sap is not alike in composition throughout the body of the plant.

The mineral elements and their salts may be found in nearly all saps. The limits of this note do not permit the enumeration of the large number of organic substances which may be found in the sap of various species. The more important of such compounds may be grouped under the acids, sugars, or carbohydrates and proteins. Many plants are of economic importance because of the materials dissolved in the sap. The sap of the sugar maple, for example, contains over 3½ per cent of sugar, while the sugar-beet and sugar-cane have a sap in which the proportion is very much higher.

The popular expression of "ascent of sap" refers to the fact that water entering the living cells of the roots is forced into the woody tissues or non-living elements through which it passes upward to the leaves at a rate which may vary from a few inches to over a yard an hour. (See *Transpiration*.) The forces operative and the mechanism of the flow are not perfectly understood. Among other facts of interest it may be mentioned that the sap-current may pass through dead sections of stem, although it is equally certain that the activities of the living cells furnish at least a part of the motive power.

The flow of sap from the sugar maple and other trees in the early spring, before the soil has thawed and while it is yet too cold for the living matter of the plant to show any great activity, is not due to the bleeding pressure, but to the expansion of the gases and liquids in the trunk and branches of the tree due to the direct warming action of the sun's rays. During the daytime the bubbles of air in the wood-cells become heated and expand, driving the sap from the wood-cells into the auger-hole which has been bored into the tree. At night the trunk of the tree cools slowly and the flow ceases, to be begun again next day.

The exudation pressure by which water or sap is forced from the living cells is exhibited in the bleeding which ensues when stems and branches are cut away. The pressure which produces bleeding is often called root-pressure, although it is exerted by any part of the plant. Bleeding is exhibited by a large number of trees at the beginning of the growing season, and is also especially noticeable in the vine, dahlia, castor-oil plant, calla, nicotiana, and corn.

The amount of bleeding exhibited by any plant may be found if the stem is cut and bent over in such manner that the end is thrust into a tumbler or small vessel, which will serve to collect the escaping sap.

Interesting records of measurement of the amount of bleeding are available. A specimen of *Betula papyracea* gave off over sixty-three pounds of water in twenty-four hours; an *Agave americana* yielded twelve and one-half pounds in twenty-four hours. The pulque of Mexico is the preparation of sap which collects in the center of the mature rosette of agave when a cavity is cut into it.

The range of concentration of sap as denoted by its osmotic properties varies widely. Cacti and other succulents have a sap which would set up a pressure of only three to twelve atmospheres. Spinose desert shrubs may have a sap which would set up a pressure of over a

hundred atmospheres. The concentration is greatest in mature leaves, and in the lilac this may be from twelve to twenty-five atmospheres, while the roots of the same plant may not show more than four or six atmospheres.

D. T. MacDougal.

SAPÍNDUS (Latin, *soap* and *Indian*, alluding to use of the fruit as soap in India). *Sapindàceæ*. Soapberry. Trees or shrubs, sometimes somewhat climbing, of economic use and sometimes used as ornamentals.

Leaves alternate, without stipules, abruptly pinnate or simple, 1-lvd. in one species; the lfts entire, rarely serrate: racemes or panicles terminal or axillary: fls. polygamous, regular; sepals 4–5, in 2 rows; petals 4–5, naked or bearing 1 or 2 glabrous or villous scales above the claw; disk annular; stamens 8–10: berry fleshy or leathery; seeds frequently globose, with a bony testa and no aril, black or nearly so.—About 15 species, tropical regions of the world.

The fruit has an alkaline principle known as saponin which makes it useful for cleansing purposes. The fruit was much used in eastern countries before the introduction of soap and is still preferred for washing the hair and cleansing delicate fabrics like silk. The seeds of some species are used for making rosaries, necklaces, and the like.

The soapberry trees in cultivation are evergreen or rarely deciduous trees with pinnate, rather large foliage and with terminal large panicles of small whitish flowers followed by berry-like globose orange-brown to black fruits. With the exception of *S. Drummondii*, which has proved fairly hardy in sheltered positions as far north as Massachusetts, they can be grown in subtropical regions only, but *S. Mukorossi* is apparently somewhat hardier than the rest. They are sometimes planted for ornament in the southern states and in southern California and some, particularly *S. Mukorossi* var. *carinatus*, may possibly be profitably planted for their fruits which are rich in saponin. They do well in rather dry and rocky or sandy soil. Propagation is by seeds which germinate readily and by hardwood cuttings in early spring.

A. *Lfts. obtuse or acutish, 4–9; rachis usually broadly winged: petals without scales.*

Saponària, Linn. A small tree, to 30 ft., with rough grayish bark: lfts. oblong-lanceolate and acute to elliptic-ovate and somewhat obtuse, opposite or alternate, entire, glabrous, veiny and lucid above, tomentulose beneath, 3–4 in. long; rachis usually winged: panicle 7–10 in. long; sepals rounded, petals ovate, hairy: fr. ⅜–¾in. across, globose, keeled, orange-brown, translucent. Fls. in Nov.: fr. in spring. S. Fla., W. India, and S. Amer. Cult. in S. Fla. and S. Calif. S.S. 2:74, 75.

AA. *Lfts. acuminate, 7–19; rachis with narrow margin or marginless: petals with 2 scales.*

B. *Trees evergreen.*

marginàtus, Willd. A tree reaching ultimately 60 ft. in height: lfts. very short-stalked or nearly sessile, 7–13, lance-oblong, acuminate, glabrous above, paler beneath and somewhat pubescent on the midnerve, 2–5 in. long, the upper nearly opposite, the lower alternate; rachis narrowly margined or marginless: fls. white, sometimes tinged with red, in pyramidal panicles; petals ciliate, ovate to ovate-lanceolate; filaments villous: fr. yellow, translucent, globose, keeled, ¾in. across. May, June. S. C. to Fla. S.S. 13:623.—Cult. for ornament in S. Fla.

Mukoróssi, Gaertn. Tree, to 60 ft.: lfts. 8–13, stalked, the stalk ⅛–¼in. long, oblong-ovate to oblong-lanceolate, oblique and cuneate at the base, glabrous, reticulate beneath, 3–6 in. long; rachis with narrow margin: panicles 5–8 in. long; sepals suborbicular to ovate, obtuse, petals ovate to ovate-lanceolate, acute, ciliate; filaments villous: fr. globose, yellow or orange-brown, about ¾in. across, slightly keeled. China, cult. in Japan. S.I.F. 1:71. Var. **carinàtus,** Radlk. (*S. ùtilis*, Trabut). Fr. more fleshy, strongly keeled.—According to Trabut this variety is cult. in Algeria for its fr. which contains nearly 38 per cent of saponin; the trees come into bearing in 8–10 years and a tree may yield 60–120 pounds of berries every year.

BB. *Trees deciduous.*

Drúmmondii, Hook. & Arn. Wild China Tree. Soapberry. Tree, to 50 ft., with scaly red-brown bark: branchlets pubescent while young: lfts. 8–19, short-stalked, lanceolate, broadly cuneate and oblique at the base, glabrous above, pubescent beneath, 2–3 in. long; rachis marginless: panicles pubescent, 6–9 in. long; sepals acute, ciliate; petals much longer, ovate, pubescent inside; filaments villous: fr. subglobose, not keeled, ½in. across, yellow, finally black. May, June; fr. Sept., Oct. Ark., La. to Ariz. and N. Mex. S.S. 2:76, 77 (as *S. marginatus*). B.B.(ed. 2) 2:500.

Alfred Rehder.

SÀPIUM (the Latin name used by Pliny for a resiniferous pine). *Euphorbiàceæ*. Tropical trees and shrubs cultivated for their economic products and sometimes for ornament.

Glabrous: juice milky and poisonous: lvs. alternate or rarely opposite, simple, denticulate to entire; stipules small, 2 conspicuous glands at the apex of the petiole and on each of the scale-like bracts: fls. generally in terminal spikes, the pistillate singly below, the staminate in 3's above, all apetalous; calyx of staminate fls. 2–3-lobed, the lobes imbricate; stamens 2–3, filaments free; ovary 1–3-celled, 1 ovule in each cell; a 3-parted central column remaining after dehiscence of the caps.: seed without a caruncle.—Nearly 100 species, in the tropics of both hemispheres, but chiefly in Amer. Two intro. species are now found wild in S. Fla. Related to Stillingia, Hura, and Homalanthus.

In their native country a number of species of Sapium are utilized in many ways. They are chiefly important as a source of rubber. *S. Jenmanii* is the chief source of rubber in British Guiana, where it is found in the alluvial forests in humid situations. It does best in well-drained clayey peat. *S. verum*, once common in Colombia, has been cut for the rubber until it is now rare, but does well under cultivation in higher altitudes, yielding ten to eighteen pounds of raw rubber to each tree. A number of other species are used for rubber in South America. *S. Pavonianum* yields a medium grade. It is easily grown but is scarcely in cultivation. *S. sebiferum* is cultivated, especially in China, for the wax of the seed-covering which is used for candles, soap, and cloth-dressing. The wood of this and other species is utilized. Some of the "jumping beans" are seeds of sapium which contain insect larvæ. Sapium may be propagated by seeds or by cuttings. The best varieties are sometimes top-grafted on seedling stocks.

Pavoniànum, Huber (*S. ùtile*, Preuss. *S. biglandulòsum*, Muell. Arg. in part). Palo de Leche. Tree, 30–50 ft. high: lvs. oblong, lanceolate, or oblanceolate: spikes solitary, elongate: style cylindrical, not persistent on the caps.: the seeds with red, aril-like covering, soon separating from the central column. Colombia.

vèrum, Hemsl. Virgin Rubber. Cancho Blanco. Tree, 60–75 ft. high: lvs. oblong-lanceolate to elliptical, acute at the base, apex rounded: style persistent on the caps.: otherwise similar to the foregoing species. Colombia and Ecuador.

Jénmanii, Hemsl. A large tree: lvs. oblong-lanceolate, abruptly and obtusely acuminate; glands of the petiole short, sessile; lateral lf.-veins more curved than in the preceding species and the ovary 1-celled: style not persistent. British Guiana.

sebíferum, Roxbg. (*Cròton sebíferus*, Linn. *Excœcària sebífera*, Muell. Arg. *Stillíngia sebífera*, Michx.). CHINESE TALLOW TREE. VEGETABLE TALLOW. Tree, 25–30 ft. high: lvs. broad rhombic-ovate, 1–3 in. broad, beautifully red-colored in age: racemes terminal: caps. ½in. thick; seeds long adhering to the central column, the aril-like coating white. China, and now cult. and naturalized in many tropical lands.

Among the species noted for their very poisonous juice are: *S. índicum*, Wild., with white bark and oblong willow-like lvs., in India, and *S. Hippòmane*, Mey., MILK TREE, POISON TREE, with thick elliptical lvs. with the apex cucullate inflexed. W. Indies to Brazil.

J. B. S. NORTON.

SAPODILLA is the name applied in the United States to *Achras Sapota*, Linn., of the family *Sapotaceæ*, generally considered one of the best indigenous fruits of the American tropics. The tree is commonly cultivated, as well as naturalized, on the Florida Keys, and the fruit (Fig. 3545) is offered in south Florida markets.

Botanically the sapodilla is closely related to the mamey sapote (*Lucuma mammosa*), the ti-es (*L. nervosa*) and the star-apple (*Chrysophyllum Cainito*), fruits which are well known in various parts of tropical America. The tree is evergreen, stately, with a dense rounded or conical crown sometimes attaining a height of 50 to 60 feet, horizontal or drooping branches, and stiff, glossy leaves thickly clustered at the ends of the young branchlets. The wood is hard and very durable, timbers in an excellent state of preservation having been found in the Mayan ruins of Yucatan. The bark contains a milky latex known commercially as chicle,

3545. Sapodilla, the fruit of Achras Sapota. (× about ½)

which is secured by tapping the trunk, and is exported in considerable quantities from Mexico to the United States, where it forms the basis of chewing-gum. The leaves are borne upon slender petioles up to 1 inch long, the blades entire or emarginate, ovate-elliptic to elliptic-lanceolate in outline, rounded-cuneate at the base and commonly obtuse at the apex, 2 to 5 inches long, glabrous, of rich green color, the midrib prominent below. The small inconspicuous flowers are produced upon short finely pubescent pedicels in the leaf-axils toward the ends of the branchlets; the calyx is composed of six small ovate-acuminate hairy sepals, the corolla white, tubular or urceolate, lobulate at the top, the stamens six, opposite the lobules, with short flattened attenuate filaments and lanceolate-acuminate extrorse anthers; staminodes six, petaloid; style clavate, hairy at the tip, the ovary ten- to twelve-celled, each cell containing one ovule.

The fruit is very variable in form, commonly round, oval, globose-depressed, or conical, and 2 to 3½ inches in diameter. The skin is thin, rusty brown, somewhat scurfy, giving the fruit a striking resemblance to an Irish potato. The flesh is yellowish brown, translucent, soft and melting when fully ripe, sweet and delicious, but when green containing tannin and a milky latex, so that it must not be eaten until it has become quite mellow. The seeds vary from none to ten or twelve, and are hard, black and shining, obovate, flattened, about ¾ inch long, easily separated from the pulp.

The flavor of the sapodilla is difficult of description, likened to that of a pear by some writers, and with a peculiar character common to several sapotaceous fruits. Some of the early writers were enthusiastic in praising it, the Spanish historian, Oviedo, going so far as to call the sapodilla the best of all fruits. More recently Firminger, an Anglo-Indian horticulturist, wrote that "a more luscious, cool and agreeable fruit is not to be met with in this or perhaps any country in the world," while Descourtilz says it is "melting, and has the sweet perfumes of honey, jasmin, and lily-of-the valley." In Florida it is a general favorite, especially among residents of the keys, and in numerous other parts of tropical America it assumes considerable importance among cultivated fruits.

The tree is considered by Pittier to be indigenous in Mexico south of the Isthmus of Tehuantepec, in Guatemala, and possibly in Salvador and northern Honduras, being especially abundant in the lowlands of Tabasco, Chiapas, and the western part of Yucatan, which are the principal centers of production of chicle gum. The common name is derived from the Nahuatl word zapotl or tzicozapotl, the latter meaning "gum zapotl" and surviving to the present day in the precise form chicozapote, by which the tree is commonly known in southern Mexico; zapotl was the name given by the Aztecs to all soft sweet fruits. In Spanish-speaking countries the sapodilla is frequently called níspero, which name properly belongs to the European medlar. In the British West Indies the name naseberry is common. In Brazil one form of the fruit is called sapotí, another sapota. The German name for the tree is Breiapfelbaum, the French sapotillier, and the Dutch mispelboom.

From its home in tropical America, the sapodilla has been carried around the globe, and though less commonly cultivated in the Orient than the papaya, it is grown in many regions, particularly in some parts of southern India, where, according to Macmillan, it thrives up to elevations of 3,000 feet, though in Ceylon it is seldom productive above 1,500 feet and succeeds best on the coast. In Ecuador its cultivation is said by Pittier to extend into the temperate belt at altitudes of more than 8,000 feet. Its culture in Florida is limited to the southern part of the state, approximately the section south of Palm Beach on the east coast and the Manatee River on the west. Mature trees have passed uninjured through temperatures of 28° F., according to Reasoner. A notable advantage of the tree for some parts of the West Indies is the fact that the branches are tough and not easily broken by hurricanes. In California it has not yet fruited, though in favored locations specimens have occasionally attained an age of several years without being injured by frost. Even in the tropics, however, the tree grows very slowly, and in California the cool winters greatly hinder its development. It seems probable that it may yet be fruited in protected foothill regions, but its culture in most parts of southern California is not practicable.

The soil best adapted to the sapodilla seems to be rich sandy loam, but it thrives almost equally well on light clay and on the shallow sandy soil, underlaid with soft limestone, which is found on the lower east coast of Florida. Even though grown under the most favorable conditions, the trees rarely come into bearing until six to eight years of age, if seedlings, and in some sections do not attain a greater ultimate height than 20 to 30 feet. They should not be set closer together than 25 to 30 feet, and require very little pruning, because of their close compact growth. As a general

thing the trees bear heavily, and two crops a year are frequently produced; this, with the natural variation in season among seedling trees, results in ripe fruit being found in the markets of tropical America at nearly all times of the year.

Experiments have shown that the sapodilla can be shipped very successfully and without excessive care in packing; notwithstanding the delicate texture of the skin it keeps well, and if picked while still hard can be kept in good condition for ten days or more. Shipments have been made from the Florida Keys to New York, the fruit being placed in small baskets which hold half a dozen good-sized fruits, six of these baskets being packed in a tomato-crate. For local consumption or for shipping to short distances, the common procedure in Florida is to pull the fruits from the tree and throw them into boxes or baskets, in which they are carried to market, where the ripe ones are picked out and sold from day to day. The sapodilla is used almost exclusively as a fresh fruit, usually eaten out of hand, but is sometimes utilized in Brazil and Cuba to prepare a delicious sherbet. Little is known of its culinary possibilities. Due to its lack of acidity it is doubtful whether it will lend itself to many different uses.

The sapodilla is generally propagated by seed, but the variation among seedlings in productiveness as well as in quality, size, and shape of fruit necessitates some asexual means of propagation, if the most desirable seedling forms are to be perpetuated. Horticulturists have been as dilatory in applying vegetative propagation to the sapodilla as they have with most of the other tropical fruits, but experiments in Florida have shown that it can readily be budded, using as stocks seedlings of the same species.

Seeds, if kept dry, will retain their vitality for several years, and are easily transported through the mails to any distance. They should be planted in shallow flats of light sandy soil, covering them to the depth of ½ inch. In warm weather germination takes place within a month, and the young seedlings, after they have made their second leaves, can be potted off and carried along in pots for the first year or two, when they are ready to be set out in the open ground. If to be budded, they may be planted in nursery rows about 3 feet apart, 18 inches apart in the row. In south Florida, May has proved to be a favorable season for budding; in strictly tropical regions the work can probably be done at any time, provided the stock plants are in active growth. Budwood should be chosen from young branches which have begun to lose their greenish color and assume a brownish tinge, and should be carefully examined to see that the eyes are well developed. Shield-budding is the method used, the details being practically the same as with the mango; buds should be cut slightly more than an inch in length, and the wood removed if it comes out readily. After making the incision in the stock, the bud should be inserted and tied as promptly as possible, as the latex soon collects around the incision and renders it difficult to do the work properly. Waxed tape should be used for wrapping. After three or four weeks the stock may be headed back, and the wrap loosened, leaving the eye exposed so that it may start into growth.

Occasional seedlings produce fruits which are nearly or quite seedless; some produce fruits weighing more than a pound, while others do not weigh over two or three ounces; some are unusually prolific, or ripen their fruit at especially desirable times of the year. From such seedlings one should select the best for propagation, having in mind the characteristics which it is most desired to perpetuate.

The tree seems to be remarkably free from insect pests and fungous diseases, and in Florida requires very little attention. While fertilizers are not commonly employed, their judicious use will doubtless improve the size of the fruit and have a beneficial effect in those frequent instances where the tree brings to maturity so many fruits that some remain very small.

F. W. Popenoe.

SAPONÀRIA (Latin, *soap*, the mucilaginous juice forming a lather with water). *Caryophyllàceæ*. Soapwort. Hardy often coarse annual or perennial erect or decumbent herbs, used for borders and rockeries.

Habit either annual and resembling that of gypsophila or perennial and similar to that of silene: lvs. flat: fls. in dichotomous cymes; calyx ovoid or oblong-tubular, 5-toothed, nerves obscure; petals 5, narrow-clawed, blade entire or emarginate, the base with scales or naked; stamens 10; ovary 1-celled: caps. ovoid or oblong, very rarely subglobose.—About 40 species, Eu., principally the Medit. region and extra-Trop. Asia. Saponarias are readily established in any soil and require but little care. *S. ocymoides* is an attractive plant for the rockery or for edging. Prop. by seed or division.

A. *Plants annual.*

B. *Calyx 5-angled.*

Vaccària, Linn. (*Lýchnis Vaccària*, Scop. *Vaccària vulgàris*, Hort.). Cow-herb. Annual: lvs. ovate-lanceolate, sessile: fls. paniculate, red; calyx pyramidal, 5-angled, glabrous; bracts membranaceous, acute. July, Aug. Eu. B.M. 2290. Var. **álba,** Hort., is a white-fld. form.

BB. *Calyx not 5-angled.*

calábrica, Guss. (*S. multiflòra*, Hort.). Annual, divaricate-branched, pilose-viscous above: lvs. opposite, oblong-lanceolate, obtuse, attenuate to the petiole, glabrous, ciliate at base: fls. in a dichotomous corymbose panicle, solitary in the axils, pale rose; calyx cylindrical, segms. obtuse; petals entire, top orbiculate, throat naked. Spring, Italy and Greece. Gn. 71, p. 78. Gt. 1:100. R.H. 1851:281. Var. **álba,** Hort. (*S. multiflòra álba*, Hort.), is a form with white fls. There are horticultural forms of this species offered in the trade under the names of *S. multiflòra compácta* and *S. multiflòra compácta álba*.—Seed should be sown in autumn for spring bloom or in April for summer-flowering.

3546. Saponaria officinalis. (×⅓)

AA. *Plants perennial.*

B. *Fls. yellow.*

C. *Lvs. linear: stamens violet.*

lùtea, Linn. Cespitose: sts. 3–6 in. high, 2-lvd.: lvs. subradical, linear, ciliate at base: fls. yellow, in dense heads; calyx round, hairy; petals linear, crenate; stamens violet. Eu.

CC. *Lvs. spatulate-oblong: stamens yellow.*

bellidifòlia, Smith. Cespitose, glabrous: sts. 8–16 in. high: lvs. spatulate-oblong, attenuate to the petiole; cauline lvs. few, linear-spatulate: fls. yellow, sessile, congested in a small head at the top of the st.; calyx subcylindrical, teeth triangular; petals oblong-linear; stamens yellow: caps. oblong. S. Eu. to Greece.

BB. *Fls. rose or white.*

C. *The plants not cespitose.*

D. *St. stout, erect.*

officinàlis, Linn. BOUNCING BET. Fig. 3546. Perennial: sts. 1½–2½ ft. high, leafy, simple, clustered, glabrous: lvs. mostly oblong-lanceolate, 3-nerved: fls. light pink (nearly white in shady situations), in compact, corymbose, paniculate cymes; calyx glabrous, the teeth triangularly acuminate; petal-lobes obovate, entire, notched at apex. July, Aug. Eu. Var. **álbo-plèna,** Hort., is a double white-fld. form growing 2 ft. high. June–Sept. Var. **caucásica,** Hort. (*S. caucásica,* Hort.), is a double-fld. form, the fls. described as white tinted rose by some, as deeper colored than the type by others, grows 15 in. high. All summer and fall. Var. **caucásica flòre-plèno,** Hort. (*S. caucásica flòre-plèno,* Hort.), is said to have double reddish purple fls. July–Sept. Var. **flòre-plèno,** Hort., is quite double-fld., the fls. paler than the type. Var. **plèna,** Hort., grows 1–3 ft. high and lilac, rose, or white fls. July–Oct. Probably includes some of the other double varieties. Var. **ròseo-plèna,** Hort., grows 2½–3 ft. high and rose-colored fls. July–Sept.

3547. White sapote.—*Casimiroa edulis.* (×½)

DD. *St. slender, decumbent.*

ocymoìdes, Linn. Sts. much-branched, 6–9 in. high, half-trailing: lvs. ovate-lanceolate, about 1-nerved, small, acute: fls. bright pink, in loose, broad cymes. Summer. Eu. B.M. 154. Gn. 60, p. 245; 78, pp. 319, 593. G 35:841. G.M. 56:433; 57:651. G.W. 8, p. 1; 15, pp. 8, 647. Var. **álba,** Hort., is a form with pure white fls., in reality a hybrid between two forms of the species. Var. **floribúnda,** Hort., is a form more profusely fld. than the type, with lvs. small and lanceolate and fls. soft pink. Gn.W. 25:67. Var. **splèndens,** Hort., has large fls. which are a more intense rose than the type. Var. **splendidíssima,** Hort., has large deep rosy crimson fls. Var. **versícolor,** Hort., is a form in which the fls. are at first pure white later becoming rose. A cross between a white-flowering variety and var. *splendens.* R.H. 1913, p. 303.

CC. *The plants cespitose.*

D. *Lvs. obovate-elliptic.*

deprèssa, Biv. Cespitose: radical lvs. tufted, obovate-elliptic, depressed: fls. subumbellate, large, rose, pedunculate; calyx very long, 5-angled, viscous-pubescent; petals bifid. Sicily.

DD. *Lvs. linear.*

cæspitòsa, DC. Cespitose: sts. 2–3 in. high, nearly naked, fl.-bearing at the top: lvs. linear, glabrous, mostly radical, hardly denticulate: fls. rather umbellate, rose; calyx cylindrical, villous, deeply lobed, lobes acute; petals emarginate at the top, the blade very narrow. Pyrenees. G.C. II. 15:501.

S. japónica, Hort. John Saul, is botanically unknown.—*S. pulvinàris,* Boiss. (S. libanotica, Hort., S. Pumilio, Boiss.). Densely cespitose-pulvinate: sts. low, 3–7-fld.: lvs. small, linear, subcarinate: infl. hirsute-villous; fls. bright rose.—*S. Sùndermannii,* Hort., closely resembles S. bellidifolia, but has rather larger fls. and more of them. June.—*S. Weinmannii,* Hort., is closely allied to S. cæspitosa, possibly only a form of it, but has paler purple fls. and a shorter calyx. Its habit is very compact and it is only 2–3 in. high.

F. TRACY HUBBARD.†

SAPOTE, WHITE. A tropical fruit (Fig. 3547). The zapote blanco of the Mexicans (*Casimiroa edulis*), known in California and Florida as white sapote, is a fruit little cultivated outside of Mexico, but occasionally seen in the southernmost parts of the United States, in the West Indies, and even in the Orient, where it is probably of recent introduction. Horticulturally, it has been given more attention in southern California than in any other region. (P. 680.)

The tree reaches an ultimate height of 50 feet or more, with a short stout trunk, often covered with warty excrescences around the base, and a broad erect crown, sometimes spreading and dome-shaped, under favorable conditions densely foliaged and of very attractive and ornamental appearance. The bark is somewhat rough, ashen gray when mature, and dotted with numerous warty light gray lenticels. The leaves are alternate, digitate, borne upon long slender petioles and composed of three to seven, commonly five, elliptical to lanceolate, acuminate leaflets, coppery when young but eventually of glossy bright green color. The small greenish flowers, less than ½ inch in diameter, are produced in spring on short axillary panicles, and are composed of a four- or five-parted calyx, with short

acute pubescent segments, and a four- or five-petaled greenish corolla, valvate in the bud, with small oblong-elliptic acute concave petals; the stamens are as numerous as the petals and alternating with them, with short filaments and small oblong anthers; the ovary is superior, five-celled, globose, bearing at its apex a three- to five-lobed sessile stigma.

The fruit, when of a choice variety, is as large as a good-sized orange, and somewhat resembles a quince in general appearance. The tender yellow or yellowish green skin, scarcely as thick as that of an apple, surrounds the soft cream-colored pulp, of melting and delicate texture and pleasant but peculiar flavor, sweet and lacking any trace of acidity, with sometimes a touch of bitterness. The seeds, normally five in number, an inch long and half as wide, are oblong to elliptical in form, light yellow in color, reticulated on the surface; their number is frequently decreased by abortion to two or three. In the tropics the fruit ripens in July and August, in California usually not before October; it is picked when fully mature but while still hard, and must be laid away for a few days before it is mellow and ready for eating. Because of its thin skin and the delicate texture of the flesh it does not ship so readily as some other fruits, yet if taken while still hard, and carefully packed, it can be sent considerable distances. It is commonly used while fresh, and an over-indulgence in it is thought by the Mexicans to induce sleep, but it is doubtful whether there are grounds for this belief. The white sapote is popular among the Mexicans, especially in the region around Guadalajara, and is regularly found in the markets.

The hardiness of the tree is attested by its behavior in southern Europe; it has fruited at La Mortola, and is cultivated at other points on the Riviera; it is also said to have fruited in the island of Jersey. In Mexico it flourishes up to altitudes of 7,000 feet, according to Von Mueller.

Although introduced to California from Mexico about 1810, it has not yet become extensively cultivated in that state, and large specimens are rather rare. One of the oldest trees, thought to have been planted about a century ago, is growing on De la Guerra Street in Santa Barbara. Although uncared for amidst the most unfavorable surroundings it bears regularly; its fruits, however, are small and practically worthless. A number of trees of considerably lesser age—most of them planted about 1895—are in bearing in various parts of southern California, and while some produce small, inferior fruits others produce large ones of delicious flavor. After it comes into bearing the tree commonly produces regularly and abundantly. It has shown itself to be remarkably drought-resistant, though it naturally succeeds much better when irrigated in the dry season. It seems to prefer a well-drained sandy loam, but thrives on heavy clay if the drainage is good, and in south Florida has done well on shallow sandy soil underlaid with soft limestone. In this latter state it has not been cultivated many years, but has come into bearing in the vicinity of Miami and seems to be at home. It has also fruited in Cuba.

Seeds should be planted as soon as possible after their removal from the fruit, in flats of light, porous soil, or singly in 3- or 4-inch pots, covering them to the depth of 1 inch. If the weather is warm, or artificial heat is provided, germination will take place within three or four weeks. The young plants should be grown in pots until 2 to 3 feet high, when they may be set out in the open ground. While young, the white sapote should be watered liberally to encourage growth, though it can get along with little water if necessary. The terminal bud should be pinched out to force the tree to branch when about 3 feet high; otherwise it is likely to make a growth of 10 to 12 feet before branching, being liable to be broken off by a severe wind.

Seedlings do not come into bearing until seven or eight years old, and are undependable at best, many producing fruit of inferior quality. For this reason trees propagated by some vegetative means should be planted. Shield-budding is successfully practised, the method being essentially the same as with the avocado. Stock plants should be selected from young, vigorously growing seedlings, with stems about ⅜ inch in diameter at the base. Budwood is taken from the ends of the branches, using fairly well-matured wood which has assumed the ashen-gray color. The buds are cut about 1½ inches long, leaving any wood that may adhere to them, and are inserted in T-incisions, after which they are bound firmly in place with waxed tape. At the end of two to four weeks, depending upon the climate, they may be unwrapped, and then re-wrapped loosely, leaving the bud exposed so that it may start into growth, at the same time lopping back the stock to a point 3 or 4 inches above the bud. In the tropics budding can probably be done at almost any season; in California spring and summer, when the stock plants are in most active growth, are the best times.

Three named varieties have been established in California—Harvey, Parroquia, and Gillespie. Of these Harvey is the largest and probably the best; the tree is very prolific, and individual fruits sometimes measure 3½ inches in diameter. F. W. Popenoe.

SAPROPHYTE (Greek, *rotten*, and *plant*, i.e., living on dead organic matter). A dependent, or heterotrophic, plant (whether bacterium, fungus, or higher plant) subsisting upon the humus of the soil, or dead or decaying organic materials. A holosaprophyte is a plant which lives exclusively on dead organic food. One which is only partially dependent on dead organic food and also feeds independently, as an autophyte, is appropriately called a partial saprophyte. The customary classification which includes under the term "saprophyte" all bacteria that do not subsist on living plants or animals no longer corresponds with facts. The integrity of the classification has been destroyed by the discovery of certain bacteria in the soil, as the nitrifying bacteria, which are able, even without sunlight, to appropriate the carbon dioxid of the atmosphere. Saprophytes intergrade with parasites on the one hand so closely and with autophytes on the other that the distinction of them is often difficult. For example, it is supposed that the chestnut blight (*Endothia parasitica*) was originally saprophytic, but has recently assumed a virulent parasitic development. Among the fungi we class as saprophytes all plants which live upon a dead or decaying organic substratum Such are the baker's yeast (*Saccharomyces cerevisiæ*), the mushroom (*Agaricus campestris*), and the stinkhorn (*Phallus impudicus*). Most mushrooms and toadstools are saprophytes. Some of the flowering plants possessing ectotrophic mycorrhiza (Indian pipe, *Monotropa uniflora*) and endotrophic mycorrhiza (*Neottia Nidus-avis*, *Corallorhiza innata*, *Epipogum aphyllum*, snow-plant, *Sarcodes sanguinea* and *Thismia Aseroë*) are also classed as saprophytes. A few algæ are saprophytic. A cave-growing form of *Glœothece rupestris*, known as var. *cavernarum*, utilizes organic food and is colorless.

John W. Harshberger.

SARÀCA (from *Sarac*, the name of the genus in India). *Leguminòsæ*. Unarmed trees (or tall climbing shrubs?), grown in the warmhouse.

Leaves abruptly pinnate, the lfts. leathery, often few-paired; stipules small, caducous: fls. yellow, rose, or scarlet, racemose, the racemes in short very branched panicles which are often lateral; calyx-tube elongated segms. 4, petal-like, ovate, strongly imbricated; petals none; stamens 3–9, free; ovary stipitate, ovules many: legume oblong or elongated, flat-compressed or turgid, leathery to somewhat woody, 2-valved.—About 6 species, Trop. Asia.

índica, Linn. A medium-sized tree: lfts. 6–12, oblong or oblong-lanceolate, acute or obtuse, 3–9 in. long, entire, short-petioled: fls. orange-red, fragrant, collected in compact, roundish panicles which are shorter than the lvs.; stamens usually 6 or 7, inserted on the fleshy annular ring at the summit of the calyx-tube; style long, curved: bracts red, appearing as a calyx: pod 4–10 in. long, 4–8-seeded; seeds oblong, compressed, 1½ in. long. India and Malaya. B.M. 3018 (as *Jonesia Asoca*). —It has flowered well with greenhouse treatment at height of 4 ft. It is suitable for outdoor planting only in tropical regions. Intro. into S. Fla.

cauliflòra, Baker. A shrubby tree: lfts. 10–12, rigidly subcoriaceous, the upper oblanceolate-oblong, acute, 1 ft. or more long, the lower shorter, more oblong: corymbs solitary or in pairs, nearly sessile, dense, 4–6 in. broad: fls. scarlet; stamens 7. India.—Intro. into S. Fla.

F. Tracy Hubbard.†

SARCÁNTHUS (name from Greek words signifying *flesh* and *flower*, in allusion to the fleshy nature of the blossom). *Orchidàceæ*. A small genus related to Vanda, and owing to the smallness of the fls. seldom cult.: sepals and petals similar; labellum firmly united with the base of the column, spurred, with 2 small lateal lobes and a longer concave middle lobe: foliage and habit of vanda. Give plenty of water in the growing season. They should have basket cult., with fern-root, and a temperature of 65° to 85°. When at rest, give very little water and reduce the temperature to 55°. Cult. practically as for vanda.

teretifòlius, Lindl. (*Luìsia tères,* Lindl.). St. 1 ft. high, with cylindrical lvs. 2–4 in. long: raceme bearing 7–8 inconspicuous fls.; sepals and petals oblong, dull green, with red disk; labellum slipper-shaped, white, lateral lobes edged with red. Sept. China. B.M. 3571.

S. inflàtus, Rolfe. Distinguished by its inflated spur, which is much longer than the segms. of the lip: sepals and petals green, with 2 dark brown stripes; front lobe of lip light yellow, side lobes white. Annam.—*S. robústus,* O'Brien. Lvs. narrowly oblong, about 6 in. long: spike few-fld.; fls. cream- to blush-white, marked with claret-purple. Borneo. G.C. III. 55:21.

Heinrich Hasselbring.

SARCOCÉPHALUS (Greek, *flesh* and *head*, alluding to the fleshy heads of fruit). *Rubiàceæ*. Shrubs or trees sometimes climbing, suitable for warmhouse culture or hardy in the extreme southern United States.

Branches subterete or obtusely quadrangular: lvs. opposite, rarely in whorls of 3, subcoriaceous: heads terminal and axillary; fls. whitish, pale pink or yellowish and crowded; calyx-tubes cohering, teeth 5–6, hairy; corolla narrowly funnelform, rather fleshy, 5-lobed; anthers 5, subsessile; disk inconspicuous; ovary 2-celled; syncarpium fleshy.—About 30 species. *S. esculéntus,* Afzel. A tree with long branches or often a scandent shrub 10–25 ft. or more high: lvs. elliptical, short-acuminate: fls. in terminal heads, white, pale pink or yellowish, fragrant; calyx-teeth furnished with alternating filiform-clavate appendages: fruiting head 2½–3½ in. diam., deep red with brown granulated surface. Trop. Afr.—Edible, the peach or country fig of the natives of Sierra Leone. *S. ovàtus,* Elmer. Tree, 18 ft. high, with rigid branchlets: lvs. glabrous, leathery, ovate or elliptic, acute at the base, obtuse at the apex, 7 x 3½ in.: infl. capitate, peduncled; fls. reddish; calyx with clavate, pubescent and deciduous appendages; corolla glabrous, nearly ½in. long. Philippines. Said to be intro. into Calif.

SARCOCHÌLUS: *Thrixspermum.*

SARCOCÓCCA (Greek, *flesh* and *berry*, alluding to the fleshy fruit). *Buxàceæ*. Ornamental woody plants grown chiefly for the handsome lustrous foliage.

Evergreen glabrous shrubs: lvs. petioled, alternate, coriaceous, entire, without stipules: fls. unisexual, apetalous, in short axillary racemes with the pistillate fls. at the base; sepals 4 or 6; disk wanting; staminate fls. with 4–6 stamens opposite the sepals; pistillate fls. with a 2–3-celled ovary with 2–3 short erect or recurved styles: fr. indehiscent, globose to ellipsoid, coriaceous or fleshy, 1–2-seeded.—Five species distributed from Cent. and W. China to the Malay Archipelago.

They are handsome evergreen shrubs with ovate to lanceolate entire lustrous leaves, rather insignificant whitish flowers in axillary clusters and red or purple berry-like fruits. *S. ruscifolia* and *S. Hookeriana* var. *humilis* have proved hardy in sheltered positions at the Arnold Arboretum, while *S. saligna* is tender. They do not seem particular as to the soil and do best in partly shaded situations. Propagation is by seeds or by cuttings which root easily.

A. *Lvs. distinctly 3-nerved, caudate-acuminate.*

salígna, Muell. Arg. (*S. prunifórmis,* Lindl. *Pachysándra coriàcea,* Hook.). Shrub: lvs. oblong-ovate to oblong-lanceolate, caudate at the apex, broadly cuneate at the base, 2–5 in. long; petiole ½–¾in. long: racemes about ½in. long: fr. purple, ovoid, ⅛–½in. long. Himalayas. B.R. 1012. I.T. 3:90.

3548. Snow-plant.—Sarcodes sanguinea. (× about 1)

AA. *Lvs. obscurely veined.*

Hookeriàna, Baill. (*S. prunifórmis* var. *Hookeriàna,* Hook.). Shrub: lvs. oblong-lanceolate to narrow-lanceolate, acuminate, cuneate at the base, 2–3½ in. long; petiole ¼–⅛in. long: styles 3: fr. subglobose, black. Himalayas, Afghanistan. Gn. 25, p. 359. Var. **dígyna,** Franch. Styles 2. W. China. Var. **hùmilis,** Rehd. & Wilson. Shrub, 1–5 ft.: lvs. lanceolate to oblong-lanceolate, 1¼–2 in. long. W. China.—Only the varieties seem to be in cult.

ruscifòlia, Stapf. Shrub, to 6 ft.: lvs. ovate to elliptic-ovate, acuminate, rounded or broadly cuneate at the base, dark green and lustrous above, 1¼–2 in. long; petioles ⅙–⅕in. long: fls. in few, usually 4-fld. racemes: fr. subglobose, dark scarlet. Oct.–Feb. Cent. and W. China. Var. **chinénsis,** Rehd. & Wilson (*S. saligna* var. *chinénsis,* Franch.). Lvs. elliptic-ovate to elliptic-lanceolate, cuneate or broadly cuneate at the base, 1½–2½ in. long. W. China.

Alfred Rehder.

SARCÒDES (Greek, *flesh-like*). *Monotropàceæ*. *S. sanguínea,* Torr. (Fig. 3548), is the Snow-Plant of the Sierra Nevadas. It is a low and fleshy plant growing 3–12 in. high and entirely devoid of green lvs. It belongs to that strange family which comprises the fleshy and parasitic plants, of which the Indian-pipe or corpse-plant is an example. Few species are known in this family, and they are all local or rare. The snow-plant derives its popular name from its habit of shooting up and blossoming as soon as the snow melts away in the

spring. The specific name *sanguinea* refers to the blood-red color of the entire plant. The snow-plant grows at an altitude of 4,000–9,000 ft. It is the only species of the genus, and is not known to be in cult.

SARCOPÒDIUM (Greek for *flesh* and *foot*). *Orchidàceæ*. Warmhouse orchids, by some referred to Bulbophyllum and Dendrobium.

Rhizome creeping, the 2-lvd. pseudobulbs usually distant on it: infl. terminal, the fls. single or in racemes; sepals and petals similar, the former usually forming a manifest chin; lip much smaller. Related to Dendrobium, and much like it in fl.-structure.—Species about 20, in the Malay Penins. and adjacent islands, and in the Trop. Himalayas.

ámplum, Lindl. (*Dendròbium ámplum*, Lindl. *Bulbophýllum ámplum*, Reichb. f.). Habit much like a bulbophyllum: pseudobulbs oblong, ovate, or fusiform, up to 2 in. long: lvs. oblong, acute, 4–6 in. long, 2 in. broad: fls. greenish white, suffused purplish; raceme few-fld., dorsal sepal lanceolate, the lateral triangular; petals linear-lanceolate, long-acuminate; lip with round lateral lobes erect, the middle lobe rhomboid, acute. Trop. Himalayas. P.M. 7:121.

S. acuminàtum, Kränzl. (Dendrobium acuminatum; Rolfe). Raceme few- to many-fld., lax; sepals triangular, long-acuminate, about 1½ in. long; petals of same length but narrower, yellowish white; lip with lateral lobes obovate, rounded, retuse, the midlobe ovate-triangular, acute, the apex reflexed. G.C. III. 42:210; 46:150. G.M. 52:659. J.H. III. 59:291.—*S. Cœlógyne*, Kränzl. (Dendrobium Cœlogyne, Reichb. f.). Fls. usually solitary, large, 2–2½ in. across, fleshy, yellow or straw-color, purple-lined, the lip deep purple; dorsal sepal lanceolate, the lateral broader and forming a manifest angled obtuse chin; petals narrowly linear-lanceolate; lip with the ovate-acute front lobe separated by a narrow isthmus. Tenasserim and Moulmein. C.O. Dend. 32. O. 1910, p. 122. J.H. III. 57:585.—*S. cymbidioides*, Kränzl. (Dendrobium cymbidioides, Lindl. D. triflorum, Lindl.). Raceme few-fld.; fls. pale yellow or straw-color, the lip yellow, suffused with rose or purple, with 2 orange spots at base of middle lobe; sepals and petals similar, acute, oblong-lanceolate, the sepals forming a very short rounded chin; lip with the middle lobe ovate-cordate, obtuse, longer than broad. Java and Philippines. G. 33:417. G.W. 14, p. 405. G.C. III. 37:15.—*S. Lóbbii*=Bulbophyllum.—*S. Treacherianum*, Kränzl. (Dendrobium Treacherianum, Reichb. f.). Raceme 3–5-fld.; fls. rose, the front part of lip yellow; dorsal sepal and petals linear-lanceolate, the lateral sepals triangular, forming a round chin, all the parts acuminate; lip with middle lobe linear-oblong, acuminate, deflexed. Borneo. B.M. 6591. J.H. III. 48:137.

GEORGE V. NASH.

SARCOSTÉMMA (name refers to the fleshy corona). *Asclepiadàceæ*. A few small-fld. more or less succulent leafless trailing or twining shrubs of the dry parts of tropical and subtropical regions of the Old World, to which N. E. Brown refers a plant long known as a Euphorbia. Fls. greenish, yellowish, or white, in sessile terminal or lateral umbels; corona double, the outer part ring-like or cup-shaped and truncate or shortly lobed, the inner part of 5 fleshy erect lobes; pollen-masses solitary in each anther-cell, pendulous. *S. viminàle*, R. Br. (*Tithýmalus péndulus*, Haw. *Euphòrbia péndula*, Link), grows in Trop. Afr.: trailing, twining, or bush-like, woody below, the lvs. sometimes represented by minute ovate bracts: corolla rotate or somewhat campanulate, greenish white or sulfur-colored. *S. Brunoniànum*, Wight & Arn., of India, has yellow fls. The sarcostemmas require the treatment given ceropegias and similar succulents.

SARGENTODÓXA (after C. S. Sargent, director of the Arnold Arboretum of Harvard University; and Greek, *doxe*, glory). *Lardizabalàceæ*. A woody vine, with deciduous 3-foliolate lvs. and dicœcious, yellow campanulate fls. in pendulous racemes and with frs. consisting of berry-like bluish black ovoid carpels. Staminate fls. 6-merous; sepals petaloid; petals wanting; nectaries minute, suborbicular; stamens with short filaments and oblong anthers: fr. consisting of ovoid stipitate carpels each with 1 ovoid, glossy black seed. Differs from all members of the family by its numerous 1-ovuled carpels. One species in Cent. China. A handsome vigorous-growing vine with rather large foliage and fragrant yellow fls. appearing with the leaves. Probably not hardy N. Prop. is by seed and by layers or cuttings. **S. cuneàta,** Rehd. & Wilson (*Holbèllia cuneàta*, Oliver, partly). Climbing, to 20 ft., glabrous: lvs. long-petioled; lfts. 3, the middle one stalked, rhombic to rhombic-obovate, 3–5 in. long, the lateral ones sessile, very unsymmetrical, ovate, slightly larger than the terminal one: staminate racemes 4–5 in. long: fls. nearly ½in. long, slender-stalked, yellow, fragrant; sepals narrow-oblong; stamen much shorter; ripe carpels ½in. long on a stalk of about equal length. H.I. 19:1817 (excluding the fruits, which belong to Sinofranchetia).

ALFRED REHDER.

SARMIÉNTA (named after Mart. Sarmiento, a Spanish botanist). *Gesneriàceæ*. A glabrous shrub, creeping or clambering over trees and rocks, to be grown in a moist greenhouse: sts. slender: lvs. opposite, rather fleshy, entire or few-toothed: fls. red, peduncled at the axils, solitary; calyx free, 5-parted, segms. narrow; corolla-tube elongate, ventricose, limb slightly oblique, lobes 5, rounded, spreading; stamens 2, posterior perfect, 2 anterior staminodea; disk obsolete; ovary superior.—One species, Chile, *S. rèpens*, Ruiz & Pav. Sts. slender: lvs. rather small, somewhat fleshy: fls. scarlet, axillary and solitary; calyx 5-parted; corolla-lobes 5, rounded and spreading. Summer. G.C. III. 29:303. F.S. 16:1646. J.H. III. 47:413.—It is said that it does not always thrive very well in cult. and that it should be planted in soft peat mixed with sphagnum and charcoal and either in a small pan or orchid-basket. It likes plenty of water, shade from bright sunshine and a position near the glass in a moist house.

SAROTHÁMNUS SCOPÀRIUS: *Cytisus scoparius.*

SARRACÈNIA (Dr. D. Sarrasin, of Quebec, a well-known physician and naturalist of his day, who sent *S. purpurea* to Tournefort nearly two centuries ago). *Sarraceniàceæ*. PITCHER-PLANT. INDIAN PITCHER-PLANT. SIDE-SADDLE PLANT. DEVIL'S BOOTS. FOREFATHER'S CUP. HUNTSMAN'S CUP. TRUMPETS. WATCHES. Pitcher-plants of swamps and savannas of the eastern United States, grown for their great oddity.

Acaulescent perennial herbs, with hollow radical lvs. usually provided with a lid or expanded blade, with a wing or keel on one side, variously colored: fl. single, terminating a naked scape, nodding, perfect, the parts mostly free and distinct; sepals and petals each 5, the latter incurved and deciduous, the sepals thick and persistent; bracts 3 beneath the calyx; stamens many; ovary globose, 5-celled, with 1 short style bearing a broadly expanded umbrella-like 5-rayed structure on the margin of which are borne the stigmatic surfaces: fr. a loculicidally 5-valved many-seeded dehiscent caps.

The family consists of three genera, Darlingtonia, Heliamphora, each with a single species, and Sarracenia, with seven species. The present genus is confined to North America, and almost wholly to the region east of the Mississippi. The most widely distributed species is *S. purpurea*, that extends from Florida and Alabama to Labrador and Minnesota. The others occur from southern Virginia to Florida and eastern Texas. All grow in moist or even in swampy savanna lands, in black sandy humus soil. The striking and beautiful pitchered leaves, as well as the large handsome flowers, early attracted the attention of gardeners, so long ago even as three centuries. But the apparent difficulty of cultivation long prevented their becoming popular objects. The careful observations of Macbride and Mellichamp in the southern states, and later of J. Hooker in England, clearly proved that the pitchered leaves are carnivorous, and that they show a remarkable microscopic structure in connection with this habit. Such has caused them to become popular objects of

study in the past three decades. All are perennial rhizomatous plants, that produce three to eight pitchered leaves in spring, and in some species (*S. Drummondii, S. psittacina*) another set of these, or of flat green leaves (*S. flava, S. Sledgei*), in autumn. When grown in sunny situations, the pitchered leaves are often richly mottled with crimson or white; sometimes even the entire leaf may be of a dark crimson-purple hue, and correspondingly attractive. Minute honey-glands occur over the exterior, which forms therefore the "alluring surface." But these are specially abundant over the inner lid surface, where they are interspersed with down-directed hairs that incline insects to move on to the upper part of the tube. So this inner lid area has been termed the "attractive surface." The upper third to half of the tube is extremely smooth, and affords little foothold for insects, which often tumble from it into the pitcher cavity. So this has been called the "conducting surface." Beneath it in *S. purpurea* is a wide glandular surface that is absent in the other species, although in some of them glands scattered

3549. Josselyn's picture, slightly reduced, of the "Hollow Leaved Lavender," 1672.

amongst fine hairs may occur. This area excretes a slightly viscous juice, which accumulates in the pitcher cavity, and which, as Mellichamp showed, readily wets and drowns any insect that falls into it. The lowest part of the pitcher in all species bears long delicate down-directed hairs that effectually prevent upward passage of insects, and so has been called the "detentive surface." The seven species vary in their carnivorous capacity, *S. flava, S. Sledgei*, and *S. Drummondii* being best; *S. minor* (*S. variolaris*), *S. purpurea*, and *S. rubra* being rather poor; while *S. psittacina*, with its small flat pitchers, catches relatively few. The insect prey is not digested, but its dissolved material is either absorbed by the pitcher walls, or rotting inside the decaying leaves, affords valuable nitrogenous food for the roots. But an over-abundant animal diet often causes browning and decay of the leaves, so that some gardeners have advised plugging with cotton wadding.

The pendent flowers vary in size from an inch to 3 inches across, and in color from pale lemon-yellow, as in *S. minor*, to deep crimson, as in *S. Drummondii* and *S. rubra*. Each lasts from eight to twelve days. The five spreading sepals inside three small bracteoles are more or less petaloid; the petals are large pendent banners, the stamens are numerous and discharge abundant pollen which early falls into the umbrelloid cavity of the style. The pistil consists of a five-celled ovary that is covered outside by crystalline nectar-secreting warts, and within bears many ovules; a style that expands above into a large umbrelloid structure with five marginal notches, at the base of each of which is a minute dry peg-like stigma. The entire pistil after pollination matures in about three months into a many-seeded capsule. Cross-pollination seems always to be necessary for formation of good seeds. This act, as well as hybridization of distinct species, can readily be effected if pollen from one flower that has been wetted by nectar from its ovarian surface be placed on the dry stigma of a flower on another plant. All of the seven species cross readily with each other, alike in the wild state and under cultivation, if flowers mature about the same time. Thus at various localities in western Florida and in Alabama, where the tall handsome species *S. flava, S. Drummondii*, and *S. Sledgei* grow, the writer has found hybrids at times to be nearly as abundant as either parent. The numerous artificial hybrids between the species, that are themselves fertile and give rise to second hybrids in which the characters of at least three parents may be blended, also testify to ease of hybridization. The seeds germinate readily in about four weeks if sown with chopped sphagnum moss on a moist sandy muck. After production of the linear cotyledons, each seedling plant forms pitchered leaves that successively increase in size till good specific characters are shown by the second year.

The larvæ of certain moths, flies, and beetles at times prey on the pitchers, while the rhizomes may be excavated and destroyed by still another type. Careful detection and destruction of the infested leaves or pieces of rhizome are recommended. Mosquitos also may breed in the liquid of the pitchers of *S. purpurea*. All of the species succeed well under cultivation if grown in pots filled with fine sandy muck, from which, while decaying, humic acid constituents are evolved. Alkaline waters are always detrimental. In this respect they require the same treatment as do other swamp or semi-swamp plants of the eastern states. They should also have a bright sunny southeastern exposure, should be kept near the glass if grown in greenhouses, and the pots should stand permanently in about an inch of water. All can endure a temperature that approaches the freezing-point in winter.

The writer has monographed the genus in Engler's "Pflanzenreich," Vol. 4, No. 110 (hft. 34, 1908). A useful synopsis, along with some helpful figures, was given by Masters in 1881 (G.C. II. 15, 16. 1881).

The sarracenias have always excited the interest of the curious, and many of the native haunts have been depleted. In his "New England's Rarities," 1672, Josselyn gives a picture (Fig. 3549) of what he calls the "Hollow Leaved Lavender," and the following account of the plant we now call *Sarracenia purpurea*: It "is a Plant that grows in salt Marshes overgrown with Moss, with one straight stalk about the bigness of an Oat straw, better than a Cubit high; upon the top standeth one fantastical Flower, the Leaves grow close from the root, in shape like a Tankard, hollow, tough, and alwayes full of Water, the Root is made up of many small strings, growing only in the Moss, and not in the Earth, the whole Plant comes to its perfection in August, and then it has Leaves, Stalks, and Flowers as red as blood, excepting the Flower which hath some yellow admixt. I wonder where the knowledge of this Plant hath slept all this while, i. e. above Forty Years."

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I. Species.

A. *Pitchers erect: fls. yellow or whitish yellow.*

1. **mînor,** Walt. (*S. variolàris*, Michx. *S. adúnca*, Smith). Fig. 3550. Pitchers erect, 8–24 in. long, gradually enlarging upward, with white areoles and often brownish red streaks above; lid cucullate, incurved over orifice; wing broadest in middle, narrowed above and below: fl. 1–2 in. wide, with pale yellow petals. Moist savanna lands, S. N. C. to N. Fla. B.M. 1710. L.B.C. 9:803. Mn. 4:1. Gn. 48, p. 203.

2. **Slédgei,** Macfar. (? *S. Gronòvii* var. *alàta* and *S. flàva* var. *crispàta* of authors). Pitchers erect, 12–30 in. long, trumpet-shaped, green with purple veins above, or greenish purple throughout; lid vertical or often slightly incurved, ovate-cordate; wing as in last: fls. 1½–2½ in. wide; petals whitish yellow to yellow, often fading to white, odor agreeable. Savanna swamps from west side of Alabama and Mobile rivers to E. Texas, often covering wide areas of marshland. —Very uniform in structure, but varying in color from green to dark claret in the pitchers; often confounded in the past with *S. flava*, which does not occupy the same area. Frequently hybridizes with *S. Drummondii* in nature to form *S. areolata*.

3550. Pitcher of Sarracenia minor. (×⅓)

3. **flàva,** Linn. Pitchers erect, 10–34 in. long, trumpet-shaped, with prominent longitudinal veins, yellow-green to green, often crimson throat, or deep crimson throughout; lid ovate-orbicular, slightly inflexed over mouth, with strong median nerve ending in mucro; wing narrow, uniform in width: fls. 2–3½ in. wide, flavous yellow, odor rather pungent. Abundant over swamps and savannas, often in humus-sand that becomes dry in summer but moist in winter; S. Va. to W. Fla. B.M. 780. L.B.C. 20:1957. R.H. 1852:121. F.S. 10:1068, 1069. G.C. II. 16:11, desc. Gn. 30, p. 367; 48:202; 57, p. 326. Mn. 2:113. Var. **atrosanguínea,** Bull (Mast.; G.C. 1881). Pitcher and lid dark crimson-claret. G.C. II. 16: 13. I. H. 27:386. Not uncommon from N. to S. C. over the coastal plain region. Var. **limbàta,** Bull. Lvs. medium to large, margin of operculum crimson. A rare form. Var. **máxima,** Mast. Lvs. large, uniformly yellowish green. Frequent in S. N. C. Var. **mínima,** Mast. Lvs. small, 9–12 in., pale green with purple veins over tube and lid. Occasional with the type form. Var. **ornàta,** Bull (*S. Fildesii*, Hort.). Lvs. 26–32 in., throat of pitcher and base of lid furnished with purple radiate lines. Frequent in N. and S. C. Var. **Rugélii,** Shuttl. (*S. erýthropus*, Bull). Lvs. large, 26–34 in., top of pitcher and base of lid dark crimson. Frequent throughout Ga. and W. Fla.

3551. Pitcher of Sarracenia purpurea. (×⅓)

AA. *Pitchers erect to decumbent: fls. crimson to purple-red.*

4. **rùbra,** Walt. (*S. Sweètii*, DC. *S. Gronòvii* var. *rùbra*, Wood. *S. mìnor*, Sweet). Pitchers erect, 6–20 in. long, slender, enlarging upward, tubular above, green to purple-veined over upper part of tube and lid; lid ovate, slightly concave and inflexed over mouth; wing rather wide, nearly uniform, from middle to top of pitcher: fls. ¾–1¼ in. wide, petals crimson, scent of sweet violets. Moist to dry savanna lands, usually in shade, from N. C. to N. W. Fla.; the most delicate and graceful species of the genus. B.M. 3515. L.B.C. 12:11. Var. **acuminàta,** DC. Lid ovate, apex acuminate. All transitions occur between this and the type species.

5. **Drúmmondii,** Croom (*S. lacunòsa*, W. Bartram. *S. leucophýlla*, Raf. *S. undulàta*, Decne. *S. Gronòvii* var. *Drúmmondii*, Wood). Pitchers erect, 10–32 in. long, attenuate, trumpet-shaped, green below, richly purple-veined and with numerous rounded white areoles above and over lid; lid orbicular, nearly erect, margin undulate, beset within by numerous white bristle hairs: fls. on long peduncles 2–3 in. wide, greenish purple to deep purple. Often abundant in swamps and over wet savanna lands from S. Ga. through N. Fla. to E. Ala. F.S. 6:560; 10:1071, 1072. G.C. II. 15:633; 16:8.—The richest in color and most striking in aspect of the genus; well worthy of cult. in every greenhouse collection. Var. **álba,** Hort. Pitchers tall, strong, green with pure white areoles above. Occasional alongside the type in S. Ga. and W. Fla. Var. **rùbra,** Hort. Pitchers attenuate, deep purple above. At times found growing with the type-species in W. Fla. The var. **undulàta,** Hort., scarcely differs from the type except in the rather more undulate margin to the lid.

6. **purpùrea,** Linn. The common pitcher-plant of the N. and the one on which the genus was founded. Fig. 3551. Pitchers ascending, in rosettes of 3–6, 2–10 in. long, widest toward middle, narrowed below and upward, green to dark purple; lid upright or slightly inclined outward with fine hispid hairs over inner lid or attractive surface; wing broad, prominent: fls. 1¼–1¾ in. wide; sepals and petals greenish purple to purple. In wet sandy muck or by swamp margins from Labrador and Minn. to N. Fla. and Ala.; flowering from fourth week in March in N. Fla. to second week of Aug. in Lab. B.M. 849. L.B.C. 4:308. F.S. 10: 1076. G.C. II. 15:821. Mn. 1:81. G.L. 27:179.—Very variable in coloring from bright green in shady places to dark purple in sunny situations. According to Loddiges, writing in 1823, this species was "cultivated before the year 1640 by Tradescant, who was gardener

to King Charles the First." Var. **heterophýlla,** Eaton. Lvs. pale green: fls. yellow-green to yellow. Very rare in Mass., W. N. Y., and S. N. J.

7. **psittacìna,** Michx. (*S. calceolàta,* Nutt. *S. pulchélla,* Croom). Pitchers procumbent in radial rosettes, 2–6 in. long, enlarging from base to hooded apex, green with purple and white veins or areoles to claret-purple throughout; apex of tube psittacoid, forming with fused lid an incurved margin to pitcher-orifice; wing narrow to wide vertical in position: fls. ¾–1¼ in. wide, greenish purple to purple. Often abundant in pine-barren swamps of Ga., N. Fla., and westward to La. F.S. 7:268, desc.; 20:2063. G.C. II. 15:816. F. 1877, p. 254.—This species flourishes well under cult. when treated as a semi-aquatic, that is with its roots largely submerged in water.

II. Natural and Artificial Hybrids.

8. **Atkinsoniàna,** Nichols. A hybrid of like parentage as *S. Stevensii.*

9. **areolàta,** Macfar. (*S. Sledgei* × *S. Drummondii*). Pitcher elongate-tubular, green below, purple-veined and areolate above and over lid. Lid circular-cordate, margin somewhat undulate, with fine white hairs within: fls. 2–2½ in. wide, yellowish purple.—This is a frequent hybrid wherever both parents occur near each other. It is specially abundant from near Mobile, Ala., westward for 30 miles, and thrives readily in cult. if grown like both parents with the roots largely submerged in waters that have a humic acid reaction.

10. **cantabrigiénsis,** Lynch. A cross of *S. Drummondii* and *S. minor* (*S. variolaris*) that shows intermediate form and coloring between the parents. Raised by Lynch in Cambridge Botanic Garden, England.

11. **Catésbæi,** Ell. A hybrid between *S. flava* and *S. purpurea,* that is common throughout the southern states. It was first described by John Ray fully 200 years ago from specimens sent to him from this country. The writer has noted as many as 117 specimens in a forenoon near Ponce de Leon, Fla. It is easily cult., and produces pitchers and fls. that are the most striking and beautiful of the genus.

12. **Chélsonii,** Veitch. A cross of *S. rubra* with *S. purpurea* raised in the Veitch gardens, and that shows intermediate characters. The writer has once only found 2 wild examples in E. Ala., the comparative rarity seeming to be due to a difference of nearly 3 weeks in the flowering periods of the parents. G.C. II. 13:725; 15:817. I.H. 27:388. S.H. 1:189.

13. **Clàytonii,** Nichols. Origin and parentage unknown; it is thus described by Nicholson: "pitchers beautifully colored vinous purple at the summit, shading to crimson."

14. **Cookiàna,** Hort. Parentage unknown, said to be one parent of *S. Sanderæ.*

15. **Coùrtii,** Hort. One of Court's hybrids between *S. purpurea* and *S. psittacina,* and combining in exact and striking manner the details of both parents. Pitchers semi-decumbent, 6–8 in. long, greenish red becoming deep crimson upward. Orifice and incurved rim wider than in *S. psittacina.* S.H. 1:177.

16. **crispàta,** André. A name of doubtful value, that seems to have been variously applied by different authors. Probably either *S. Sledgei* or a hybrid of *S. flava* with *S. minor.* The writer has gathered undoubted examples of the last-named cross near Summerville, S. C. Pitchers erect, green with whitish areolations above, lid broadly ovate, somewhat constricted over orifice: fls. bright yellow. I.H. 27. 387. G.C. II. 15:633; 16:9.

17. **decòra,** Hort. A probable cross between *S. psittacina* and *S. minor,* and so of like but more recent parentage with *S. formosa.*

18. **excéllens,** Nichols. A probable hybrid between *S. minor* and the var. *alba* of *S. Drummondii.*

19. **excúlta,** Nichols. A hybrid of like parentage as *S. Moorei,* which see.

20. **exornàta,** Nichols. Said to be a hybrid of *S. purpurea* with *S. crispata.*

21. **Fárnhami,** Hort. A beautiful hybrid said to be a cross between *S. Drummondii* and *S. rubra,* and which combines details of both parents in pitcher and fl. The writer has collected a single wild example near Milligan, Fla., where the former parent is common and the latter is sparse.

22. **flambeau,** Hort. A hybrid of doubtful origin and parentage, cult. at Kew Gardens. Possibly a cross of *S. purpurea* with *S. minor,* and so of like origin as *S. Swaniana.*

23. **formòsa,** Veitch. Pitchers ascending, intermediate between the parents *S. psittacina* and *S. minor* as to shape, color, and lid-formations. Gt. 32:317.

24. **illustràta,** Nichols. Lvs. elongate-tubular, veins becoming deep crimson upward, lid cordate, sightly acuminate, with crimson veins. Between *S. flava* var. *picta* and the hybrid *S. Stevensii,* so with 3 parts of S. flava "blood" and 1 of *S. purpurea.*

25. **Maddisoniàna,** Nichols. A hybrid with the same parentage as *S. formosa,* but in reversed relation. Pitchers ascending, short, with dull purple veins and fine whitish areoles upward, cucullate end of tube and fused lid richly white and purple-veined.

26. **Mandaiàna,** Hort. A natural hybrid with like parentage to *S. Moorei.* Over wide areas from N. Cent. Fla. to the Alabama River it is nearly always to be found wherever both parents are common. A tall handsome type with crimson throat of *S. flava* var. *Rugelii,* and the crimson and white areolations of *S. Drummondii.* It grows well under cult. First sent out by Pitcher & Manda.

27. **melanorhòda,** Veitch. A cross between *S. Stevensii* and *S. purpurea,* so with 1 part parentage of *S. flava* and 3 parts *S. purpurea.* Pitchers ascending, 6–12 in. long, widening from base to mouth, lid erect or slightly incurved with undulate margin and within showing short hairs, top of pitcher and lid crimson-green with dark crimson hispid veins, wing prominent, broadest in middle.

28. **Mitchelliàna,** Nichols. (*S. Drummondii* var. *rubra* crossed by *S. purpurea*). Pitchers almost erect, funnel-shaped, pale green with red veins and whitish areoles above, lid cordate-reniform with undulate margins, and deep crimson veins around white areoles. —The artificial hybrids were sent out by Bull. The writer has got a few like plants growing wild near Bay Minette, Ala., where both parents are common.

29. **Moòrei,** Mast. This, the first artificial hybrid produced, was raised by Moore, of Glasnevin, as a cross of *S. flava* with *S. Drummondii.* Pitchers tall, erect, tubular, with strong veins, light green below, crimson-veined and faintly white-areolate above with usually rich crimson posterior throat area; lid crimson, and white-areolate with slightly undulate margin and hispid hairs within: fls. of a yellowish rose-to-purple color. As noted above *S. Mandaiana* is a natural hybrid of similar parentage. G.C.II. 1: 702, desc.; 16:44.

30. **Pátersonii,** Hort. A hybrid raised by Patterson, orchidologist of Bridge of Allan, Scotland, and with parents like No. 28.

31. **Pòpei,** Hort. Pitchers narrow, erect, with crimson veining around mouth and ovate-acuminate lid: fls. yellowish crimson with characters intermediate between those of parents. G.C. II. 16: 41. Raised by Pope of Glasnevin Garden, Dublin, between *S. flava* and *S. rubra.* It seems rarely to be produced in nature, since the former flowers about 3 weeks before the latter.

32. **porphyroneûra,** Hort. Probably a synonym of, and of like parentage with *S. Catesbæi,* and first exhibited about 1882.

33. **Sánderæ,** Nichols. An artificial cross of *S. Drummondii* var. *alba* with *S. Cookiana* of unknown parentage.

34. **Sanderiàna,** Hort. A garden hybrid of *S. Drummondii* var. *rubra* and *S. Farnhami,* distributed by Sander. Cult. at Kew, and of great beauty.

35. **Stèvensii,** Mast. Similar in appearance to, and of like origin as, the natural hybrid *S. Catesbæi.* Raised by Stevens, gardener at Trentham, England. G.C. II. 16:40.

36. **Swaniàna,** Nichols. Pitchers ascending to suberect, greenish crimson above with crimson veins and whitish areoles, lid ovate-cordate with slightly bilobed apex, similarly colored as extremity of tube, wing broad in middle tapered toward extremities. According to Nicholson, it is "a handsome and well-marked hybrid between *S. variolaris* (*minor*) and *S. purpurea.*"

37. **Tolliàna,** Nichols. Stated to be a hybrid of *S. Drummondii* var. *alba* and *S. flava,* but the writer considers it rather to be *S. flava* crossed by *S. purpurea.* So like *S. Catesbæi* and *S. Stevensii.*

38. **vittàta,** Nichols. Between *S. purpurea* and *S. Chelsonii.* Not in general cult.

39. **Wílliamsii,** Mast. Of same hybrid origin and aspect as *S. Stevensii.*

40. **Willisii,** Nichols. A beautiful but complex cross of *S. Courtii* (*S. purpurea* × *S. psittacina*) with *S. melanorhoda,* that is a hybrid of *S. Stevensii* (*S. purpurea* × *S. flava*) with *S. purpurea.* It more or less combines characters from all of the 3 species-parents, and is delicately colored pale green, white, and crimson.

41. **Wilsoniàna,** Nichols. Of same hybrid origin as *S. Stevensii* and others.

42. **Wrigleyàna,** Veitch. Reputed to be a garden cross between *S. psittacina* and *S. Drummondii* or the converse.

J. M. Macfarlane.

SARSAPARILLA of commerce comes from various species of Smilax. Wild sarsaparilla of America is *Aralia nudicaulis.*

SASKATOON. Fruit of a bush-like species of Amelanchier.

SÁSSAFRAS (Spanish, *Salsafras,* Saxifraga; medicinal properties similar to those of Saxifraga were attributed to it by Spanish discoverers). *Lauràceæ.* Sassafras. Ornamental trees grown for their handsome foliage assuming beautiful tints in autumn and for their bright-colored fruit.

Deciduous: lvs. alternate, entire or 3-lobed, slender-petioled: fls. dicœcious, rarely perfect, apetalous; calyx 6-parted; stamens 9, the 3 inner ones furnished at the base with 2 stalked, orange-colored glands; staminodes 3 or wanting; anthers opening with 4 valves; ovary superior, 1-loculed: fr. an oblong-ovoid, 1-seeded, dark blue drupe surrounded at the base by the thickened scarlet calyx.—Two species, one in E. N. Amer. and one in China.

3552. Sassafras tree.

The sassafrases are handsome trees of pyramidal habit with rather large, entire or 3-lobed leaves and small yellow flowers in few-flowered racemes appearing in spring with the leaves and followed by ornamental dark blue fruits on red fleshy stalks. The native species is hardy North, while the Chinese one which is still little known in cultivation is somewhat tenderer. The American sassafras usually affects light lands, although it may grow in clay loams. It is a desirable tree for ornamental planting on account of its handsome light green foliage, which is interesting with its varying shapes and its orange-yellow or bright red color in autumn, and on account of its decorative bright-colored fruit. It prefers, at least in the North, a warm and sunny position. It is not easily transplanted when old on account of its long tap-roots. Propagation is by seeds sown as soon as ripe; also by suckers, which are often freely produced, and by root-cuttings.

variifòlium, Kuntze (*S. officinàle,* Nees. *S. Sássafras,* Karst. *Laùrus Sássafras,* Linn.). Figs. 3552 (winter tree), 3553. Tree, 30–60, or occasionally 90 ft. high: young branches bright green, pubescent: lvs. oval and entire, or 3-lobed almost to the middle, obtusish, silky-pubescent when young, glabrous at length, 3–4 in. long: fls. yellow, ¼in. across, glabrous inside, without staminodes, in several-fld. racemes, umbellate when unfolding, afterward at the base of the young branchlets; staminate fls. without rudimentary pistil; staminodes wanting: fr. ½in. high. April, May. Maine to Ont. and Mich., south to Fla. and Texas. S.S. 7:304, 305. Em. 2:360. G.F. 7:215. Gn. 31, p. 449; 63, p. 167. G.W. 13, p. 366. Var. **álbidum,** Fern. (*Laùrus álbida,* Nutt.). Buds and younger branches glabrous and glaucous: lvs. glabrous. Mass. to S. C. and Ky.

Tzùmu, Hemsl. (*Pseudosássafras Tzùmu,* Lecomte). Tree, to 100 ft.: lvs. similar in shape to those of the preceding species, 4–8 in. long: fls. perfect, smaller, pubescent inside, with 3 staminodes alternating with the 3 glandular stamens; the staminate fls. with rudimentary pistil: otherwise like the preceding species. Cent. China. H. I. 29:2833.

ALFRED REHDER.

SATUREÌA (the old Latin name used by Pliny), also spelled *Satureja.* Syn., *Calamíntha. Labiàtæ.* SAVORY. Hardy aromatic herbs and subshrubs, grown in borders for their flowers and also as pot-herbs.

Leaves entire, narrow and small or toothed, or broad and larger: floral whorls either axillary or in terminal spike-like racemes; calyx campanulate-tubular or tubular, rarely campanulate, 10–13- rarely 15-nerved, 5-toothed, sometimes 2-lipped; corolla-tube short or long, exserted, upper lip flat, entire or emarginate, lower lip expanded, 3-cleft, with flat lobes, the midlobe usually larger and emarginate; stamens 4: nutlets ovoid, smooth.—About 160 species in the warmer regions of both hemispheres.

A. *Plants annual.*

Ácinos, Scheele (*Calamíntha Ácinos,* Clairv.). Annual, herbaceous, about 6 in. high: sts. suberect, branched, pubescent or villous: lvs. ovate, rather obtuse, base narrowed, subserrate, green on both sides; floral lvs. similar, exceeding the fls.: floral whorls about 6-fld., distant; calyx 3–4 lines long, deeply 13-striate, hispid; corolla purple-blue, scarcely exceeding the calyx. Eu., Caucasus.—Escaped from cult. in N. Amer.

horténsis, Linn. (*Calamíntha horténsis,* Hort.). SUMMER SAVORY. Annual herb, pubescent: sts. erect, about 6 in. high or a little more: lvs. oblong-linear, acute, base narrowed to a short petiole; floral lvs. similar: floral whorls laxly somewhat 6-fld., in dense interrupted spikes; calyx scabrous-hispid on the nerves; corolla sparsely pubescent outside, scarcely exceeding the calyx. Eu., and widely escaped from cult.

AA. *Plants perennial.*

B. *Lvs., at least some of them, subrotund.*

alpìna, Scheele (*Calamíntha alpìna,* Lam.). Perennial, diffuse, pubescent or villous: sts. much branched and somewhat woody at base, about 6 in. high: lvs. petioled, subrotund or ovate, scarcely serrate; floral lvs. sometimes narrower, about equaling the calyx: floral whorls 4–6-fld.; calyx subsessile, purplish; corolla larger, purple, throat strongly dilated. Medit. region.

córsica, Caruel (*Thỳmus córsica,* Pers. *Calamíntha córsica,* Benth.). Subshrub, perennial, small, much-branched, rather glabrous: lvs. scarcely 2 lines long, petioled, subrotund, entire, usually glabrous, sometimes pilose; floral lvs. similar: floral whorls on flowering branches, 1 or 2; calyx subsessile; corolla light purple. Corsica.

BB. *Lvs. ovate, oblong-linear or spatulate.*

montàna, Linn. (*Calamíntha montàna,* Lam. *C. officinàlis,* Moench). WINTER SAVORY. Subshrub, glabrous or slightly scabrous-pubescent: sts. woody at base; branches erect or ascending, 6–12 in. high: lvs. oblong-linear, acute or inferior spatulate or cuneate, obtuse; upper and floral lvs. narrower: floral whorls many-fld., laxly secund, approximate in a spike or raceme; calyx campanulate, 10-nerved or rarely obscurely 13-nerved; corolla white or purplish. Eu., N. Afr., and widely cult.

vària, Webb & Berth. (*Thỳmus ericæfòlius,* Roth. *Micromèria vària,* Benth.). Subshrub, pubescent or villous: sts. procumbent, much branched, branchlets ascending, canescent-tomentose, rarely glabrous: lvs. sessile, lower ovate, upper lanceolate, fascicled at the axils, all obtuse, somewhat canescent beneath; floral lvs. minute: floral whorls 2–10-fld.; calyx erect, slightly pubescent, purplish; corolla scarcely exceeding the calyx. Canary Isls.

3553. Sassafras variifolium. (×⅓)

S. grandiflòra, Scheele (S. grandiflora, Mœnch.) Herbaceous perennial: lvs. ovate, serrated: sts. decumbent, branching from the base: fls. in axillary whorls, quite large, 1½ in. long, with a straight tube; upper lip flattened, purple. June, July.

F. TRACY HUBBARD.

SATÝRIUM (Greek, *satyr; Satyrion* was the name given by Dioscorides to one of the orchids). Syn., *Diplécthrum*. *Orchidàceæ*. Terrestrial orchids with tuberous roots, some of the species adapted to the warmhouse, others to the coldframe.

Tuber undivided: lvs. few, on the lower part of the st., rarely many at the sides of the tall st.: fls. medium-sized or rather large, in often densely fld. spikes; bracts membranaceous or somewhat leafy, sometimes imbricate in the young spike and often strongly reflexed, in a dwarf species overtopping the fls.; sepals free, rather similar to the petals; labellum erect, broad-concave, galeate or cucullate undivided: caps. erect, oblong, not beaked.—About 125 species, India, Mascarene Isls., Trop. and S. Afr. Most of the species, of which several are more or less commonly cult. abroad, succeed well in a coldframe, in a compost of turfy peat, fibry loam and sand with plenty of drainage. Prop. by division of roots, made as fresh growth is commencing.

cárneum, R. Br. One to 2 ft. high: sts. stout: lvs. 2, radical, subsessile, ovate or orbicular-ovate: scapes with several ovate or spathaceous sheaths; spikes oblong, 3–8 in. long, dense, many-fld.: fls. large, pink or rose-colored; sepals and petals united at base, odd sepal lanceolate-oblong, obtuse, lateral sepals larger; petals elliptic-oblong; lip cucullate. S. Afr. B.M. 1512. G.C. III. 4:697. G.W. 2, pp. 349, 350.

nepalénse, Don. St. 6–30 in. high, usually very stout: lvs. few, oblong to linear-oblong, 4–10 x 2–4 in., rather fleshy, sessile: spike 1–6 in. long, densely fld.; bracts oblong or lanceolate, much larger than the fls.: fls. fragrant, white to rose-pink; sepals linear-oblong, obtuse; petals rather narrower, lip superior, broadly ovate, concave and strongly keeled on the back. Himalayas to Ceylon and Burma. B.M. 6625. Var. **ciliàtum,** Hook. f. (*S. ciliàtum,* Lindl.), is a small plant with the spurs hardly longer than the sepals. Himalayas.—This species and its variety require greenhouse heat.

sphærocárpum, Lindl. About 12–18 in. high: sts. stout: lvs. 2–4, suberect, ovate-oblong or elliptic-oblong, somewhat fleshy: scapes with a few large spathaceous sheaths; spikes 2–8 in. long, dense and many-fld.; bracts ovate or ovate-lanceolate: fls. large, white, variously blotched and sometimes suffused with red; sepals and petals united nearly to the middle, lanceolate-oblong, more or less recurved, lateral sepals broader than the other segms., lip cucullate, broadly elliptic-ovate. S. Afr. B.M. 7295.

S. aurantiacum, T. S. Ware, is a species with broad lvs., long and compact fl.-spike and rich orange fls. Probably of garden origin.

F. Tracy Hubbard.

SAUROMÀTUM (*saura*, lizard; referring to the spotted flower). *Aràceæ*. Perennial herbs, with unisexual naked flowers, grown for ornament.

Tubers bearing a single pedate lf. one year, the next year lvs. and fls.: petioles cylindrical, spotted below; blade pedately parted: peduncle short: spathe soon withering, its tube oblong, swollen at the base, more or less connate. its blade or banner long-lanceolate, black-purple, variously spotted.—Species 6, India, Java, and Trop. Afr. The following are hardy bulbous plants, with large and curious fls. The fls. are produced from Jan. until June, and the bulbs have kept well in a dry state for a year. There is little danger of the bulbs shriveling or rotting. Plant them 6 in. deep in pots or in the garden. Easily managed by the amateur.

guttàtum, Schott. Petioles 3 ft. long, not spotted; lf.-segms. 6–8 in. long, 2–3 in. wide, the lateral smaller: spathe-tube green on the back, 4 in. long, the upper third narrowed; blade 12 in. long, 2 in. wide below, gradually narrowing above, olive-green on the back, yellowish green within, with dense, irregular black-purple spots. Himalayas. J.F. 1:12. B.R. 1017 (as *Arum venosum*).

venòsum, Schott (*S. simlénse*, Schott.). Petioles spotted, 3½ ft. long; lf.-segms. 8–10 in. long, 4 in. wide, the lateral smaller: spathe-tube 3–4 in. long, purple on the back: blade 14–16 in. long, 3 in. wide below, about 1 in. wide from the middle to the apex, purple on the back, yellow within and with crowded oblong purple or black spots. Himalayas. B.M. 4465 and F.S. 13:1334 (both erroneously as *S. guttatum*).

S. brévipes, N. E. Br. Petiole up to 15 in. long, rose, the segms. of blade 5–9, 4–6 in. long, narrowly linear-lanceolate, caudate-acuminate: spathe shortly stalked, the tube swollen, 1½ in. long, pale yellowish green, faintly rose-spotted, the limb narrow, convolute, twisted, arching, 4–6 in. long, pale greenish or rose, bright red at throat; spadix as long as spathe, slender, rose below, orange above. Sikkim. B.M. 7940.

Jared G. Smith.
George V. Nash.†

SAÙROPUS (Greek for *lizard foot*). *Euphorbiàceæ*. Tropical shrubs rarely cult.: lvs. alternate, simple: fls. in axillary clusters, apetalous, sepals imbricate; no rudiment of a pistil in the staminate fls.; disk absent from the pistillate fls.; styles almost entire; ovules 2 in each of the 3 cells of the ovary: fr. more or less fleshy.—About 20 species of Trop. Asia and South Sea Isls. Related to Phyllanthus. *S. álbicans*, Blume, occurring in many varieties from Ceylon to the Philippines, has edible fr. and has been in cult. in Eu.

J. B. S. Norton.

SAURÙRUS (Greek, *lizard's tail*, referring to the curve of the spike of fls.). *Saururàceæ*. Lizard's Tail. Perennial marsh herbs, suitable for the bog-garden.

Erect: lvs. heart-shaped, converging-ribbed, petioled, without distinct stipules: fls. crowded in a slender-naked-peduncled terminal spike or raceme; perianth none; stamens mostly 6 or 7, hypogynous: fr. somewhat fleshy, wrinkled, of 3–4 carpels united at base and indehiscent; seed usually solitary.—Two species, one in N. Amer., the other in Asia.

3554. Saururus cernuus. (×⅓)

cérnuus, Linn. Lizard's Tail. Fig. 3554. Height 2–5 ft.: lvs. cordate, acuminate: fls. white, fragrant, in a spike which is nodding at the end; bract lanceolate; filaments long and capillary. In swamps and shallow water, Conn. to Ont., Minn., Mo., and southward. June–Aug. B.B. 1:482.

Lourèirii, Decne. (*S. chinénsis*, Hort.). Perennial, from a strong rhizome: sts. stout, 12–16 in. high, round below, angled above: lvs. alternate, petioled, cordate-based, ovate, acute, 4–5 in. long, bright green: spikes cylindrical, 4–5 in. long, axillary in the uppermost lvs., which turn yellowish white at the time of flowering; filaments very short. China and Japan. R.H. 1908, p. 395.

F. Tracy Hubbard.

SAUSSÙREA (named after Theodor de Saussure, 1767–1845, or for his father, Horace Benoit de Saussure, 1740–1799). *Compósitæ*. Annual, biennial, or perennial, glabrous or tomentose herbs of various habit, sometimes planted in the garden for ornament.

Leaves unarmed, alternate, entire, toothed, pinnatifid or pinnatisect: heads narrow or broad, sometimes crowded on the dilated top of a simple st., peduncled, or sessile, solitary, corymbose or panicled; fls. purple or bluish, all perfect and similar, tube slender, limb narrow 5-cleft; involucre ovoid-oblong, globose or hemispheric, bracts not spinescent: achenes glabrous, oblong, 4-ribbed.—About 200 species, temperate regions of Eu., Asia, and N. Amer., mostly in the mountains. *S. gossipiphora*, Don. Perennial, densely long white or yellowish matted woolly: st. 6–12 in. high, hollow, clavate, often 4 in. broad at top: lvs. sessile, linear, remotely toothed or runcinate-pinnatifid: heads very many, cylindric; involucre-bracts linear-oblong, shining: achenes narrowly obovoid. Himalayas and China. G.C. III. 51:85. *S. leucòma*, Diels. Plant 4–9 in. high: lvs. basal, narrowly pinnate, upper almost linear, the blade being entirely sacrificed to the development of the abundant cottony tomentum in which practically the whole plant is smothered, the fl.-heads alone are free of it and form a compact mass 2–3 in. diam. China. G.C. III. 51: suppl. Feb. 10. *S. Veitchiàna*, Drumm. & Hutchins. Herb, 2–3 ft. high, with about 2–5 leafy scapes from a tufted crown: fl.-sts. rigid, floccose upward: lvs., the lowest, 10 x 2 in., oblong-linear, green above, loosely hairy below; the upper ovate-lanceolate; bracts blush-pink or purplish: heads nearly ovoid, over 1 in.; florets deep purple. China. B.M. 8381. G.C. III. 50:85.

F. Tracy Hubbard.

SAVORY. Sweet-herbs.

Summer savory is *Satureia hortensis* of the *Labiàtæ*. Cultivated in kitchen-gardens for its aromatic green parts, which are gathered in midsummer for flavoring meat, dressings, and other culinary preparations. The slender, erect, branching, herbaceous stems, 10 to 12 inches tall, bear soft narrow green leaves and in summer clusters of pink, purplish or white flowers, which are followed by brown ovoid seeds whose vitality lasts three years. Propagation is by means of seed, which is sown in drills 12 to 18 inches apart in April or May in light, mellow, well-drained loam of moderate richness. When 2 to 3 inches tall the plants are thinned to 5 or 6 inches asunder, or for early crop they may be transplanted from hotbeds sown in March.

Winter savory (*S. montana*) is a hardy European perennial species, having much the qualities of the annual, but with woody, slender, very branching stems 12 to 16 inches tall, narrow, very acute leaves, white, pink or lilac flowers and brown seeds, whose average vitality is three years. It may be managed like thyme.

M. G. Kains.

SAXEGÓTHÆA (in honor of Prince Albert of Saxe-Coburg-Gotha, consort of Queen Victoria). *Taxàceæ*. An evergreen tree, native of Chile, similar in habit and foliage to the yew: monœcious, staminate fls. in cylindrical spikes clustered at the end of the branchlets; pistillate fls. solitary at the end of branchlets: fr. a small stalked irregularly subglobose cone with the scales terminating in spiny flattened points; seeds ovate, keeled, lustrous, brown. The plant is not hardy North and it is doubtful whether it is in cult. in this country; it is of slow growth and has no particular ornamental merit, but botanically it is very interesting. Prop. is by intro. seeds or by cuttings treated like those of taxus; it also may be grafted on taxus or podocarpus. **S. conspícua**, Lindl. Tree, to 40 ft., with whorled drooping branches: lvs. linear or linear-lanceolate, spiny-pointed, at the base abruptly contracted into a short decurrent stalk, dark green above, with 2 broad white lines beneath, ½–1 in. long: staminate spikes ¼in.long: fr. about ½in. across. J.H.S. 1851, pp. 260, 261. F.S. 7, p. 84. J.F. 2, pp. 69, 71. B.H. 6, p. 309 (pl. 75). I.H. 1, p. 16. G.C. III. 2:684; 5:782.

S. grácilis, Hort.=Podocarpus nubigena.

Alfred Rehder.

SAXÍFRAGA (Latin, *rock* and *to break;* said by some to refer to the fact that many of the species grow in clefts of rock, by others to the supposition that certain species would cure stone in the bladder). Including *Bergènia* and *Peltiphýllum*, genera which are maintained as distinct by Engler in his last treatment of the group. *Saxifragàceæ*. Saxifrage. Rockfoil. Chiefly perennial herbs, but a few species are annual and a few others biennial, while some others are subshrubby; useful for border planting, rockeries, and alpine gardens, and much prized by fanciers, particularly abroad.

Plants usually with more or less developed caudicles which are either above or below ground: lvs. commonly clustered at the base and most often alternate on the sts., very variable in shape: infl. paniculate, corymbose, racemose or solitary: fls. as a rule not large, white, yellow, red, pink, or purple; calyx either free from or partly adnate to the base of the ovary, the tube short or elongated, 5-cleft or 5-parted; petals usually equal but occasionally decidedly unequal; stamens 10, rarely 5: fr. a 2-beaked, 2-celled caps. opening down or between the beaks, or sometimes 2 almost separate follicles; seeds numerous.—About 400 species from a horticultural viewpoint or approximately 250 botanically speaking. Temperate (principally alpine) and northern boreal regions, rare in Asia, very few in S. Amer. and lacking in Austral., S. Afr., and the Pacific islands. In preparing the following treatment of the genus and in the arrangement of species, Engler, in Engler & Prantl's Pflanzenfamilien, has been followed with the exception above mentioned, while the specific delimitation is largely based on Engler's Monographie der Gattung Saxifraga, 1872, with cultural and other horticultural information drawn from Irving & Malby's Saxifrages. The true saxifrages, so-called (excluding Bergenia and Peltiphyllum), have been separated into several genera at different times. The horticultural species mentioned in this treatment which are native of N. Amer. have been divided among the following genera: Saxifraga, Muscaria, Chondrosea, Micranthes, Spatularia, Leptasea, Heterisia, Peltiphyllum and Antiphylla. See Small in N. Amer. Fl., vol. 22, pt. 2, 1907.

Saxifrages are various in habit and stature, but they are mostly low and spreading with rosulate or tufted root-leaves. Most of the species in cultivation are grown as rock-garden plants, although the large-leaved members of the Megasea or Bergenia section are sometimes used as border plants. Owing to the small attention given to rock- and alpine-gardening in America, the saxifrages are little known to our horticulturists. Most of them are abundantly hardy as to frost, but are likely to suffer from the dryness and heat of the American summer. Partial shade in summer is essential for the best results with most of the species. In winter the stools should be given ample covering of leaves. The most useful kinds for this country are the species of the Megasea section. These are low plants of bold habit, and are admirably adapted for rockwork and for spring forcing under glass. Fig. 1819, Vol. III, shows a clump of these plants in the lower left-hand corner.

The alpine species are mostly dwarf plants with more or less persistent foliage. Many of them, as *S. oppositifolia*, make dense moss-like mats; others, of which *S. Aizoon* may be taken as a cultural type, produce a dense rosette of leaves at the surface of the ground, from which arises a flower-scape. Some of these forms are very interesting because of the vari-colored or silvery effect produced by natural incrustations of lime on the leaves, particularly on the leaf-edges. Give shade.

Most saxifrages make stolons and offshoots freely, and by these the plants are easily propagated; they are also increased by division. Some make bulblets and multiply in this manner.

The number of species of saxifrage cultivated abroad in rockeries and alpine-gardens is very large and there are many fanciers who have made very large collec-

CIII. Greenhouse group of parent and hybrid sarracenias.

1, S. purpurea; 2, S. psittacina; 3, S. Stevensii × (S. flava × S. purpurea); 4, S. Chelsonii × (S. purpurea × S. rubra); 5, S. rubra; 6, S. Sledgei; 7, S. Moorei × (S. flava × S. Drummondii); 8, S. minor; 9, S. areolata × (S. Drummondii × S. Sledgei); 10, S. Drummondii; 11, S. flava. Between 8 and 10 is a hybrid of S. Mitchelliana × (S. Drummondii × S. purpurea).

tions of them. The following account has attempted to include those species which are in more general cultivation, although there are numerous others which occur in some of the collections, and it includes the better known hybrids and certain seedlings. A large part of these species are either very rare or lacking in American gardens. Very few of the species have been modified to any extent under domestication.

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KEY TO THE SECTIONS.

A. *Lvs. glandular-punctate, usually large and thick; the petiole sheathed at the base.*
I. BERGENIA. Species 1–5.

AA. *Lvs. not glandular-punctate (sometimes pitted), usually not large; the petiole not sheathed at the base.*

B. *Seeds spherical: the lvs. brown-striate.*
II. CYMBALARIA. Species 6, 7.

BB. *Seeds fusiform or elongated: the lvs. usually not brown-striate.*

C. *Pits absent on the lvs. (some species of Section Trachyphyllum have 1 pit at the apex of the lf.): lime secreted.*

D. *Plants annual or biennial: caudicles absent.*
IV. TRIDACTYLITES. Species 10.

DD. *Plants perennial (No. 20 may occasionally be biennial): caudicles present.*

E. *Caudicles subterranean.*

F. *The caudicles annual, biennial, or perennial; the secondary shoots with shortened internodes, bulbous and separating from them with age.*
V. NEPHROPHYLLUM. Species 11–13.

FF. *The caudicles perennial; the secondary shoots permanently attached to them.*

G. *Lvs. peltate.*
XV. PELTIPHYLLUM. Species 100, 101.

GG. *Lvs. not peltate.*

H. *Caps. somewhat inflated, splitting above the middle.*
VII. BORAPHYLLA. Species 37–47.

HH. *Caps. not inflated, splitting below the middle.*

I. *Fls. white.*
III. MISCOPETALUM. Species 8, 9.

II. *Fls. yellow.*
IX. HIRCULUS. Species 52–54.

EE. *Caudicles above ground.*

F. *Petals unequal: plants mostly with runners.* VIII. DIPTERA. Species 48–51.

FF. *Petals equal.*

G. *Ovary more or less adnate with the calyx-tube.*

H. *Lvs. herbaceous, undivided or lobed.*
VI. DACTYLOIDES. Species 14–36.

HH. *Lvs. rigid, withering, commonly setose, not herbaceous.*
X. TRACHYPHYLLUM. Species 55–62.

GG. *Ovary entirely free.*
XI. ROBERTSONIA. Species 63–65.

CC. *Pits present on the lvs.: lime secreted.*

D. *Secondary shoots separating early from the caudicles, more or less stoloniferous, their apex with a rosette of lvs.*
XII. EUAIZOONIA. Species 66–77.

DD. *Secondary shoots remaining attached to the perennial caudicles.*

E. *The lvs. alternate.*
XIII. KABSCHIA. Species 78–96.

EE. *The lvs. decussately opposite.*
XIV. PORPHYRION. Species 97–99.

Unkeyed
XVI. HYBRIDS. Species 102–135.

Section I. Bergenia (Megasea).

A. *Margin of lf. not ciliate, but more or less undulate or crenate: lvs. not pubescent.*
B. *Scape and infl. glabrous.*
C. *Lvs. orbiculate-cordate* ..... 1. **cordifolia**
CC. *Lvs. obovate to long-obovate, more or less cuneate at the base* ..... 2. **crassifolia**
BB. *Scape and infl. pubescent* ..... 3. **purpurascens**
AA. *Margin of lf. ciliate: lvs. sometimes pubescent.*
B. *Base of lf. distinctly cordate although narrow: calyx glabrous* ..... 4. **ligulata**
BB. *Base of lf. usually narrowed to the petiole: calyx pubescent or at least puberulent* ..... 5. **Stracheyi**

1. **cordifòlia,** Haw. (*Megásea cordifòlia,* Haw. *Bergènia cordifòlia,* Sternb.). Twelve to 20 in. high, robust: lvs. orbiculate-cordate, broad and fleshy, margin undulate-serrate, glabrous, shining; petioles long and thick: infl. a short, thick, angled, shiny scape: fls. clear rose, in dense nodding cymes partly hidden in the lvs.; pedicels short and thick; calyx-lobes short and broad; petals roundish. March–May. Siberia. Gn.M. 3:136.—Closely allied to *S. crassifolia* but differing in the broader cordate-based lvs. and in the rounder petals. Var. **álba,** Hort. (*Megásea cordifòlia* var. *álba,* Hort.). Fls. delicate blush-pink, not true white. Var. **grandiflòra,** Hort. Said to be unusually handsome in lf. and fl. Var. **purpùrea,** Hort. (*S. purpùrea,* Hort. *Megásea cordifòlia* var. *purpùrea,* Hort.). Lvs. smooth and coarsely serrate, the panicles larger than the type and carried well above the lvs.: petals broad rounded and deep reddish purple. Var. **ròsea,** Hort. (*Megásea cordifòlia* var. *ròsea,* Hort.) has been offered.

2. **crassifòlia,** Linn. (*S. cuneifòlia,* Hort., not Linn. *S. sibírica,* Hort., not Linn. *Megásea crassifòlia,* Haw. *Bergènia crassifòlia,* Fritsch). Fig. 3555. Six to 16 in. high, stout: rhizomes woody: lvs. obovate to long-obovate, large and thick, narrowed at the base and decurrent on the petiole, margin serrate to nearly entire, apex obtuse, glabrous, shining: infl. a fairly tall, angled, reddish or purplish scape: fls. deep rose, lilac or purplish, in dense panicles, elevated above the lvs.; calyx-lobes oblong, obtuse; petals elliptic-oblong. March–May. Altai to Mongolia. B.M. 196. G.M. 34:67. Mn. 10, p. 74.—*S. Van Hoùttei,* Hort., is only a variation of this species, with lighter pink fls. Var. **orbiculàris,** Hort. (*S. orbiculàris,* Hort. *Bergènia orbiculàris,* Stein. *Megásea orbiculàris,* Hort.). A small-growing form with broad rather rounded lvs., a branching habit and an abundance of light rosy fls. which are borne well above the foliage.

3555. Saxifraga crassifolia.

3. **purpuráscens,** Hook. f. & Thom. (*Megásea purpuráscens,* Hort. *Bergènia purpuráscens,* Engl.). Three to 12 in. high: lvs. roundish-obovate to short-oblong, 2–3 in. long, base somewhat cordate, margin more or less undulate, glabrous: infl. a scape about 1 ft. high, purple, this and the pedicels very pubescent: fls. deep purple, nodding, in few-fld. corymbose panicles; calyx-lobes very obtuse; petals ¾in. long, obovate-oblong, sometimes long-clawed: fr. elliptic-lanceolate, erect. June. Sikkim (India), 10,000–15,000 ft. B.M. 5066. H.F. II. 1:172. B.H. 9:1. F.S. 14:1401.—A very handsome species because of its purple scapes and fls. and the beautiful purple-and-crimson autumnal foliage. Succeeds best in a rather sheltered spot.

4. **ligulàta,** Wall. (*Megásea ligulàta,* Hort. *Bergènia ligulàta,* Engl.). One foot high, stout: radical lvs. large, orbicular or obovate, 2–12 in. diam., base cordate, margins entire but ciliate, both surfaces glabrous: infl. an erect naked scape, this and the pedicels and calyx glabrous: fls. white, rose or purplish, campanulate in nodding 1-sided racemes; calyx-lobes ovate, not narrowed at base; petals ⅓–1 in. long, orbicular and clawed: fr. subglobose, cernuous. March–May. Himalayan region. B.M. 3046 ("the sepals too acute and the leaves too undulate," according to Hooker). L.B.C. 8:747. R.H. 1868:270. J.H. III. 69:136. Gn. 62, p. 25; 76, p. 204.—Not perfectly hardy at Boston. Sometimes erroneously written *S. lingulata* which is a very different species (No. 67).—*S. ornàta,* Decne. (*Bergènia ornàta,* Stein), is said to have large coriaceous, persistent lvs., fleshy sts., and large rose fls. in cymes. Apparently does not possess any character to distinguish it from *S. ligulata* except the fls. are a shade lighter in color. Var. **ciliàta,** Hook. (*S. ciliàta,* Royle. *S. thysanòdes,* Lindl. *S. Strâcheyi* var. *thysanòdes,* Hort. *Megásea ciliàta,* Haw. *M. ligulàta* var. *ciliàta,* Hort. *Bergènia ciliàta,* Stein). Lvs. hirsute on both surfaces, margins strongly ciliate. B.M. 4915. B.R. 32:33 (as *S. thysanodes*). G.C. III. 5:365. F.E. 16:472. Var. **Leìchtlinii,** Hort. (*S. Leìchtlinii,* Hort. *Megásea Leìchtlinii,* Hort.). Grows about 1 ft. high and has large crimson lvs. and rose-colored fls. Var. **rôsea,** Hort., is a form with rose-colored fls. Var. **rûbra,** Hort., is an early-flowering, low form with red or red-purple fls. Var. **speciòsa,** Hort. (*S. speciòsa,* Hort., not Doerfl. & Hayek. *Megásea speciòsa,* Hort.). Lvs. broadly ovate, leathery: fls. crimson or deep rosy crimson. Gn. 71, p. 250. J.H. III. 60:393.—By some this is thought to be a garden hybrid *S. ligulata* × *S. crassifolia.*

5. **Strâcheyi,** Hook. f. & Thom. (*S. unguiculàta,* Hort., nòt Engl. *Megásea Strâcheyi,* Hort. *Bergènia Strâcheyi,* Stein). Fig. 3556. Six inches to 1 ft. or more high: lvs. obovate, usually not cordate at base, margin subentire, ciliate or crenate-serrate, both surfaces glabrous: infl. a scape about 1 ft. high with the pedicels and calyx pubescent or puberulous: fls. blush-pink to rose (sometimes yellow), in broad branching panicles ¾–1 in. diam.; calyx-lobes oblong. March. Kashmir, 8,000–14,000 ft. B.M. 5967(?). G.M. 39:233. J.H. III. 32:281. G. 12:337.—More hardy than *S. ligulata.* Var. **álba,** Hort. (*S. afghánica,* Aitch. & Hemsl. *S. afghanistánica,* Leicht. *Megásea afghánica,* Hort.). A snowy white-fld. form, the lvs. bronzy or ruby-brown. Gt. 35:1228. G. 31:751. Var. **Mîlesii,** Hort. (*S. Mîlesii,* Hort. Leicht. *Bergènia Mîlesii,* Stein. *Megásea Strâcheyi* var. *Mîlesii,* Hort.). Differs from the type in having longer lvs. (9–12 x 4–5 in. at the middle): fls. white; petals distinctly clawed. March. Himalaya. Var. **Schmîdtii,** Hubb. (*S. thysanòdes,* Hort. Haage & Schmidt, not Lindl. *S. Schmîdtii,* Regel. *Bergènia Schmîdtii,* Hort.). Lvs. ovate, base equally rotundate or attenuate to the petiole, margin coarsely crenate and then dentate, the teeth cuspidate-ciliate: fls. panicled, similar to those of *S. crassifolia.* Himalaya. Gt. 27:946. B.R. 29:65 (as *S. ciliata*).

Section II. Cymbalaria.

A. *Lower lvs. 7–11-lobed; the lobes acute..* 6. **Cymbalaria**
AA. *Lower lvs. 5–7-lobed; the lobes obtuse or very shortly apiculate* ..... 7. **Huetiana**

6. **Cymbalària,** Linn. Annual or biennial: sts. nearly erect or somewhat flexuous, branched, 3–12 in. high: lvs. tender, with age brown-striate on both surfaces, margin glandular-pilose; lower lvs. reniform, cordate or truncate at base, 7–11-lobed, lobes broad-acute; upper lvs. short-petioled, 3–7-lobed, base attenuate: infl. cymose with elongated axis; pedicels long, 1-fld., these and the calyx short glandular-pilose: fls. yellow; calyx-lobes oblong, acute; petals oblong, base cordate, distinctly clawed, 3 times the length of the calyx-lobes. May–Aug. Caucasus and Asia Minor.—The lvs. are light green, glossy and ivy-like. It sows itself

abundantly and is suitable for moist spots in rockwork or along streams. Some, possibly much, of the material cult. as *S. Cymbalaria* is really the closely allied *S. Huetiana*.

7. **Huetiàna,** Boiss., frequently incorrectly offered as *Huettiàna, Hùetii,* and *Huèttii* (*S. Cymbalària,* Hort., not Linn.). Annual or biennial(?): sts. weakly erect or decumbent, flaccid, 4–6 in. high: lvs. soft, with age brown-striate below; lower lvs. reniform-cordate, base cordate or truncate, broader across, 5–7-lobed, lobes broad, obtuse or very shortly apiculate; upper 3-lobed or entire, ovate: infl. cymose with long erect pedicels; fls. small but numerous, bright yellow; calyx-lobes triangular, acute; petals oblong, obtuse, base distinctly clawed, 3 times the length of the calyx-lobes. May–Aug. Asia Minor.—Very closely allied to *S. Cymbalaria* and by some considered a variety of that species. It differs in its dwarfer less upright habit, fewer and more obtuse lobes of the lvs. and other technical floral characters and probably in its infl. being a cincinnus instead of a bostryx. A very effective plant for the rockwork.

Section III. Miscopetalum.

A. *Rhizome rather thick: lvs. unevenly and coarsely crenate or dentate*..... 8. **rotundifolia**
AA. *Rhizome slender: lvs. 5–9-crenate or shallow-lobed, the lvs. smaller than the last*..... 9. **taygetea**

8. **rotundifòlia,** Linn. Sts. 8–12 in. high, erect from a somewhat thickened rhizome, leafy and paniculate from the middle or above: lvs. rather thick, more or less hairy on both surfaces; basal and lower on petioles 3–4 times longer than the blades, reniform or orbicular, base cordate, unequally and coarsely crenate or dentate; cauline almost sessile, base obtuse or cuneate, with more or less incise-dentate lobes: infl. a branched panicle with long, slender glandular-hirsute peduncle and pedicels; fls. white, spotted with red or purple; calyx-tube very short, lobes triangular oblong, acute; petals oblong-lanceolate. May, June. Eu. and Asia. B.M. 424.—A very satisfactory species for moist and shady parts of the rockwork. Var. **glandulòsa,** Griseb. (*S. glandulòsa,* Hort. *S. lasiophýlla,* Schott. *S. angulòsa,* Schott. *S. rotundifòlia* var. *angulòsa,* Hort.). Sts. tall, glandular-pubescent: basal lvs. obtusely crenate; the cauline lvs. incise-dentate: the panicle branches spread out and many-fld.

9. **taygétea,** Boiss. & Heldr. (*S. rotundifòlia* var. *taygétea,* Engl.). Sts. 3–6 in. high, erect from a slender rhizome, almost naked, pubescent: lvs. small, firm, sparse hirsute, slightly membranaceous-margined; the radical lvs. long-petioled, subcordate-reniform, broadly and obtusely 5–9-crenate; the cauline lvs. none or 1 or 2 minute ones which are 3-parted or linear: infl. loosely paniculate-corymbose; the branches 1–2-fld.: fls. white with purple dots; calyx-lobes oblong, rather obtuse; petals elliptical-lanceolate, obtuse. June–Aug. Greece.—Much of the material cult. under this name is really *S. cuneifolia.*

Section IV. Tridactylites.

10. **adscéndens,** Linn. (*Muscària adscéndens,* Small). One to 6 in. high, the whole plant viscidulous and clothed with short glandular hairs: sts. erect: the basal lvs. crowded, the cauline few, cuneate, gradually attenuate all the way to the base, the apex rounded or truncate, 3–5-lobed, the lobes subequal, oblong or ovate, rather obtuse or acutish: infl. corymbose, sparingly branched from the middle or base of the fl.-st. branches erect; fls. white; calyx glandular-pilose, tube campanulate, in fr. rounded at the base and twice as long as the lobes; petals cuneate, emarginate, slightly 5-nerved, double as long as the calyx-lobes. June, July. Eu. and in the Rocky Mts., S. Canada to Colo. and Utah.—A very common and widespread European species which has not been frequently cult.

Section V. Nephrophyllum.

A. *Basal lvs. cuneate or spatulate*..... 11. **lactea**
AA. *Basal lvs. cordate or reniform*..
B. *Infl. corymbose-paniculate*..... 12. **granulata**
BB. *Infl. racemose, 1–5-fld.*..... 13. **rivularis**

3556. Saxifraga Stracheyi, as the flowers are appearing in earliest spring. (×¼)

11. **láctea,** Turcz. Cespitose, 4–6 in. high: sts. erect, glandular-pubescent below, paniculate above: lvs. light green, lower cuneate, 3–5-parted, lobes oblong, very obtuse, horizontal-spreading; upper 3-parted, lobes linear, obtuse: infl. axillary, with pedicels much longer than the fls., 2-fld., the terminal fl. exceeded by the lower; fls. white (milky white according to trade-lists); calyx-lobes ovate, obtuse, longer than the tube; petals obovate-cuneate, lightly 3-nerved, 3 times as long as the calyx-lobes. June. Siberia.—Probably not in general cult.

12. **granulàta,** Linn. Meadow Saxifrage. Sts. erect or ascending from a bulbiferous base, 6–20 in. tall, slightly foliose, often branched below, lax paniculate, soft-hirsute, glandular-viscous above: lvs. pilose, bearing bulblets in the axils, reniform, incise-lobed, lobes entire or crenate, decurrent at base on the hirsute petiole; cauline lvs. subsessile, wedge-shaped, 3–5-parted: infl. open, panicled, with glandulose elongated pedicels (sometimes contracted and umbel-like): fls. white, campanulate, somewhat drooping, about 1 in. diam.; calyx-lobes longer than the ovate tube, linear-oblong, obtuse; petals obovate-oblong, strongly attenuate at base, 3-nerved. April–June. Eu., N. Afr. Gn.W. 25:513.—The common meadow saxifrage of Eu. and an attractive plant. The species proper is, however, seldom cult. Var. **flòre-plèno,** Hort. (*S. granulàta* var. *plèna,* Hort.), is the common form in cult. and differs only in its double fls. G. 25:201; 26:213. Gn.W. 23:389.

13. **rivulàris,** Linn. Cespitose, the sts. ascending 1–3 in. high, more or less villous: basal lvs. with petioles 3–5 times longer than the blades, reniform, palmately 3–7-lobed, lobes obtuse, petioles with broad ciliate stipules; upper lvs. short-petioled, 3-lobed: infl. long, peduncles arising from the axils of the lower lvs., almost as long as the whole st.; fls. at the top short-pedicelled or sessile: fls. 1–5, white (often tinged purple), erect; calyx short-glandular pilose or rather glabrous, tube hemispherical, lobes ovate, obtuse, shorter than the tube; petals obovate-oblong, twice as long as the calyx-lobes. July, Aug. Circumboreal, in N. Amer. to the White Mts. and in the Rocky Mts. to Mont.

Section VI. Dactyloides (Muscaria).

A. *Lower lvs. undivided or short 3–5-pointed: petals mostly small (see also S. moschata and S. globulifera, which have some of the lvs. undivided).*
B. *Plants loosely cespitose, with indeterminate secondary shoots borne in the lf.-axils.*

CC. *Infl. a few-fld. panicle borne on a fl.-st. 2–4 in. high*.....14. **tenella**
CC. *Infl. 1-, rarely 2-fld., borne on a fl.-st. about 1 in. high*.....15. **aphylla**
BB. *Plants densely cespitose: scape 1-fld. or few-fld., paniculate*.....
C. *Axils of the lvs. of the secondary shoots with buds of undeveloped cataphylla.*
D. *Calyx-lobes mucronate*.....26. **conifera**
DD. *Calyx-lobes obtuse*.....28. **spathulata**
CC. *Axils of the lvs. of the secondary shoots without buds of undeveloped cataphylla.*
D. *Lvs. linear*.....16. **muscoides**
DD. *Lvs. spatulate*.....17. **androsacea**
AA. *Lower lvs. more or less digitately lobed or divided (entire in Nos. 26 and 28): petals longer and broader than calyx-lobes.*
B. *Secondary shoots indeterminate: the infl. borne in the axils of the lower lvs.*
C. *The lvs. glandular-pilose, orbiculate-digitate: fls.-sts. 3–6 in. high*.18. **ajugifolia**
CC. *The lvs. not glandular, wedge-shaped: fl.-sts. 1½–3 in. high*..19. **perdurans**
BB. *Secondary shoots determinate, ending in an infl.*
C. *Petals obovate-cuneate, attenuate-clawed.*
D. *Blades of the almost sessile lvs. oblong-cuneate*.....25. **pedemontana**
DD. *Blades of the petiolate lvs. ovate or orbicular.*
E. *Divisions of the suborbicular or reniform lvs. lanceolate*..20. **geranioides**
EE. *Divisions of the ovate lvs. linear*.....21. **pedatifida**
CC. *Petals obovate, obovate-oblong or oblong, not attenuate clawed.*
D. *Plants loosely cespitose, frutescent, the rosettes of rigid lvs. of this year far removed from those of the previous year.*
E. *Lvs. cuneately attenuate to the petiole; the lobes horizontally spreading.*
F. *Lower lvs. incise 3-lobed; the midlobe usually entire*.....22. **Camposii**
FF. *Lower lvs. pedately divided; the midlobe 3-parted*.....34. **obscura**
EE. *Lvs. trifurcate, bowed-attenuate to the petiole; the lobes divaricate.*
F. *Petiole deeply grooved; the midlobe of lf. entire*.....23. **canaliculata**
FF. *Petiole not deeply grooved: the midlobe of lf. 3-toothed*.....24. **trifurcata**
DD. *Plants densely cespitose, the rosettes of lvs. of this year close to those of the previous year (specimens of S. decipiens excepted).*
E. *Axils of the lvs. of the secondary shoots without buds of undeveloped cataphylla.*
F. *Petals oblong, equaling or rarely exceeding the calyx-lobes in width*.....36. **moschata**
FF. *Petals obovate or obovate-oblong, exceeding the calyx-lobes in width.*
G. *Nerves of the lvs. usually prominent.*
H. *Blades of lvs. sessile or short-petioled; the midlobe oblong*....33. **exarata**
HH. *Blades of lvs. with petioles as long as the blades: the midlobe linear*.....35. **mixta**
GG. *Nerves of the lvs. not at all prominent.*
H. *Divisions of the lvs. more or less acute*....31. **decipiens**
HH. *Divisions of the lvs. more or less obtuse*..32. **cespitosa**
EE. *Axils of the lvs. of the secondary shoots with buds of undeveloped cataphylla.*
F. *Calyx-lobes mucronate.*
G. *Lvs. undivided and sessile*.....26. **conifera**
GG. *Lvs. 3-lobed and petioled*.27. **hypnoides**
FF. *Calyx-lobes obtuse.*
G. *The lvs. all undivided*...28. **spathulata**
GG. *The lvs. (the lowest excepted) lobed.*
H *Calyx-lobes ovate-triangular, about equaling the length of the tube*.....29. **globulifera**
HH. *Calyx-lobes ligulate-lanceolate, twice the length of the tube*...30. **Maweana**

Subsection HOLOPHYLLÆ.

14. **tenélla,** Wulf. Lax, cespitose, 2–4 in. high, with foliose, prostrate or erect caudicles: sts. erect, slender, glabrous: lvs. yellow- or apple-green, shining, thin but rather stiff, lower and also cauline, linear-subulate, cuspidate-aristate, margin setulose-ciliate or glabrous, glandulose-ciliate toward the base: infl terminal, few-fld. panicles with slender pedicels longer than the fls.: fls. white or yellowish white; calyx-lobes triangular, acute, equaling the tube, glabrous; petals obovate-oblong, recurved above, 3-nerved, twice as long as the calyx-lobes. June, July. Mountains of Cent. Eu.

15. **aphýlla,** Sternb. (*S. leptophýlla,* Froel.). Loosely cespitose, about 1 in. high with numerous sparsely foliate caudicles with rosettes at the top: sts. sparsely glandular-pilose: lvs. light green, rather thin, entire or 3–5-cuspidate, the divisions ovate-lanceolate, obtuse: infl. almost leafless 1-fld., rarely 2-fld. glandular scapes: fls. light yellow; calyx-lobes ovate, acute; petals linear, acute, equaling the calyx-lobes. June, July. Mountains of Eu.

16. **muscoìdes,** All. Densely cespitose, 1–2 in. high, with short caudicles: sts. columnar, densely imbricate-foliose, ashy pilose: lvs. linear, rounded-obtuse, base attenuate, when dried 3-nerved, apex cinerous: infl. numerous, terminal, few-fld. racemes or more seldom several-fld. panicles with very short pedicels: fls. white or yellowish white (rarely citron-yellow or purple); calyx-lobes ovate, obtuse; petals round-obovate, very obtuse, smoothly emarginate, 3-nerved, twice as long as the calyx-lobes. July, Aug. High mountains from the Pyrenees to Austria. Gn. 76, p. 615.—Frequently confused with *S. moschata* and *S. cespitosa.* A strictly Alpine species forming a dense moss-like cushion, the uppermost lvs. of which are reddish toward the base and fresh green toward the apex and are rather fleshy. Suitable only for alpine-gardening. Var. **fòliis-variegàtis,** Hort., is a form with yellow-and-white variegated lvs. Very likely this really is a variety of *S. moschata.*

17. **androsàcea,** Linn. Cespitose, 1–3 in. high (possibly more), with the basal and lower lvs. aggregated and sessile: lvs. dark green, shiny, spatulate or obovate, cuneate, apex entire or 3–5-toothed, the teeth short and acute, the central twice longer than the lateral, when dry 5–11-nerved, margin ciliate, at the top glandulose-ciliate; cauline lvs. oblong-lanceolate: infl. numerous, almost naked, sparsely glandular, 1–3-fld., rarely 5-fld. scapes: fls. small, clear white or greenish white; calyx-lobes ovate, obtuse, the base and margins glandular; petals obovate-oblong, 3-nerved, at the top emarginate, the uppermost portion reflexed, twice longer and broader than the calyx-lobes. June–Aug. Mountains of S. and Cent. Eu., also the Baikal region of Asia.

Subsection AXILLIFLORÆ.

18. **ajugifòlia,** Linn., also spelled *ajugæfolia.* Cespitose, about 3–6 in. high: st. decumbent, rooting: lvs. sparsely glandular-pilose, light green, rather thick and fleshy, orbiculate-digitate, 3–5-parted, attenuate to the flat petiole, lobes lanceolate, acute: infl. 1–5 slender, nearly simple, few-fld. scapes arising from the axils of the lower lvs.; bracts linear, entire, acute; pedicels very short, puberulent: fls. rather small, whitish or clear milk-white; calyx-lobes ovate, acute; petals ovate-oblong, 3-nerved, very shortly clawed, twice longer than the calyx-lobes. May–July. S. Eu.

19. **perdûrans,** Kit. Cespitose, 1½–3 in. high: sts. procumbent: lvs. rather thick, bright green, the lower surface striped purple at the nerves, those of the young shoots and the lower cauline similar, without glands, wedge-shaped, attenuate to the flat petiole, palmately 3–5-parted, lobes horizontal spreading, oblong, obtuse, muticous, faintly 3-nerved: infl. a solitary, axillary, subsimple, few-fld. scape with a reddish base and one partially clasping lf.; bracts 3-parted or entire: fls. 1–5, cymose, white; calyx-lobes roundish; petals spreading, oblong, 3-nerved, more than twice as long as the calyx-lobes. June, July. Mountains of E. Cent. Eu.—Closely allied to *S. ajugifolia.*

Subsection CERATOPHYLLÆ.

20. **geranioîdes,** Linn. (*S. palmàta,* Hort., not Smith and others). Biennial or perennial, cespitose, 2–10 in. high, with numerous frutescent subwoody, leafy caudicles: sts. erect, somewhat pilose: lvs. bright green, lower rather pilose, suborbicular or reniform, palmately 3-divided with the lateral lobes bifid, lobes lanceolate-acute or 2–3-toothed, base of the ciliate petiole dilate; cauline lvs. cuneate-ovate with narrow lobes: infl. subcorymbose, many-fld., with pedicels shorter than the fls.: fls. white, campanulate; calyx-lobes erect, linear-lanceolate, acute; petals obovate-oblong, long-clawed, more than twice longer than the calyx-lobes. May–July. Mountains of Eu.—Best prop. by seed. A showy little ground-cover plant suitable for terraces and the like.

21. **pedatífida,** Ehrh. (*S. cuspidàta,* Schleich.). Cespitose, 2–8 in. high, with frutescent, subwoody, leafy caulicles: sts. erect, rather stiff, puberulent: lvs. fresh green, the lower with ovate and pedate-parted blades, many-nerved and borne on flat petioles which are longer than the blades, the lateral lobes of which are 3-lobed, the lobules linear, entire and more or less mucronate; the lvs. of the young shoots longer-petioled and with longer, narrower lobes; the cauline lvs. 3–5-lobed; bracts narrowly linear: infl. subcorymbose, the peduncles much overtopping the lvs., the pedicels and calyx glandular-pilose: fls. 3–9 on a peduncle, campanulate, white; calyx-lobes erect, lanceolate, acute; petals obovate-oblong, 5–7-nerved, long-clawed, 2 or 3 times longer than the calyx-lobes. June. S. Eu.—Closely allied to *S. geranioides* but distinguished readily by the gradual narrowing of the blades, which are many-nerved into the petiole and also by the linear divisions of the lvs.

3557. Saxifraga Camposii.

22. **Campôsii,** Boiss. & Reut. (*S. Wállacei,* McNab. *S. Wallaceàna,* Hort.). Fig. 3557. Perennial, loosely cespitose, 3–6 in. high, with slightly shrubby caudicles covered with old retroflex lvs.: fl.-sts. erect, reddish, entirely glabrous: lvs. stiff, dark green, shiny, those of the young shoots and the lower ones incise-3-lobed, more than double the length of the strongly broadened, nerved petiole and having decidedly prominent nerves, the lateral lobes of the blade again 2-lobed or dentate with the teeth mucronulate, the midlobe usually entire, linear and mucronate; cauline lvs. cuneate, attenuate to the petiole, more obtusely dentate; bracts spatulate, acute: infl. terminal, 6–10-fld., more or less congested corymbs or panicles: fls. large, ¾in. across, subcampanulate, white; calyx-lobes oblong, acute; petals rounded-obovate, shortly clawed, 3-nerved. May–July. Spain. B.M. 6640. Gn. 35, p. 392; 75, p. 335. A.F. 4:493. G.M. 43:192; 55:276; 57:620. J.H. III. 70:250.—This species has been intro. into Amer. but never succeeded well owing, it is said, to the hot climate. An attractive little plant on account of its showy fls. which are occasionally used for cut-fls.

23. **canaliculàta,** Boiss. & Reut. Lax, cespitose, 6–8 in. high, with ascending caudicles which are covered below with old, rather remote lvs., and terminate in rosettes: fl.-sts. numerous, erect, very glabrous: lvs. very stiff, quite dark green, strongly viscid below, with transversely broader blade which is 3-parted and is borne on a flat, deeply grooved petiole, midlobe of the blade entire, the lateral ones 2–3-parted, with the lobes bowed and mucronate at their apex; cauline lvs. 3-parted; bracts linear, mucronate: infl. corymbose-paniculate: fls. white; calyx-lobes linear-lanceolate, mucronulate; petals obovate-oblong, attenuate to the claw, 3-nerved, twice as long as the calyx-lobes. July. Spain.—Allied to *S. Camposii* from which it differs in the more spreading divisions of the lvs. and the fact that the petioles are not broadened except at the base.

24. **trifurcàta,** Schrad. Perennial, loosely cespitose, 4–8 in. high, with slightly shrubby leafy caudicles covered with old reflexed lvs.: fl.-sts. erect, glabrous: lvs. dark gray-green, viscid, twice as long as the petioles, palmately 3-parted, nerved, the lateral lobes of the blade sub-3-divided, the midlobe cuneate, 3-toothed, with the teeth mucronulate; cauline lvs. few, shorter-petioled, 3-parted; bracts linear, acute: infl. loosely paniculate; pedicels long: fls. milk-white, numerous; calyx glabrous, the lobes lanceolate, acute; petals obovate-oblong, 3-nerved, nearly 3 times the length of the calyx-lobes: fr. ovate. May. Spain. G.C. III. 48:295. F.E. 18:442.—A quick grower, which is frequently cult. abroad and which is also useful for pot cult. Var. **ceratophýlla,** Hort. (*S. ceratophýlla,* Dry.). Lvs. rigid and more deeply parted than the type and rather glaucous: fls. white, in lax panicles. June. Spain. B.M. 1651.

25. **pedemontàna,** All. Sparsely glandular-pubescent, cespitose, 2–4 in. high, with densely leafy caudicles: lvs. bright green, those of the young shoots and the lower cauline, cuneate or obversely triangular, attenuate to the flat ciliate petiole which equals or is shorter than the 3-lobed blade, lobes horizontally spreading, the lateral ones bifid or all 3 incise-dentate, teeth obtuse or rather acute, obsoletely nerved; lower bracts cuneate, sessile, 5–7-parted or linear-oblong, obtuse: infl. few-lvd., rather glabrous scapes bearing corymbose panicles with slender pedicels which are glandular-pubescent as is the calyx: fls. large, campanulate, milk-white; calyx-lobes linear, obtuse; petals obovate-cuneate, attenuate to a claw, 3-nerved, double the length of the calyx-lobes. July. Mountains of S. Eu. Gn. 78, p. 271. Var. **cervicórnis,** Engl. (*S. cervicórnis,* Viv.). Younger lvs. longer-petioled, the blade 3-lobed; the lateral lobes bifid, less horizontally spreading, rather acute, the nerves decidedly prominent: the calyx-lobes rather acute. June. Sardinia and Corsica. Gn. 76, p. 19; 79, p. 29.

Subsection GEMMIFERÆ.

26. **conífera,** Coss. & Dur. Densely cespitose, ½–3 in. high, with numerous short, densely imbricate-foliose caudicles: fl.-sts. stiff, ascending, few-lvd., purple below, densely glandular-pubescent above: lvs., those of the caudicles, subpatent; cauline erect-spreading; all of them undivided, sessile, oblong- or lanceolate-linear, cuspidate-aristate, leathery, margin short-ciliate: infl. 3–9-fld., corymbose-racemose or paniculate: fls. white; calyx pubescent-glandular, the lobes ovate-triangular, mucronate; petals not known. June, July. Spain.—Rare and seldom cult.

27. **hypnoïdes,** Linn. (*S. hibérnica,* Hort.). Perennial, loosely cespitose, 1½–8 in. high, with herbaceous loosely foliose caudicles which are frequently reddish tinted: sts. erect, covered with very slender glands: lvs. light green, those of the caudicles rather thick, sparsely covered with slender hairs, when old rather glabrous, the suborbicular blade is cut all the way to the base, 3-lobed, and is borne on a rather broad, flat, 1-nerved, ciliate petiole which is shorter than the blade, lobes of the blade linear-lanceolate, a little dilated at the middle, acute or mucronate, with the lateral lobes divaricate, often 2-lobed; upper lvs. of the young shoots 3-toothed, attenuate to the long petiole, the uppermost linear-lanceolate; cauline lvs. few and like the bracts linear-lanceolate, ciliate and acute or mucronate: infl. 3–7-fld. panicles: fls. long-pedicelled, white, ⅛–1 in. diam.; calyx very densely glandulose, the lobes oblong-triangular, mucronulate; petals obovate, 3-nerved, twice longer than calyx-lobes: fr. ovate-globose. May–July. Mountains of Eu. as far north as Great Britain and Ireland. G.C. III. 43:302.—Frequently confused with *S. cespitosa,* Linn., and *S. decipiens,* Ehrh., and the varieties of the 3 species are almost hopelessly confused. Botanically speaking very probably Hooker in his Students' Flora of the British Islands, ed. 3, p. 142, is correct in referring *S. cespitosa* and *S. decipiens* as varieties to this species, but horticulturally at least they are better retained as separate species. Var. **gemmífera,** Hort. (*S. Kíngii,* Hort., also spelled *Kingiàna*), is a close-growing, compact form. Var. **purpùrea,** Hort., is offered in the trade. Var. **ròsea,** Hort., is offered in the trade. Var. **Whitlàvii,** Hort. (*S. Whitlàvii,* Hort.), is a form with closely packed foliage said to be suitable for edging. A variation of this is offered as *S. Whitlàvii compácta.*

28. **spathulàta,** Desf., also spelled *spatulata.* Perennial, very densely cespitose, 2½–4 in. high, with short, prostrate, very densely imbricate-foliose caudicles: sts. slender, erect, few-lvd.: lower lvs. spatulate, ciliate, apex obtuse, rarely 3-toothed, 3-nerved; cauline linear: infl. 3–5-fld. corymbose panicles with pedicels longer than the fls. and sparsely glandular as is the calyx: fls. white; calyx-lobes ovate, very obtuse; petals obovate-oblong, twice as long as the calyx-lobes: fr. subglobose. June. N. Afr.—It is doubtful whether this species is hardy in E. U. S. It forms very thick, close mats which are reddish green or brownish with the silver-gray buds of the shoots dotted through. Not very showy, as the panicles are few-fld.

29. **globulífera,** Desf. Cespitose, about 3–4 in. high, with densely foliose, short caudicles: sts. prostrate, nearly glabrous or sparsely pilose, few-lvd.: lvs. bearing in their axils buds which are shorter than the lvs.; lvs. all nerved and borne on dilated rather flat petioles; the lowest spatulate-cuneate, entire; the others 3-lobed or, if the lateral lobes are bifid, 5-lobed, the midlobe oblong-lanceolate or, if all the lobes are tridentate, with the teeth rather acute; cauline lvs. oblong-linear, obtuse; bracts linear, obtuse: infl. 3–7-fld., subcorymbose-panicled; pedicels twice or more longer than the fls.: fls. white; calyx short-pilose, the lobes ovate-triangular, obtuse; petals obovate, 3-nerved, more than twice the length of the calyx-lobes: fr. subglobose. May, June. S. Spain and N. Afr.

30. **Maweàna,** Baker. Cespitose, about 6 in. high, with copiously branched, slender purple caudicles which are glandular-pubescent: fl.-sts. erect from a decumbent base: lvs. 6–8 to a shoot, loosely disposed, cordate-reniform, ternate-palmately-parted, the lobes with 3–5 oblong, subobtuse teeth; the petioles spreading, the upper half narrowly winged, often 2–3 times longer than the blade: axillary buds copious and robust: infl. laxly corymbose, 4–9-fld., borne on densely puberulent peduncles: fls. white, large; calyx-lobes ligulate-lanceolate, subobtuse, twice as long as the densely puberulent tube; petals obovate-cuneate. May. Morocco. G.C. 1871:1355.

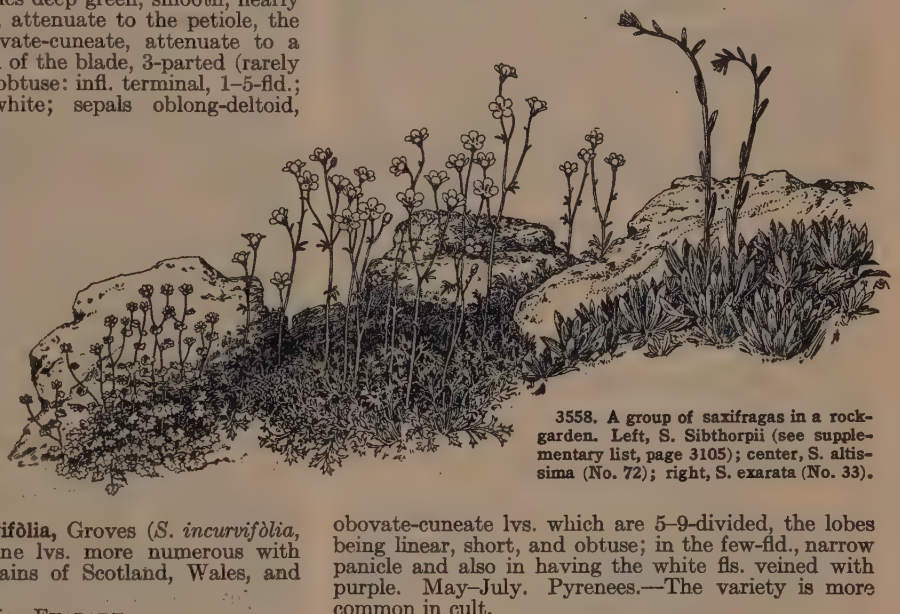
Subsection CESPITOSÆ.

31. **decípiens,** Ehrh. (*S. cæspitòsa,* Hort., not Linn.). Cespitose, about 3 in. high, the caudicles herbaceous, rarely subligneous, rather long and leafy: sts. erect, few-lvd., smooth or at first glandular-pilose above: lvs. obovate-cuneate or spatulate, attenuate to the 1-nerved, flat petiole, apex either 3-pointed or 3-lobed, lateral lobes 2- or 3-lobed or even the midlobe 3-lobed, the lobes oblong acute; cauline lvs. deeply 3-lobed: infl. loosely panicled, few-fld. (usually 3): fls. white; sepals oblong-lanceolate, subacute; petals obovate, 3-veined. May, June. Eu. L.B.C. 16:1510. Gn. 78, p. 271.—Approaches *S. cespitosa,* Linn., from which it is most easily distinguished by the acute lf.-lobes and subacute sepals; also approaches *S. hypnoides,* from which it is readily told as that species has buds in the axils of the lvs. of the barren shoots, whereas *S. decipiens* has not. Very variable; some of the cult. forms are: Var. **álba,** Hort., which has strong growth and white fls. Var. **Árkwrightii,** Hort. (*S. Árkwrightii,* Hort.). Rather tall-growing and free-flowering: the buds are suffused with a pale rose tint, but the fls. are pure white, flat, and large, ¾–1 in. across. G.C. III. 45:314. Var. **bathoniénsis,** Hort. (*S. bathoniénsis,* Hort. *S. muscoìdes* var. *bathoniénsis,* Hort.). A rapid grower, 10–14 in. high, with stout branching sts. bearing large scarlet-crimson fls. Var. **bristoleàna,** Hort. Fls. bright crimson. Var. **Clîbranii,** Hort. (*S. Clîbranii,* Hort. *S. muscoìdes* var. *Clîbranii,* Hort.). A plant of robust constitution, increasing rapidly and flowering freely; the foliage consisting of closely set rosettes of grass-green color: fl.-sts. 5–6 in. high, bearing fls. which are variously described as deep clear rose, rich crimson and rich blackish crimson, ½in. or more diam. G.C. III. 45:301. G. 36:395. Gn. 73, p. 264. J.H. III. 58:431. Var. **grandiflòra,** Hort., is a free-growing plant 6–8 in. high with good-sized fls. of a rich red fading to pink. Very similar to var. *bathoniensis.* Var. **grœnlándica,** Engl. (*S. cespitòsa* var. *grœnlándica,* Hort.). Densely cespitose, with few-lvd., few-fld. sts. and broadly cuneate, palmately 3–5-divided lvs.; the lobes ovate-lanceolate, acute. Ireland, Scotland, Wales, Norway, Iceland, Greenland, and Lab.

Var. **hýbrida,** Hort., is probably a strain of red-fld. hybrids. It is suggested by one author that they are the result of a cross between *S. decipiens* and *S. granulata.* Some of the trade names of these variants are *S. decipiens hýbrida grandiflòra,* Hort. (*S. decipiens grandiflòra hýbrida,* Hort. *S. hýbrida grandiflòra,* Hort.), with large rich crimson or bright red fls. *S. hýbrida grandiflòra álba,* Hort., with neat cushions of dark green foliage and large pure white fls. resembling those of *S. Burseriana* var. *gloria. S. ròsea supérba,* Hort., which is said to be a remarkably effective variety with rich rose-red fls. G.M. 56:151. *S. hýbrida spléndens,* Hort., with rosettes of moss-like foliage covered with medium-sized brilliant red or dark carmine-red fls. All of these forms are much prized by fanciers abroad.

Var. **lutéscens,** Hort., is offered in the trade. Var. **purpùrea grandiflòra,** Hort., is a trade name for a form which is said to be more vigorous than previous red saxifrages. It is said to form compact basal tufts with bright red fls., fading to rose, nearly 1 in. diam. April. Var. **sanguínea,** Hort. (*S. sanguínea supérba,* Hort., not *S. sanguínea,* Franch. *S. muscoìdes* var. *sanguínea supérba,* Hort.). Habit neat and compact, growth rapid: fls. rich blood-red, well retained when old. Var. **Stérnbergii,** Engl. (*S. Stérnbergii,* Willd. *S. hibérnica,* Haw., not Sternb. *S. hypnoìdes* var. *Stérnbergii,* Hort.). Lvs. ciliate, somewhat pedate; the midlobe entire, the lateral 2-parted, or the midlobe and also the lateral 3-parted; the divisions rather obtuse. Germany, Ireland, Norway, and Greenland. Var. **villòsa,** Engl., is a form which is villous and canescent and has white fls.

32. **cespitòsa,** Linn., more commonly spelled *cæspitosa* (*Muscària cæspitòsa,* Haw.). Cespitose, 2–6 in. high, a robust grower with short, more or less densely foliose caudicles: sts. few, few-lvd., densely glandular above: lvs. of the caudicles deep green, smooth, nearly glabrous, either cuneate, attenuate to the petiole, the apex 3-toothed, or obovate-cuneate, attenuate to a petiole double the length of the blade, 3-parted (rarely 5), the lobes linear and obtuse: infl. terminal, 1–5-fld.; fl.-sts. stoutish: fls. white; sepals oblong-deltoid, obtuse; petals narrowly obovate or oblong-obovate, rounded at the apex. June–Aug. N. Eu., N. Asia, and N. Amer., Greenland, and Lab., the Rocky Mts. of N. U. S. and Canada to the Pacific coast, south there to Wash. and Ore. Gn. 76, p. 283.—Probably the true *S. cespitosa* is rare in cult. Var. **hírta,** Hort. (*S. hypnoìdes* var. *hírta,* Hort.). A distinct form with very hairy lvs. giving it quite a white, woolly appearance. Var. **incurvifòlia,** Groves (*S. incurvifòlia,* D. Don), has the cauline lvs. more numerous with incurved lobes. Mountains of Scotland, Wales, and Ireland.



3558. A group of saxifragas in a rock-garden. Left, S. Sibthorpii (see supplementary list, page 3105); center, S. altissima (No. 72); right, S. exarata (No. 33).

Subsection EXARATÆ.

33. **exaràta,** Vill. Fig. 3558. Cespitose, 3–6 in. high, with subligneous and also herbaceous caudicles which are rosulate at their tips: fl.-sts. erect, few-lvd., soft hirsute below, mixed with slender glandular hairs above: lvs. of the caudicles cuneate, sessile or petiolate, 3-lobed, the midlobe oblong-obtuse, the lateral either undivided or 2-parted, rather acute; lvs. of the young shoots 3-divided or lanceolate undivided; cauline lvs. 3-parted; bracts lanceolate; infl. paniculate, 4–10-fld.; the pedicels and calyx short-glandular: fls. usually white or yellowish white but sometimes rose or purple; calyx-lobes obtuse or subacute; petals obovate or obovate-oblong, 3-nerved, double the length of the calyx-lobes. June, July. Alpine regions of Eu., Pyrenees to Greece. G.M. 54:555.—A variable species not commonly cult.

34. **obscùra,** Gren. & Godr. Cespitose, 3–8 in. high, with somewhat shrubby, elongated caudicles covered with old lvs.: fl.-sts. erect, slender, nearly naked, pilose: lvs., those of the shoots and the lower, pedate-divided, with lanceolate lobes, linear, long-petioled, broadened at base, lateral lobes bifid or 2-toothed, teeth lanceolate, the midlobe 3-parted; cauline lvs. 3–5-parted: infl. 5–15-fld., with pedicels shorter than the fls.: fls. white; calyx-lobes linear, subacute; petals oblong, not at all clawed, double the length of the calyx-lobes. July, Aug. Pyrenees.—A rare, little-known species.

35. **mixta,** Lapeyr. The whole plant glandular-pilose, densely cespitose, 2–3 in. high, with subwoody columnar caudicles which are densely imbricate with persistent old lvs.: fl.-sts. erect: lvs. mostly light green, soft and more or less strongly nerved, those of the caudicles and shoots cuneate, borne on a large petiole which equals the blade in length, 3-lobed, the lobes horizontally spreading, obtuse or at other times the lobes 3-lobed, the lobules linear, obtuse; cauline lvs. obovate-cuneate, 3-lobed; bracts oblong, obtuse: infl. corymbose-paniculate: fls. milk-white, not uncommonly purple-nerved; calyx-lobes ovate, obtuse; petals round-ovate, 3 times as long as the calyx-lobes. June–Aug. Pyrenees.—Said to be an attractive little plant with a good habit, but the species proper appears not to have been cult. Var. **Iratiàna,** Engl. (*S. Iratiàna,* F. Schultz). About 2 in. high, differing from the type in the deep green, broadly obovate-cuneate lvs. which are 5–9-divided, the lobes being linear, short, and obtuse; in the few-fld., narrow panicle and also in having the white fls. veined with purple. May–July. Pyrenees.—The variety is more common in cult.

Subsection MOSCHATÆ.

36. **moschàta,** Wulf. (*S. muscoìdes,* Hort., not All. *S. muscoìdes* var. *moschàta,* Hort.). Cespitose, 1–5 in. high, the caudicles herbaceous or subligneous, foliose: lvs. smooth, nerves not prominent, glabrous or glandular-pilose; those of the caudicles linear, entire, obtuse or cuneate, 3-, rarely 5-parted, lobes linear, obtuse, horizontally spreading; cauline lvs. few, 3-lobed or entire; bracts linear, obtuse: infl. racemose or paniculate, 1–10-fld., borne on erect, few-lvd., subglabrous or glandular-pilose fl.-sts.: fls. commonly yellowish but not uncommonly rose or dark purple, seldom almost white; calyx-lobes ovate, obtuse; petals spreading, oblong, obtuse, 3-nerved, slightly exceeding the calyx-lobes: fr. ovate-globose. May, June. Cent. and S. Eu. Gn. 76, p. 283 (as *S. cespitosa*).—Linnæus included this under *S. cespitosa* and in consequence the two species have been commonly confused. There seems no doubt, however, that Linnæus intended his *cespitosa* to apply to the Lapland form. *S. moschata* is readily separated from the true *S. muscoides* by the lobed lvs.; those of the latter are unlobed and linear. A very variable species; some of the varieties in cult. are: Var. **Alliònii,** Engl. (*S. Alliònii,* Gaud., not Baumg. *S. muscoìdes* var.

Alliònii, Hort.). Laxly cespitose, robust, 3–6 in. high: lvs. long-petioled, 3–5-lobed at the apex; the lobes short and very obtuse: infl. many-fld., paniculate: fls. white; petals broader and obovate. Switzerland. Var. **atropurpùrea,** Sternb. (*S. atropurpùrea*, Sternb. *S. muscoìdes* var. *atropurpùrea*, Ser. *S. muscoìdes* var. *purpùrea*, Sternb.), has the petals dark purple and sometimes obovate-oblong. G.W. 5, p. 254. G.M. 58:1. Var. **compácta,** Correv. (*S. muscoìdes* var. *compácta*, Koch). Tufts small and very dense: lvs. densely imbricate: sts. usually 1-fld., often scarcely ½in. high. Var. **dénsa,** Hubb. (*S. muscoìdes* var. *dénsa*, Hort. *S. dénsa*, Hort., not Willd.), has the foliage so tightly packed as to give the effect of turf: fls. white. Var. **Férgusonii,** Hubb. (*S. Férgusonii*, Hort.). Free-flowering, so much so as nearly to hide the vivid green carpet of foliage: fls. bright crimson, in clusters on very short sts. "Guildford Seedling," also treated as a form of *S. muscoìdes* and *S. Rhei*, appears to be nothing more than a later-flowering form of var. *Fergusonii*. Gn.W. 23:427. Var. **pygmæa,** Engl. (*S. pygmæa*, Haw. *S. muscoìdes* var. *pygmæa*, Hort.). Densely cespitose: the lvs. rather thick, all entire, the apex rotund-obtuse or with three crenatures. Var. **Rhèi,** Hort., also spelled *Rhæi* and *Rhœi* (*S. Rhèi*, Schott. *S. cespitòsa* var. *Rhèi*, Hort. *S. muscoìdes* var. *Rhèi*, Hort.). Forms mossy hillocks covered in April and May with masses of rather large rose-colored fls. Grows about 6 in. high. A form of this more commonly cult., is known as *S. Rhèi supérba* or *S. muscoìdes Rhèi supérba*, and has a more robust habit and larger deeper colored fls.

Section VII. Boraphila (Spathularia, Micranthes).

A. *Petals lanceolate, clawed, usually somewhat unlike.*
B. *Infl. without bulblets: fls. numerous.* 37. **leucanthemifòlia**
BB. *Infl. with bulblets: fl. solitary at the end of the main st.* 38. **bryophora**
AA. *Petals obovate or obovate-rotundate, about alike.*
B. *Lvs. more or less spatulate, ovate, or obovate.*
C. *The lvs. thin and herbaceous.*
D. *Lf.-blades about as broad as long.*
E. *Infl. many-fld., corymbose-paniculate: sepals not reflexed.* 39. **davurica**
EE. *Infl. few-fld., loosely paniculate: sepals reflexed.* 40. **Lyallii**
DD. *Lf.-blades elongated.* 41. **micranthidifòlia**
CC. *The lvs. thick, leathery.*
D. *Blades of lvs. elongated or elongate-cuneate.*
E. *Margins of the oblanceolate or oblong-spatulate lvs. remotely short-dentate: petals oblong-linear or linear-lanceolate.* 42. **pennsylvanica**
EE. *Margins of the ovate-oblong lvs. entire or slightly sinuate-crenate: petals obovate.* 43. **integrifolia**
DD. *Blades of lvs. ovate or obovate.*
E. *Cymules compact or closely corymb-like at maturity: lvs. roundish ovate.* 44. **nivalis**
EE. *Cymules open and often raceme-like at maturity: lvs. ovate, obovate or spatulate.* 45. **virginiensis**
BB. *Lvs. reniform or suborbicular.*
C. *Bulblets lacking in the axils of the basal lvs.* 46. **punctata**
CC. *Bulblets present in the axils of the basal lvs.* 47. **Mertensiana**

37. **leucanthemifòlia,** Michx. (*S. Michaùxii*, Brit. *Spatulària petiolàris*, Small). Five to 15 or more in. high, caudicles short: lvs. short-pilose on both sides, the basal fleshy, bright green, long-spatulate, cuneate-attenuate to the margined petiole, coarsely dentate, the teeth equal and acute; lower bracts linear-lanceolate, narrowly dentate, upper ones nearly entire: infl. 1 or more scapes arising from the axils of the basal lvs. and branching paniculate from the middle, with the branches more or less diffuse; pedicels slender: fls. white, numerous and star-like; sepals lanceolate; petals unequal, the 3 larger ones with 2 light yellow spots at their cordate base, twice as long as the sepals: fr. ovate. June. Mountains of Va. to N. C. and Ga. L.B.C. 16:1568. B.M. 2959. B.B. 2:176; (ed. 2) 2:221 (as *Hydatica petiolaris*).

38. **bryóphora,** Gray (*Spatulària bryóphora*, Small). Two to 8 in. high, slender: lvs. 1 in. or less long, basal rather far apart, rosulate at the top of the slender caudicles, oblong-elliptic to oblanceolate, obtuse, entire, ciliate: infl. solitary or tufted naked scapes, paniculately branched, the branches erect-spreading, 1-fld. at the end of the main st.; pedicels drooping: fls. white; sepals oblong to ovate; petals unequal, the 3 upper ovate with 2 spots at their cordate base, the 2 lower ovate, with abruptly narrowed base. Sierra Nevada Mts., Calif.—At one time offered by dealers in native plants.

39. **davùrica,** Pall., also spelled *dahurica* (*Micránthes davùrica*, Small). Three to 8 in. high: rhizome thick: lvs. basal, rather stiff, forming a rosette, sparsely covered with very short hairs, obovate-cuneate, rounded at the apex, deeply and evenly dentate, teeth ovate, acute, blades cuneate-attenuate at the base to the petiole which is membranaceous sheathing at its base; bracts oblong-lanceolate, the lowest of them oblong-cuneate: infl. erect naked scapes, which are solitary or several together, and are covered with very slender canescent, partly glandular hairs, many-fld. and corymbose-paniculate branched from the middle; pedicels filiform: fls. white, numerous; sepals yellow-green, ovate, rather acute, erect-spreading and not reflexed in age; petals obovate-oblong, scarcely twice as long as the sepals. E. Siberia and the islands of Bering Sea.—Much of the so-called American *S. davurica* and apparently more or less of the material cult. as *S. dahurica* is really *S. Lyallii* from which it differs in having the peduncles hairy instead of glabrous and many- instead of few-fld., smaller fls. and other characters. Somewhat similar to *S. virginiensis*.

40. **Lyallii,** Engl. (*S. dahùrica*, Lyall. *Micránthes Lyallii*, Small). Four to 15 in. high: rhizome slender: lvs. fresh green, obovate ("flabellate, varying to suborbicular or reniform-flabellate"), cuneate, attenuate to a basally dilated petiole, equally serrate-dentate above, glabrous, almost nerveless: infl. 6–10-fld. loosely paniculate scapes which are naked, slender, erect, almost glabrous, with very slender, erect-spreading later erect pedicels which are purple almost glabrous: fls. milk-white; calyx purple, the sepals ovate-triangular, reflexed; petals obovate-rotund, slightly clawed, 1-nerved. Rocky Mt. region, Brit. Col., Alaska, and Bering Sea region.—Has been confused with *S. davurica*, Pall., which see.

41. **micranthidifòlia,** Steud. (*S. eròsa*, Pursh. *Micránthes micranthidifòlia*, Small). Up to 3 ft. high: lvs. all basal, oblong or oblanceolate, obtuse, attenuate to a flat petiole which is partly clasping at the base, erose-dentate, sparsely and also very shortly pilose, margin short-ciliate: infl. paniculate, loosely fld. and elongated, borne on a tall softly pilose scape; pedicels filiform, densely covered with slender glandular hairs, viscid: fls. numerous, white; sepals linear-lanceolate, obtuse, finally reflexed; petals oval, obtuse, with a yellow blotch below the middle, slightly longer than the sepals. June, July. Cold mountain brooks and wet rocks, Pa. to N. C. and Tenn. B.B. 2:174; (ed. 2) 2:219.—Occasionally cult.

42. **pennsylvánica,** Linn. (*Micránthes pennsylvánica*, Haw.). Swamp Saxifrage. Tall and stout, up to 3 ft or more high, viscid pubescent: rhizome thick: lvs. all

basal, sometimes almost 1 ft. long, oblanceolate or oblong-spatulate, attenuate to a short petiole which is half clasping at the base, obtuse, very shortly and also remotely dentate, margin short-ciliate: infl. 4–8-fld. cymes in a large panicle at first clustered, borne on a naked erect scape which is few-striate, shortly pilose, toward the top glandulose-pilose: fls. numerous, small, greenish; calyx-lobes deltoid, spreading, in fr. reflex; petals oblong-linear or linear-lanceolate, 1-nerved, a little longer and narrower than the calyx-lobes. June, July. Swamps and low meadows, Maine to Ont. and Minn., south to Va. and Mo. B.B. 2:173; (ed. 2) 2:219.—Recommended as a bog-plant.

43. **integrifòlia,** Hook. (*Micránthes integrifòlia*, Small). Whole plant glandular-pilose, viscid, very viscid above, 4–14 in. high: caudex short and somewhat woody, the st. always solitary: basal lvs. dark green, submembranaceous, ovate-oblong, very obtuse, entire or very slightly sinuate-crenate, base spatulate: infl. paniculate, more or less loosely so or spike-like, borne on an erect naked scape: fls. white, small; calyx rather glabrous, the lobes ovate, obtuse, spreading, at length reflex; petals obovate, slightly emarginate, 1-nerved, a little longer than the calyx-lobes. Calif. northward and in the Rocky Mts.—Occasionally offered by dealers in native plants.

44. **nivàlis,** Linn. Two to 6 in. high: rhizome rather terete, short and simple but thick and hard, crowned with a tuft of lvs.: lvs. rather thick and leathery, roundish-ovate, generally abruptly narrowed to the petioles, obtuse, sharply crenate-serrate, upper surface dark green, under surface purple or red and often pubescent; bracts broad, purple or red: infl. composed of cymules aggregated into one or more terminal conspicuously bracted heads and borne on erect solitary or clustered purple or purple-tinged scapes which are glandular-viscid especially above: fls. white, very short-pedicelled or sessile; sepals ovate or deltoid-ovate, obtuse, ciliate; petals oblong to elliptic, mostly obtuse, narrowed into claw-like bases or scarcely so. June, July. Circumboreal, including N. Great Britain. B.B. 2:174; (ed. 2) 2:218 (as *Micranthes nivalis*).

45. **virginiénsis,** Michx. (*Micránthes virginiénsis*, Small). Low, viscid-pubescent plant, 3–12 in. high (occasionally taller): lvs. rosulate, thickish, ovate, obovate or spatulate, narrowed into a broad petiole, both surfaces glabrous or the upper short-pilose and the lower hirsute, crenate-toothed: infl. solitary, a small cyme, close at first, becoming loose and paniculate, which is borne on a hirsute and glandular-soft-pilose scape: fls. white, small, few or many; sepals ovate, mostly obtuse; petals obovate-oblong, double the length of the sepals: fr. ovate, the follicles united merely at base, purplish. April–June. Common on rocks and dry hillsides. New Bruns. to Minn., south to Ga., Mo., and Tenn. B.M. 1664. L.B.C. 17:1699. B.B. 2:174; (ed. 2) 2:218.—A very attractive spring-blooming plant for partially shaded spots in the wild-garden or rockery. Var. **flòre-plèno,** Hort., is a double-fld. form.

46. **punctàta,** Linn. (*S. argùta*, Don. *S. æstivàlis*, Fisch. & Mey. *Micránthes argùta*, Small. *M. æstivàlis*, Small). Six to 18 in. high: rhizome rather stout and woody: lvs. forming a basal rosette, dark green, reniform to suborbicular, equally and strongly dentate or crenate, with long almost filiform, channeled petioles: infl. a terminal, many-fld., crowded or loose panicle which is borne on the solitary, erect or ascending naked scape: fls. white, not punctate; sepals ovate-oblong, rather acute and reflexed; petals obovate or oblong, twice as long as the sepals. Asia, W. N. Amer., and in the Rocky Mts.—A variable species, the American representatives of which have been separated as *S. arguta* and *S. æstivalis*, but the differences seem too slight to be considered specific.

47. **Mertensiàna,** Bongard (*Heterísia Mertensiàna*, Small). Perennial, 4–13 in. high, subpubescent: lvs. basal, in a rosette, subrotund, base cordate, incise-lobed, the lobes quadrate, 3-toothed with the teeth obtuse or acute; the petioles long, slender, pilose and at the base with a long membranaceous sheath: infl. a loosely diffuse panicle with erect-spreading glandular-pubescent branches borne on a slender erect almost naked green scape: fls. white with very long pedicels; sepals ovate, obtuse, reflexed; petals oblong, obtuse, double the length of the sepals. Alaska to Alberta, south to Mont. and Calif.—Very similar to *S. punctata* but readily distinguished by the incise-lobed lvs.

Section VIII. Diptera.

A. *Lvs. roundish, more or less deeply 7-lobed, serrate: stolons when present short*.....
B. *Longer petals entire*.....48. **cortusifolia**
BB. *Longer petals strongly serrate*.....49. **Fortunei**
AA. *Lvs. roundish or ovate, remotely dentate: stolons usually long and slender.*
B. *Margins of lvs. doubly crenate-dentate; the petiole twice as long as the blade: plant usually tall*.....50. **sarmentosa**
BB. *Margin of lvs. coarsely dentate or undulate dentate; the petiole as long as or slightly longer than the blade: plant low, not over 6 in. high*.51. **cuscutæformis**

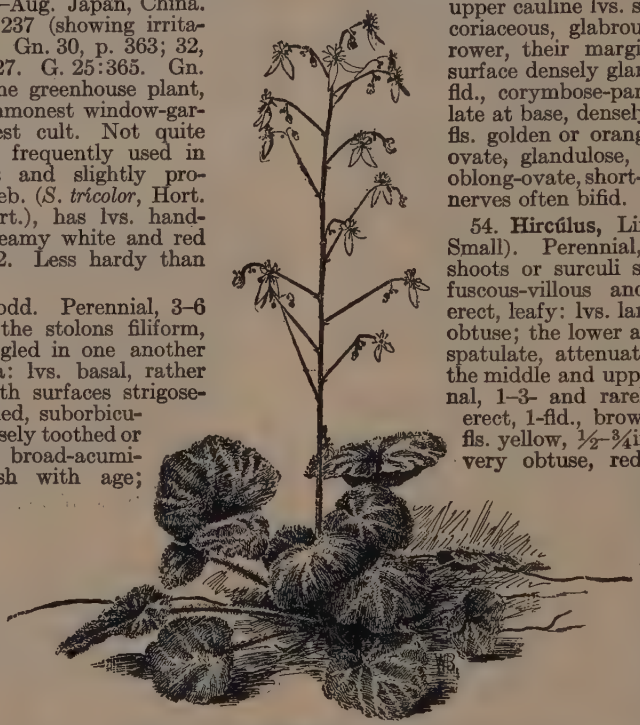
48. **cortusifòlia,** Sieb. & Zucc., also spelled *cortusæfolia*. From 6–12 in. high, not stoloniferous: lvs. basal, rather thick and fleshy, bright green, the lower part reddish, strigose-pilose, margin ciliate, roundish, 7-lobed, midlobes larger and simple or 3-lobed, acute-serrate, base cordate; petioles 3–4 times as long as the blade and broadened into a sheath ciliate with long rusty brown hairs: infl. laxly paniculate, terminal on an erect, striate, strigose-pilose scape; pedicels long, very slender, erect: fls. white; calyx-lobes lanceolate, acute; petals 3-nerved, unequal, 3 (generally) slightly longer than the calyx-lobes and obovate-lanceolate, the other 2 (sometimes 1–3) 8–10 times longer and quite entire, very long-attenuate to a claw. Oct. Japan. B.M. 6680. Var. **mádida,** Maxim. (*S. mádida*, Makino). Lvs. thin-membranaceous, deeply lobed, with the lobes 3-lobulate and incise-dentate. Oct. Japan. G.C. III. 46:370.

49. **Fórtunei,** Hook. (*Bergènia Fórtunei*, Stein). Perennial, scarcely (if at all) sarmentose, up to 2 ft.: lvs. dark green, one-colored, basal, thick, strigose-pilose, rounded-reniform, nerved, somewhat 7-lobed, the lobes rounded, strongly and acutely laciniate-serrate; petioles longer than the blade, thick, sheathing, with the sheaths ciliolate-dentate: infl. loosely paniculate, borne on a stout, erect, strigose-pilose scape; the panicle-branches glandular, spreading, 4–7-fld.; pedicels nodding: fls. white; calyx-lobes ovate, rather obtuse, spreading; petals 1-nerved, unequal, 4 smaller, lanceolate, very entire or subentire, the fifth much longer, 3 or 4 times larger than the others, strongly serrate. June–Oct. Japan. B.M. 5377. G.L. 24:351. Gn. 74, p. 622; 78, p. 564. G.C. III. 45:20. G. 6:445. G.W. 14, p. 398. Gn.W. 24:759.—A very showy species which is not entirely hardy in England, requiring winter protection. Var. **trícolor,** Hort., is a form with the lvs. irregularly blotched with rose, white, and yellow. F.S. 21:2227, 2228.

50. **sarmentòsa,** Linn. (*S. japónica*, Hort. *S. chinénsis*, Lour.). Strawberry Geranium. In England known as Mother of Thousands, a name also applied to *Linaria Cymbalaria*. Old Man's Beard. Fig. 3559. Perennial, 9–24 in. high, stoloniferous, the stolons long and filiform: caudex short: lvs. basal, rather thick, strigose-pilose, reniform-rotundate, rarely rounded-ovate, nerved, doubly crenate-dentate with broad acute teeth, upper surface green veined white, lower surface

reddish; petioles twice as long as the blade, semi-terete: infl. loosely paniculate, borne on an erect, strigose-pilose scape, the panicle-branches glandulose, spreading, 4–7-fld.: fls. white, numerous; calyx short-glandular, the lobes ovate, obtusish or acute, spreading; petals 1-nerved, clawed, unequal, the 3 smaller ovate, acute, of these the two outer have a yellow spot, the middle one 2 scarlet spots, the other two 3–4 times larger and lanceolate-elliptic. May–Aug. Japan, China. B.M. 92. G.C. III. 7:237 (showing irritability of plant to light). Gn. 30, p. 363; 32, p. 37. R.H. 1876, p. 427. G. 25:365. Gn. W. 25:781.—An old-time greenhouse plant, and also one of the commonest window-garden subjects. Of easiest cult. Not quite hardy in England but frequently used in sheltered rock crevices and slightly protected. Var. **trícolor,** Sieb. (*S. trícolor*, Hort. *S. trícolor supérba*, Hort.), has lvs. handsomely marked with creamy white and red variegations. G.Z. 9:32. Less hardy than the type.

51. **cuscutæfórmis,** Lodd. Perennial, 3–6 in. high, stoloniferous, the stolons filiform, often branched and tangled in one another like the sts. of cuscuta: lvs. basal, rather thick, plano-convex, both surfaces strigose-pilose, green, white-veined, suborbicular or ovate, nerved, coarsely toothed or undulate-dentate, teeth broad-acuminate, becoming obtusish with age; petioles longer than or equaling the blade, rather terete and thick: infl. laxly secund-paniculate from below the middle of the slender, ascending, strigose-pilose scape; the panicle-branches glandulose, erect-spreading, slender, 2–3-fld.: fls. white; calyx very short-glandular, the lobes ovate, acutish, spreading; petals 1-nerved, very short-clawed, lanceolate-elliptic, 3 of them smaller and often pink toward their base and with a yellow spot, the other 2 slightly or twice longer. June, July. Japan. L.B.C. 2:186. B.M. 2631.—Not hardy in England unless very heavily protected.



3559. Saxifraga sarmentosa (×⅓). No. 50.

Section IX. Hirculus.

A. *Petals obovate*.....52. **diversifolia**
AA. *Petals elongated, oblong or ovate-oblong.*
B. *Infl. 3–12-fld., corymbose-panicled: the lower lvs. lanceolate*.....53. **turfosa**
BB. *Infl. 1–3- (rarely 5-) fld., racemose: the lower lvs. spatulate*.....54. **Hirculus**

52. **diversifòlia,** Wall. Eight to 18 in. high, forming tufts of basal lvs.: sts. hirsute below and glandular (becoming glabrous with age) above, erect and foliose: lvs. polymorphous, the lower petioled, ovate, obtuse or cordate-based, subacute, undulate, sparsely hirsute or glabrous; cauline mostly sessile, very entire, oblong-lanceolate, obtuse and glandular: infl. corymbose-racemose or paniculate, rarely few-fld. fls. yellow, obscurely spotted, ½–¾in. across; sepals ovate, spreading, at length reflexed; petals obovate, short-clawed, 5-nerved with 4 glands at their base, exceeding the sepals. July–Sept. Himalayas and China. B.M. 6603.—Said to be the handsomest of the group and very showy when massed. Var. **foliàta,** Hubb. (forma *foliàta*, Engl. & Irmscher). Sts. erect, with 1 or more lvs., 3–20-fld.: lvs. cordate-ovate, glabrous or very shortly and densely glandular-pilose on the margin: fls. golden yellow; sepals with the nerves mostly parallel. Aug., Sept. China.

53. **turfòsa,** Engl. & Irmscher. Sts. erect, 7–14 in. high, rather densely foliose, reddish and glabrous below, pale and short-glandular-pilose above, stoloniferous at base, the stolons about 4 in. long and laxly foliate: basal and also the lower st.-lvs. lanceolate, obtuse, narrowed to a petiole as long as the blade, glabrous; middle and upper cauline lvs. sessile, oblong-lanceolate, coriaceous, glabrous; the uppermost narrower, their margin and often the upper surface densely glandular-pilose: infl. 3–12-fld., corymbose-panicled; pedicels bracteolate at base, densely short-glandular-pilose: fls. golden or orange-yellow; sepals oblong-ovate, glandulose, reflexed; petals oval or oblong-ovate, short-clawed, 3-nerved, lateral nerves often bifid. Sept., Oct. China.

54. **Hircúlus,** Linn. (*Leptásea Hircúlus*, Small). Perennial, 4–12 in. high: basal shoots or surculi short, prostrate, filiform, fuscous-villous and remotely foliose: sts. erect, leafy: lvs. lanceolate, flat, entire and obtuse; the lower and those of the surculi spatulate, attenuate to the ciliate petiole, the middle and upper lvs. sessile: infl. terminal, 1–3- and rarely 5-fld.; the peduncles erect, 1-fld., brown-villous and glutinose: fls. yellow, ½–¾in. across; sepals oblong, very obtuse, reddish ciliate; petals oblong or ovate-oblong, spotted with red at the base, 3 times longer than the sepals: fr. ovate. July–Sept. N. temperate, subarctic and alpine regions. B.B. 2:171; (ed. 2) 2:216.—An excellent plant for cold damp locations as it is a native bog-grower. Var. **grandiflòra,** Hort., is freer flowering than the type and has golden yellow fls. 1 in. across; more desirable than the type.

Section X. Trachyphyllum (Leptasea, Chondrosea).

A. *Stolons or runners absent: the young shoots leafy and also floriferous.*
B. *Sts. with a basal rosette of lvs., but few-lvd. above*.....55. **chrysantha**
BB. *Sts. equally and loosely lvd.*
C. *Axils of the cauline lvs. with buds.*
D. *Peduncles glabrous: calyx-lobes ovate-triangular*.....56. **aspera**
DD. *Peduncles glandular: calyx-lobes lanceolate.*
E. *Lvs. linear-lanceolate, gray-green; margin ciliate or spinulose*.....57. **bronchialis**
EE. *Lvs. lanceolate; under surface lineolate; margin strigose, with white hairs*.....58. **gemmipara**
CC. *Axils of cauline lvs. without buds, the lowest, however, have more or less elongated leafy shoots.*
D. *Petals oblong, 1-nerved: the cauline lvs. oblong*.....59. **aizoides**
DD. *Petals obovate, 3-nerved: the cauline lvs. lanceolate*.....60. **cinerascens**
AA. *Stolons or runners present: the young shoots sarmentose.*
B. *Fls. long-pedicelled*.....61. **Brunoniana**
BB. *Fls. almost sessile*.....62. **flagellaris**

55. **chrysántha,** Gray (*Leptásea chrysántha*, Small). Dwarf cespitose plant, 1–2 in. high, with creeping

shoots: lvs. mostly basal, in a rosette (a few cauline), imbricated, oblong-ovate, glabrous and fleshy: infl. 1–3-fld., terminal on filiform, glandular-pubescent peduncles: fls. large, yellow; calyx-lobes ovate or oblong-ovate, obtuse; petals oval to broadly obovate, much longer than the calyx-lobes. Mountains of Colo. and New Mex.—Has been offered by dealers in native plants.

56. **áspera,** DC. More or less cespitose, 4–6 in. high, with prostrate, mostly dark purple caudicles: fl.-sts. erect or ascending, remotely lvd.: lvs. pale green, shiny, lanceolate-linear, spiny-aristate and ciliate, those of the caudicles bearing buds in the axils: infl. 1-fld. or few-fld. panicles, on glabrous peduncles: fls. yellowish white; calyx sparsely glandular below, the lobes ovate-triangular mucronulate; petals oblong or obovate-oblong, 3-nerved, double the lengths of the calyx-lobes, oblique truncate. May, June. Mountains of Eu.—A rock-loving species suitable for rockeries and alpine gardens, best grown in a moist but well-drained spot. Little known in Amer. Var. **bryoïdes,** DC. (*S. bryoïdes,* Linn.). Lvs. of the caudicles very dense, slender ciliate, the apex incurved; the cauline lvs. subapproximate, erect, appressed to the sts. which are 2–3 in. high and 1–2-fld.

57. **bronchiàlis,** Linn. Dwarf, cespitose, 4–8 in. high: sts. ascending, densely foliose at the base; fl.-sts. few-lvd.: lvs. stiffish, almost leathery, gray-green, shiny, linear-lanceolate, margin ciliate or spinulose: infl. few or many-fld., paniculate, borne on erect-spreading glandulose pedicels: fls. yellowish white with orange-red dots; calyx-lobes oblong-lanceolate, rather obtuse, glabrous; petals oblong, 3-nerved, twice as long as the calyx-lobes. May. Asia and Alaska.—The material from the Cascade Mts. of Wash. to Alberta and southward along the Rocky Mts. to New Mex., which has passed as *S. bronchialis,* has been separated under the name of **S. austromontàna,** Wiegand (*S. bronchiàlis,* Pursh, not Linn. *Leptásea austromontàna,* Small). It differs from *S. bronchialis* in its more subulate, darker green lvs., more slender often purple sts., more slender pedicels, smaller white petals with purple dots above and not clawed at the base. *S. austromontana* is probably not in cult.

Var. **cherlerioïdes,** Engl. (*S. cherlerioïdes,* Don. *S. Stelleriàna,* Merck., also spelled *Stellariàna. Leptásea cherlerioïdes,* Small). Densely cespitose, with the caudicles very densely imbricate-leafy: lvs. short, flat above, convex below, somewhat spatulate, acute-mucronate: fl.-sts. shorter, 2–3 in. high, few-fld., glandulose or glabrous: fls. white; calyx-lobes rather obtuse. May. Asia and N. Amer., Unalaska, Bering Straits.

58. **gemmípara,** Franch. Sts. erect from a long rhizome, 4–5 in. high, branched, the branches rising from pockets, pilose below; the axils with buds: lvs. lanceolate, long-mucronate, entire, pale, shiny and lineolate on the under surface, both surfaces and the margin strigose with white hairs: infl. paniculate-corymbose, borne on a densely glandular fl.-st. which is naked above; pedicels bracteolate at their base: fls. yellow to white; sepals lanceolate, glabrous or glandulose, scarcely or not spreading; petals oblong, obtuse, abruptly attenuate to a long claw, twice as long as the sepals. July–Sept. China.

59. **aizoïdes,** Linn. (*Leptásea aizoïdes,* Haw.). Loosely cespitose, 2–6 in. high, with decumbent or ascending, foliose, glabrous or sparsely very short pilose caudicles which are branched from the base: lvs. green or reddish, the lower linear or linear-oblong, mucronate, flat below, above slightly convex, glabrous or more or less rigid-ciliate; the upper rather remote, smaller, oblong, rather obtuse, rarely ovate: infl. 1-fld., often many-fld., racemose, borne near the top of the st. on axillary peduncles: fls. yellow, more or less spotted with orange; calyx-lobes oblong-triangular, obtuse, spreading; petals oblong, 1-nerved, 1½ times as long as the calyx-lobes. June–Aug. Eu., Asia, arctic Amer., south to Gulf of St. Lawrence, mountains of N. Vt., W. N. Y., and the Lake Superior region. B.B. 2:171; (ed. 2) 2:217. (The Rocky Mt. form has been segregated as *S. Van-Brúntiæ,* Small.)—Usually found in stony places where there is trickling water. Very easy to grow and may be divided almost any time. Var. **aurantìaca,** Hort., is a form with the fls. described as of "old-gold passing off to a kind of coppery red." Var. **atrorùbens,** Engl. (*S. atrorùbens,* Bert.). Lvs. stiffly spinulose-ciliate: fls. rich crimson (Engler says orange-red or cinnamon-colored). Cent. Eu.

60. **cinerascens,** Engl. & Irmscher. Densely cespitose, 2–4 in. high, the caudicles prostrate, rosulate-lvd.: lvs. of the caudicles rather stiff, linear-lanceolate, margin cartilaginous and lax-ciliate or ciliate-spinulose, apex tapering to a persistent awn, under surface shining, whitish; the cauline lvs. lanceolate, rather stiff, aristate, margin densely short, black glandular-pilose: infl. 1–3-fld., on fl.-sts. which are often reddish their whole length and black glandular-pilose as are the pedicels: fls. golden yellow; sepals ovate, subacute, not reflexed; petals obovate, narrowed to a stipitate base, 3-nerved, the lateral nerves bifid. Sept. China.—Rare.

61. **Brunoniàna,** Wall. Fig. 3560. Lax, cespitose, 2–8 in. high, very glabrous, stoloniferous; the stolons wiry, filiform and reddish: sts. erect, slender: lvs. stiffish, light green, becoming gray in age, linear-lanceolate, cartilaginous-mucronate, setose-ciliate; the lowest imbricate, erect and appressed; the upper few and smaller: infl. 1–4-fld. corymbs; the peduncles and pedicels glandulose, the latter 3 or 4 times longer than the fls.: fls. light yellow; calyx-lobes ovate, obtuse; petals oblong, obtuse, 3-nerved, 3–4 times longer than the calyx-lobes. July, Aug. Temperate Himalaya. B.M. 8189.—*Spatularia Brunoniana,* Small, is not this species but a variety of *S. leucanthemifolia. S. Brunoniana* spreads freely by means of its runners and likes a moist spot. Not commonly in cult. in Amer. Var. **grandiflòra,** Hort., is offered in the trade. Var. **majúscula,** Engl. & Irmscher (*S. majúscula,* Hort.). Larger than the type: sts. 3–8 in. high: infl. composite, 3–9-fld.; the branches 1¾–4 in. long. Sept., Oct. China.

3560. Saxifraga Brunoniana.

62. **flagellàris,** Willd. (*Leptásea flagellàris,* Small). Sts. simple, erect, 1–8 in. high, leafy, densely glandular-pilose: the plant stoloniferous, the stolons bearing a minute bud and roots at their apex: lvs. more or less minute, glandular-pilose, margin glandular-pilose or setose-ciliate; the basal and lower lvs. close together, obovate-oblong; the upper lanceolate: infl. corymbosely 1–10-fld.; the pedicels very short: fls. large, golden yellow; calyx divided beyond the middle or even to the base, the lobes oblong, obtuse, densely glandular-hirsute;

petals obovate-cuneate, the apex obtuse, 5–7-, rarely 9-nerved, 2 or 3 times longer than the calyx-lobes. May–July. Boreal and alpine Eu., Asia, and N. Amer., southward in the Rocky Mts. to Ariz. J.F. 3:237. Gn. W. 25:530.—It requires a moist boggy situation and is difficult to carry through the winter.

Section XI. Robertsonia.

A. *Lvs. of the rosette obovate or obovate-oblong, attenuate to a flat petiole.*
B. *Blades of lvs. very glabrous: panicle-branches 1–3-fld.*.....63. **cuneifolia**
BB. *Blades of lvs. sparsely hirsute: panicle-branches 3–6-fld.*.....64. **umbrosa**
AA. *Lvs. of the rosette ovate or orbicular; the petiole round or roundish*.....65. **Geum**

63. **cuneifòlia,** Linn., sometimes misspelled *cunæifòlia*. Laxly cespitose, 4–6 in. high, with slender subligneous caudicles: sts. slender, erect, short-glandular and naked: lvs. very glabrous, rather thick, the upper surface dark green and shiny, the lower paler and dull or violet, obovate or subrotund, very obtuse, cuneately attenuate to a long flat ciliate petiole, margin slightly cartilaginously repand-crenate: infl. a loose panicle with 1–3-fld. branches: fls. white; calyx-lobes oblong-triangular, very obtuse; petals oblong, 3-nerved with a yellow spot at the base (occasionally also spotted with purplish red dots). June, July. Mountains of Eu.—There is a form of this species which is grown as **S. Búcklandii,** Hort., which only differs in having 2 or 3 yellow spots on each petal.

Var. **subíntegra,** Ser. (*S. apennìna,* Bert. *S. cuneifòlia* var. *appenìna,* Koch. *S. capíllipes,* Reichb.). Caudicles long, scantily lvd., forming a rosette at their tip: lvs. smaller, retuse, few-dentate or entire, petiole equaling the blade: sts. few-fld., simple paniculate. Switzerland, Tyrol, Apennines, and Maritime Alps.

64. **umbròsa,** Linn. London Pride. St. Patrick's Cabbage. Loosely cespitose, 6–12 in. high, with subligneous caudicles: sts. erect, naked: lvs. forming a dense rosette 6–12 in. across, rather thick, leathery, gray-green, dull shiny, lower surface tinged reddish or violet, oblong or obovate-oblong, sparsely hirsute, very obtuse, attenuate to the ciliate (rarely glabrous) petiole, margin obtusely crenate: infl. laxly paniculate with 3–6-fld., shortly glandulose-hirsute branches: fls. white, varying pink; calyx-lobes oblong, rather obtuse; petals oblong-ovate, 3-nerved, with several red dots at their base and a yellow spot in the middle. June, July. Eu.—A very neat and attractive plant, frequent in European gardens, but rarely seen here. Var. **acanthifòlia,** Hort., is offered in the trade. Var. **bellidifòlia,** Hort., is offered in the trade. Var. **crassiphýlla,** Hort., is offered in the trade. Var. **eròsa,** Hort., is offered in the trade. Var. **fòliis-variegàtis,** Hort., a form with the lvs. variegated. Var. **grácilis,** Hort., is offered in the trade. Var. **marmoràta,** Hort., is offered in the trade. Var. **primuloìdes,** Hort. (*S. primuloìdes,* Hort.), is described as follows: Will grow in sun, but prefers entire or partial shade. It forms masses of dark green rosettes of primula-like lvs., whence rise a host of slender sts. about 6 in. high, bearing little fls. of a kind of rose-pink (fls. also stated to be bright carmine-rose). Var. **rotundifòlia,** Hort., is offered in the trade. Var. **serratifòlia,** Don. (*S. serràta,* Sternb. *S. serratifòlia,* Mackay), is a form with erect, oblong lvs. whose margins are acutely serrate. Ireland. There is a form of this variety known as *S. umbròsa serràta mìnor.* Var. **variegàta,** Hort., is a form with the lvs. variegated with white.

65. **Gèum,** Linn. (*Micránthes Gèum,* Small). Six to 12 in. high, with subligneous caudicles: sts. nearly naked, erect, glandular-hirsute: lvs. variable, reniform-cordate, margins cartilaginous, crenate, the crenations equal except toward the very top where they are shorter, both surfaces but especially the lower hirsute, petioles 3–4 times longer than the blade and channeled above: infl. paniculate, the branches 3–6-fld., pedicels slender; fls. white; calyx-lobes oblong, obtuse; petals ovate-oblong, twice as long as the calyx-lobes, with a yellow spot at their base and occasionally with several smaller purple-red dots. May, June. Pyrenees, Ireland and said to occur in Newfoundland.—A species in common cult. abroad and very variable, by some considered as a variety of *S. umbrosa.* Var. **crenàta,** Hort., (*S. umbròsa* var. *crenàta,* Ser.). Lvs. crenate or crenate-dentate: fls. pink, unspotted. Pyrenees. Var. **crinìtum,** Hort., is said to resemble a refined form of *S. umbrosa.* Var. **dentàta,** Engl. (*S. dentàta,* Link. *S. hirsùta,* Linn. *S. umbròsa* var. *hirsùta,* Hort. *S. umbròsa* var. *dentàta,* Hort.). Lvs. rather glabrous or hirsute, orbicular, acute-serrate: fls. white with 1 yellow dot or even several purple dots on each petal (by some said to be unspotted).

Section XII. Euaizoonia (Chondrosea).

A. *Fls. white (frequently dotted with red or purple).*
B. *Margin of the lower lvs. reflexed and crenulate or almost entire.*
C. *Upper surface of lower lvs. convex.*66. **longifolia**
CC. *Upper surface of lower lvs. sulcate or flat.*
D. *Surface of lf. sulcate.*
E. *Lower lvs. more or less spatulate or obovate.*
F. *Apex of lvs. rather acute: calyx-tube glabrous*.....67. **lingulata**
FF. *Apex of lvs. more or less obtuse: calyx-tube glandular.*
G. *Lvs. obovate-ligulate*....68. **catalaunica**
GG. *Lvs. linear at base, spreading above into a spoon-shaped blade*...69. **cochlearis**
EE. *Lower lvs. linear: the plant 1–3-in. high*.....70. **crustata**
DD. *Surface of lf. flat*.....71. **Hostii**
BB. *Margin of the lower lvs. not reflexed, serrate.*
C. *Fl.-sts. paniculate above.*
D. *Cauline lvs. oblong, obtuse*.....72. **altissima**
DD. *Cauline lvs. spatulate or oblanceolate, acute.*
E. *Calyx-lobes ovate; petals obovate or elliptic.*
F. *The lvs. spatulate*.....73. **Aizoon**
FF. *The lvs. oblong or obovate*..75. **cartilaginea**
EE. *Calyx-lobes lanceolate-elliptic; petals oblong-elliptic*.....74. **Zelebori**
CC. *Fl.-sts. paniculate, branching from the base*.....76. **Cotyledon**
AA. *Fls. commonly not white.*
B. *Petals pink or purple (sometimes white or white tinted pink)*.....75. **cartilaginea**
BB. *Petals yellow, red-orange or copper-colored*.....77. **mutata**

66. **longifòlia,** Lapeyr. One to 2 ft. high: st. erect, densely glandular: lvs. basal, very numerous, forming a thick rosette which is frequently 6–7 in. diam., convex, linear-lanceolate, light or gray-green edged silvery, 6 in. long, base ciliate, margin erose-crenulate: infl. a full, pyramidal panicle, branched from the base, many-fld., everywhere glandulose-pilose: fls. white, sometimes dotted purple toward the center; calyx-lobes ovate or oblong, obtuse; petals obovate, 3-nerved, the midnerve usually bifid toward the apex. June, July. Pyrenees. B.M. 5889. G.C. III. 28:402; 39:149; 52:244, 245. Gn. 66, p. 105; 70, p. 124; 72, p. 142; 76, p. 103. G.W. 10, p. 91. G. 14:347.—This species will grow in any rock crevice and is very showy in lf. and in fl., but it has the unfortunate habit of dying when through flowering. Prop. by seed but care must be taken as it hybridizes very readily. Var. **hýbrida,** Hort., is a form which is offered in the trade: grows 18 in. high: fls. white. Var. **magnífica,** Hort., is a form with large rosettes up to

12–14 in. diam. and very profusely fld. panicles which attain a length of 2 ft. and a diam. of 16 in. The fls. are white. G.C. III. 53:390 (as *S. longifolia*). Gn. 77, p. 298; 79, p. 30.

67. **lingulàta,** Bell. Fig. 3561. One to 2 ft. high with ascending branched caudicles which are covered with appressed vestiges of lvs. and form a cespitose clump: sts. erect or ascending, usually glabrous or sometimes sparsely glandular-pilose, leafy: basal lvs. numerous and rosulate, sulcate above, usually linear-spatulate and rather acute, somewhat ciliate, margin erose-crenulate and crustate with lime; cauline lvs. shorter, the margin cartilaginous and less crustate: infl. a thyrsoid panicle from the middle of the scape or above, the branches slender, corymbose-paniculate at their tip, 3–5-fld., very often secund: fls. small, white; calyx glabrous, the lobes ovate or oblong, very obtuse; petals obovate or obovate-oblong, attenuate toward the base, 3-nerved, 2 or 3 times longer than the calyx-lobes. June, July. S. Eu. B.M. 8434. Gn. 79, p. 188. G.C. III. 49:65, note.—A variable species requiring lime and good drainage. Var. **Alberti,** Hort. (*S. Alberti,* Regel & Schmalh.), is probably a hybrid: it has much larger rosettes and the infl. is more spreading: fls. white, heavily spotted red. Turkestan. Var. **austràlis,** Engl. (*S. austràlis,* Moric.), usually has longer and broader spatulate lvs. which are nearly flat on the top. Italy and Sicily. Var. **Bellàrdii,** Hort., equals the type. G.C. III. 54:135. Var. **lantoscàna,** Engl. (*S. lantoscàna,* Boiss. & Reut.). Lvs. short, blunt, spatulate, more or less attenuate at the base but not so at the apex; margin narrowly crustate. Maritime Alps. G. C. II. 15:109. Gn. 64, p. 61; 73, p. 55. Minor forms of this variety are cult., as *S. lantoscàna erécta,* having pure white fls., and *S. lantoscàna supérba,* having arching plumes of creamy white fls. larger than those of the variety proper.

3561. Saxifraga lingulata.

68. **catalaùnica,** Boiss. & Reut. Densely cespitose, 1–2 ft. high: lvs. of the rosette, which grows to be 3 in. diam., erect-spreading, obovate-ligulate, rather obtuse, margin subentire and white-crustate, glabrous, glaucous, subcanaliculate above; the cauline lvs. few, obovate-oblong: infl. a slender-branched cymose panicle borne on an erect few-lvd. fl.-st. with erect bracteolate slender glandular-viscid pedicels, which are longer than the fls.: fls. white; sepals oblong, obtuse, glabrous, longer than the glandular tube of the calyx; petals spatulate-oblong, 3 times as long as the sepals. May, June. Spain. Gn.W. 25:125.—By some considered only a variety of *S. lingulata.*

69. **cochleàris,** Reichb. (*S. lingulàta* var. *cochleàris,* Engl.). Six to 9 in. high, densely cespitose, with short much-branched caudicles covered below with withered lvs.: lvs. densely rosulate, spreading, ½–1 in. long, linear at their base, toward the top spreading into a rounded or spatulate blade, glaucous, coriaceous, margin cartilaginous and crustate with lime; the cauline lvs. small, linear, acute, red-brown: infl. paniculate, erect and open, either thyrsoid or subcorymbose, borne on very slender bright red-brown fl.-sts.: fls. white, ½–¾ in. diam.; calyx red-brown, the lobes small, ovate, obtuse; petals obovate, apex rounded. June, July. Maritime Alps. Eu. B.M. 6688. G.C. III. 44:245; 51:174. Gn. 74, p. 326. Var. **màjor,** Hort., has much larger rosettes of lvs. and taller sprays of fls. It is suggested that it may be of hybrid origin. Var. **minor,** Hort. (*S. Probynii,* Correv.), has minute rosettes of silvery lvs. and much shorter sprays of fls. which are white.—Apparently some of the material grown as *S. valdensis* is referable to this.

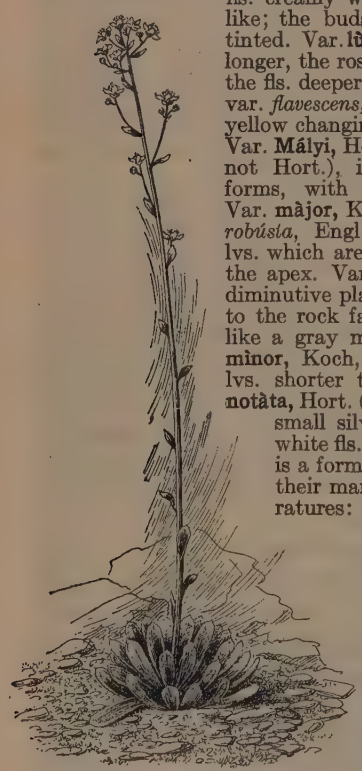
70. **crustàta,** Vest (*S. incrustàta,* Vest). About 1–3 in. high with ascending branched caudicles which are covered with appressed vestiges of lvs. and form cespitose clumps up to 4 or 5 in. diam.: sts. ascending, densely glandular-pilose: basal lvs. light gray-green, the lower third pink, sulcate, linear, obtuse, minutely crenulate with the crenatures very close together, crustate with lime, ciliate toward the base; cauline lvs. few, linear-lanceolate, serrate, glandular at base: infl. a scape, racemose from the middle or above, the branches 1-fld. or paniculate 3–6-fld.: fls. yellowish white sometimes purple-dotted toward the center; calyx sparse-glandulose at base, the lobes oblong-triangular with membranaceous margins; petals obovate, base scarcely attenuate, almost 3 times as long as the calyx-lobes. June. Tyrol.—Easy to grow and adapted to a shady location; scarcely known in Amer.

71. **Hòstii,** Tausch (*S. elàtior,* Mert. & Koch. *S. Aizoòn* var. *Hòstii,* Hort.). Cespitose, 6–18 in. high: sts. erect, rather stout and glandular-pilose: basal lvs. numerous, rosulate, rather erect, lingulate with an obtuse apex and ciliate base, margin crenulate, the crenatures truncate; cauline lvs. oblong, rather obtuse, crenate-serrate; bracts oblong-linear, glandular ciliate: infl. a scape, paniculate above the branches, elongated, naked and densely glandular-pilose; the pedicels densely short-glandular: fls. white, often with numerous purple dots toward the center; calyx-lobes ovate-triangular; petals oblong or obovate-oblong, double the length of the calyx-lobes. May–Aug. Mountains of Cent. Eu.—A strong grower and said to produce offsets very freely and in this way spread rapidly. Var. **rhætica,** Engl., also spelled *rhætica* (*S. rhætica,* Kerner). Basal lvs. linear-lingulate, apex rather acute: petals obovate-oblong, white with numerous purple dots above the middle. Mountains of Austria.

72. **altíssima,** Kerner (*S. Hòstii* var. *altíssima,* Hort.). Fig. 3558. Cespitose, 1–2 ft. high: sts. erect, stout, glandular-hirsute: lvs. thick, the basal spreading, broad, tongue-shaped, rather acute, base ciliate, margin serrate, serratures acute and cartilaginous; cauline lvs. oblong, rather obtuse, serrate; bracts oblong-linear or linear, obtuse and glandular-pilose ciliate: infl. a scape racemosely paniculate above, the branches about 10-fld. and densely glandular-pilose; pedicels densely short-glandular: fls. white, their base greenish and purple-dotted toward the center; calyx-lobes ovate, obtuse, cartilaginous margined; petals elliptic, 3-nerved, twice as long as the calyx-lobes. Tyrol.—Very closely allied to *S. Hostii,* possibly not specifically distinct. Little known in Amer. outside fanciers' collections.

73. **Aizòon,** Jacq. (*Chondrósea Aizòon,* Haw.). Fig. 3562. Perennial, cespitose, 4–20 in. high: sts. erect, foliose: basal lvs. curved, thick, rather flat above, smooth, the base ciliate, margin serrate, many-pored, more or less crustate with lime, serratures cartilaginous at the apex and antrorsely acuminate; cauline lvs. smaller, cuneate or spatulate, base glandular-ciliate: infl. a scape, corymbose-racemose, corymbose-paniculate or paniculate above, the branches 3–5-fld., more or less glandular-pilose, rarely glabrous: fls. cream-colored, commonly purplish red spotted in the center; calyx-lobes ovate; petals obovate or elliptical, 3–5-nerved

almost twice as long as the calyx-lobes: fr. globose. June, July. Alpine and boreal parts of Eu. and Asia, in N. Amer. from Greenland and Lab. to Sask., locally south to Nova Scotia, New Bruns., mountains of N. Vt., and Lake Superior. J.H. III. 69:135.—A very variable alpine plant, much tufted and forming small dense rosettes. **S. Pôrtæ,** Stein, from Italy has white fls. and is apparently only a minor variation of *S. Aizoon.* Var. **ambígua,** Hort., is offered in the trade. Var. **atropurpûrea,** Hort., is said to have slender branching sts. and rose-purple fls. Var. **balcàna,** Hort., also spelled *balkàna* (*S. balcàna,* Hort.), is a form with close rosettes of medium size and rather flat white fls. with larger red spots than usual (fls. reported as sometimes pale pink). Balkan Mts. Var. **baldênsis,** Farrer, with ash-gray lvs., which are short, thick and markedly dentate; their apex rounded: the young shoots glossy, blood-crimson: fls. whitish. N. Italy. Var. **brevifôlia,** Hort., with white fls. is offered in the trade. Var. **bulgárica,** Hort., has rosy spotted fls. Var. **californica,** Hort. (*S. californica,* Hort.), with white fls. must not be confused with *S. californica,* Greene (*Micránthes californica,* Small), a species of Section Boraphila, closely related to *S. virginiensis* which is probably not in cult. Var. **Chúrchillii,** Hort., with pointed gray lvs. in stiff rosettes. Var. **cultràta,** Hort., is offered in the trade. Var. **dûbia,** Hort., is offered. Var. **erécta,** Hort., is offered in the trade. Var. **flavéscens,** Hort., is a free-growing decorative form with clear lemon-yellow fls. produced in good spikes. Not to be confused with *S. flavéscens,* Hort. (*S. media* × *S. aretioides*), which is apparently scarce in cult. Var. **intácta,** Engl. (*S. intácta,* Willd.), has beautiful white, unspotted fls. *S. intácta màjor* is the cultural name of a larger form, about 6 in. high. *S. intácta mìnor* is the cultural name of a dwarf form. Var. **lagaveàna,** Hort., also known as *La Graveàna* and *La Ga Dauphane,* is a miniature plant with tiny silvery rosettes and ruddy sts. 6 in. high, bearing 4–6 fls. on each st.: fls. creamy white, thick and waxlike; the buds globular and pink-tinted. Var. **lûtea,** Hort., has the lvs. longer, the rosettes more open, and the fls. deeper yellow than those of var. *flavescens;* fls. at first primrose-yellow changing to creamy yellow. Var. **Mályi,** Hort. (*S. Mályi,* Schott, not Hort.), is one of the tallest forms, with good-sized rosettes. Var. **màjor,** Koch (*S. Aizoòn* forma *robústa,* Engl.), has oblong-linear lvs. which are not much broader at the apex. Var. **mînima,** Hort., is a diminutive plant that clings tightly to the rock faces and looks almost like a gray moss: fls. white. Var. **mìnor,** Koch, has oblong-obovate lvs. shorter than the type. Var. **notàta,** Hort. (*S. notàta,* Schott), has small silver-margined lvs. and white fls. Var. **paradôxa,** Hort., is a form with long bluish lvs., their margins with silvery serratures: fls. white. Engadine. Gn. 74, p. 463. See *S. paradoxa* in suppl. list. Var. **pectinàta,** Hort. (*S. pectinàta,* Schott, Nym. & Kotschy), has narrow lvs. with blunt teeth and conspicuous silvery margins forming small rosettes: the fls. are small, of a nice white and spotted with red.



3562. Saxifraga Aizoon. (×½)

Var. **récta,** Ser., in part (*S. récta,* Lapeyr, in part. *S. Aizoòn* forma *grácilis,* Engl. *S. carinthìaca,* Schott, Nym. & Kotschy), has lvs. which are spatulate-linear, slightly dilated toward the apex, narrowly and also deeply serrate: the sts. laxly paniculate from the middle and above; the branches 1–3-fld.; fls. white. Var. **rôsea,** Hort., is similar to the type, but has bright pink fls. Var. **rosulàris,** Hort. (*S. rosulàris,* Schleich.), has finely incurved rosettes and large sprays of white fls. Var. **Stabiàna,** Hort. (*S. Stabiàna,* Ten.), has large rosettes and sprays of creamy white fls. Not very distinct from the type. Var. **Sturmiàna,** Hort. (*S. Sturmiàna,* Schott, Nym. & Kotschy), is a good-sized form with flattish rosettes, probably referable to the type-form.

74. **Zelébori,** Schott. Sts. densely and longly glandular-pilose toward the base, decreasingly so toward the apex: lvs. of the glaucous rosette, which is 1½ in. diam., almost linear, acute, very minutely serrate, the serratures inverted-acute and contiguous (the lowest less so); cauline lvs. shorter, oblanceolate, acute, glabrous, above the middle sharply serrate (serratures rather remote), apex appressed serrate-crenate: fls. white, not dotted; calyx glabrous, the lobes lanceolate-elliptic, obtuse; petals oblong-elliptic, not clawed, obtuse, apex rounded. Serbia.—Plants under this name are offered in English trade-lists, but the species is not included in any of the recent treatments of Saxifraga. The above description is taken from Schott's original. Whether the plant offered is the same is undetermined. Probably a variation of *S. Aizoon.*

75. **cartilagínea,** Willd. (*S. Kolenatiàna,* Regel). Six to 9 in. high: st. sparingly glandulose, few-lvd.: lvs. rosulate, oblong or obovate-oblong, acute or acuminate; the margin cartilaginous toward the base, serrate, serratures antrorsely subacuminate, toward the apex subcrenate, crenatures truncate: infl. a scape, racemose or paniculate above, the branches 1–5-fld.: fls. white, rose, or purple; calyx-lobes ovate-triangular, rather acute; petals obovate, 2–3 times longer than the calyx-lobes. June–Aug. Caucausus region and Asia Minor.—*S. Kolenatiana* has been kept distinct by some but seems to differ only in the slightly more acute serratures of the lvs. In gardens it is more common under this name. A somewhat larger form is known as *S. Kolenatiàna màjor,* Hort.

76. **Cotylèdon,** Linn. Tufted, 6–24 in. high: st. erect: lvs. thick and fleshy, basal lingulate or obovate-lingulate, short-apiculate, the base softly fimbriate, margin serrate, serratures cartilaginous, at their apex antrorsely acuminate; cauline lvs. lingulate-lanceolate, the lower part glandular-ciliate, the upper serrulate; bracts linear, acute and glandular: infl. a scape, paniculate from the base, the panicle composite, pyramidal, glandular-pilose all over, the branches paniculate from their middle, 5–15-fld.: fls. white, occasionally tinged rose; calyx-lobes longer than the glandulose tube, oblong-acute; petals obovate-cuneate, 3–5-nerved, midnerve mostly bifid, 2–3 times longer than the calyx-lobes. May–July. Mountains of Eu. G. 11:209; 34:781; 35:541. G.W. 12, p. 471.—Easy to prop. as it makes a large number of side shoots which root quickly when potted. Var. **icelándica,** Maxwell (*S. icelándica,* Hort.), is the largest form of the species and produces numerous offsets. The rosettes are very large and flat and the ligulate lvs. are usually bronzed and leathery. G. 35:707. Var. **pyramidàlis,** Ser. (*S. pyramidàlis,* Lapeyr, not Ten. *S. nepalénsis,* Hort.), is a very robust form from 2–4 ft. high when in fl. The rosettes are large and glaucous and the fls. very numerous in a large pyramidal panicle, white, speckled with crimson. May, June. G.C. III. 53:389. G. 35:163. Gn. 61, p. 393; 74, p. 266; 78, p. 349. Var. **pyrenàica,** Hort., has more pointed lvs. and shorter plumes of white fls. Pyrenees.

77. **mutàta,** Linn. Six to 12 in. high: rhizome thick, horizontal or oblique: sts. ascending, foliose: basal lvs.

lingulate, rosulate; margin cartilaginous, densely fimbriate below, entire or obsoletely serrulate above with many little indistinct pits; cauline lvs. lingulate-spatulate, very obtuse: infl. racemosely paniculate from the base or middle of the scape, this and the peduncles glandular-hirsute: fls. yellow, red-orange or copper-colored; calyx-lobes oblong-triangular, sparsely glandular-pilose or glabrous; petals linear-lanceolate, acute, 3-nerved, narrower than and twice the length of the calyx-lobes. July, Aug. Mountains of Cent. Eu. B.M. 351.—Suitable for rather heavy shade. The plant dies after flowering. Said to be biennial.

Section XIII. KABSCHIA.

A. *Caudicle lvs. broader or as broad above the middle as below it.*
B. *Petals as long as or slightly longer than the calyx-lobes: fls. reddish or purplish. (The following four species are very closely related.)*
C. *Infl. spreading, branched.*
D. *Lower lvs. spatulate-lingulate, the tip somewhat recurved* ...78. **media**
DD. *Lower lvs. spatulate-oblanceolate, the tip spreading*.....79. **Stribrnyi**
CC. *Infl. spicate or nearly so.*
D. *Rosette lvs. spatulate-lingulate, their apex rounded mucronate.*80. **Grisebachii**
DD. *Rosette lvs. linear-lanceolate, their apex acute or acutish*...81. **Friderici-[Augusti**
BB. *Petals 2–4 times as long as the calyx-lobes.*
C. *Fls. yellow.*
D. *Infl. 1–3- (rarely cymosely 3–5-) fld.: basal lvs. gray-green*.....82. **aretioides**
DD. *Infl. 4–6-fld., in a close head: basal lvs. green or somewhat glaucous*.....83. **Ferdinandi-[Coburgi**
CC. *Fls. not yellow (sometimes cream-colored), usually white, sometimes rose.*
D. *The petals obovate to cuneate: basal lvs. not recurved at tip.*
E. *Lower lvs. deeply keeled, acute.*84. **scardica**
EE. *Lower lvs. flat or slightly keeled, blunt.*
F. *Petals obovate, 3 times as long as the obtuse calyx-lobes.*
G. *Lvs. spatulate, light gray-green*.....85. **Rocheliana**
GG. *Lvs. obovate-cuneate, shorter and broader than the preceding*....86. **marginata**
FF. *Petals elliptic-spatulate, twice as long as the acute calyx-lobes*.....87. **Boryi**
DD. *The petals rounded-obovate: basal lvs. more or less recurved.*
E. *Recurved only at the tip of lf.*
F. *Infl. 1-fld.: fls. pale or rosy lilac*.....88. **lilacina**
FF. *Infl. 2–4-fld.: fls. white*...89. **squarrosa**
EE. *Recurved from the base or middle of lf.*
F. *Basal lvs. linear-oblong, rather acute*.....90. **cæsia**
FF. *Basal lvs. spatulate-linear, obtuse*.....91. **valdensis**
AA. *Caudicle lvs. narrowed above the middle.*
B. *Fls. white.*
C. *Petals obovate, base strongly cuneate-attenuate.*
D. *Cauline lvs. acute: infl. cymose-racemose, 1–3-fld.*.....92. **tombeanensis**
DD. *Cauline lvs. long-mucronate: infl. corymbose-paniculate, 3–7–20-fld.*.....93. **Vandellii**
CC. *Petals obovate-subrotund*.....94. **Burseriana**
BB. *Fls. yellow or yellowish green.*
C. *Stamens as long as the petals*.....95. **sancta**
CC. *Stamens decidedly longer than the petals*.....96. **juniperifolia**

78. **mèdia,** Gouan (*S. calyciflòra,* Lapeyr). Cespitose, 2–3 in. high, with short densely foliose caudicles: sts. erect, leafy, densely glandular-pilose: basal lvs. imbricated, stiff, gray-green, reddish toward their base, the rosettes flattened-depressed, spatulate-lingulate, apex acute or obtuse, margin narrowly cartilaginous, ciliate below, 7–11 pits near the margin when old; cauline lvs. spatulate, cartilaginous, and densely glandular-hirsute on both surfaces except toward the tip which is mucronate and glabrous: infl. cymose-paniculate or racemose; peduncles and calyx purplish and densely glandular: fls. flesh-colored or purplish, at length dark blue; calyx-lobes ovate; petals erect, obovate, about 3–5-nerved, scarcely longer than the calyx-lobes. June, July. Pyrenees. Gn. 78, p. 108.

3563. Saxifraga Grisebachii.

79. **Strîbrnyi,** Velen., also spelled *Strîbnryi, Strîbnyri,* and *Strîburyi* (*S. porophýlla* var. *Strîbrnyi,* Velen.). Cespitose, 4–5 in. high, with short, densely foliate caudicles: fl.-sts. erect, branched, sparsely leafy, spreading, glandular-pilose: lower lvs. rosulate, spreading, sessile, spatulate-oblanceolate, apex submucronate, fleshy, above intramarginally pitted, carinate below, margin narrowly cartilaginous toward the base, sparingly ciliate; cauline lvs. oblong-spatulate, subacute, green, sometimes reddish toward the apex, margin below glandular-ciliate, both surfaces sparsely glandular-pilose: infl. cymose, branches spreading or slightly recurved up to 1½ in. long; the pedicels up to ½in. long, spreading, glandular-pilose: fls. nodding, carmine, ½in. diam.; calyx campanulate, reddish purple and densely glandular-pilose outside, the lobes subequal, oblong-ovate, apex rounded, glandular-pilose outside; petals suberect, broad-spatulate, apex obtusely dentate, glabrous, about the same length as the calyx-lobes. Feb.–April. Bulgaria. B.M. 8496. G.C. III. 46:195. Gn. 73, p. 212. G.L. 24:366.—A hardy species with grayish foliage and open infl.

80. **Grîsebachii,** Degen & Doerfl. (*S. mèdia* var. *montenegrìna,* Hort.). Fig. 3563. Cespitose, 4–6 in. high, with short, densely foliose caudicles: fl.-sts. erect, leafy, densely spreading, glandular-pilose: lower lvs. imbricate, spreading, sessile, spatulate-lingulate, apex rounded-mucronate, above numerous intramarginal small pits, below carinate, margin cartilaginous, slightly ciliate toward the base; cauline lvs. spreading, oblong-spatulate, reddish, the tip contracted into a green mucron, both surfaces densely glandulose-pilose except the mucron: infl. racemose or subspicate; pedicels much shorter than the bracts: fls. purple or crimson; calyx reddish purple, densely glandular-pilose, the lobes unequal, oblong-elliptic, apex rounded; petals erect, elliptic-lanceolate, ciliate below. March. Albania and Macedonia. B.M. 8308. G. 33:513. G.C. III. 33:123. G.M. 46:119. Gn. 63, p. 180; 72, p. 215; 77, p. 120; 79, p. 31. G.W. 12, p. 470. J.H. III. 46:207.—Hardy in England.

81. **Fríderici-Aùgusti,** Bias., also spelled *Frederici-Augusti* and *Federici-Augusti* (*S. porophýlla,* Boiss., not Bertol. *S. sempervìvum,* Koch. *S. thessálica,* Schott.). Cespitose, 2–6 in. high with short densely foliate caudicles: sts. erect, densely glandular: basal lvs. forming a flattened rosette, linear-lanceolate, acute or acutish, glabrous, flat, entire, often ciliate at the base, remotely pitted near the margin; cauline lvs. spatulate, glandular: infl. a spike-like raceme, dark purple; pedicels all about equal and shorter than the bracts: fls. violet-purple; calyx glandular, the lobes ovate, obtuse; petals cuneate-spatulate, scarcely longer than the calyx-lobes. April. Dalmatia, Serbia, Greece, and N. E. Asia Minor. G. 35:761.—This species has been treated as *S. media* var. *Friderici-Augusti,* Engl., but differs from that species in the narrower lvs. and more spicate raceme. It has also been referred to *S. porophylla,* Bertol., as a synonym: the latter is said to have lingulate basal lvs. with obtuse apex, and flesh-colored petals. The distinctions between *S. Friderici-Augusti* and *S. porophylla* seem to be very unsatisfacory. Much of the material cultivated as *S. Frederici-Augusti* is really *S. apiculata.*

82. **aretioìdes,** Lapeyr. Cespitose, about 2 in. high, with woody, densely imbricate-foliose caudicles: sts. short and leafy, glandular-hirsute: lower lvs. sulcate, weakly keeled, leathery and stiff, both sides gray-green but violet at the base of the under surface, linear-lingulate, apex rather obtuse, margin narrowly cartilaginous, the lower portion ciliate and near the margin are 7–9 pits noticeable with age; cauline lvs. linear-spatulate, glandular-hirsute and cartilaginous except the apical portion: infl. terminal, 1–3-fld., rarely cymose, 3–5-fld.; the pedicels and calyx glandular: fls. golden yellow, calyx-lobes ovate and acutish; petals broad-obovate, 5–7-nerved, more than twice as long as the calyx-lobes. April–July. Mountains of Eu. B.M. 5849.—Should be planted on a shady ledge where it will obtain plenty of moisture. Little known in Amer. Var. **primúlina,** Hort., grows about 1½ in. high; the peduncles are paler green than the type; the fls. are true primrose-yellow and the petals are usually well rounded and fairly well imbricated.

83. **Férdinandi-Còburgi,** Kell. & Sünderm. Cespitose, about 2 in. high, with columnar foliose branched caudicles: sts. with 9–12 lvs., glandular-hairy as is the calyx and tinted red-brown: lower lvs. somewhat glaucous, up to ½in. long, little narrowed toward the top, margin fine-hairy below, apex thickened and incurved-pointed; cauline lvs. 9–12 in number: infl. close heads of 4–5 (5–6) large, rich yellow fls.: petals $\frac{5}{16}$in. long, ⅛in. wide, strongly narrowed toward the base. March, April. Macedonia.

84. **scárdica,** Griseb. (*S. scarèllica,* J. Wood). Cespitose, 3–4 in. high, with woody, very densely foliate caudicles: sts. ascending and glandular-pilose: basal lvs. leathery, stiff, light gray-green, pale violet toward the base, oblong acute, spreading, upper surface concave, lower convex-carinate, lower margin indistinctly serrulate or ciliate, upper cartilaginous, entire, when old there are 9–15 pits near the margin; cauline lvs. few, lanceolate, acute, glandular-hirsute except the apical portion, cartilaginous and glandular-hirsute: infl. corymbose, 3–11-fld.: fls. white, ivory-white, or pale rose-red; calyx-lobes ovate, acutish; petals obovate-cuneate, 5-nerved, more than twice the length of the calyx-lobes. June, July. Orient. B.M. 8243. Gn. 65, p. 323; 69, p. 231. S. E. Eu.—Readily distinguished from *S. Rocheliana* by its keeled and more pointed lvs. The species itself is hard to grow and consequently is rare in cult. The plant grown as *S. scárdica vèra* is the true *S. scardica,* Griseb. G. 34:199. Var. **obtùsa,** Sprague, differs from the type in having subacute to obtuse lower lvs. with fewer pits, fl.-sts. 1–3-fld. and green, and the calyx-lobes obtuse and less pubescent. March. Macedonia. B.M. 8058 (as *S. scardica*). G. 32:529.

85. **Rocheliàna,** Sternb., also incorrectly spelled *Rochelliana.* Very densely cespitose-cushioned, forming mats 8–12 in. diam., 2–3 in. high, with more or less elongated, densely imbricated, foliose, often columnar caudicles: lower lvs. stiff, shiny light gray-green above, violet below, densely aggregated, horizontally spreading, spatulate, obtuse, very smooth, flat above, rather convex below the base, ciliate, 7–9 pits near the margin noticeable when old; cauline lvs. few, obovate-spatulate, cartilaginous and glandular-pilose except the apical portion: infl. corymbose-paniculate, 3–9-fld., borne on an erect purple-red glandular-pilose fl.-st.; pedicels erect, these and calyx glandulose and pale green: fls. white; calyx-lobes ovate, obtuse, erect; petals obovate, clawed-attenuate, 7-nerved, thrice the length of the calyx-lobes. April–July. E. and S. E. Eu.—Flowers freely. Var. **coriophýlla,** Engl. (*S. coriophýlla,* Griseb., also spelled *coryophýlla*). The lower lvs. smaller, less horizontally spreading, oblong, obtuse, fewer pitted: fls. ivory-white. Bosnia and N. Albania.

86. **marginàta,** Sternb. Cespitose, about 3 in. high, with caudicles which are subnaked below or short-columnar, woody and leafy: lower lvs. obovate-cuneate, obtuse, the base ciliate, the upper margin cartilaginous; cauline lvs. cartilaginous and glandular-pilose excepting the apical portion: infl. corymbose, 5–7-fld., borne on erect fl.-sts., these as well as the pedicels and calyx being black-glandular-pilose: fls. white; calyx-lobes ovate-oblong, obtuse; petals obovate, attenuate at base, 5–7-nerved, 3 times the length of the calyx-lobes. March–June. S. Italy. B.M. 6702. Gn. 77, p. 206; 79, p. 294. G.L. 18:117.—Suitable for sunny ledges and rocky crevices, but requires lime and good drainage. Some of the material cult. under this name may be *S. Boryi.*

87. **Bòryi,** Boiss. & Heldr. (*S. marginàta,* Bor. & Ch., not Sternb.). Cespitose-cushioned, about 1½ in. high, with densely imbricate-foliose caudicles which are elongated and columnar: lower lvs. oblong-spatulate, obtuse, glabrous, erect-spreading, subcoriaceous, flat above and subcarinate below, margins ciliate at base or others entire, remotely pitted near the margin; cauline lvs. few, minute and glandulose: infl. corymbose, 3–5-fld., borne on erect glandular fl.-sts.: fls. white; calyx glandular, the lobes triangular-ovate, acute; petals elliptic-spatulate, twice the length of the calyx-lobes. April–July. S. E. Eu.—Thrives in a sunny location. Closely allied to *S. marginata* but differs in having smaller lvs., acute calyx-lobes and shorter and narrower petals.

88. **lilácina,** Duthie. Cespitose, ½–1 in. high, with numerous very densely foliose, columnar caudicles: lvs. rosulate, oblong, obtuse, recurved and thickened toward the apex, sparsely ciliate at the base, margin cartilaginous and incurved, 3–5-pitted toward the apex; cauline lvs. 1–2, alternate, erect, linear-oblong or spatulate, obtuse, glandular, half-clasping at base: infl. 1-fld., borne on glandular-pubescent fl.-sts. which are lilac: fls. about ½in. diam., pale or rosy lilac with a purple center; calyx ⅛in. long, glandular-pubescent, the lobes ovate-oblong, obtuse; petals ⅓in. long, obovate-rotund, cuneate at the base, the margins undulate. March, April. W. Himalayas. G.C. III. 35:290. Gn. 65, p. 250.—The plant is very dwarf, and is grayish green in color, though the lf.-tips are dark green.

89. **squarròsa,** Sieber. Very densely cespitose, about 3 in. high, with woody, subcylindrical caudicles which are very densely imbricate-leafy: lvs. of the caudicles dark green, imbricated, erect, becoming curved-spreading at the apex, linear-lanceolate, obtuse, submucronulate, very narrowly cartilaginous margined, at the base fimbriate, the back convex and obtusely carinate above, marked with 7 pits, crustate with lime when young;

cauline lvs. linear, slightly carinate, 3–5-pitted: infl. 2–6-fld., borne on very slender sts. which are glandular below and sparsely glandular or glabrous above: fls. white; calyx glabrous, the lobes ovate, obtuse, slightly cartilaginous at their tips; petals subrotund-obovate, 5-nerved, the nerves straight, twice as long as the calyx-lobes. May–Aug. Mountains of Eu. G.L. 28: 185.—A small species useful in alpine-gardens in a sunny spot. It likes to be firmly wedged between stones with sufficient earth for its root-development.

90. **cæsia,** Linn. (*S. recurvifòlia*, Lapeyr). Dwarf, cespitose, about 3 in. high, with curved, woody, imbricate-foliose caudicles: lvs. of the caudicles densely congested, gray or light gray-green, arched-recurved from the base, linear-oblong, rather acute, near the margin 7-pitted, fimbriate from the base to the middle, convex and obtusely carinate dorsally, crustate with lime when young; cauline lvs. narrowly spatulate, slightly carinate, 3–5-pitted, glandular-ciliate at the base: infl. subcorymbose, 2–6-fld., borne on glabrous or sparsely glandular-pilose, green fl.-sts.: fls. snow- or cream-white; calyx-lobes ovate or obtuse, sparsely glandular, scarious at their apex, otherwise ciliate; petals obovate, 3–5-nerved, lateral nerves bowed or straight, almost 3 times as long as the calyx-lobes. June–Aug. Mountains of Eu. L.B.C. 5:421. Var. **màjor,** Don, has the sts. more robust, taller, and strongly villous: the rosettes of gray lvs. are rather larger than the type and the milk-white fls. are larger. May, June.

91. **valdénsis,** DC. Cespitose, 1–3 in. high, with short, woody, imbricate-foliose caudicles: sts. erect, glandular: lower lvs. densely congested, gray-green, light violet on the under side, erect, recurved from the middle, spatulate-linear, obtuse, dorsally convex and obtusely carinate, 9-pitted near the margin, crustate with lime, fimbriate from the base to the middle; cauline lvs. spatulate, 3–5-pitted, glandular: infl. compactly corymbose, 6–10-fld., borne on dark purple fl.-sts.: fls. white; calyx-lobes ovate, very obtuse, glandular; petals obovate, 3–5-nerved, almost 3 times as long as the calyx-lobes. May–July. Mountains of Cent. Eu. —Resembles a minute *S. lingulata* var. *cochlearis*.

92. **tombeanénsis,** Boiss. (*S. diapensioìdes* var. *tombeanénsis*, Hort.). One to 2 in. high, with numerous very densely foliose, columnar, erect, or ascending caudicles: lvs. of the caudicles imbricate, erect, incurved at their tip, ovate-lanceolate, subulate, 3-cornered, apex mucronulate, near the margin very slightly cartilaginous, very minutely serrulate, 5 minute pits are noticeable when old; cauline lvs. linear-lanceolate with the exception of the apical part, narrowly cartilaginous-marginate, acute, glandular-pilose: infl. cymose-racemose, 1–3-fld., borne on erect sts., these as well as the peduncles and calyx densely slender glandular-pilose: fls. white; calyx-lobes oblong-triangular; petals broadly obovate, strongly cuneate-attenuate toward the base, many-nerved, 3 or 4 times as long as the calyx-lobes. April. S. Tyrol and N. Italy.

93. **Vándellii,** Sternb. About 2 in. high, the caudicles very closely imbricate-foliose and also strongly congested: lvs. of the caudicles leathery, very stiff, light green, erect, lanceolate, acute, stiffly mucronate, 3-cornered, 5–7-pitted (noticeable when old) near the cartilaginous margin, fimbriate at the base, when young crustate with lime; cauline lvs. linear-lanceolate, glandular-pilose except the long-mucronate apex: infl. corymbose-paniculate, 3–7–20-fld., borne at the top of erect fl.-sts.; peduncles and calyx covered with spreading, glandular hairs: fls. white with reddish veins; calyx-lobes ovate-lanceolate, acute; petals erect, obovate, strongly cuneate-attenuate toward the base, many-nerved, 3–4 times as long as the calyx-lobes. April–Aug. Tyrol. G.C. III. 44:71; 57:238. Gn.W. 25:458.—Best suited to rock-fissures as it has deep woody tap-roots; also requires lime.

94. **Burseriàna,** Linn. Cespitose, 2–4 in. high, with densely imbricate-foliose caudicles: lvs. of the caudicles densely congested, stiff and prickly, fresh gray-green, when old light brown, 3-cornered, linear-subulate, acuminate, stiffly mucronate, 7-pitted (noticeable when old) near the cartilaginous margin, short-fimbriate at the base, crustate with lime when young; cauline lvs. smaller and appressed: infl. usually 1-fld. on glandular-pilose, remotely leafy fl.-sts., these and the calyx frequently dark purple: fls. white, the veins often colored, showy; calyx-lobes ovate, rather acute, tube glandular-hirsute; petals obovate-subrotund, base somewhat clawed, spreading. Jan. to May or June. Mountains of Cent. Eu. G. 1:793; 19:59. G.M. 54:103. Gn. 71, p. 187; 74, p. 55; 75, p. 165; 78, p. 116. G.L. 24:44; 25:392. G.C. III. 55:151. J.H. III. 69:137. G.W. 7, p. 433; 12, p. 470.—One of the earliest flowering and one of the most commonly cult. Very variable and the parent of many hybrids. Some of the varieties in cult. are: Var. **Bòydii,** Hort., equals both *S. Bòydii* and *S. Bòydii* var. *álba*, Var. **crenàta,** Hort., a form with crenate petals, close to var. *major*. G. 36:289. Var. **élegans,** Hort., equals *S. Irvingii*. Var. **glòria,** Hort., is a large-fld. form with fl.-sts. 1½ in. high: peduncles rich red: fls. pearly white, of a satiny texture, over 1 in. diam.; petals with crimped edges. G. 31:252; 35:177; 36:288. Gn. 78, p. 81. G.M. 50:213. Var. **grandiflòra,** Hort., is practically identical with var. *gloria*. G.M. 57:185. Var. **macrántha,** Hort., has minute rosettes which are very dense and form a cushion-like mound: fl.-sts. reddish, 1 in. high: fls. white and saucer-like. April. Var. **mágna,** Hort., is distinguished from var. *major* by having a very densely tufted habit: lvs. spiny, glaucous: peduncles 3 in. high and 1-fld., reddish: fls. white, more than 1 in. across, even larger than var. *gloria*. G.C. III. 47:164. Var. **magnífica,** Hort., grows about 1½–2 in. high with small dense rosettes of subulate gray lvs.: scape 1-fld.: fls. have huge, orbicular petals which are white and deeply crenate and the disk is of a paler yellow than that of var. *major*. April, May. Gn.W. 20:203; 26:251. Var. **màjor,** Hort., is less cushion-like in habit, has pronounced silvery rosettes twice as large as the type, reddish scarlet fl.-sts. 3 in. high, and fls. about 1 in. diam. with crimped white petals. Feb. Austrian Alps. G.C. II. 21:141. G. 31:253. Gn. 63, p. 75. Var. **mínima,** Hort., is said to have diminutive white fls. Var. **mìnor,** Hort., is mentioned in connection with *S. Paulinæ* as one of the parents of that hybrid. Var. **ròsea,** Hort., equals *S. Irvingii*. Var. **speciòsa,** Hort., has bright red scapes bearing solitary fls. which are larger and later than the type; the petals are pure white, broad and almost round. Var. **tridentìna,** Jenkins (var. *tridentàta*, Hort.), is more tufted than var. *major*, the fl.-sts. more richly scarlet and the fls. less notched at the margins, the petals reflexed, white. Jan., Feb. Dolomites. G. 37:379.

95. **sáncta,** Griseb. Cespitose, about 2 in. high, the caudicles densely leafy: lvs. rigid, prickly, dark green, the lower imbricate, spreading, lanceolate, acuminate, stiffly mucronate, the entire margin ciliate-denticulate, carinate, 3–5 minute pits (noticeable when old) near the cartilaginous margin; cauline lvs. lanceolate, mucronate: infl. corymbose-paniculate from the middle or upper part of the glabrous sts.: fls. small, light or rich orange-yellow; calyx glabrous, lobes ovate, entire and obtuse; petals spatulate-oblong, 3-nerved, the lateral nerves bowed. June. Macedonia.—Fine for covering moist stony banks in the rock-garden. Var. **speciòsa,** Hort., is offered in the trade as a form with fine yellow fls.

96. **juniperifòlia,** Adams (*S. juniperìna*, Bieb.). Cespitose, 1–2 in. high, the woody caudicles densely imbricate-foliose: lvs. of the caudicles green, very stiff and prickly, erect, appressed, subulate, a little broader at the ciliate base, stiffly mucronate, toward the middle

and apex entire, almost 3-cornered, with 5–7 minute pits noticeable when old near the cartilaginous margin; cauline lvs. light green, long-ciliate at the base: infl. racemose or spicate-capitate, few-fld., borne on leafy, short, crisply villous fl.-sts.: fls. small, yellow; calyx light green, tube villous, lobes ovate, acute, mucronate, pectinately ciliate; petals oblong-spatulate, 3-nerved, slightly longer than the calyx-lobes. May–July. Caucasus.—Little known outside of botanic-garden collections.

Section XIV. Porphyrion (Antiphylla).

A. *Lvs. oblong-obovate, their apex flat or recurved.*
B. *Infl. 1-fld.: petals obovate-oblong, 5-nerved*.....97. **oppositifolia**
BB. *Infl. 2–9-fld.: petals lanceolate, 3-nerved*.....98. **biflora**
AA. *Lvs. oblong-lanceolate, recurved from their middle*.....99. **retusa**

97. **oppositifòlia,** Linn. (*Antiphýlla oppositifòlia*, Small). Caudicles procumbent and much branched, 6–8 in. long, the branches densely cespitose, the flowering ones erect, about 6 in. high at most, glabrous and 1-fld.: lvs. opposite, stiff, dark green, gray-tipped, the lower and those of the sterile branches imbricate in 4 rows, the upper rather remote, oblong or obovate, apex spreading-recurved, obtuse, thickened, 1–3-pitted, 3-cornered-carinate below: fls. showy, violet or lilac, sometimes rose-purple, terminal; calyx-lobes ovate, obtuse; petals obovate-oblong, 5-nerved, 3 times as long as the calyx-lobes. March–June, rarely Aug. Rocks, alpine and boreal parts of Eu., Asia, and N. Amer., south to Gulf of St. Lawrence, mountains of N. Vt., Mont., and Idaho. L.B.C. 9:869. G.C. III. 49:117. Gn. 71, p. 179; 76, p. 603; 78, p. 57.—An excellent little rock-plant, making a sedum-like mat, the foliage of a purplish cast. Many variations in cult. Var. **álba,** Hort., has a compact habit, very dark green lvs., and starry white fls. Var. **coccínea,** Hort., has fls. of a richer shade of purple than the type. Var. **grandiflòra,** Hort., is a form with elongated branches larger, obovate-rotund petals which are attenuate only at the clawed base and 7–9-nerved: the fls. are large and rosy purple. Pyrenees. Var. **latìna,** Farrer (*S. latìna*, Hayek), is a form with very small compact foliage and good-sized, soft rosy purple fls. whose petals are obovate, rather acute, and 5-nerved. Italy. Var. **màjor,** Hort., has creeping, rooting sts., tiny rosettes of deep green lvs., and many fls. of a rich crimson-red. This is considered by some to be identical with var. *pyrenaìca* or very nearly so. Var. **pyrenàica,** Hort., is a robust very free-growing form, with large crimson fls. A form of this variety with very large rosy lilac fls. and a rather erect habit, said to come from the mountains of Wales, is cult. under the name of *S. pyrenàica supérba*. G.C. II. 21:419. Var. **Rudolphiàna,** Kittel (*S. Rudolphiàna*, Hornsh.), a form with short branches, forming small, very dense tufts: upper lvs. and calyx-lobes glandular-ciliate: sts. short and more or less erect: fls. terminal and erect; petals obovate, 3–5-nerved. Austrian Alps. Var. **speciòsa,** Farrer, has a stouter and bolder habit and foliage than other forms of the species and has very large pale rose fls. showing very little tendency toward the magenta. Var. **splèndens,** Hort. (*S. spùria* var. *splèndens*, Hort.), is a form with large fls. of a very bright purplish crimson or intense rose-purple, which are produced very freely in March. Wales.—This will grow well on a north exposure. It is also grown under the name of var. *pyrenaica splendens*.

98. **biflòra,** All. (*S. ròsea*, Lapeyr). Caudicles prostrate, branched, the branches ascending, pilose above, about 2 in. high: lvs. opposite, rather remote, thick, fleshy, green or purple, lower obovate-rotund, upper obovate-spatulate, apex rather obtuse, rarely acute, 1-pitted, sparsely pilose and also ciliate, dorsally subcarinate: infl. corymbosely paniculate, 2–9-fld.: fls. frequently in pairs, dark violet, deep purplish crimson or blackish blue; calyx broad-ovate, glandular-hirsute, lobes ovate obtuse, ciliate; petals lanceolate, 3-nerved, one-half longer than the calyx-lobes and narrower than them. April–July. Mountains of Eu.—Found wild in rocky debris watered by the melting snows. Seldom seen in cult.

99. **retùsa,** Gouan. Caudicles prostrate, much branched, the branches densely cespitose, only about 1–2 in. high; fls.-sts. erect, 1–4-fld., glandular-hirsute above: lvs. rather stiff, green with a grayish cast, the lower and those of the sterile branches imbricate in 4 rows, spreading or recurved from their middle, oblong-lanceolate, apex flat-triangular and 3–5-pitted, 3-cornered-carinate; upper lvs. obovate ciliate at the obtuse, thickened, retuse apex, base hirsute: fls. large, rich ruby- to purple-red; calyx hirsute, the lobes oblong, obtuse; petals lanceolate, twice as long as the calyx-lobes. May–July. High Alps of S. Eu. Gt. 32:1110.—May be grown on a shady ledge in rich, but stony, well-drained soil. Not common in cult.

Section XV. Peltiphyllum.

A. *Lobes of lvs. double dentate: fls. pinkish or white; petals ovate or elliptical, obtuse*.....100. **peltata**
AA. *Lobes of lvs. coarsely mucronate-serrate: fls. greenish; petals spatulate, bidentate*.....101. **tellimoides**

100. **peltàta,** Torr. (*Peltiphýllum peltàtum*, Engl.). Umbrella Plant. Perennial, 1–3 ft. high, rhizome horizontal, fleshy, 2–3 in. thick: lvs. tufted, basal, long-petioled, the petioles often 1–3 ft. long and rough-glandular, blades large, peltate, almost centrally so, often 1 ft. across, orbicular, many-lobed, rather sharply and unequally toothed: infl. corymbose, borne on simple erect scapes which are longer haired than the petioles and appear before the lvs.: fls. numerous, pinkish or white, ½in. diam.; sepals ovate to oval, obtuse, glandular-ciliate; petals ovate to elliptical, obtuse. April. Margins of streams, Calif. and Ore. B.M. 6074. F.S. 23:2441. G.C. III. 27:139. Gn. 26, p. 545; 55, p. 6. Gng. 7:307. C.L.A. 17:412.—One of the largest of all saxifrages. Hardy in Mass., with slight protection, and a most desirable plant when bold effects are desired. Var. **gigantèa,** Hort., is offered in the trade.

101. **tellimoìdes,** Maxim. Up to 3 ft. or more high: st. robust, erect, leafy: lvs. radical, long-petioled, the petiole provided with short adnate stipules at its base, blade suborbiculately peltate, 5 in. or more across, 7–9-lobed, the lobes ovate and mucronate-acute, unequally and coarsely mucronate-serrate: infl. cymose, many-fld.: fls. short-pedicelled, greenish; calyx-lobes triangular-ovate; petals spatulate, bidentate at their apex, twice or more longer than the calyx-lobes. Japan. R.H. 1908, p. 251.—Hardy in England and resembles *S. peltata*.

Section XVI. Hybrids.

A. BETWEEN SPECIES OF SECTION I.

102. **cordifòlia × purpuráscens,** Hort. The following named forms are some of the results of reciprocal crosses of these 2 species. They are all robust, although varying much in stature and in color of fl. **Athlete,** Hort. (*Megásea Athlete*, Hort.), said to be a fine variety. **Brilliant,** Hort. (*S. cordifòlia* var. *Brilliant*, Hort. *Megásea Brilliant*, Hort.). Lvs. large, richly tinted in autumn and winter: fls. purple; calyx and pedicels crimson. **compácta,** Hort. (*Megásea compácta*, Hort.). Fls. bright rose. **corrugàta,** Hort. (*S. cordifòlia* var. *corrugàta*, Hort. *Megásea corrugàta*, Hort.). Dwarf habit: lvs. large and rough: fls. pink. **Crœsus,** Hort. (*Megásea Crœsus*, Hort.). Very pretty with red fls.

Delia, Hort. (*Megásea Delia*, Hort.). Fls. crimson-purple. **Distinction,** Hort. (*Megásea Distinction*, Hort.). Dwarf crowded habit, with enormous head of pale pink or rosy purple fls. **Magnet,** Hort. (*Megásea Magnet*, Hort.). Fls. rose. **Progress,** Hort. (*Megásea Progress*, Hort.). A free-growing plant, with tall scapes of rosy purple, bell-shaped fls. which are 1¼ in. across. **Puck,** Hort. (*Megásea Puck*, Hort.). Large fls. **spléndens,** Hort. (*S. cordifòlia* var. *spléndens*, Hort. *S. cordifòlia* var. *hýbrida spléndens*, Hort. *Megásea spléndens*, Hort. *M. hýbrida spléndens*, Hort.). Fls. bright or rosy crimson.

AA. BETWEEN SPECIES OF SECTION II.

103. **Vetteriàna,** Beauverd (*S. hederàcea* × *S. Huetiàna*). Lvs. intermediate between the two parents: fls. sulfur-yellow or whitish, the size of those of *S. Huetiana* and twice as large as those of *S. hederacea;* the petals more elongated than those of the last-mentioned species. June. Switzerland.—A spontaneous hybrid which appeared in the alpine garden of the Hortus Boissierianus.

AAA. BETWEEN SPECIES OF SECTIONS XI AND XII.

104. **Ándrewsii,** Harv. (*S. Gèum* × *S. Aizoòn. S. Guthrieàna*, Hort., also spelled *Guthriàna* and *Gutheriàna. S. acanthifòlia*, Hort. *S. umbròsa* var. *acanthifòlia*, Hort.). About 6 in. high: lvs. rather thick, in loose rosettes similar to *S. Aizoon*, but much longer and more or less lingulate: fls. white, thickly dotted with red for two-thirds the length of the petals. June. A spontaneous hybrid probably of garden origin. Gn.W. 25:598. —*S. Guthrieana* is credited to the Pyrenees.

105. **Éngleri,** Huter (*S. Aizoòn* × *S. cuneifòlia*). Lvs. elongate, obovate-oval, the narrowed lower portion ciliate, margin indistinctly crenate and obscurely pitted: fl.-sts. about 4 in. high, glandular-hairy: infl. laxly 2–3-fld.: fls. very small. A garden hybrid.—Quite probably all of the material grown as *S. Engleri* is not the same as another form, "with beautiful, long, silvered lvs. in handsome rosettes bearing upward of 20 handsome plumes of white fls. to a height, some of them, of more than 1 ft.," which is mentioned in English journals.

AAAA. BETWEEN SPECIES OF SECTION XII.

106. **Dr. Ramsey,** Hort. (*S. longifòlia* × *S. cochleàris*). Resembles the latter parent more, but both the spoon-shaped lvs., which take on a brilliant red tint in the fall, and the infl. of white fls. are larger than in *S. cochlearis*. The fls. are sprinkled with pink dots. A garden hybrid.

107. **spléndens,** Hort. (*S. longifòlia* × *S. Cotylèdon*). A showy plant about 1½ ft. high, with silvery rosettes more like the former parent and the looser infl. of the latter: fls. white. A garden hybrid.

108. **Burnátii,** Sünderm. (*S. cochleàris* × *S. Aizoòn*). Rather intermediate in character, but more nearly approaching the former parent in its lf.-rosettes and the infl. of large white fls. A natural hybrid found in the Maritime Alps.

109. **Grándfieldii,** Hort. Said to have been raised from *S. Aizoon* var. *rosularis*, by some said to be more probably raised from *S. Aizoon* var. *lutea*. The lvs. are ligulate, about 1 in. long and ¼in. broad, encrusted and form a basal rosette: fls. pure white, unspotted and borne on stalks 15 in. high in spreading sprays. A garden hybrid of English origin. G. 36:673.

110. **Gaudínii,** Bruegg. (*S. Aizoòn* × *S. Cotylèdon*). Also spelled *Gaudiniana*. Rosettes small and silver-gray: the fls. white. Supposed to be a spontaneous hybrid. Eu.

111. **Macnabiàna,** Hort. (*S. Cotylèdon* × *S. Hòstii. S. Hòstii* var. *Macnabiàna*, Hort.). The rosettes of lvs. are intermediate in character, but the lvs. are much smaller than in *S. Cotyledon* and the plant is seldom more than 1 ft. high, more or less branched above: fls. numerous, white, heavily speckled with pink to purple dots, the spots large. May, June. A garden hybrid. Gn.W. 20:868. J.H. III. 57:61.

AAAAA. BETWEEN SPECIES OF SECTION XIII.

112. **ambígua,** DC. (*S. mèdia* × *S. aretioìdes*). About 2½ in. high with reddish or purplish glandular fl.-sts.: lvs. linear, nearly obtuse and a little reflexed: fls. purple, red or coppery, with the petals a little longer than the calyx-lobes. Pyrenees. G.C. III. 54:183.—One of three native hybrids resulting from this cross. *S. ambigua* comes nearest to *S. media*, with red sepals and petals; *S. lùteo-purpùrea*, Lapeyr, is intermediate between the parents and has red sepals and yellow petals; while *S. Lapeyroùsii*, Don, resembles *S. aretioides* more closely; its sepals are green and its petals yellow.

113. **aurantìaca,** Hort. (*S. mèdia* × *S. aretioìdes*). More nearly resembling *S. aretioides* but the rosettes are larger: fls. yellow. Very similar to *S. luteo-purpurea*, Lapeyr.

114. **intermèdia,** Hort. (*S. Grisebáchii* × *S. Strib-nryi. S. Grisebáchii* var. *intermèdia*, Hort.). Very similar in all respects to the former, but with a racemose infl. instead of a spicate one, the pedicels longer than those of *S. Grisebachii:* fls. red. Probably a natural hybrid. G.C. III. 46:195.

115. **Bertolònii,** Sünderm. (*S. Frìderici-Aùgusti* × *S. porophýlla*). Nearer the former parent in habit, about 3 in. high, the rosettes of lvs. 1½ in. diam.; lvs. long, narrow, and pointed, with the chalk-pits very evident: infl. a nodding raceme borne on a red st. with red leafy bracts which are tipped with green: fls. red, on short pedicels. A garden hybrid.—Does well in a crevice or on a ledge, but requires lime.

116. **Kéllereri,** Sünderm. (*S. Frìderici-Aùgusti* × probably a form of *S. Burseriàna*). Inclined in habit to the former, with well-developed rosettes which are nearly 2 in. diam., but the lvs. are longer and narrower and are acutely pointed and pitted with white dots: fl.-sts. 5 in. high, glandular-hairy and terminated by a cluster of erect pink-tinted fls.; the shade deeper toward the base, fls. cylindrical in form with the petals never reflexed. Feb., March. A garden hybrid.

117. **Eudoxiàna,** Kellerer (*S. Ferdinándi-Còburgi* × *S. sáncta*). An intermediate in character, but vigorous like *S. sancta*. The lvs. have the silvery appearance of the former parent and the length and pointedness of the latter: sts. tinged red and bearing a head of 2–3 deep orange-yellow fls. which are rather small. A garden hybrid raised at Sofia, Bulgaria.

118. **apiculàta,** Engl. (*S. Rochelìana* × *S. sáncta. S. Frèderici-Aùgusti*, Hort., not Bias. *S. lùteo-purpùrea*. Hort., not Lapeyr). Cespitose, forming a large dark green mat, with subligneous, very densely lvd. caudicles fl.-sts. 2–3½ in. high, glandular-pilose: basal lvs. linear-oblong, acutely cuspidate, slightly carinate, thick, with pitted margins; cauline lvs. subspatulate: infl. 5–9-fld., the branches 1–2-fld.: fls. yellow; calyx with the tube turbinate and densely glandular-pilose; lobes ovate-oblong, apiculate and glandulose-ciliate; petals obovate, spreading, a little longer than the calyx-lobes. Dec.–March. Said to be from the Pyrenees. B.M. 8048. G.C. III. 15:557; 39:250. G.M. 49:208. Gn. 69, p. 210; 76, p. 147. Gn.W. 20:67. G.W. 11, p. 4. J.H. III. 44:186. Var. **álba,** Hort. Habit free, the fl.-sts. 3 in. high, the fls. pure white or pale cream-colored and borne profusely. G. 34:233. Gn. 73, p. 201. Var. **Mályi,** Hort. (*S. Mályi*, Hort., not Schott, also spelled *Mayli* and *Molyi. S. lùteo-purpùrea* var. *Mályi*, Hort.), has deeper-colored fls. which are better shaped and

later opening than the type. Var. **pállida,** Hort., a form said to have pale yellow fls., is offered in the trade.

119. **púngens,** Sünderm. (*S. Rocheliàna* × *S. juniperifòlia*). In general appearance it is similar to the latter parent, with rather smaller rosettes of dark green, sharp-pointed lvs., but with the more compact habit of *S. Rocheliana.* Its. fl.-sts. are about 1–2 in. high, glandular-hairy and tinged red-brown, bearing several deep golden yellow fls. which are larger and paler than those of *S. juniperifolia.* A garden hybrid.

120. **Bòrisii,** Kellerer (*S. marginàta* × *S. Ferdinándi-Còburgi*). It more closely resembles the latter parent. About 2–3 in. high with large rosettes of silvery lvs.; bracteate, glandular sts. each bearing 4 or 5 large yellow fls. which are paler than *S. Ferdinandi-Coburgi.* A garden hybrid raised in Sofia, Bulgaria.—*S. Kyrillii* is another product of the same cross.

121. **Kyríllii,** Kellerer (*S. marginàta* × *S. Ferdinándi-Còburgi*). Another product of the same cross as *S. Borisii* but more closely resembling the former parent. The lvs. show the chalk-pits more distinctly; the green, glandular sts. are about 3 in. high and bear pale yellow fls. which are lighter and usually larger than those of *S. marginata.* March. A garden hybrid, raised at Sofia, Bulgaria.

122. **Súndermannii,** Hort. (*S. marginàta* × *S. Burseriàna*). A smaller plant than *S. Obristii* (a result of the reciprocal cross) and resembling the latter parent more closely. About 2–3 in. high, habit tufted and free-growing, the rosettes larger than in *S. Obristii,* ⅝in. diam.: lvs. ¼in. long, broadest at the base and tapering to a point as in *S. Burseriana,* upper surface channeled or concave and covered with a chalky deposit on the margins and apex: infl. 1- or 2-fld., borne on green fl.-sts. which are obtuse, bracted, and covered with glandular white hairs: fls. white, ¾in. across; sepals obtuse, tinged red-brown and glandular; petals with crisped margins as in some forms of *S. Burseriana* and double the length of the sepals. A garden hybrid. G.C. III. 49:228.—Very free-flowering.

123. **Pétraschii,** Sünderm. (*S. tombeanénsis* × *S. Rocheliàna*). Of neat habit and very free-flowering. The plant has compact cushions of glaucous lvs. in rosettes: sts. about 2 in. high, glandular and red-tinged, bearing heads of 3–5 large white fls. which are 1 in. across. March, April. A garden hybrid. G.C. III. 49:172. G. 33:231. Gn. 75, p. 190. G.M. 54:201.—Does best on a soil which has been liberally mixed with pieces of sandstone.

124. **kestoniénsis,** Hort. Supposed to be a seedling of *S. Burseriana,* though by some said to resemble *S. scardica* var. *obtusa* more closely. It has very white fls. which come very early and are starry. The fl.-sts. are bright red and about 3 in. high. Jan.–March. A garden hybrid.

125. **Bòydii,** Dewar (*S. Burseriàna* × *S. aretioìdes. S. Burseriàna* var. *Bòydii,* Hort.). Plant tufted, gray and very slow-growing, fairly intermediate: lvs. more nearly resembling *S. Burseriana,* but instead of tapering to an acute point they are linear with an abrupt point: infl. 1–3-, rarely 4–5-fld.: fls. almost as large as those of *S. Burseriana,* but yellow as in *S. aretioides.* March. A garden hybrid. G.C. III. 39:250. G. 32:333. G.M. 53:317.

Var. **álba,** Hort. (*S. Burseriàna* var. *Bòydii,* Hort.). A plant which very little resembles *S. Boydii* and by some is thought to be a hybrid (*S. Rocheliàna* var. *coriophýlla* × *S. Burseriàna*). Lvs. subulate, arranged in small rosettes which form dense cushions: fls. white, borne on scapes about 2 in. high, bearing a cyme of 3–4 fls. Gn. 71, p. 178; 72, p. 177. It resembles *S. Burseriana* in many respects but differs in having larger lvs. and more fls. to a scape. Var. **késtoni,** Hort., is offered in the trade,— possibly the same as *S. kestoniensis.*

126. **Faldonside,** Boyd (*S. Burseriàna* × *S. aretioìdes*). Lvs. silvery: st. suffused with pink: fls. lemon-yellow, borne in 2's or 3's, ¾in. diam., of beautiful form with full overlapping petals which are crimped at the edges; the small orange-colored glandular disk in the center of the fl. adds to its attractiveness. Feb., March. A garden hybrid.—Free-flowering. The same cross as *S. Boydii* but freer growing and with larger fls. of a better form.

127. **Salomònii,** Sünderm. (*S. Burseriàna* × *S. Rocheliàna. S. salmónica,* Hort.). The habit is more that of the former but the infl. and stronger growth that of the latter parent: rosettes usually ½in. diam.; lvs. awl-shaped, 3-cornered with cartilaginous margins and decidedly glaucous: fl.-sts. 1½–2 in. high, tinged red, pubescent and covered with lvs.; fl.-buds suffused with pink, but fls. white, more the substance of *S. Rocheliana* and borne 3 or 4 to a st., about ¾in across. Feb., March. A garden hybrid. Gn.W. 22:291.

128. **Obrístii,** Sünderm. (*S. Burseriàna* × *S. marginàta*). A robust plant, about 3–4 in. high, with rosettes about ¾in. diam.: sts. glandular and tinged red-brown: lvs. strap-shaped, acute, with 4 or 5 chalk-pits on their margins: fls. 2–4 to a st., large, almost 1 in. across, ivory-white; petals broad, rounded and overlapped as in *S. marginata.* March. A garden hybrid. G.C. III. 49:229.—It is very like an enlarged *S. Burseriana* in general appearance though the foliage is intermediate and the fls. resemble *S. marginata.* Another distinct form resulting from this cross is *S. Sundermannii.*

129. **Elízabethæ,** Sünderm. (*S. Burseriàna* × *S. sáncta. S. Cherrytrees,* Hort.). Very free-growing, forming cushion-like tufts: lvs. deep green, in small rosettes which are closely packed together: fl.-sts. 2 in. high, tinged red, glandular; the bracts tipped with green: fls. yellow (variously stated as sulfur, primrose, and canary), quite large and in heads of 3–5. March, April. A garden hybrid. G.L. 18:116; 25:153.

130. **Írvingii,** Hort. (*S. Burseriàna* var. *macrántha* × *S. Frìderici-Augústi. S. Burseriàna* var. *élegans,* Hort. *S. Burseriàna* var. *ròsea,* Hort.). This partakes more of the character of the former, with similar tufts of foliage and single fls. The latter parent shows in the color of the fls. which are blush-pink, deeper at the center. The fl.-sts. are only 1 in. or so high and the plant is very free-blooming. March. A spontaneous hybrid at Kew. G.C. III. 57:158. G. 37:187. Gn. 76, p. 193; 79, p. 152. G.M. 58:149.—*S. kewensis* is another product of the same cross but more allied to *S. Friderici-Augusti.*

131. **kewénsis,** Hort. (*S. Burseriàna* var. *macrántha* × *S. Frìderici-Augústi*). About 2–3 in. high with the lvs. of the latter parent but the cushioned habit of the former: sts. pale glandular-hairy; bracts red tipped with green: fls. intermediate in shape; sepals deep red and glandular, while the petals are rose, much deeper colored toward their base. March. A garden hybrid. G.C. III. 51:247.

132. **bursiculàta,** Jenkins (*S. Burseriàna* var. *màjor* × *S. apiculàta*). Plant about 3 in. high, with silver-gray rosettes: lvs. acutely pointed, glaucous and similar to the former parent, while the horizontal spread of the rosettes and their size show the influence of *S. apiculata:* fl.-sts. 3–4-fld.: fls. large and white. March. A garden hybrid. G.C. III. 49:158. G. 33:183. Gn. 75, p. 155. G.M. 54:188. J.H. III. 62:357.

133. **Paulínæ,** Sünderm. (*S. Burseriàna* var. *mìnor* × *S. Ferdinándi-Còburgi*). Habit compact, nearer like that of the latter parent, about 2 in. high, with larger rosettes of glaucous foliage: sts. tinged with red and fls. pale yellow, about ¾in. diam. March. A garden hybrid.—Somewhat resembles *S. Elizabethæ,* but the foliage is more glaucous and the rosettes are smaller. Var. **compácta,** Hort., is said to have compact cushions

of dark green foliage and stout sprays of clear yellow fls. resembling *S. Boydii*.

134. **Haàgei,** Sünderm. (*S. sáncta* × *S. Ferdinándi-Còburgi*). This more nearly resembles the latter parent. Its habit is very compact, its foliage is similar and glaucous: fl.-sts. 2–3 in. high, bracted, tinged red-brown and glandular-hairy: fls. golden yellow, 4–5 to a st., clustered in heads. March, April. A garden hybrid. Gn. 78, p. 170.

135. **Godseffiàna,** Hort., also known as *S. Godseffi* and *S. L. S. Godseff* (*S. sáncta* × *S. Elizabethæ*). Habit of growth intermediate, foliage spiny and in close tufts: fl.-sts. 3–4 in. high, reddish and having reddish green-tipped lvs.: fls. an improvement on *S. Elizabethæ*, being deeper yellow and having better form. A garden hybrid.

S. atróvirens, Hort., is offered in the trade as a form growing 6 in. high, with white fls. Probably belongs in Section Dactyloides.—*S. Bàkeri*, Hort., is one of the smaller mossy saxifrages with vivid green foliage, a plant of compact habit with rich carmine or rose fls. Probably belongs in Section Dactyloides.—*S. Bòykei*, Hort., is offered in the trade.—*S. capillàris*, Hort., is offered in the trade as a white-fid. species.—*S. carniólica*, Hort., is offered in the trade and said to have white fls.—*S. caryophýlla*, Hort., is offered in the trade as one of the easiest to grow, fls. white. Perhaps a misspelling of coriophylla, which is a variety of S. Rocheliana.—*S. circuénta*, Hort., is said to have silvery braided foliage and pretty little panicles of white fls. borne on sts. 4 in. high. It belongs to Section Euaizoonia.—*S. cristàta hýbrida*, Hort., is offered in the trade as a form growing 6 in. high, with white fls. Probably a form of S. Aizoon near var. paradoxa.—*S. elàtior*, Mert. & Koch=S. Hostii.—*S. elàtior*, of German authors=S. altissima.—*S. elàtior*, Wimm.=S. Aizoon var. major.—*S. Ganolini*, Hort., is offered in the trade as growing 6 in. high with white fls.—*S. Háworthii*, Hort., forms cushions of rather pale green, about 6 in. high, the growth being packed and somewhat rounded at the top: fls. pure white and numerous. Probably belongs in Section Dactyloides.—*S. Héctori*, Hort., is offered in the trade.—*S. hýbrida*, Hort., not others=S. decipiens.—*S. hýbrida*, Haw.=*S. hypnoides*.—*S. incurvifòlia*, Hort., not Don, is listed as belonging to the encrusted section and as having white fls.—*S. incurvifòlia*, Don, is a variety of S. cespitosa.—*S. lævis*, Hort. (?) of Bieb. and of Oettingen. The plant in cult. under this name belongs to Section Trachyphyllum and has a spreading habit like S. aizoides with loose rosettes of narrow elliptic-oval lvs.: fl.-sts. about 2 in. high, tinged crimson below and bearing each 4–6, not large, rich yellow fls. Caucasus. Requires a moist situation.—*S. lævis*, Bieb., also from Caucasus, is placed in Section Kabschia by Engler, but by several other authors is said to be close to S. Aizoon or S. aizoides and may be the same as the plant in cult.; if not the one now grown as S. lævis must receive a new name.—*S. lævis*, Oettingen, seems to be the same as that of Bieb. as far as the description is concerned; the plants have not been seen.—*S. lèans*, Hort., is offered in the trade as a very compact form, 6 in. high, with white fls. Probably belongs in Section Dactyloides.—*S. Lindesiàna*, Hort., also spelled Lindisiana, is offered in the trade as a mossy species with white fls. Perhaps belongs in Section Dactyloides.—*S. linguefórmis*, Hort., is offered in the trade.—*S. palmàta*, Hort., is uncertain and seems to be sometimes S. decipiens, sometime. S. geranioides. Var. *fòliis variegàtis* is a variety of one of these species with variegated foliage.—*S. paradóxa*, Hort., is described in a trade-list as a beautiful member of the Aizoon group with long and "braided" foliage. Presumably a natural hybrid between S. crustata and S. Hostii. Considered by some as a variety of S. Aizoon, which see.—*S. paradóxa*, Kit.=S. moschata var. pygmæa.—*S. pectinàta*, Pursh=Luetkea pectinata, Kuntze.—*S. pedatífida*, Hort., is offered in the trade as a white-fid. species.—*S. Pseùdo-Fósteri*, Hort., is offered in the trade as a hybrid of the encrusted section. Var. *sáncta*, Hort., is offered in the trade as an early yellow-fid. form.—*S. pyrolifòlia*, Don=Leptarrhena pyrolifolia, R. Br.—*S. Ringeàna*, Hort., is offered in the trade as a dwarf plant of spreading habit, growing 4 in. high and having white fls. Probably belongs in Section Dactyloides.—*S. rupéstris*, Lapeyr.=S. ascendens.—*S. rupéstris*, Salisb.=S. hypnoides. Which of these the material offered in the trade as a very compact plant growing 6 in. high, with white fls. cannot be determined with certainty, though probably the second as it is said to belong to the mossy section.—*S. Schroèderi*, Hort., is offered in the trade as allied to S. ceratophylla which is a variety of S. trifurcata, a species of Section Dactyloides.—*S. sexemífida*, Hort., is offered in the trade.—*S. Sibthorpii*, Boiss. Fig. 35. Of the Cymbalaria group: perennial, cespitose, with reniform long-stalked obtuse-lobed lvs. and small yellowish fls.: petals ovate-elliptic. A good rock-plant, but seems not to be in the trade.—*S. Stánsfieldi*, Wm. Robinson, is said to have a close-growing habit, dark green foliage and white fls. borne on sts. 4 in. high. Perhaps it belongs in Section Dactyloides.—*S. stellàta*, Hort., not. Pav., is offered in the trade as a white-fid. mossy plant, 1 ft. high. This is unquestionably not the stellata of Pavon which is the Peruvian representative of S. cespitosa and grows scarcely 1 in. high.—*S. stenoglóssa*, Tausch. Lvs. of the rosette rather erect, cuneate or cuneate-linear, acute, serratures narrow, the lower ones spreading, the uppermost contiguous, with the terminal tooth slightly protruding. A plant is offered under this name, but whether the same as the indeterminable Tausch species it is impossible to say. The above given description is a translation of the original of Tausch.—*S. Tantiànæ*, Hort., is offered in the trade.—*S. umbrophýlla*, Hort., is offered in the trade as a white-fid. species. Var. *persifòlia*, Hort., is also offered.—*S. tenuifòlia*, Hort., is offered in the trade as growing 6 in. high, with white fls. Probably belongs in Section Dactyloides.—*S. Van Houttei*, Hort., is offered in the trade. It belongs to Section Bergenia and has light pink fls.—*S. venética*, Hort., is offered in the trade as a species with minute tufts and primrose-yellow fls. belonging in the encrusted section.—*S. Webbiàna*, Hort., is offered in the trade. Possibly belongs in Section Dactyloides.

F. Tracy Hubbard.

SCABIÒSA (Latin, *itch*, referring to medicinal use). *Dipsacàceæ*. Scabious. Mourning Bride. Annual or perennial herbs, their base more or less woody, comprising some of the showy and commonly cultivated garden flowers.

Leaves entire, dentate-lobate or dissected: heads terminal, depressed subglobose or ovoid-conical, pedunculate or rarely sessile in a dichotomous infl.; bracts of the involucre 1–2-rowed, herbaceous: fls. blue, rose, yellowish, or white; calyx bristly; corolla-limb 4–5-cleft, subequal or frequently oblique or 2-lipped; stamens 4, very rarely 2: achene adnate to the involucel at the base or up to the middle.—About 70 species, Eu., Asia, and Afr., rare in the tropics.

In any moderately good garden soil a succession of flowers is produced from June until frost. The flowers are very serviceable for cutting purposes. Propagated by seed or division. Many of the perennial species act like biennials in cultivation, and often flower the first year from seed. *S. atropurpurea* is a common garden annual, of easy cultivation from seed.

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KEY TO THE SPECIES.

A. *Radical lvs. dentate or lobed.*
- B. *Fls. yellow (horticultural variations of Nos. 5 and 7 are yellowish)*.... 9. **ochroleuca**
- BB. *Fls. dark purple, rose, crimson, blue, or white (forms of Nos 5 and 7 are yellowish).*
  - C. *Calyx-limb sessile or nearly so.*
    - D. *Surfaces of lf. pilose-pubescent with appressed white hairs*... 5. **ucranica**
    - DD. *Surfaces of lf. pubescent, but not with appressed white hairs*... 10. **Columbaria**
  - CC. *Calyx-limb pedicellate.*
    - D. *Plant 6–18 in. high*..... 3. **stellata**
    - DD. *Plant 2 ft. high*..... 7. **atropurpurea** 8. **japonica**

AA. *Radical lvs. entire.*
- B. *Plants annual.*
  - C. *Lvs. oblong-spatulate*..... 6. **Reuteriana**
  - CC. *Lvs. ovate-oblong*..... 4. **brachiata**
- BB. *Plants perennial.*
  - C. *Prevailing shape of blade linear, but occasionally broader*..... 2. **graminifolia**
  - CC. *Prevailing shape of blade lanceolate, but occasionally narrower*.. 1. **caucasica**

1. **caucásica,** Bieb. A hardy perennial 18 in. high: lvs. glaucous or whitish, the lower lanceolate-linear, acute, the upper cut and divided: heads flattish: fls. light blue. June–Oct. Caucasus Mts. Gn. 35, p. 121. G. 4:423; 25:443. Gn.W. 23:481; 26:171. Var. **álba,** Hort., has white fls. G. 29:71. G.M. 38:839. There is also a form of this, var. **álba perfécta,** Hort., which is offered in the trade—possibly the same as var. *perfecta*. Var. **magnífica,** Hort., is a large-fid. form with deep lavender-blue fls. Gn. 77, p. 445; 78:58. G.M. 56:674. Var. **pállida,** Hort., has silver-gray foliage. Var **perfécta,** Hort., has large fringed fls. G W. 3, p. 587.

2. **graminifòlia,** Linn. A perennial herb, somewhat woody at the base, about 1 ft. high: lvs. linear, silvery: fls. pale blue. June–Oct. Eu. B.R. 835. G. 36:643.

3. **stellàta,** Linn. An annual plant, hairy, simple or somewhat branched, 6–18 in. high: lvs. cut or somewhat lyrate, the terminal lobe large, obovate, dentate, the upper ones often pinnately parted: fls. blue, in long-peduncled heads; corolla 5-cleft, the lobes radiate. June and later. S. Eu.

4. **brachiàta,** Sibth. & Smith. An annual species about 1 ft. high: lower lvs. ovate-oblong, the upper pinnately cut, lyrate; the lower lobes decurrent, the terminal large, obovate, oblong: fls. light blue. June and later. Eu., Asia.—Recent authors have kept this distinct as the type of the genus Callistema where it becomes *C. brachiatum*, Boiss.

5. **ucránica,** Linn. (*S. Wúlfenii*, Roem. &. Schult.). Biennial or perennial: sts. erect, branched: lvs. pilose-pubescent with appressed white hairs; the lower pinnately parted, segms. oblong or oblong-linear, entire or dentate; the upper often undivided: calyx-limb short-stipitate; corolla white or yellowish white, rarely rose or blue, lobes nearly entire or crenate: fruiting head spherical. Eu., Asia Minor, and Persia.

3564. Scabiosa atropurpurea.—The mourning bride or pin-cushion flower. (×⅓)

6. **Reuteriàna,** Boiss. Annual: st. erect, branched: lower lvs. oblong-spatulate, entire; the other lvs. lyrate, lateral segms. on each side 1–2, short, lanceolate, terminal segm. much larger: involucre setose at base: calyx-limb short-stipitate; corolla pale violet, lobes denticulate: fruiting head ovate. Asia Minor.

7. **atropurpùrea,** Linn. (*S. màjor*, Hort. *S. maritima*, Linn. *S. calyptocárpa*, St. Amans). Sweet Scabious. Fig. 3564. An annual branching plant about 2 ft. high: radical lvs. lanceolate-ovate, lyrate, coarsely dentate; st.-lvs. pinnately parted, the lobes oblong, dentate or cut: fls. dark purple, rose, or white, in long-peduncled heads, becoming ovate or oblong in fr. July–Oct. S. Eu. Gn. 21, p. 118. B.M. 247. F.S. 12:1203.—Very variable and in common cult. **S. vària,** Hort., not Gilib., is probably a name applied to mixed varieties of *S. atropurpurea*. Var. **candidíssima,** Hort., is a white-fld. form; also occurs double under the horticultural names of *candidissima flòre-plèno* and *candidissima plèna*. Var. **coccínea,** Hort., is a scarlet-fld. form. Var. **compácta,** Hort., only a compact form, probably referable to var. *grandiflora*. Var. **flòre-plèno,** Hort., see var. *grandiflora*. Var. **grandiflòra,** Hort. (*S. grandiflòra*, Hort. *S. atropurpùrea* var. *máxima*, Hort. *S. atropurpùrea* var. *flòre-plèno*, Hort.), is really a large-fld. strain occurring in several variant forms based on habit, fl.-color, and the like. One form is known horticulturally as *grandiflòra compácta*, also occurring double, and a second as *máxima plèna*. By some authorities this variety includes all the others; it is the common garden strain. Var. **màjor,** Hort., also known horticulturally as *grandiflòra màjor*, is a tall-growing form of which the following variations are named in the trade: *màjor aurantìaca*, *màjor sulphúrica*, and *màjor compácta atropurpùrea*. Var. **máxima,** Hort., see var. *grandiflora*. Var. **mìnor,** Hort., see var. *nana*. Var. **nàna,** Hort. (*S. atropurpùrea* var. *mìnor*, Hort. *S. mìnor*, Hort.), also known horticulturally as *grandiflora minor*, is a smaller-growing group of plants, very much branched, of which the following forms are named in the trade: *mìnor aùrea flòre-plèno*, also known as *S. mìnor aùrea flòre-plèno*, which has light yellow double fls.; *nàna fòliis-aùreis* with yellow foliage, and *nàna plèna*. Var. **pùmila,** Hort., also known horticulturally as *grandiflòra pùmila*, is a dwarf group occurring in various colors; there is also a double form horticulturally known as *pùmila flòre-plèno*. This is the group listed in the trade as Tom Thumb.—The forms of *S. atropurpurea* are among the most popular of flower-garden annuals. Seeds sown in the open ground in spring should give bloom in early summer and continue till frost. The composite-like heads are produced on long sts., good for cutting.

8. **japónica,** Miq. Perennial, tufted, about 2 ft. high, dichotomously branched: lvs. pinnatisect, lobes narrow: fl.-heads terminal or axillary, very long-peduncled, violet-blue, about 2 in. across, involucral bracts in 2 rows, very unequal, shorter than the fls. Sept. to frost. Japan.—Closely allied to *S. atropurpurea*.

9. **ochroleùca,** Linn. (*S. Columbària* var. *ochroleùca*, Hort. *S. alàta*, Hort.). A hardy perennial herb about 18 in. high: st. branching and somewhat hairy: lvs. whitish-pubescent, the radical crenate or lyrately pinnatifid, tapering to a petiole, pubescent on both sides, those of the st. 1–2-pinnately divided or cleft into oblong or linear lobes: peduncles long, slender: lvs. of the involucre shorter than the fls. June to autumn. Eu. and Asia. Var. **Webbiàna,** Hort. (*S. Webbiàna*, D. Don). Height 6–10 in.: lower lvs. canescent-villous, the upper glabrous. Resembles the type but is smaller in all its parts. B.R. 717.

10. **Columbària,** Linn. A hardy perennial quite variable in character, 2 ft. high: st. branching, glabrous or nearly so: radical lvs. ovate-obtuse, crenate, membranous, pubescent on both sides; st.-lvs. glabrous, pinnately parted, the segms. linear, entire or slightly incised: fls. blue, in ovate-globular heads on long pubescent peduncles. June–Sept. Eu., Asia, Afr. Var. **álba,** Hort., is a white-fld. form.

S. alpina, Linn.=Cephalaria alpina, Schrad.—*S. elàta*, Hornem. =Cephalaria tatarica, Schrad.—*S. lùtea*, Hort., is a perennial growing 5–7 ft. high: fls. yellow, not known botanically. G. 25:442. Var. *gigantèa*, Hort., is also offered in the trade.—*S. tatárica*, Linn. =Cephalaria tatarica, Schrad. R.B. 33:353.

F. Tracy Hubbard.†

SCABIOUS. For common scabious, see *Scabiosa*. For Shepherd's or Sheep scabious, see *Jasione perennis*.

SCÆVOLA (Latin, a diminutive of *scæva*, the *left-handed*, probably alluding to the form of the corolla). *Goodeniàceæ*. Herbs, subshrubs, or shrubs suitable for greenhouse culture: lvs. alternate: fls. solitary between 2 bracteoles, sessile or pedunculate, axillary or the peduncles dichotomously branched with a fl. in each fork; calyx-tube adnate, limb usually very short; corolla oblique, the tube slit open to the base, lobes nearly equal; ovary wholly inferior or rarely the summit free, 2-celled with 1 erect ovule in each cell, or 1-celled with 1 or 2 erect ovules: fr. indehiscent, more or less succulent.—About 83 species, mostly Australian, but also the Pacific islands, Asia, and one each in Afr. and the W. Indies. A few of the species which have been cult. are: *S. attenuàta*, R. Br., with broadly lanceolate lvs. and blue fls. in terminal leafy spikes. Austral. B.M. 4196. *S. cuneifórmis*, Labill., with obovate lower and oblong-cuneate upper lvs. and blue fls. in a long interrupted spike. Austral. *S. suavèolens*, R. Br., a prostrate, or decumbent hardy perennial or subshrub with petiolate lvs. obovate to oblong-spatulate, and blue fls. in interrupted terminal hirsute spikes. Aug. Austral. For a recent treatment of this genus, see Krause in Engler's Pflanzenreich, hft. 54 (IV. 277 and 277*a*), 1912.

SCÁNDIX (Greek, *to sting*, in reference to the roughness of the fr.). *Umbellíferæ*. Glabrous or pubescent annual herbs, one of them grown for foliage and bloom: lvs. pinnately decompound, the segms. small and narrow: umbels composite, few-rayed, or now and then simple (1-rayed); involucre none or 1-bracted: fls. white, polygamous; calyx-teeth minute or wanting;

3565. Scandix Pecten-Veneris. (×½)

petals often unequal, oblong, cuneate or obovate: fr. oblong-linear, laterally compressed, long-beaked, primary ridges prominent, broad obtuse or filiform.—About 12 species natives of temperate or subtropical regions of the northern hemisphere.

Pécten-Véneris, Linn. Fig. 3565. A hardy garden annual 6–12 in. high, with finely cut lvs. and small white fls. in simple umbels. Eu.—Little grown.

S. cerefòlium, Linn. See Chervil.

SCAPHOSÈPALUM (Greek, *boat* and *sepal*, alluding to the form of the lower sepal). *Orchidàceæ*. A genus separated from Masdevallia on the character of the lateral sepals, which are united into a boat-shaped organ. In habit the plants resemble masdevallias, except that the parts of the rhizome are longer, thus making the tufts less compact, and the racemes assume climbing habits, becoming very long and bearing fls. for months in succession. The dorsal sepal is free or nearly so; labellum and sepal small.—The genus contains about 10 or more species.

Grow in a coolhouse well protected from the sun. Keep the summer temperature as low as possible. Give plenty of water when growing. When at rest, water sparingly but do not allow the plants to become entirely dry. Use as small a pan as possible. The culture is like that for masdevallia. (Wm. Mathews.)

gibberòsum, Rolfe (*Masdevállia gibberòsa*, Reichb. f.). Lvs. 3–5 in. long, oblong-obovate or lanceolate, obtuse: peduncle 6–10 in. long, warty, bearing a loose raceme of 4–8 fls.: dorsal sepal boat-shaped, with a long tail, dull red, with strong, greenish ribs; lateral sepals partly connate in a concave lamina, then spreading horizontally, yellow, spotted with red and ending in yellowish tails. Colombia. B.M. 6990.

punctàtum, Rolfe (*Masdevállia punctàta*, Rolfe). Densely tufted; lvs. elliptic-lanceolate, subacute, 3–5 in. long: peduncles pendulous: fls. small, dull yellowish, thickly speckled with crimson; dorsal sepal broadly ovate, concave, strongly 5-ribbed, ending in a stiff incurved tail; lateral sepals spreading horizontally, falcately incurved, with a filiform process near the tip. Colombia. B.M. 7165. HEINRICH HASSELBRING.

SCAPHYGLÓTTIS (Greek, *boat* and *tongue*, referring to the hollowed labellum). *Orchidàceæ*. Branched epiphytic orchids grown in the warmhouse: new branches borne annually at the apex of the old branch, solitary or paired, sheathed at the base, 2-lvd. at apex, finally fleshy thickened, forming pseudobulbs which are linear or narrowly fusiform: lvs. narrow, sometimes linear, coriaceous: fls. in pairs or few in fascicles between the lvs. at the base of the innovation, small; sepals erect and rather spreading, lateral broader than the dorsal; petals similar to the sepals; labellum articulate or continuous with the foot of the column, not divided or obscurely lobed; column rather long, 2-auricled at the apex; pollinia 4.—About 15 species, Mex. to Brazil.

álba, Rolfe. Sts. fascicled, narrowly spindle-shaped, 1¾–2 in. long, 2-lvd.: lvs. linear, 1¾–2½ in. long, minutely bilobed at apex: fls. small, white, in fascicles of 3 or 4; sepals oblong, rather connivent; petals somewhat narrower; lip cuneate-oblong, nearly entire. Hab.(?).

S. Cogniauxiàna, Wildem. A small species with narrow lvs. 2–4 in. long: fls. greenish yellow; sepals acute, petals subacute. Brazil.—*S. stellàta*, Lodd., differs from S. violacea in having larger fls., with more spreading segms. and lateral lobes of the lip as large as the middle one. Guiana.—*S. violàcea*, Lindl. Sts. terete, striated, articulated: lvs. 2–3 in. long, linear or linear-lanceolate: fls. violet, minute; lateral sepals twice as broad as the dorsal; lip white, fleshy, channeled. Guiana. B.M. 4071. B.R. 1901.

F. TRACY HUBBARD.

SCHÆNÓSTOMA: *Chænostoma.*

SCHAUÈRIA (after J. C. Schauer, professor at Greifswald, 1813–1848). *Acanthàceæ*. Erect half-shrubby herbs, of greenhouse cult., with entire lvs.: fls. yellow or red, in a terminal thyrse or spike; calyx 5-parted, segms. linear or setaceous; corolla-tube long, gradually broadened upward; limb 2-lipped, the upper lip interior narrow, entire or emarginate, erect, lower lip cut into 3 subequal, recurved segms.; stamens 2 each, with 2 parallel anthers, about as long as the upper lip; aborted stamens wanting; style filiform; ovary seated on a disk, 2-loculed, with 2 seeds in each locule.—About 8 species from Brazil. Closely related to Jacobinia, from which it differs by the equal parallel anther-cells. It is distinguished from Anisacanthus by its setaceous calyx-lobes, and from Fittonia by its habit.

3566. Schaueria flavicoma, often known to the trade under the name of Justicia flava. (×⅓)

flavícoma, N. E. Br. (*Justícia flavícoma*, Lindl. *Justícia flàva*, Hort., not Kurz.). Fig. 3566. Half-shrubby plant, with erect, branched sts. up to 4 ft. high: lvs. opposite, petiolate, ovate to ovate-lanceolate, shining green, undulate: fls. light yellow, 1½ in. long, borne in erect, feathery panicles; calyx-

lobes long, subulate, glandular-hairy, persistent after the corolla has fallen. Autumn. Brazil. B.M. 2816 (as *Justicia calycotricha*). B.R. 1027. L.B.C. 20:1921 (as *Justicia callitricha*). J.H. III. 61:277.—This plant has been confused with *S. calycótricha*, Nees, and has long been cult. under that name. *S. calycótricha*, Nees, has a smooth calyx and broader ovate lvs. which are very obtuse or subcordate at the base.

HEINRICH HASSELBRING.

SCHEÈLEA (after Scheele, distinguished German chemist). *Palmàceæ*. Pinnate palms from Trop. S. Amer. They are spineless, tall or dwarf: lf.-segms. arranged in regular series or grouped, linear, in young plants unequally and obtusely 2-cut at the apex: fls. yellowish, diœcious or monœcious, the males very numerous in the upper part of the branches, the females few or solitary in the lower part and sometimes peduncled; petals of the males long-club-shaped or cylindrical; stamens 6, shorter than the petals: fr. 1–3-seeded.—About 10 species. Almost unknown in Amer. Cult. in hot moist house. Prop. by rarely obtainable imported seeds. Considered by some the same as *Cocos butyracea*. The following species has never been described as a Scheelea and it is only by inference on Karsten's part that it can be placed there. **S. butyràcea,** Karst. This species was once cult. in S. Calif. Franceschi remarks that it comes from Venezuela and is a magnificent palm with the habit of attalea. H. A. Siebrecht states that it is rare in cult. and that it is more interesting than beautiful. On account of its large st.-base or crown, it requires so large a pot or tub for the size of the plant that it does not make a very ornamental subject.

N. TAYLOR.†

SCHEÈRIA (Frederick Scheer presented the original species to the Royal Botanic Gardens at Kew, he having received material in 1850, through J. Potts, from Chihuahua, Mex.). *Gesneriàceæ*. A name proposed for 4 Mexican and Trop. American herbs which are now referred to Achimenes (which see). From Achimenes, Seeman, its founder, distinguished it "by its truly infundibuliform, not bilobed, stigma." In habit, the genus suggests *Achimenes hirsuta*, *A. pedunculata*, and *A. multiflora*. In the American trade one species is offered, **S. mexicàna,** Seem. (*S. cæruléscens*, Hort.). St. erect, hairy: lvs. ovate, hairy, dentate, stout-stalked, opposite: fls. solitary in the axils, stalked, the corolla 2–2½ in. long, the tube inclined or drooping and curved, the wide-spreading 5-lobed limb blue-purple. Lvs. with a metallic luster. B.M. 4743. H.F. II. 3:160 (as *Shuria mexicana*). Gt. 2:354. This will be found under its accepted name *Achimenes Scheerii*, Hemsl., in the supplementary list, Vol. I, p. 208.

L. H. B.

SCHEFFLÈRA (named after G. C. Scheffler). Including *Heptapleùrum*, *Paratròpia*, and *Sciadophýllum*. *Araliàceæ*. Glabrous or pubescent trees or shrubs or sometimes climbing by means of switch-like branches, grown in the greenhouse or hardy in the far South.

Leaves various, mostly digitately compound, rarely simple and then usually mixed with compound lvs., very seldom double digitately compound: fls. in umbels, heads, or racemes, these mostly arranged racemosely, seldom in whorls; calyx-limb weakly developed, obscurely and shortly toothed or almost lacking; petals 5 or more (–15), mostly 5–6; stamens as many as the petals: fr. globose to ovate or elongated, sulcate or angled.—About 150 species in the tropical regions of the world. *Paratropia Stelzneriana*, Barb.-Rodr., belongs to this genus. See under *Paratropia*.

odoràta, Merr. & Rolfe (*Polýscias odoràta*, Blanco). A glabrous vine 6–18 ft. high: petioles longer than the lfts.; lfts. 5 or 6, smooth and shining, coriaceous, elliptic to broadly ovate, obtuse or very shortly acuminate: panicles lax, terminal: fls. greenish, 6-merous: fr. globose, fleshy. March, April. Philippines.—Occasionally cult.

S. acuminàta, Harms (Actinophyllum acuminatum, Pav. Sciadophyllum acuminatum, Poir.), has climbing sts. 10 ft. high, 7–11 oblong, obliquely acuminate, coriaceous lfts. and yellow fls. in small heads. May. Peru.—*S. cónica*, Harms (Actinophyllum conicum, Pav. Sciadophyllum conicum, Poir.), has shrubby sts. 10 ft. high, 7–13 oblong, abruptly acuminate, coriaceous lfts., and small heads of whitish red fls. May. Peru.—*S. polybótrya*, Viguier (Paratropia polybotrya, Miq. Heptapleurum polybotryum, Seem.), is a sparingly branched shrub, 5–7 oblong-ovate to obovate-oblong, caudate-acuminate lfts. and long racemes of small green fls. Winter. Java. B.M. 6238.—*S. Sciadophýllum*, Harms (Aralia Sciadophyllum, Sw. Sciadophyllum Brownii, Spreng.), has tree-like sts. 10–15 ft. high, 7–11 nearly umbellate oblong-lanceolate, glabrous unequal lfts. and white fls. in heads which are in long compound racemes. Peru.—*S. venulòsa*, Harms (Paratropia venulosa, Wight & Arn. Heptapleurum venulosum, Seem.), is a small glabrous tree or climbing shrub with glabrous entire acuminate lfts. and small compound panicles of greenish fls. India. Var. *erythrostàchya*, Hort., differs in having very large lvs., with broad lfts. and very tiny deep red fls., borne in a branched terminal panicle. Trop. Asia. B.M. 7402.—*S. vitiénsis*, Seem. (Aralia vitiensis, Gray. Agalma vitiensis, Seem.), has digitate lvs., obovate-oblong, obtuse entire lfts., with horizontally spreading veins and 3–7 fls. in an umbel. Fiji Isls.

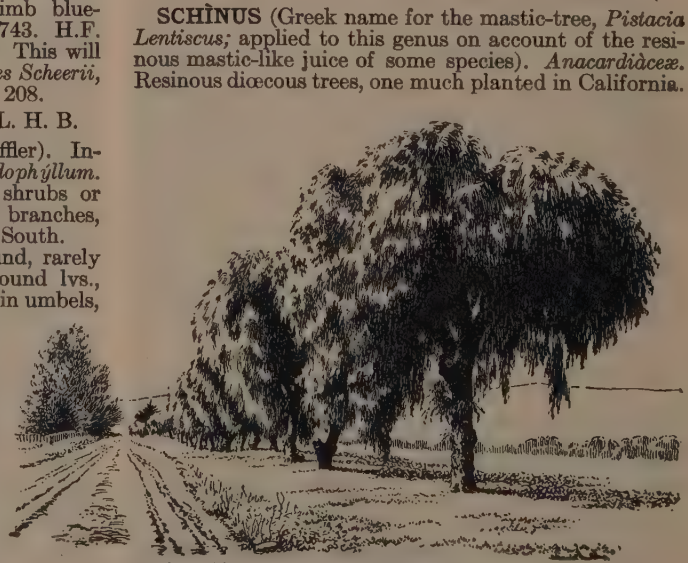
F. TRACY HUBBARD.

SCHÌMA (said to be an Arabian name). *Ternstræmiàceæ*. Evergreen trees or shrubs, suitable for the warm-house: peduncles 1-fld., solitary in the axils or above crowded in a short raceme: fls. showy; sepals 5, slightly unequal; petals 5, much larger, connate at base, strongly imbricate, the outermost concave or somewhat hooded; stamens numerous; ovary 5- (rarely 4–6-) celled: caps. ligneous, commonly depressed-globose.—About 9 species, Trop. Asia. Here belongs a neat little tea-like shrub about 2 ft. high, known to the trade as *Gordonia javanica*. Schima and Gordonia are closely related genera, distinguished by Bentham and Hooker as follows: Schima has inferior radicles, sepals scarcely unequal, ovules few in each locule and laterally affixed; Gordonia has superior radicles, sepals markedly unequal, ovules numerous in each locule and pendulous.

Norónhæ, Reinw. (*Gordònia javánica*, Rollison). Tender evergreen shrub, 2 ft. high or perhaps more, branched, glabrous: lvs. alternate, elliptic-lanceolate, coriaceous, entire: fls. solitary in the axils, white, 1½ in. across, shorter than the lvs.; petals obovate. Java. B.M. 4539. J.F. 1:46.—A good pot-plant for the warm-house. Readily increased by cuttings.

F. TRACY HUBBARD.†

SCHÌNUS (Greek name for the mastic-tree, *Pistacia Lentiscus;* applied to this genus on account of the resinous mastic-like juice of some species). *Anacardiàceæ*. Resinous diœcous trees, one much planted in California.



3567. Schinus Molle, the California pepper-tree.

Leaves alternate, pinnate; lfts. sessile, axillary: panicles terminal, bracteate: fls. small, whitish, with short, 5-lobed calyx, 5 imbricated petals, broad annular disk, and 10 stamens: fr. a globose drupe.—About 17 species, all S. American except one in the Hawaian Isls., one in Jamaica, and one in St. Helena. Only two are cult.; they are semi-tropical and grown in the warm-house at the E. and in N. Eu., in the open at the S. and in Calif., as far north as the San Francisco Bay region. Molle, the old generic name, is from Mulli, the Peruvian name of *S. Molle*, and not, as sometimes supposed, Latin *molle*, soft, which would not be applicable in this case.

Schinus Molle is everywhere present in southern California, where it attains a height of 50 feet and sows itself. It was a great thing for this region in years past before the water systems had reached their present efficiency. Now the pepper-tree is under a ban, and justly so. Next to oleander the pepper-tree is most subject to black scale. Hence the pepper-trees, being large and numerous, have been indirectly a serious menace to the orchards of citrous fruits. Thousands of old trees, 2 to 3 feet in diameter, have been cut because of their proximity to orange orchards. Los Angeles boasts some magnificent avenues of them. *S. terebinthifolius* is but little known in this region, the tallest tree being only 15 feet as yet, but it is likely to be extensively planted in the near future. (Ernest Braunton.)

Mólle, Linn. Peruvian Mastic-Tree. Californian Pepper-Tree. Figs. 3567, 3568. Evergreen tree, 20 ft. and more, with rounded outline and graceful, pendulous branchlets when not trimmed: lvs. 9 in. or more long, glabrous, of many alternate, linear-lanceolate lfts. 1½–2 in. long: fls. in conical panicles, yellowish white: ripe frs. the size of peppercorns (whence the popular, but misleading, Californian name), of a beautiful rose-color. Peru. G.F. 8:505. R.H. 1889, p. 225. G.C. III. 17:588, 589. Gn. 25, p. 418. B.M. 3339.—In S. and Cent. Calif. more extensively cult. than any other ornamental tree except, perhaps, the blue gum (*Eucalyptus globulus*), and thriving best in the warm interior valleys, though hardy on the coast at San Francisco. Valued as a lawn and avenue tree; often planted as a street tree, for which, however, it is unsuited, being too spreading and branching too low. *Molle* was a generic name used by Tournefort, and placed in apposition with Schinus by Linnæus (explained above).

terebinthifòlius, Raddi, with racemose fls., lvs. composed of 7 broader, somewhat serrated lfts. and scarlet berries, is sparingly met with in cult. in S. Calif., and proves hardy in San Francisco. Brazil.

depéndens, Ort. (*Duvaùa depéndens*, DC.), is a shrub or small tree, with more or less drooping branches: lvs. ⅓–1 in. long, oblong or obovate: fls. yellow, 1 line long, produced in great numbers in racemes about as long as the lvs.: berries black. W. S. Amer. B.M. 7406. B.R. 1568 (*Duvaua ovata*); 1573 (*D. dependens*); 29:59 (*D. longifolia*).—The berries are said to be used medicinally in Argentina. The genus Duvana was distinguished from Schinus chiefly by its simple foliage, but it is now considered a subgenus of Schinus.

Jos. Burtt Davy.

SCHISMATOGLÓTTIS (Greek, *falling tongue*, referring to the fact that the limb of the spathe soon falls off). *Aràceæ*. Herbs, with stoloniferous rhizomes and the caudex above ground, grown in the warmhouse and also adapted to culture in the dwelling where a day temperature of 70° can be maintained throughout the winter.

Leaves oblong or ovate-cordate, rarely hastate or lanceolate, frequently marbled, maculate, or striped; petiole sheathing at base or nearly to the middle: peduncles solitary or fascicled: spathe cylindrical; spadix sessile, included in the spathe, upper portion male which is cylindrical or clavate, lower portion female, shorter or narrower, cylindrical or conical, sometimes the two are interrupted by an aborted male area: fls. monœcious, male perianth none; stamens 2–3, distinct; female perianth none, staminoids if present few, ovary oblong.—About 75 species, mostly natives of the Malay Archipelago. Monographed by Engler in Engler's Pflanzenreich, hft. 55 (IV. 23Da), 1912.—Among the

3568. Foliage and fruit of Schinus Molle. (×⅛)

finest variegated foliage plants of the arum family and hardly if at all inferior in beauty and ease of cult. to the popular dieffenbachias, which they closely resemble. For cult. see *Dieffenbachia* and also see *Philodendron*, to which the genus is somewhat closely allied.

A. *Petiole shortly and broadly sheathed only at base.*

tecturàta, Engler (*Colobogýnium tecturàtum*, Schott. *S. variegàta*, Hook.). Lvs. oblong-lanceolate, obtuse or rounded at the base, long-cuspidate at apex, dark green above, marked whitish along the midrib; petiole 3–4 in. long or less than half the length of the blade. Borneo.—This species has been confused in the trade with *S. neoguineensis*.

AA. *Petiole long-sheathed below.*

B. *Blade oblong-lanceolate; caudicle erect.*

concínna, Schott (*S. Lavállei*, Lind.). Lvs. lanceolate or lanceolate-oblong, rounded or narrowed at the base but not cordate, blotched with silvery white, some of the blotches much larger than others; petiole 6–8 in. long; blade 5–7 x 1⅛–2¼ in.; sheath reddish. Malaya. I.H. 28:418. Var. **immaculàta,** N. E. Br. (*S. Lavállei* var. *Lansbergiàna*, Lind.), differs in having purple sheaths and lf.-stalks, and foliage green above, dark wine-purple below. Var. **purpûrea,** N. E. Br., is a Sumatran form with foliage blotched gray above and dark wine-purple beneath.

BB. *Blade ovate, about 1½ times longer than broad; base emarginate or subcordate.*

C. *The petiole longer than blade.*

D. *Upper surface of blade ashy-blotched.*

púlchra, N. E. Br. (*S. decòra*, Bull). Lvs. ovate obliquely cordate, irregularly blotched with silvery

white, the total mass of green being less than the variegation; petiole 3–4½ in. long; blade 4–5 x 1¾–2½ in. Borneo. I.H. 31:520. G.C. II. 24:361.—*S. decòra* var. *Wittmaniàna* was offered in 1893 by John Saul, Washington, D. C.

DD. *Upper surface of blade ashy-striped.*

longispàtha, Bull. Lvs. ovate, base slightly cordate, apex acuminate, upper surface broadly ashy-white-striped in the middle, otherwise green; petiole 1½ times as long as the blade. Borneo. I.H. 29:466.

CC. *The petiole about equaling the blade and verrucose.*

asperàta, Engler. Caudex short: lvs. ovate or obovate, base cordate or only emarginate, apex acuminate, upper surface green with minute white dots, lower pale black-dotted; petiole about as long as blade. Borneo. Var. **álbo-maculàta,** Engler (*S. crispàta,* Hook.), has the upper surface of the lvs. silvery with the exception of the midnerve, the lateral nerves, and the margins, which are green. Borneo. B.M. 6576.

BBB. *Blade ovate-oblong or its outline more or less triangular and cordate or rarely cordate-ovate, sometimes varying in the same specimen.*

C. *Adult st.-blades oblong-ovate, base distinctly cordate; blade ashy-maculate.*

neoguineénsis, N. E. Br. (*S. novoguinénsis,* Engler. *S. variegàta,* Hort., not Hook.). Lvs. ovate-cordate, bright green, irregularly blotched with pale yellowish green, the total mass of green being greater than the variegation; petiole 9–12 in. long; blade 8–9 x 5–5¾ in. New Guinea. I.H. 27:380 (as *Colocasia neoguineensis,* the variegation being a bright creamy white).

CC. *Adult st.-blades thin, broadly ovate-cordate, white or palely ashy-maculate.*

pícta, Schott. Lvs. ovate-cordate, the basal lobes short, but the sinus deep, dark green above, marked with lacerated glaucous spots at the middle, on each side of the midrib, and between the nerves; petiole 8–16 in. long; blade 6–7 in. long. Java.

BBBB. *Blade broadly ovate-cordate, slightly longer than broad, posterior lobes semi-ovate.*

latifòlia, Miq. (*S. rupéstris,* Zoll. & Mor.). Caudex thick, above ground: lvs. ovate, acute, deeply cordate, 6–18 x 6–12 in., upper surface dull green, lower paler, posterior lobes semi-ovate, sinus acute; petiole usually longer than the blade. Java, Celebes, and the Philippines.

S. oblongifòlia var. *Cúrtisii,* Hort., is offered in the trade but is apparently not known botanically.—*S. Roebelínii,* Pitcher & Manda, 1895, p. 138. "Lvs. beautifully marked with silvery white in a broad feathery variegation. Only the center and edge of the lvs. are plain light green. The plant is compact, free-growing, with thick lvs. as enduring as those of a rubber tree. A fine house plant." This plant is imperfectly known. It is figured in Pitcher & Manda's catalogue for 1895:141 as S. Roebelini, and the same is used in A.G. 19:589 (1898) as S. picta and in V. 23:71 (1899) as S. crispata. The plant so pictured is distinct from any species described above. There is more white than green in the lf., only the edges and midrib portion being green. Some growers think it to be a sport of S. asperata var. albo-maculata.—*S. Seèmanii,* Hort. Bull, was advertised by the U. S. Nursery Co. 1895, but seems unknown to botanists.—*S. siaménsis,* Hort. Bull, imperfectly known to botany. Possibly a species of Aglaonema.

F. Tracy Hubbard.†

SCHÍSMUS (Greek, *schisma,* a cleft, referring to the 2-lobed lemma). *Gramíneæ.* Low annuals with short dense panicles of pale shining spikelets. Species 4, Medit. region and Afr. *S. calýcinus,* Coss., has recently been intro., but is of no horticultural importance.

A. S. Hitchcock.

SCHIZÆA (Greek, *to split*). *Schizæàceæ.* A group of small ferns with twisted grass-like lvs. and sedge-like sporophylls formed of a cluster of closely compacted pinnæ, each with 2 rows of sporangia, which in common with the family are pear-shaped, with an apical ring, opening by a vertical fissure.

pusílla, Pursh. Our only native species, growing in sand at the edges of bogs, mainly in N. J. Lvs. 1 in. long, grass-like, twisted sporophylls 2–3 in. long, with the apex expanded and consisting of 6–8 closely compacted divisions. Known locally as curly-grass. The prothallus resembles the protonema of a moss, being filamentous rather than thallose as in ordinary ferns.

L. M. Underwood.

SCHIZÁNDRA (Greek, *schizein,* to cleave, and *aner, andros,* man, stamen, referring to the cleft or separate anther-cells). Including *Sphæróstema* and *Maximowíczia. Magnoliàceæ.* Ornamental vines grown chiefly for their handsome bright green foliage and the scarlet or orange-red berry-like fruits.

Deciduous twining shrubs: lvs. alternate, long-petioled, entire or denticulate, exstipulate: fls. slender-stalked, in few-fld. axillary clusters, dicœcious or moncœcious; sepals and petals 9–12, not differing; stamens 5–15, more or less connate: carpels numerous, imbricated in the fl., developing into berries disposed on the elongated filiform receptacle, forming a drooping raceme.—Ten or 12 species in E. Asia from N. China and Japan to the Malay Archipelago and one species in N. Amer. The frs. of the Asiatic species are eaten in their native countries.

These are handsome vines mostly twining to the height of 10 to 20 feet, with bright green medium-sized, generally ovate or elliptic, slender-stalked leaves and with axillary long-stalked usually cup-shaped white or red flowers followed by showy scarlet or red, rarely black, berry-like fruits forming drooping racemes. *S. chinensis* is hardy North, while the other Chinese species are somewhat tenderer; the native *S. coccinea* can be grown only South. They may be used for covering rocks, trees, shrubs, or fences, and seem to thrive best in partly shaded and somewhat moist places in a porous, sandy loam. To enjoy the very showy fruit which ripens at the end of August or in September, both sexes must be planted together, as most species are dicœcious. Propagation is by seeds, by greenwood cuttings under glass, root-cuttings or layers, and also by suckers.

coccínea, Michx. High-climbing shrub: lvs. slender-petioled, ovate or oval, acuminate, entire or obscurely denticulate, glabrous, 2–3½ in. long: fls. moncœcious, crimson-purplish, ⅓–½in. across; stamens 5, connate into a 5-lobed disk with the anther-cells widely separated: berries scarlet, forming a loose raceme 2–3 in. long. June. S. C. to E. Texas. B.M. 1413.

chinénsis, Baill. (*Maximowíczia sinénsis,* Rupr.). Climbing to 25 ft.: lvs. broadly oval or ovate, acute or acuminate, remotely denticulate, dark green and shining above, glabrous except at the veins beneath, 2–4 in. long; petiole ½–1½ in. long: fls. dicœcious, pinkish white, ½in. across, fragrant; stamens 5, divided at the apex: berries scarlet, forming a rather dense raceme 1–4 in. long. May, June. Japan, N. China, Amurland. Gt. 12:382. F.S. 15:1594. Gn. 6, p. 583. M.D.G. 1899:568. G.C. III. 50:2. Var. **rùbra,** Hort., is probably *S. rubriflora* (see below).

S. glaucéscens, Diels. Similar to S. chinensis: lvs. oval to elliptic, denticulate, glaucescent beneath: fls. orange-red: fr. scarlet. Cent. China.—*S. grandiflòra,* Hook. f. & Thoms. Lvs. elliptic, denticulate: fls. carmine or pink, 1 in. across: fr. red. Himalayas, W. China.—*S. Hénryi,* Clarke. Branches winged: lvs. broadly ovate to elliptic-ovate, glaucescent beneath: fls. creamy yellow, on pedicels 2–3 in. long. Cent. China. G.C. III. 38:162.—*S. nigra,* Maxim. Similar to S. chinensis: lvs. smaller, quite glabrous: fls. white: fr. bluish black. Japan. Seems more tender than S. chinensis.—*S. propínqua,* Hook. f. & Thoms. (Sphærostema propinquum, Blume). Lvs. ovate to ovate-lanceolate, about 4 in. long on ½in.-long petioles: fls. pale yellowish: fr. scarlet, forming racemes to 6 in. long Himalayas. B.M. 4614. For cult. in subtropical regions or in the warm greenhouse. Var. *sinénsis,* Oliver. Lvs. oblong to lanceolate, remotely dentate. Cent. and W. China.—*S. pubéscens,* Hemsl. & Wilson. Lvs. broadly elliptic to ovate, remotely denticulate, pubescent beneath, 3–4 in. long: fr. red and orange in racemes about 4 in. long. Cent. China.—*S. rubriflòra,* Rehd. & Wilson. Lvs. obovate to oblong-obovate, denticulate: fls. dark red, about 1 in. across: fr. crimson, in long racemes. W. China.—*S. sphenan-*

thèra Rehd. & Wilson. Similar to S. chinensis: lvs. obovate or elliptic, glabrous: fls. orange-red, ¾in. across; stamens many: fr. scarlet. Cent. and W. China. Var. *lancifòlia*, Rehd. & Wilson. Lvs. lanceolate, minutely denticulate: fls. smaller. W. China.

ALFRED REHDER.

SCHIZÁNTHUS (Greek, *split* and *flower;* from the incised corolla). *Solanàceæ.* BUTTERFLY FLOWER. Erect half-hardy annual herbs, more or less glandular-viscid, grown outdoors and also in the greenhouse for bloom. They can be trained into immense pot subjects.

Leaves frequently pinnatisect, the segms. incised or dentate: cymes terminal and open: fls. incised, showy and variously colored; calyx deeply 5-cleft, almost 5-parted, the lobes linear; corolla-tube short or elongated, cylindrical, the limb spreading, oblique, somewhat 2-lipped, laciniate; perfect stamens 2, exserted; disk inconspicuous; ovary oblong, 2-celled: caps. membranaceous-chartaceous; seeds numerous.—About 7 species, all from Chile. These choice plants are of easy cult. in any good garden soil. They are also useful as pot-plants for spring flowering, the seed being sown in early fall and the plants kept in a light house and given plenty of root-room as they need it. There is a strain offered in trade under the name of *S. hybridus*, Hort., which is not readily placed botanically. It does not appear to be specific in rank and apparently consists of a series of large-fld. garden hybrids. It is offered in several variations.

A. *Corolla-tube as long as the calyx; stamens short-exserted.*

B. *Middle segm. of the anterior lip of the corolla notched at summit.*

retùsus, Hook. St. 2 ft. high: lvs. pinnatisect, with the segms. entire, dentate, or pinnatifid: fls. in the type deep rose, with the large middle segm. of the upper lip orange except at the tip; the lateral segms. of the posterior lip falcate, acute, linear, longer than the middle segm. B.M. 3045. B.R. 1544. G. 5:361; 23:35. G.M. 51:416. H.F. 1:136. Var. **álbo-maculàtus,** Hort., is a form with white-spotted fls. Var. **álbus,** Hort., has the fls. white with the middle segm. of the upper lip suffused with yellow. Gn. W. 17:458. Var. **lilácinus,** Hort., has lilac fls. Var. **nànus,** Hort., a dwarf form, is offered in the trade. Var. **trimaculàtus,** Hort. (*S. trimaculàtus*, Hort.), has the fls. purple-crimson with 3 distinct golden yellow spots bordered with bright purple. R.B. 32, p. 61.

BB. *Middle segm. of the anterior lip not notched at apex.*

Gràhamii, Gill. Lvs. 1–2-pinnatisect; segms. entire or dentately pinnatifid: fls. typically lilac or rose, with the middle half of the middle segm. of the anterior lip yellow or orange; the lateral segms. of the posterior lip falcate, linear, acute, shorter than the middle segm. B.M. 3044. R.H. 1843:529. H.F. 1:136. Var. **álbus,** Hort., has white fls. Var. **carmíneus,** Hort., has carmine fls. Var. **cárneus,** Hort., is offered in the trade and has flesh-colored fls. Var. **lilácinus,** Hort., has lilac fls. Var. **níveus,** Hort., has pure white fls. Var. **ròseus,** Hort., has rose-colored fls.

AA. *Corolla-tube shorter than the calyx; stamens long-exserted (not noticeably so in S. wisetonensis).*

wisetonénsis, Hort. (*S. pinnatus* × *S. Grahamii*). Apparently intermediate between the two parents, the fl. resembling that of the latter parent in outline, the corolla-tube seemingly shorter than the calyx, the stamens usually rather short-exserted, the fls. vary in color from white through bluish and pink to carmine-brown, the midlobe of upper lip often suffused with yellow. A hybrid of garden origin now very generally cult. G. 25:161; 28:225; 33:351. G.M. 43:332; 53:164. Gn.M. 13:76. Gt. 53, p. 326; 54:1544. G.W. 6, pp. 38, 39. J.H. III. 64:321. R.B. 27:169. C.L.A. 19:166. F.E. 23:646. Var. **compácta,** Hort., is only a more compact form than the type.

pinnàtus, Ruiz & Pav. (*S. pórrigens*, Graham. *S. Prièstii*, Paxt.). Fig. 3569. The most variable of the species, with many horticultural forms distinguished by height of st. and color-markings of the fls. Typically 2 ft. high: lvs. 1–2-pinnatisect; the segms. entire, dentate or incisely pinnatifid: fls. varying in depth of color, the lower lip usually violet or lilac; the upper paler, its middle section with a yellow blotch at its base and spotted with purple or violet. B.M. 2404; 2521. B.R. 725; 1562 (as var. *humilis*). Gng. 12:613. G.W. 3, p. 497.—The plant known horticulturally and in trade-lists as *S. grandiflòrus*, Hort., and variations, undoubtedly belongs here. Var. **álbus,** Hort. (*S. grandiflòrus álbus*, Hort.), has fls. slightly larger than the type, white or yellowish. Var. **candidíssimus,** Hort., has pure white fls. Var. **compáctus,** Hort., is a compact form similar to var. *nanus*, and offered in several forms in the trade. Var. **lilácinus,** Hort., has lilac fls. Var. **nànus,** Hort., is dwarfer than the type, offered in several colors in the trade. Var. **níveus,** Hort., has pure white fls. Var. **oculàtus,** Hort. (*S. grandiflòrus oculàtus*, Hort.), has a purplish black blotch surrounded with yellow at the base of the middle segm. of the upper lip or with the typical yellow portion dotted with small dark purple spots. B.H. 1862:451. H.F. II. 2:264. Var. **papilionàceus,** Hort., has a central coloring somewhat as var. *oculatus*, with the general color of the fl. marbled in various shades. Var. **ròseus,** Hort., has rose-colored fls. Var. **tigridioìdes,** Hort., is also cult.

3569. Schizanthus pinnatus. (×½)

F. TRACY HUBBARD.†

SCHIZOCÁPSA (Greek, *cut* and *capsule* or *fruit*). *Taccàceæ.* Perennial herbs: root tuberous: lvs. radical, entire, nerved: scape undivided, the fls. umbellate, pedicelled; perigonium-tube connate with the ovary, the limb superior, 6-parted, unequal, finally deciduous; stamens 6; ovary 1-celled with 3 parietal placentæ: caps. 1-celled, dehiscent along the angles into 3 valves which are soon recurved. One species, China, *S. plantagínea*, Hance. Plant entirely glabrous: lvs. rather broad, lanceolate, entire, acute, 8–9 in. long, gradually narrowed to a short basally sheathing petiole: infl. umbellate, 15–20-fld.: fls. angled-pedicelled, yellowish green: caps. trigonous, vertically convex-complanate. China. G.W. 4, p. 169.

SCHIZOCÉNTRON (Greek for *split* and *thorn*). *Melastomàceæ.* A monotypic genus, the species being S. **élegans,** Meissn. (*Heèria élegans*, Schlecht. *Heèria procúmbens*, Naudin. *Heterocéntron élegans*, O. Kuntze). A low creeping vine-like plant forming a dense carpet, rooting at the joints: branches terete or near so, reddish, somewhat appressed-pubescent: lvs. ovate, distinctly petioled, obtuse: fls. solitary and terminal on slender peduncles, less than 1 in. long; corolla a deep

purple, nearly 1 in. broad: fr. very hairy, producing seed freely by which the plant is readily prop. (or by cutting). Vera Cruz, Mex. G.C. III. 42:293. Gt. 62, p. 275. This species, although first described in 1839, has not been in cult. until since its rediscovery in 1901 at Jalapa by J. N. Rose. It is a very dainty plant, well worthy of ornamental cult. It is grown to some extent in Mexican gardens at an elevation of about 3,000 ft., where it does unusually well, growing apparently as well in shade as in the bright sunlight. The plant has been grown for a number of years in the N. Y. Botanical Garden, and when in full flower makes a most striking display. It forms a dense mat and is well suited for close carpet-bedding.

J. N. Rose.

SCHIZOCÒDON (Greek *cut* and *bell*, referring to the fringed corolla). *Diapensiàceæ*. Glabrous herbs, with the caudex perennial and scale-bearing between lvs., suitable for outdoor planting: lvs. all radical, long-petioled, ovate-rotund, base cordate, crenulate-undulate, leathery and persistent: fls. few at the top of the scape, racemose, subsecund, nodding, 1–2-bracted; calyx 5-parted, the segms. linear-oblong, striate-nerved; corolla

3570. Schizocodon soldanelloides. (×½)

funnelform, 5-lobed, the lobes truncate, fimbriate, and imbricate; stamens 5; ovary ovoid-globose, 3-celled: caps. globose, 3-angled.—Perhaps 4 species, Japan. *S. soldanelloides* is a pretty alpine plant or boreal with rosy fls. fringed like the well-known soldanellas of the Alps. It may be readily distinguished from Soldanella (which is a member of the primrose family) by the lvs. being toothed, and the stamens 4 instead of 5. The name "fringed soldanella" has been proposed for schizocodon, but all soldanellas are fringed. "Fringed galax" would be better, as galax is the nearest relative, schizocodon being, in fact, the Japanese representative of the American galax. The lvs. of schizocodon are sometimes more or less bronzy, like those of galax, but their form is not so pleasing. The plant is only a few inches high, and the fls. are borne to the number of 4–6 on a scape. The scapes are numerous and the fls. about 1 in. across. Since 1892 this plant has excited an amount of interest comparable to that caused by the intro. of shortia, in 1889.

soldanelloìdes, Sieb. & Zucc. Fringed Galax. Fig. 3570. Hardy, tufted, alpine plant a few inches high: lvs. leathery, evergreen, long-stalked, the blade roundish, wedge-shaped or subcordate at the base, coarsely toothed, the teeth apiculate: fls. nodding; sepals 5, oblong, obtuse; corolla deep rose in center passing into blush or white at the edges; staminodes linear. Japan. B.M. 7316. Gn. 44:418. G.C. III. 13:415; 51:348. G.M. 36:206. J.H. III. 34:323; 44:347. V. 20:119.—This is probably the only species in the genus, as *S. uniflorus* is Shortia and *S. ilicifolius* is thought to be a variety of *S. soldanelloides*, with more variable lvs. and fls. ranging from red to white. Offered by many European dealers, and by one or two Americans; little known here.

F. Tracy Hubbard.†

SCHIZOLÒBIUM (Greek, *to cleave* and *pod*, alluding to the manner of dehiscence). *Leguminòsæ*. Tall trees adapted to the warmhouse and planted outdoors in the extreme South: lvs. large, bipinnate; lfts. numerous, small: fls. in axillary racemes or in panicles at the ends of the branches; calyx-tube disk-bearing, oblique, turbinate, the segms. slightly unequal, reflexed; petals 5, clawed, ovate or rotundate, slightly unequal; stamens 10, free; ovary scarcely stipitate: legume compressed, obovate, 2-valved, 1-seeded.—One, possibly 2, species. Brazil and Panama.

excélsum, Vog. A tree reaching a height of 120 ft. in its native habitat: lvs. fern-like, with 18 pairs of lfts. which are about 2 in. long and 20-jugate, oblong, very short-petiolulate, white beneath and golden pilose on the midnerve: fls. yellow, in large panicles. Brazil. R.H. 1874, p. 113.—Intro. into S. Fla. and S. Calif.

F. Tracy Hubbard.

SCHIZONÒTUS: *Holodiscus.*

SCHIZOPÉTALON (Greek, *cut* and *petals*, alluding to the cut petals). *Cruciferæ*. Half-hardy erect annual herbs used in border planting: lvs. alternate, sinuate, dentate or pinnatifid: fls. purple or white, in terminal, leafy-bracted racemes; sepals erect; petals clawed, pinnate-lobed, involute: silique narrowly linear, knotty; seeds many.—About 10 species, S. Amer. **S. Wálkeri,** Sims. St. weak, assurgent: lower lvs. 4–5 in. long, sinuate-pinnatifid, elongate-oblong in outline, long-attenuate at base, scabrous on both surfaces, distant: peduncles solitary, axillary, but collected at the top into a raceme: fls. white; calyx cylindrical; petals spreading, ovate, incise-pinnatifid. Chile. B.M. 2379. G. 24:240.

SCHIZOPHRÁGMA (Greek, *schizein*, to cleave, and *phragma*, wall; the inner layer of the wall of the valves is cleft into fascicled fibers). *Saxifragàceæ*. Ornamental vines grown for their handsome bright green foliage and their showy clusters of white flowers.

Shrubs climbing by aërial rootlets: lvs. opposite, long-petioled, dentate or entire: fls. in loose cymes; sepals and petals 4–5; stamens 10; style 1; ovary 4–5-loculed; marginal sterile fls. consist only of 1 large white sepal, terminating the branchlets of the infl.: fr. a small, 10-ribbed caps.—One species in Japan and another in China, allied to Hydrangea and Decumaria.

These are handsome woody vines with rather large bright green foliage and loose terminal cymes of small white flowers with large and showy sterile ones at the margin. They are well adapted for covering walls and trunks of trees and cling firmly by means of aërial rootlets. The Japanese species is hardy as far north as New York City, while the Chinese one is tenderer. They thrive best in rich, moderately moist soil and partial shade, but also do well in full sun if the soil is not too dry. Propagation is by seeds or greenwood cuttings under glass; also by layers.

hydrangeoìdes, Sieb. & Zucc. Climbing to 30 ft. and more: lvs. on reddish petioles 2–3 in. long, orbicular or broadly ovate, shortly acuminate, rounded or cordate at the base, remotely and coarsely dentate, bright green above, pale beneath, almost glabrous, 2–4 in. long: cymes peduncled, 8 in. broad; marginal fls. pediceled, consisting of an oval to broadly ovate white

sepal about 1½ in. long. July. Japan. S.Z. 1:26, 100. Gn. 15, p. 301; 34, p. 281. R.H. 1881, p. 313, fig. 72. B.M. 8520.—The species is often confounded with *Hydrangea petiolaris*, which is easily distinguished by its marginal fls. having 4 sepals. Like *Hydrangea petiolaris*, young plants produce small lvs. and make little growth if unsupported and allowed to trail on the ground. It has been once intro. under the name *Cornidia integerrima*, which is a Chilian plant with entire evergreen lvs.

integrifòlium, Oliver (*S. hydrangeoìdes* var. *integrifòlium*, Franch.). Climbing to about 12 ft.: lvs. ovate or broadly ovate, acuminate, truncate or subcordate at the base, entire or sparingly denticulate, usually pubescent on the veins beneath, of thickish texture, 4–6 in. long: cymes to 10 in. broad; the sepals of the sterile fls. ovate to ovate-oblong, 1½–2½ in. long. July. W. China. H.I. 20:1934. J.H.S. 28, p. 62. Var. **mólle,** Rehd. Petioles and lvs. beneath densely soft-pubescent: sterile sepals 2–3 in. long. W. China. Var. **denticulàtum,** Rehd. Lvs. thinner, broadly ovate to oblong-ovate, minutely or sinuately denticulate, pubescent on the veins beneath: sterile sepals usually ovate-oblong, broadly cuneate at the base, 1½–2¼ in. long. Cent. China.—This species is showier than the preceding on account of the larger sterile sepals, but is less hardy.

ALFRED REHDER.

SCHIZÓSTYLIS (Greek, *to cut*, and *style*, alluding to the filiform segments of the style). *Iridàceæ*. Greenhouse or half-hardy plants: sts. fascicled on the rhizome, bulbless or slightly bulbous-thickened at the base: lvs. linear or narrow-ensiform: spathes remote along the simple peduncle, somewhat distichous, greenish, lanceolate, complicate: fl. sessile in the spathe; bracts narrower than the spathe, green or somewhat scarious, 2-keeled; perianth showy, red, the tube slender, the lobes equal, oblong or ovate; ovary 3-celled: caps. obovoid or oblong, the top truncate, 3-grooved, membranaceous.—Two species, S. Afr.

coccínea, Backh. & Harv. CRIMSON FLAG. A winter-blooming tender plant: st. 1–2 ft. high, bearing 2–3 lvs.: basal lvs. 2–3, about 1½ ft. long: fls. bright red, about 2 in. across. B.M. 5422. F.S. 16:1637. G.L. 24:208. J.H. III. 48:539.—The following cultural notes are taken from Garden and Forest 9:16: "The species blooms from Oct. to late Dec. and is useful for cut-flowers at this season. It is perfectly hardy in England but of little use here except for indoor use. The roots should be planted out in rich soil in spring about 8 in. apart, and encouraged to make a strong growth. In the fall the plants may be lifted, potted and placed in a cool greenhouse, where they will flower. After flowering they may be stored in a frame until spring, when the fleshy roots will need to be separated (leaving 3–5 buds to each root), and planted out as before."

F. TRACY HUBBARD.†

SCHLEICHÈRA (named for J. C. Schleicher, a Swiss botanist). *Sapindàceæ*. Tree of some economic value and hardy in the far south of the U. S.: lvs. alternate, not stipulate, pinnate; lfts. opposite (or alternate), entire, repand-wavy or slightly serrate: infl. simple elongated panicles or racemes: fls. small, fascicled, regular, polygamously dicœcious; calyx 4–6-cut, small, cup-shaped; petals lacking; disk complete, glabrous, wavy; stamens 5–8; ovary 3–4-celled: fr. dry-crustaceous-coriaceous. One species, Asia. **S. trijuga,** Willd. A large tree: lvs. paripinnate, 8–16 in. long; lfts. 4–8, opposite, 1–10 x ⅔–4¼ in., elliptic or elliptic-oblong, obtuse or short-acuminate, entire, sessile or subsessile: racemes axillary: fls. yellowish or green: fr. ¾–1 in. long, ellipsoidal, glabrous, apiculate, smooth or spiny. Himalaya region, south through India, Ceylon, Burma, to Java and Timor. Intro. into Calif.—The timber is good, the bark is astringent and when mixed with oil is used by the natives to cure the itch, the oil of the seed is of economic use, and the subacid pulpy aril is edible.

F. TRACY HUBBARD.

SCHLÍMMIA (named in honor of M. Schlim). *Orchidàceæ*. Epiphytic herbs, with oblong somewhat spindle-shaped 1-lvd. pseudobulbs, suitable for the warmhouse with cattleyas and the like: lvs. leathery, contracted to the petiole: scapes erect or recurved from between the pseudobulbs, simple, few-sheathed: fls. rather large, fleshy, ivory-white, few in a lax raceme, short-pedicelled; sepals, the dorsal free, narrow, concave-keeled, the lateral very broad, connate with the foot of the column, forming a helmet-like sac; petals narrower than the dorsal sepal, spreading at their tip; labellum variously lobed, the apex reclining on the foot of the column; pollinia 2.—Three species from the Colombian Andes. *S. jasminodòra*, Planch. & Lind. Pseudobulbs long and slender: lvs. oval, long-petioled: scape about 1 ft. high bearing 3 secund fls.; fls. white and very fragrant; dorsal sepal linear erect; petals reflexed; labellum fleshy, shorter than the column. Colombia. *S. trífida*, Reichb. f. Pseudobulbs elongate-ovate, clustered: lvs. oblong, acute: scape lateral, drooping, deep purple, bearing a 1-sided raceme of about 4 fls.: fls. fragrant; dorsal sepal turned downward, lateral waxy white with a few purple spots inside; petals linear, acute, bent outward; labellum trifid at the apex, white, marked with rich orange. Colombia. G.C. II. 7:141.

F. TRACY HUBBARD.

SCHLUMBERGÈRA (named for Friedrich Schlumberger). *Cactàceæ*. Similar to Zygocactus in habit, but with regular fls. and angled fr. Schumann referred some of the species to Phyllocactus (Epiphyllum), but such a reference can hardly be entertained. The genus seems to be confined to Brazil, but little is known about it in a wild condition. Its treatment should be the same as zygocactus (the old Epiphyllum). Two well-known species are in cult.

Russelliàna, Brit. & Rose (*Epiphýllum Russelliànum*, Hook.). Sts. more upright, with pendent branches: joints ¾–1½ in. long by ⅜–¾ in. broad, oblong or elliptical to obovate, light green; margins crenate, with 2–4 areoles on either side, bearing a few very short dark gray bristles: fls. from the end of the youngest joints, red, 1¾–2¼ in. long: fr. red, 4-angled or narrow-winged. Brazil. B.M. 3717.

Gærtneri, Brit. & Rose (*Epiphýllum Gærtneri*, Schum. *E. Russelliànum* var. *Gærtneri*, Reg.). EASTER CACTUS. Sts. of more upright habit, with drooping branches: joints long-oblong or elliptical to obovate, ⅝–2¼ in. long by ½–1 in. broad, dark green, margins crenate, with about 5 areoles on either side, bearing 6–12 rather stiff, long, yellow or brown bristles, which are especially conspicuous on the truncated apex, where they form a considerable beard: fls. from the apex of the youngest joints, 2½–3 in. long, scarlet-red: fr. red. Brazil. B.M. 7201.

J. N. ROSE.

SCHŒNIA (named in honor of Dr. Schœn). *Compósitæ*. An annual, adapted to the greenhouse in the N. and outdoors in the S.: lvs. alternate or the lower ones opposite, entire: fl.-heads in a loose corymb: involucre turbinate or campanulate; outer bracts scarious, imbricate, inner row petal-like; receptacle without scales; florets all tubular, 5-toothed; those of the circumference fertile, the disk-florets sterile.—One species, Austral. *S. Cassiniàna*, Steetz. An erect corymbosely branched annual, 1–2 ft. high: lvs. lanceolate or linear, or the lower oblong-spatulate: fl.-heads in a loose terminal corymb: outer bracts of involucre brown, the radiating laminæ of the inner white or pink, oblong: achenes in a single row at the circumference. Austral. J.H. III. 47:7.

SCHOMBOLÆLIA (compounded from *Schomburgkia* and *Lælia*). *Orchidàceæ*. A generic name to designate the hybrids between Schomburgkia and Lælia. *S. tibibròsa*=S. tibicinis × L. tenebrosa.

SCHOMBOLÆLIOCÁTTLEYA (compounded from the names *Schomburgkia* and *Læliocattleya*). *Orchidàceæ*. A name to comprise the hybrids between Schomburgkia and Læliocattleya. *S. schœnbrunnénsis*=S. rosea × Lc. Lucia.

SCHOMBÚRGKIA (named for Dr. Schomburgk, naturalist and geographer, who explored British Guiana). *Orchidàceæ*. Orchids with the habit of cattleyas or lælias, except that they are less compact.

Pseudobulbs long, fusiform, bearing several brown scales and 2–3 leathery lvs. at the summit: fl.-sts. from the top of the pseudobulbs, sometimes very long, bearing a terminal raceme or panicle of showy fls.: fls. like those of Lælia except that the sepals and petals are narrow and undulate and the labellum does not completely envelop the column; labellum always evidently 3-lobed.—About 15 species, in Trop. Amer.

3571. Schomburgkia tibicinis. (×⅛)

Give schomburgkias plenty of heat and a light place near the glass, which should be slightly shaded during the hot summer months. Provide freely of water in the growing season. Rest them in a temperature of 55°. *S. tibicinis* and *S. Lyonsii* are to be classed amongst the showy easily grown orchids resembling lælias. (Wm. Mathews.)

tibícinis, Batem. (*Epidéndrum tibícinis*, Batem.). Fig. 3571. Pseudobulbs 1–1½ ft. long, tapering upward: lvs. 2–3, oblong, leathery: raceme 4–8 ft. high, bearing numerous fls. each 3½ in. across; sepals and petals oblong, undulate, crisp; lateral lobes of the labellum large, cucullate, middle lobe small, emarginate; fls. deep pink, speckled with white on the outside, rich chocolate-red within; labellum white within, deep rose-color at the sides, with a short chocolate-red middle lobe. Summer. Honduras, Cuba. G C. III. 4:212; 3:651. Var. **grandiflòra,** Lindl. Fls. larger and paler, with more yellow in the lip. B.R. 31:30. B.M. 4476. F.S. 1:54.—*S. tibicinis* requires less compost than the other species.

Lyonsii, Lindl. Pseudobulbs about 1 ft. high, with 2–3 linear-oblong lvs. at the top: racemes erect, 9 in. long, bearing 12–25 fls., each subtended by a reflexed bract about 3 in. long; fls. 2 in. across; sepals and petals ovate to ovate-lanceolate, undulate, white with several rows of purple spots; labellum larger, recurved, acute, white, with a yellowish brown crisp margin; anther 2-horned. Aug. Jamaica. B.M. 5172. F.S. 20:2130. G.C. III. 26:203.

ròsea, Lind. Related to *S. undulata*. Bracts, peduncles and labellum light rose: sepals and petals oblong, undulate, narrower than the labellum; labellum with rotund lateral lobes and a smaller subrotund middle lobe, margin crisp.. Colombia.

crìspa, Lindl. Pseudobulbs numerous, long: lvs. oblong-lanceolate: fls. yellowish brown; sepals and petals oblong, undulate; labellum ovate-oblong, obscurely 3-lobed. Guiana. B.R. 30:23. B.M. 3729 (as *S. marginata* var.).

undulàta, Lindl. Fls. in a dense raceme; sepals and petals linear, undulate, crisp, longer than the labellum, rich brownish purple; labellum cucullate, middle lobe oval, acute or obtuse, violet-purple. Jan. Colombia. B.R. 31:53.

S. Lueddemánii, Prill. Fls. brown, with the lip and column purple, and the crest and anther yellow; sepals and petals linear-oblong, obtuse, manifestly undulate, 1½–1¾ in. long; lip 3-lobed, ⅔in. long, the middle lobe ovate-orbicular, apiculate, about ¼in. long, the edges incurved near apex. Venezuela. B.M. 8427.—*S. Sanderiàna*, Rolfe. Fls. rose-carmine; sepals lanceolate-oblong, 1½ in. long; petals oblanceolate-oblong; lip obscurely 3-lobed, 1½ in. long, the front lobe broadly rounded obtuse, crisped-undulate. Origin unknown. J.H. III. 51:383.—*S. Thomsoniàna*, Reichb. f. Sepals and petals linear-oblong, 1½ in. long, cream-white passing to yellow at apex, the sepals undulate, the petals crisped; lip 3-lobed, the middle lobe oblong, emarginate, much crisped, deep purple, with a yellow disk. Cayman Isls. B.M. 7815.—*S. Wàllisii*, Reichb. f. Resembling S. Lueddemanii. Lip with broad obtuse side lobes, and very acute front lobe, all brown at apex.

GEORGE V. NASH.†

SCHOMBURGKIOCÁTTLEYA (compounded from *Schomburgkia* and *Cattleya*). *Orchidàceæ*. A genus established to contain the hybrids between Schomburgkia and Cattleya. *S. spiràlis*=S. tibicinis × C. Mossiæ.

SCHÒTIA (named for Richard Schot, companion of Jacquin during his travels in America, 1754–1759). *Leguminòsæ*. Small trees or unarmed shrubs, suitable for greenhouse-growing.

Leaves odd-pinnate; lfts. leathery, or small; stipules short: fls. red, showy, clustered in short panicles; bracts and bracteoles ovate or oblong, caducous; calyx-tube disk-bearing, turbinate, short or the base long-attenuate, segms. 4, strongly imbricated; petals 5, slightly unequal, subsessile, imbricated, either ovate or oblong or minute scale-like; stamens 10, free, or shortly connate at the base; ovary stipitate: legume oblong or broad-linear.—About 6 species, Subtrop. and S. Afr.

A. *Fls. on rather long pedicels.*

B. *Petals longer than the calyx.*

speciòsa, Jacq. A tree or shrub, about 10 ft. high: lvs. variable in form, which fact has led to much separation of this species into varieties and species; lfts. 8–32, linear, oblong, or obovate: fls. crimson, in terminal panicles. S. Afr. B.M. 1153 (as *S. tamarindifolia*).—Intro. in S. Calif.

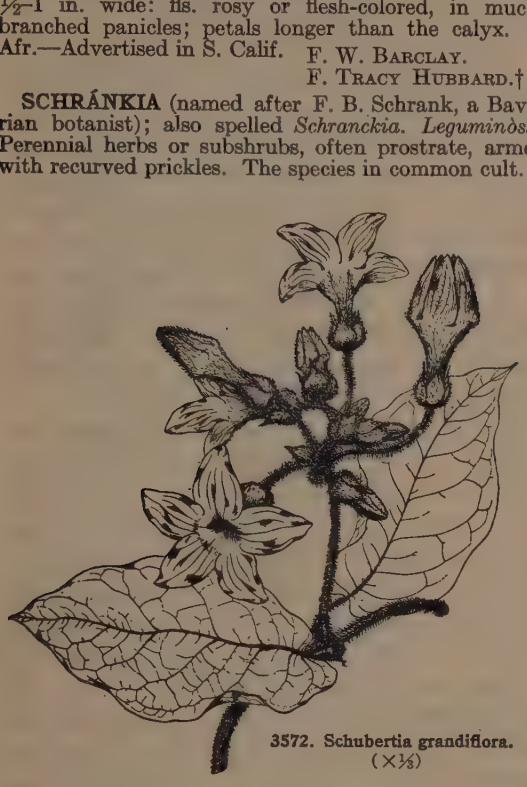
BB. *Petals shorter than the calyx.*

brachypétala, Sond. A large shrub or small tree: lfts. 8–10, larger than in *S. speciosa*, ovate-oblong or obovate: panicles many-fld., axillary and terminal; calyx-tube conical, crimson; petals very small, linear, hidden by the calyx. S. Afr.—Cult. in S. Fla. and S. Calif.

aa. *Fls. nearly sessile.*

latifòlia, Jacq. Becoming a tree 20–30 ft. high: lfts. 4–8, ovate-oblong or obovate, usually 1½–2½ in. long, ½–1 in. wide: fls. rosy or flesh-colored, in much-branched panicles; petals longer than the calyx. S. Afr.—Advertised in S. Calif. F. W. Barclay.
F. Tracy Hubbard.†

SCHRÁNKIA (named after F. B. Schrank, a Bavarian botanist); also spelled *Schranckia. Leguminòsæ.* Perennial herbs or subshrubs, often prostrate, armed with recurved prickles. The species in common cult. is



3572. Schubertia grandiflora. (×⅓)

an outdoor plant. Lvs. bipinnate, often sensitive, petiole without glands, frequently bristly between the pinnæ; the lfts. small; stipules bristle-like: fls. in globose heads or cylindrical spikes, peduncles solitary or fascicled at the axils, rose or purplish, 5–4-merous, sessile, perfect or polygamous; calyx very minute; petals connate to the middle in a funnelform corolla; stamens numerous, free; ovary subsessile: legume linear, acute or acuminate, both sides aculeate.—About 10 species, all American; one has also been discovered in Trop. Afr. These plants are also known as Morongia, the following species, in that case, taking the name *M. uncinata,* Brit.

uncinàta, Willd. Sensitive Brier. A hardy herbaceous perennial, branched and decumbent, 2–4 ft. long, well armed with short prickles: lvs. very sensitive, with about 6 pinnæ; pinnæ with 16–30 lfts.: fls. pink, in globular heads nearly 1 in. through. May–July. Va. to Ill. and south. B.B. 2:256.
F. Tracy Hubbard.†

SCHREBÈRA (perhaps after J. C. D. Schreber, 1739–1810, physician and naturalist). *Oleàceæ.* Trees with unequally pinnate lvs. and fls. in very much-branched cymes: calyx tubular-bell-shaped, irregularly 4–7-lobed; corolla salver-shaped; tube cylindrical; lobes 4–7, spreading; stamens 2, near the top of the corolla-tube; ovary 2-celled.—About 15 species, Afr. and India. Nathusia, with 4 species at the date of Engler & Prantl, Die Pflanzenfamilien, IV. 2 (1895), is a synonym of this genus.

swietenioìdes, Roxbg. (*Nathùsia swietenioìdes,* Kuntze). A tree, about 40 ft. high, nearly glabrous: lfts. 5–7, ovate, acute, 4 x 2 in.: fls. white, with brown marks, about ½in. across, in many-fld. cymes. Cult. in S. Fla.

SCHUBÉRTIA (named after Gotthilf Heinrich von Schubert). *Asclepiadàceæ.* Twining shrubs, occasionally grown in the warmhouse: lvs. large: fls. large, white, borne in loose umbels; sepals ovate, generally acute, alternating with single glands; corolla funnelform or salver-shaped, with a broad tube; crown upright, included: follicles thick and hairy.—About 6 species from S. Amer. **S. grandiflòra,** Mart. & Zucc. Fig. 3572. Branches twisting, straw-colored, covered with long rigid red-brown hairs: lvs. cordate, obovate, acute, both surfaces densely brown-pubescent: umbels few-fld.; pedicels long-hairy: fls. white; sepals oval-acute; corolla large, tube gourd-shaped, glabrous inside, the lobes oval-elongate, obtuse, erect, sparsely pale yellow pilose Brazil. G. 36:503; 37:351. Gt. 50:1492. G.F. 3:369 (adapted in Fig. 3572). Gn. 32:84. **S. gravèolens,** Lindl. (*Araùjia gravèolens,* Mast.), is a Brazilian climber, likely to be found in collections of greenhouse plants, smaller-fld. than the above. See p. 2610, under Physianthus. There may be confusion in the use of the names *S. graveolens, S. grandiflora,* and *Physianthus auricomus.*

SCIADÓCALYX: *Isoloma.* The following species was not treated under *Isoloma,* see Vol. III, p. 1705. **Isolòma Warszewíczii,** Hort. (*Sciadócalyx Warszewiczii,* Regel. *Kohlèria Warszewiczii,* Hanst.). Perennial herb, 3–4 ft. high, with catkin-like stolons: st., petioles, lvs., and calyx villous-hirsute: lvs. opposite, long-petioled, oval or cordate, crenate: fls. in axillary umbels of 3–6 fls., bright yellow or yellowish green, red- or brown-dotted; calyx adnate to ovary, 5-lobed, lobes almost horizontally spreading; corolla almost oblique at base, tube slightly inflected, limb 5-lobed, lobes rounded; ovary hirsute, surrounded by a glandular, 5-lobed ring. Colombia. B.M. 4843. Gt. 2:256.

SCIADOPHÝLLUM (*shade leaf,* because of the umbrageous foliage). *Araliàceæ.* As understood by Bentham & Hooker in Genera Plantarum, it is a genus of the American tropics, at that time with about 22 known species, differing from Schefflera, among other things, in the calyptrate or coherent rather than free petals and sometimes 4-merous fls. Harms, in Engler & Prantl's Pflanzenfamilien, refers it to Schefflera, and under this name (p. 3108) are here described any species probably now in the trade.

SCIADÓPITYS (Greek, *skias, skiados,* umbrella, and *pitys,* spruce, alluding to the position of the leaves). *Pinàceæ.* Umbrella Pine. Ornamental tree grown for its handsome foliage and regular pyramidal habit.

Evergreen resinous tree: lvs. of two kinds; small and scale-like lvs. scattered on the shoot, but crowded at its end and bearing in their axils a whorl of 20–30 long linear flat lvs. furrowed on each side, more deeply beneath; these lvs. really consist each of 2 connate lvs. borne on undeveloped spurs like those of Pinus; they have been sometimes called cladodes, but are not true cladodes: fls. monœcious; the staminate oval, consisting of spirally disposed 2-celled anthers and appearing in dense clusters at the ends of the shoots; the pistillate are solitary at the ends of the shoots and consist of numerous spirally arranged scales subtended by a small bract and bearing 7–9 ovules: cone oblong-ovate, woody, the bracts connate, with the broadly orbicular thick scales spreading at the margin; seeds oval, compressed, with narrow wing, emarginate at the apex.—One species in Japan, with very strong and straight-grained, nearly white wood.

3573. Whorls of foliage of Sciadopitys verticillata. (×⅙)

The umbrella pine is a very handsome tree of narrow

pyramidal habit, with linear, rather large, needle-like dark green and lustrous leaves in whorls and oval cones 3 to 4 inches long. It is hardy as far north as Portland, Maine, and is of rather slow growth. It thrives well in a moderately and constantly moist, loamy, and also in clayey soil; in dry soil or in soil which periodically becomes dry, it grows poorly. Propagation is by seeds and layers, and sparingly by cuttings of half-ripened wood in summer; but seedlings are to be preferred, as they grow more symmetrically and more vigorously.

verticillàta, Sieb. & Zucc. UMBRELLA PINE. Figs. 3573, 3574. Tree, attaining 100 ft., with ascending branches forming a narrow pyramidal compact head, in old age loose and with pendulous branches: scale-like lvs. dark brown, ⅛in. long: needles 15–35 in each whorl, linear, stiff, obtuse, and emarginate, deeply furrowed on both sides, dark green and glossy above, with a white line beneath, 3–6 in. long: cone 3–5 in. long, ovate-oblong; seed ½in. long; cotyledons 2. Japan. B.M. 8050. S.Z. 2:101, 102. F.S. 14:1485, 1486. Gt. 32, p. 149; 37, p. 437. Mn. 4, p. 154. Gng. 1:25. Gn. 28, pp. 204, 205; 38, p. 499; 71, p. 176; 76, p. 144. G.M. 45:97; 47:272. Gn.W. 11:297. F.E. 21:172, pl. 115. M.D.G. 1906:557. R.H. 1884, pp. 16, 17.—There is a dwarf variety and a form with variegated foliage, both intro. from Japan.

ALFRED REHDER.

3574. Umbrella pine.—Sciadopitys verticillata.

SCÍLLA (the old Greek name used by Hippocrates: *I injure*, according to Miller, alluding to the poisonous bulbs). *Liliàceæ.* SQUILL. WILD HYACINTH. BLUEBELL. Perennial bulbous plants remarkable for easy culture, quick growth and beautiful blue, rose, or white flowers, blooming early in the spring (some in autumn), and therefore desirable plants for the wild-garden, rock-garden, or border; they are very useful in pots for midwinter flowers, for window-boxes and for room-decoration; some are stove plants; some of the South African forms have handsome spotted foliage.

Bulb tunicated, large or small: lvs. radical, 1 to several in number, linear, loriform, lanceolate, oblong or nearly ovate, in *Scilla autumnalis* appearing after the fls.: scape 1 to several, simple, leafless: fls. in racemes, which are several- to many-fld., open, compact or spicate; bracts small, sometimes minute, hyaline: pedicels short or long, sometimes filiform: fls. small or middle-sized (1 in. across), segms. of perianth distinct, perianth blue, porcelain-blue, rose-colored or whitish, open-rotate, cylindric-campanulate, or open-campanulate, segms. persistent for some time; stamens 6, affixed at base or below the middle of the segms.; anthers ovate or oblong, dehiscing longitudinally, introrse; ovary sessile, stigma small, capitate; ovules 2 in each locule, rarely 8–10, ascending: caps. globose; seeds 1–2 in each cell, rarely more; testa black, appressed; embryo small in albumen. —About 80 species, widely distributed in Eu., Asia, and Afr. in temperate districts. The genus is distinguished from Ornithogalum chiefly by the color of the fls. and deciduous perianth, from Hyacinthus by the segms. distinct from the base or very nearly so. Great Britain possesses 3 species of Scilla, *S. verna*, *S. autumnalis*, and *S. nonscripta*, while Germany has, in addition to *S. autumnalis*, 3 others, viz., *S. amœna*, *S. bifolia*, and *S. italica*. For *S. Fraseri*, see *Camassia*.

Among the early flowers there is none more valuable than the scillas. They vary considerably in form of flower and foliage, and although typically they have blue or blue-purple flowers, most, if not all, of the species in cultivation have white and red-purple forms. *S. sibirica* and *S. bifolia* are the earliest to flower, and of these forms the Asia Minor or Taurian kinds are in advance. The form of *S. sibirica* known as *multiflora* is nearly past before the usual type begins to expand. There is also sometimes cultivated in the garden a pleasing white scilla, with hyacinth-like flowers, known to the trade as *S. amœna*. But these white forms are mostly oddities; the effective ones are the blue-flowering kinds. Occasional hybrids between scillas and chionodoxas are met with (see page 749). *Chionoscilla Alleni* is the accepted name for a natural hybrid between *Chionodoxa Luciliæ* and *Scilla bifolia*, first obtained by Mr. Allen, of England, in 1891.

None of the hardy squills requires special culture, and if planted where they can remain undisturbed for a series of years, they seldom disappoint one if the soil is occasionally enriched by top-dressings of manure. The writer has grown them distributed in the grass of the lawn for a number of years with considerable success. The bulbs should be planted as early as possible in autumn. The varieties may be increased by offsets taken after the foliage has matured. For the cool greenhouse or conservatory, many of the scillas are ideal subjects. For this culture, five or six bulbs may be put in a 5-inch pot and the vessel afterward transferred to a coldframe and covered until growth commences. Up to this period very little water will be required, but as the flower-cluster appears the quantity should be increased and the pots transferred to the greenhouse, giving them a position near the glass. The foliage matured, the bulbs may be shaken out of the soil and stored. More attention should be paid to the propagation of the scillas by commercial dealers, for these bulbs should become one of the features of the wild-garden in early spring.

The *Urginea Scilla*, sometimes called *Scilla maritima*, needs to be mentioned in this connection on account of its yielding a medicine for many centuries held in esteem. Almost everyone is familiar with sirup of squills, and has obtained relief from its use in severe colds. The scales of the bulb contain mucilage, sinistrin, sugar, and crystals of calcium oxalate (stated by botanists to ward off snails); the active principles are scillipicrin, scillitoxin, and scillin (the latter producing numbness, vomiting, and the like). Scilla bulbs or roots should never be used unless under proper direction, as in their fresh state they are extremely acrid, and might prove dangerous.

The trade names are considerably confused. Many of the so-called horticultural species and races may be united as mere varieties of species that have been defined botanically. The following names are thought to include all those in the American trade, but other species are known to fanciers.

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KEY TO THE SPECIES.

A. *Shape of fls. campanulate: color blue, blue-lilac, rose-purple, white.*
B. *Pedicels short: bracts linear, in pairs: raceme many-fld.: fls. broadly campanulate, produced from April to June* ..... 1. **nonscripta**
BB. *Pedicels short: bracts in pairs, scarious-hyaline* ..... 2. **puschkinioides**
BBB. *Pedicels long (1–1½ in.): raceme equilateral, compact: fls. cylindric-campanulate, produced in May* ... 3. **hispanica**
AA. *Shape of fls. saucer-shaped to open-rotate.*
B. *Color of fls. rose, size small.*
C. *Size of fls. small, color rose-purple: raceme dense, 30–60-fld.: lvs. linear, fleshy* ..... 4. **numidica**
CC. *Size of fls. very small (⅓in. long): raceme dense: scape slender: bracts whitish, minute* ..... 5. **chinensis**
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C. *Raceme very dense (100–150-fld.), at first conic, then long, compact and broad: scape robust. May.* 7. **peruviana**
CC. *Raceme several- to many-fld., open: fls. mostly distant.*
D. *Lvs. single: raceme about 5-fld.: plant small. May* ..... 8. **monophyllos**
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FFFF. *Number of fls. 20–60: scapes 1–3: bracts minute, linear, white* ..... 15. **japonica**
EEEE. *Foliage linear, thick, channeled: raceme 6–10-fld.: fls. fragrant. April to May.* 16. **verna**

1. **nonscrípta,** Hoff. & Link. (*S. nùtans,* Smith. *S. festàlis,* Salisb. *S. cérnua,* Salisb. *Hyacínthus nonscríptus,* Linn.). Common Blue Squill. Harebell. Lvs. 10–18 in. long, ½in. broad, subacute, concave: scape solitary, tall, stout: raceme 6–15-fld.: bracts in pairs: fls. blue, purple, white, or pink, drooping. April–June. W. Eu., Great Britain. B.M. 1461. Among the garden forms are **álba,** white; **cærùlea,** blue; **lilácina,** lilac-blue; **ròsea,** rose- or pink-colored; **cérnua,** nodding.—This is one of the most beautiful of squills, fragrant, thriving best in somewhat shady and sheltered places. Originally placed in the genus Hyacinthus, on account of the general form of the perianth, it was removed to Scilla as having the segms. distinct or nearly so, and is now often considered as forming a distinct genus (Agraphis, Link; Endymion, Dumort.), either alone or with other species which connect it with the other scillas.

2. **puschkinioìdes,** Regel. Bulb ovate, tunicate: lvs. radical, 2–4, glabrous, broadly linear, obtuse, 2½–3 in. long: scape low, glabrous: pedicels erect, strict, short, base bibracteate; bracteoles scarious, hyaline: perianth campanulate, pale blue, middle nerve deeper blue; base of filaments united; anthers linear-oblong; style filiform. Turkestan.

3. **hispánica,** Mill. (*S. campanulàta,* Ait. *S. pátula,* DC.). Spanish Jacinth. Bell-flowered Squill. Lvs. 5 or 6, glabrous, ascending, lanceolate, ½–1 in. broad, subobtuse, convex at back: scape long: raceme equilateral, compact: fls. cylindric-campanulate; perianth usually blue but often becoming rose-purple, or white; pedicels 1–1½ in. long. May. Spain and Portugal. B.M. 1102. Gn. 78, p. 456; 79, p. 265.—Hardy. Several varieties of it are in the trade under the specific name *campanulata,* viz., **álba,** white; **albomàjor,** large white; **cárnea,** flesh-colored; **hyacinthoìdes,** hyacinth-like; **ròsea,** rose-colored. This species is worthy of wider acquaintance. The bulbs are cheap and easily obtained in autumn, and if planted then they are sure to bloom the following spring.

4. **numídica,** Poir. (*S. parviflòra,* Desf.). Bulb ovoid, 1–2 in. thick: lvs. 4–6, fleshy, herbaceous, linear, 6–8 in. long, 1½–3 lines broad, suberect: scape solitary or paired, ½–1 ft. high: racemes dense, 30–60-fld.: pedicels short, ascending, 3–5 lines long: bracts minute, linear, evanescent: perianth rose-purple, 1½ lines long: single ovule in each of the ovarian cells: caps. small, globose, grooved. Flowering in winter in its native home, Algeria.

3575. Scilla peruviana in full bloom.—Also known as Scilla ciliaris. (×¼)

5. **chinénsis,** Benth. (*Barnárdia scilloìdes,* Lindl.). Chinese Squill. Lvs. 2 or 3, equaling or exceeding the scape, rather hard, acute, channeled: bulb small, ovate: scape erect, slender, or wand-like: raceme spicate, dense, elongated: pedicels short; bracts whitish, minute: perianth rose-colored tipped with green; stigma a mere point. June. China. B.M. 3788.—Half-hardy. A beautiful species with the dense elongated raceme of rose-colored fls., worthy of cult. in any rock-garden.

6. **autumnàlis,** Linn. Autumn Squill. Starry Hyacinth. Lvs. several, obtuse, channeled, half-terete, growing on through the winter and dying away in the spring: scapes several: racemes corymbose, spicate, open; perianth rose-colored, ½in. across. July–Sept. Eu. (Great Britain), N. Afr. B.M. 919.—Hardy. The flowering sts. generally precede the lvs. but occasionally the two come up together. As the flowering advances, in most cases a tuft of lvs. similar to those of *S. verna* shoot out by the side of the st. for the following year.

7. **peruviàna,** Linn. (*S. ciliàris,* Hort. *S. Clùsii,* Parl.). Cuban Lily. Peruvian Jacinth. Hyacinth of Peru (once thought to be a Peruvian plant). Fig. 3575. Bulb large, ovate, tunicate: lvs. many, broad-linear, 6–12 in. long; margins ciliated with minute white

bristles, channeled: scape robust, terminated by a many-fld. conic broad and compact raceme of purple, lilac, reddish, or whitish fls.: fls. rotate; corolla persistent; anthers short. May, June. Region of Medit., not Peru. B.M. 749. Gn. 27, p. 288. R.H. 1882, p. 508.—The hyacinth of Peru is not hardy in Mass. It propagates freely by offsets. It flowers all through May and

3576. Scilla bifolia. (×⅓)

June and forms a most attractive object in the herbaceous border or bed. *S. peruviana*, however, has one fault that may tell against it in the opinion of many cultivators—it never flowers two years in succession; it seems to need a whole year's rest after the effort of producing its large spike of fls.

8. **monophýllos,** Link (*S. monophýlla*, Plan. *S. pùmila*, Brot.). Dwarf Squill. Lf. solitary, inclosing the base of the scape, 2 in. long, ½in. broad, involute, ovate-acuminate, with a callous apex, glabrous: scape erect, slender, usually 5–20-fld.: pedicels long, ascending, springing from a small sheathing bract: perianth bright lilac, ½in. across, open, spreading; filaments lilac-blue, dilated at base; anthers erect, blue. May. Spain, Portugal. B.M. 3023.—Hardy.

9. **bifòlia,** Linn. Fig. 3576. Bulb tunicated, oblong-oval: lvs. 2, seldom 3, cucullate, 4–8 in. long, ¼–½in. broad: scape 2–8-fld., ebracteate: fls. stellately rotate; perianth blue, sometimes reddish or whitish; anthers blue, versatile. March. Eu., Asia Minor. B.M. 746.—Hardy. Several varieties of this exquisite little plant are in the trade: **álba,** white-fld.; **ròsea,** pink-fld.; **rubérrima,** red-fld.; **spléndens,** intense cobalt-blue fls. Cultivators would do well to obtain all the varieties possible; also as many bulbs of this beautiful species as they can afford. It is one of the most charming of hardy, early spring-flowering plants.

10. **natalénsis,** Planch. Bulb thick, large, ovoid, subglobose: lvs. broadly lanceolate, glabrous, 9–12 in. long, 3–4 in. broad, ascending: scape erect, terete, 1–1½ ft. long: raceme dense, simple, elongated, open, many-fld. (50–100): bracts solitary, subulate: fls. pale blue, stellate, rotate: pedicels long, pale blue. Natal. B.M. 5379. F.S. 10:1043.—Suitable for greenhouse cult. It is a graceful and elegant species, suitable for cult. in pots.

11. **hyacinthoìdes,** Linn. (*S. parviflòra*, Salisb.). Hyacinth Squill. Lvs. 10–12, spreading, 1–1½ ft. long, ½–1¼ in. broad, narrowed at both ends, minutely ciliate-denticulate on the margins: scape straight, long: racemes many-fld., broad, open: pedicels long, 1–1½ in.: bracts whitish, minute, persistent; perianth bluish lilac, open, campanulate. Aug. Medit. region. B.M. 1140.—Hardy. This species is noted for its extreme shyness in flowering. The bulbs are sometimes 2 in. diam., and produce a profusion of offsets. In Fish's Bulb Culture several varieties are mentioned: **cærùlea,** fine blue; **álba,** fine white, free-flowering; **ròsea,** distinct flesh-colored; **rùbra,** deep red, large and fine.

12. **sibírica,** Andr. (*S. amœna* var. *prœcox*, Don). Siberian Squill. Fig. 3577. Lvs. 2–4, ascending, narrow, 4–6 in. long: scapes 1–6, 3–8 in. long: racemes 1–3-fld.; fls. rotate, horizontal or drooping, with short pedicels; perianth deep blue. March. Russia, Asia Minor. B.M. 1025. Gn. 11, p. 165. P.M. 14:100. L.B.C. 2:151.—Hardy. This plant ought always to have a little shelter. It forms attractive tufts and has a desirable habit for rock-gardens. Several trade forms exist, viz., **álba, multiflòra, pállida; amœnula,** dwarfer with brighter blue fls.

13. **amœna,** Linn. Star Hyacinth. Fig. 3578. Lvs. 4–7, flaccid, ascending, glabrous, 6–9 in. long, ⅓–⅔in. broad: scapes several, equaling the lvs.: racemes several-fld., 4–8, open; fls. distant, ½–¾in. diam., blue: pedicels ascending or spreading. March. Austria, Germany. B.M. 341. G. 37:295.—Hardy. It grows luxuriantly, several flowering sts. being found on the same plant.

14. **itálica,** Linn. Italian Squill. Bulbs ovate, clustered together: lvs. radical, several, flaccid, spreading, lanceolate, acute, 4–8 in. long, ¼–½in. broad: scape solitary, slender, longer than the lvs.: raceme dense, many-fld.: pedicels filiform, spreading; bracts in pairs: fls. fragrant, smelling like lilac, pale blue; perianth rotate, blue; segms. puberulous at apex; filaments white; anthers sagittate, dark blue. March–May. B.M. 663. L.B.C. 15:1483.—Hardy. This plant has less brilliant fls. than either *S. sibirica* or *S. bifolia*, but abundantly compensates for the paleness of its blue by the fulness and the sweetness of its fragrance. It is also taller than either of the others.

15. **japónica,** Baker (*Ornithógalum japónicum*, Thunb. *Barnárdia japónica*, Schult. f.). Japanese Jacinth. Bulb ovoid, 9–12 lines thick: lvs. 2–3, fleshy, herbaceous, 6–12 in. long, 4–16 lines broad, acute: scapes 1–3, strict, erect: raceme 20–60-fld.: pedicels

3577. Scilla sibirica. (×⅓)

ascending: bracts minute, linear, white: perianth 1½ lines long, rose-purple: caps. turbinate, trisulcate, 2½–3 lines long; ovules solitary in each ovarian locule. Japan.

16. **vérna,** Huds. Sea-Onion. Spring Squill. A delicate little plant, with a small bulb and narrow-

linear lvs. 2–4 in. long: scape seldom 6 in. long, with several small, erect blue fls. in a short, terminal raceme, almost flattened into a corymb: perianth-segms. scarcely above 3 lines long, spreading. Spring. A plant occurring in stony and sandy wastes near the sea in W. Eu., as in Denmark, reappearing farther east on the Rhine and in Sardinia.—Hardy.

3578. Scilla amœna. (×⅓)

S. axillàris, C. H. Wright. Of robust habit: lvs. 1 ft. long, 2½ in. broad: raceme many-fld.: perianth-segms. white outside with green keel, bright violet edged with white inside. Hab.(?).—*S. cilícica*, Siehe. Bulb bluish violet: lvs. 4–8 in. long, about ½in. broad at apex: scape slightly taller than lvs.: pedicels one-half as long as fls.: fls. 2–6, bright blue, often tinged with violet; filaments white, thread-like. Asia Minor. G.C. III. 44:194, desc.

John W. Harshberger.

SCINDÁPSUS (an old Greek name, transferred to these plants). *Aràceæ*. Climbing perennials, differing from Monstera in floral characters and in the long-petioled, long-sheathed, ovate-lanceolate, or ovate-acuminate lvs.—Species about 20 (Engler & Krause, Pflanzenreich, IV. 23B), E. Indies. Scindapsus comprises one popular and worthy warmhouse plant, that known to gardeners as *S. argyræus*; also *S. aureus*, Engler (see *Pothos aureus*).

pictus, Hassk. Internodes of the st. 3–4 in. long, 2 in. thick: petioles 1½–2 in. long; blade 4–6 in. long, 2½–3¼ in. wide, one side half as wide as the other, coriaceous, bright green (drying black), obliquely ovate-cordate. Var. **argyræus,** Engler (*S. argyræus*, Hort. *Pòthos argyræus*, Hort.), is the cult. form, with broad, deeply cordate lf.-blades which are spotted and blotched above with silvery white. Celebes, Philippines, Java.

S. anómalus, Hort.=Monstera acuminata.—*S. Cuscuària*, Presl, is sometimes kept separate as Cuscuaria marantifolia. Not known to be in the trade. It is a question whether the Aglaonema commutatum sometimes mentioned in horticultural literature is this species or is properly referable to Aglaonema.—*S. pertùsus*, Hort. =Rhaphidophora pertusa.

Jared G. Smith.

SCÍRPUS (Latin for *bulrush*). Bulrush. Sedge. *Cyperàceæ*. A large group of rush-like or grass-like plants inhabiting the whole globe. Flowers perfect, in spikelets which are solitary, clustered or umbellate; scales spirally arranged; perianth of bristles or none, not enlarged in fr., smooth or barbed, persistent; ovary 1-loculed, with 1 anatropous ovule; style not thickened at the base, 2–3-cleft: fr. an achene with bristles attached. Only a few species are in cult., and these are all perennials (except perhaps the last), suited for shallow water or damp places. The larger are important for use in aquatic gardens. The nomenclature of those in the trade has been very much confused.

A. *Sts. leafy.*

atróvirens, Muhl. Sts. clustered, tall and stout, 2–4 ft. high, bluntly triangular: lvs. long, coarse, and firm, 3–6 lines wide, spreading: involucre foliaceous: umbel sparingly compound; rays stiff, very unequal; spikelets ovoid-oblong, acutish, dark greenish brown, in dense heads of 5–25; scales oblong, cuspidate; perianth-bristles 6, downwardly barbed above; styles 3. E. U. S. in mud or damp soil.

Holoschœnus, Linn. Stiff and rush-like, from stout rootstocks: sts. clustered, slender, cylindrical, 1–3 ft. high: lvs. 1–2, basal, stiff, erect and narrow, furrowed: bracts several, the larger one appearing as a continuation of the st.; spikelets very numerous and small, closely packed in 1 to several globular, light brown heads, 3–5 lines in diam.; scales ovate, mucronate, ciliate; perianth-bristles none; styles 2–3-cleft. Eu., Asia.—The form in cult is var. **variegàtus,** Hort., with sts. alternately banded with green and yellowish white. Damp or dry soil.

AA. *Sts. with very short basal lvs. or none.*

B. *Rootstocks very stout, creeping: sts. scattered, 3–9 ft. high.*

lacústris, Vahl. Great Bulrush. Sts. terete, smooth, tall, stout, and flexible, 3–9 ft. high: lvs. reduced to a few basal sheaths: bracts very short, erect: umbel compound, flexuous: spikes in heads of 1–5, oblong-conical, pale brown, 2½–8 lines long; scales ovate-oblong, obtuse, rarely mucronate; perianth-bristles 4–6, downwardly barbed throughout; styles 2–3. In shallow quiet water, N. Amer., Eu., Asia.—A composite species probably consisting in Eu. and Amer. of several distinct forms, each of specific rank. Typical *S. lacustris* is a 3-style form common in Eu., not found in Amer. *S. Tabernæmontànus*, Gmel., is a European 2-style form. The horticultural variety of the latter species, with alternate bands of green and yellowish white, is var. **zebrìna,** Hort. (*Júncus zebrìnus*, Hort.). *S. vállidus*, Vahl, and *S. occidentàlis*, Chase, are 2-styled American species. *S. heterochætus*, Chase, is a 3-styled American form. The bulrush is very effective as a border plant in aquatic gardens.

3579. Scirpus cernuus. Known to gardeners as Isolepis gracilis. (×⅓)

BB. *Rootstocks almost wanting: sts. cespitose, forming turf, 3–12 in. high, very slender.*

cérnuus, Vahl (*S. grácilis,* Koch. *Isólepis grácilis,* Hort.). Fig. 3579. Sts. very slender or filiform, cylindrical, erect or more often drooping: basal sheaths leafless or with a very short filiform blade: involucral bract subulate, about equaling the spikelet, the latter usually solitary, oblong-lanceolate, 1–3 lines long; scales oblong-oval, obtuse, pale brown or whitish; bristles none; styles 3: achene in greenhouse plants rarely maturing. Widely distributed, common in Eu. G. 21:614; 25:111.—Grows well in damp pots, the drooping sts. producing a very graceful effect. This plant is now considered under Scirpus by practically all authors. *S. cernuus* is an older name than *S. gracilis.*

K. M. WIEGAND.

SCLEROCÁRPUS (Greek, *hard* and *fruit,* the achenes are inclosed in a hardened palea). Syn., *Gymnópsis,* in part. *Compósitæ.* Annual or perennial strigose-pubescent herbs, suitable for outdoor planting in the S.: sts. branching: lvs. alternate or the lower rarely all opposite, dentate or subentire: heads small or medium, at the ends of the branches, pedunculate, many-fld.: fls. yellow; the ray-fls. few to several, fertile; pappus wanting: achenes more or less 4-sided with a broad flat summit.—About 15 species. N. Amer., region of Texas and Mex., Trop. Afr., and Trop. Asia. *S. uniseriàlis,* Benth. & Hook. f. (*Gymnópsis uniseriàlis,* Hook. *Gymnolòmia uniseriàlis,* Hort.). Annual, 1–2 ft. high, loosely branched: lvs. alternate, slender-petioled, deltoid- or rhombic-ovate, or the uppermost lanceolate, coarsely dentate, the strigose pubescence of the lower surface canescent: corollas orange. Texas and Mex. R.H. 1853:261. G.C. III. 28:165.

SCLEROCÀRYA (Greek, *hard* and *nut* or *kernel*). *Anacardiàceæ.* Trees or shrubs, one of which, *S. caffra,* has been intro. into S. Calif.: lvs. aggregated toward the ends of the branches, alternate, odd-pinnate, glabrous; lfts. opposite, long-petiolate, very entire, glaucous below: the male fls. spicate; fls. polygamous; sepals 4, orbicular, colored, imbricate; petals 4, oblong, obtuse, spreading, reflexed, imbricate; disk depressed, entire; stamens in the male fls. 12–15, in the female fewer; ovary subglobose, 2–3-celled: drupe somewhat fleshy, the shell woody, 2–3-celled.—About 5 species, Trop. and S. Afr. *S. cáffra,* Sond. Glabrous: lvs. alternate, 6–12 in. long; lfts. 1½–2 in. long, with a short, often oblique tapering point, base acute, pale below: male spikes 2–4, terminal: fls. very short-pedicelled, bracteolate, the dried pedicel red: drupe suborbicular, the size of a small walnut. S. Afr.

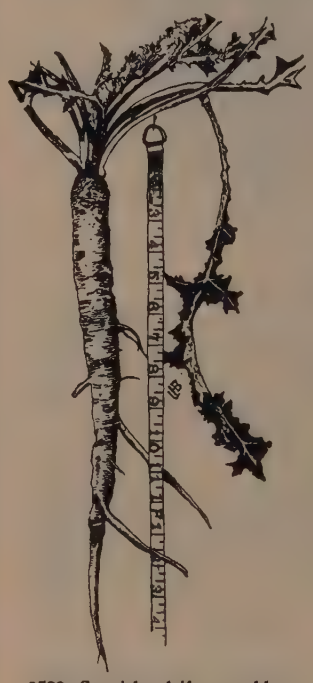
SCOLOPÉNDRIUM (from *Scolopendra,* the name of a centiped, the resemblance being found in the lines of linear sori on the backs of the lvs.). *Polypodiàceæ.* The name most common in the trade for the hart's-tongue ferns (known as *Scolopendrium vulgare*) and its varieties. See *Phyllitis.*

SCOLÒPIA (Greek, *thorn* or *stake,* probably so named on account of the spines). *Flacourtiàceæ.* Spiny trees, the spines often compound, one of which, *S. crenata,* has been intro. in S. Calif.: lvs. alternate, entire; stipules minute or none: fls. small, racemed, axillary, dicœcious; sepals 4–6; petals 4–6, subsimilar; stamens many; ovary 1-celled: berry 2–4-seeded.—About 30 species, Afr., Asia, and Austral.

crenàta, Clos. Branches of young trees armed, of old unarmed: lvs. 2–6 x 1–2 in., ovate or oblong-lanceolate, base acute, obtusely or acutely acuminate, subcrenate, glabrous: racemes axillary, 1–3 in. long: sepals and petals 5–6 each: fr. globose, green, when dry the size of a cherry. India, China, and the Philippines.—Intro. into Calif.

SCÓLYMUS (old Greek name used by Hesiod). *Compósitæ.* Three or four herbs, all natives of the Mediterranean region. *S. grandiflorus,* a perennial species, is rarely cultivated abroad for its flowers and *S. maculatus,* an annual species, for its variegated foliage.

Scolymus hispanicus (Fig. 3580) is the vegetable known as golden thistle or Spanish oyster plant. It makes a root very like salsify, except that it is much lighter colored and considerably longer. Its flavor is less pronounced than that of salsify, but when carefully cooked, it possesses a very agreeable quality which is somewhat intermediate between that of salsify and parsnip. It is adapted to all the methods of cooking employed for those vegetables. The particular value of the Spanish oyster plant, aside from affording a variety in the kitchen-garden, is its large size and productiveness as compared with salsify. The product may be nearly twice as great, for a given area, as for salsify. The seeds are much easier to handle and to sow than those of salsify. They are sown in March or April. The seeds, or rather achenes, are flat and yellowish, surrounded by a white scarious margin. The roots may be dug either in fall or spring. The greatest fault of the Spanish oyster plant lies in the prickly character of the leaves, which makes the plant uncomfortable to handle. The roots are often 10 to 12 inches long and 1 inch thick. It is said that the leaves and stalks are eaten like cardoons by the people of Salamanca; also that the flowers are used to adulterate saffron.



3580. Spanish salsify, or golden thistle.—Scolymus hispanicus.

The *S. hispanicus,* Linn., is a biennial plant, native to S. Eu. The radical lvs. are very spiny, oblong, pinnatifid, dark green, marked with pale green spots. The plant grows 2–2½ ft. high, is much branched and bears bright yellow fl.-heads which are sessile and contain only 2 or 3 fls., all of which are ligulate. The heads are sessile, terminal, and axillary.

L. H. B.

SCOPÒLIA (named in honor of Joh. Ant. Scopoli, 1725–1788). *Solanàceæ.* Erect slightly branched glabrous hardy perennial herbs for outdoor planting: lvs. membranaceous, entire: fls. lurid purple or greenish, veined, nodding, borne on solitary filiform pedicels; calyx broad-campanulate, membranaceous truncately or broadly 5-lobed; corolla campanulate, the limb folded, 5-angled or shortly and broadly 5-lobed; stamens 5; ovary conical, 2-celled almost to the apex: caps. included in the calyx.—About 5 species, 1 in Eu., 1 in Himalaya, and the others in Japan and China. *S. carniólica,* Jacq. (*Hyoscỳamus Scopòlia,* Linn.). About 1 ft. or more high: lvs. entire, petiolate, about 3 in. long, ovate or obovate-oblong, subcuspidate: fls. solitary, axillary, nodding; corolla lurid red, yellow, or green inside. Russia. B.M. 1126.—Somewhat used in medicine.

SCORPIÙRUS (Greek, *scorpion* and *tail*, alluding to the twisted form of the legume). *Leguminòsæ.* Nearly hardy stemless or decumbent herbs, adapted to the open border: lvs. simple, very entire, elongate, twisted and folded; stipules adnate to the petiole: fls. yellow, often few, solitary or umbelled, on axillary peduncles, nodding; calyx with the 2 upper lobes connate above; petals long-clawed, the standard suborbiculate, the wings oblique-obovate or oblong, the keel incurved, beaked-acuminate; stamens free from the standard; ovary sessile, many-ovuled: legume subterete, circinate-involute, sulcate-costate, the ribs often tuberculate or muricate, indehiscent.—About 6 species, S. Eu., N. Afr. to the Canary Isls., and W. Asia. Prop. by seed sown in the open border in the spring. *S. vermiculàta*, Linn. A trailing annual: lvs. tapering into the petioles: fls. solitary on the peduncles, the standard streaked with red: pod thick, glabrous, with the inner ribs almost obsolete, but the 10 outer ones bear crowded stipitate tubercles which are obtusely dilated at the apex. Medit. region. See the article *Worms*.

SCORZONÈRA (old French *scorzon*, serpent; *S. hispanica* was used against snake-bites). *Compósitæ.* The vegetable known as scorzonera or black salsify is a plant with a long fleshy tap-root like that of salsify, but differing in having a black skin. The flesh, however, is white. It is cultivated and cooked like salsify, but being somewhat more difficult to raise it is rarer than that vegetable, although considered by many to be superior to it in flavor. The leaves may be used for salads. Scorzonera is a perennial plant, but it is treated in cultivation as an annual or biennial crop.

Perennial herbs, or rarely annual, floccose, lanate or hirsute: lvs. sometimes entire and grass-like, or wider, sometimes more or less pinnately lobed or dissected: heads long-peduncled, yellow, the fls. all radiate: achenes glabrous or villous.—Over 100 species, all natives of the Old World. Cult. same as salsify.

Botanically, also, Scorzonera is closely allied to salsify. The two vegetables are easily distinguished in root, leaf, flower, and seed. The leaves of Scorzonera are broader, the flowers are yellow (those of salsify being violet), and the seeds are white. Also, the involucral bracts of Scorzonera are in many series; of salsify, in one series.

hispánica, Linn. SCORZONERA. BLACK SALSIFY. Perennial herb, 2 ft. high: st. much branched: lvs. clasping, lanceolate, or in some forms linear, undulate, glabrous: heads solitary at the ends of the many branches of the infl. Cent. Eu. WILHELM MILLER.

SCOTCH BROOM: *Cytisus scoparius.* **S. Pine:** *Pinus sylvestris.*

SCOURING-RUSH: *Equisetum.*

SCREW BEAN: *Prosopis.* **S. Pine:** *Pandanus.*

SCROPHULÀRIA (a reputed remedy for scrofula). *Scrophulariàceæ.* FIGWORT. Herbs or subshrubs, glabrous or hirsute, often fetid, sparingly grown in the herbaceous border.

Leaves opposite or the upper alternate, entire, incised, or dissected: cymes lax, in a terminal simple or somewhat branched thyrsus: fls. small, rarely rather large, greenish purple, purple, lurid or yellow; calyx deeply 5-cleft or 5-parted; corolla 5-lobed, short, 4 erect, the anterior one spreading; stamens 4, perfect, didynamous: caps. ovoid or subglobose.—About 150 species, Medit. region, Orient and N. Amer.

aquâtica, Linn. A tall glabrous plant: sts. very acute-angled or winged: lvs. ovate-oblong, rather obtuse, base cordate; the petioles winged: thyrse elongated, often 1–2 ft. long, the cymes peduncled, laxly many-fld.: calyx-segms. orbiculate. Eu. and Caucasus. Var. **variegàta,** Hort., the lvs. have a broad white marginal band.

marilándica, Linn. (*S. nodòsa* var. *marilándica*, Gray). A tall-growing hardy perennial herb, usually 5 ft. high, often more, with large, dark green, ovate-acuminate lvs. and small, dull purplish or greenish fls. in a nearly naked, open thyrse. Throughout the U. S. —The plant is sometimes used as a foliage background for the herbaceous border. It is too inconspicuous in fl. and too weedy in habit for general use.

F. TRACY HUBBARD.†

SCURVY-GRASS (*Cochlearia officinalis*, Linn.), a common European perennial, is so called from its anti-scorbutic qualities which have long been recognized. Stimulant, diuretic, stomachic, and laxative properties have been ascribed to it. In general appearance—leaf, flower, and fruit—it somewhat resembles its close relative, water-cress, but in flavor it is acrid, bitter, pungent, and has a strong suggestion of tar. Bruising reveals a disagreeable odor. When cultivated it is treated as an annual, the seed being sown on garden loam in a cool, shady place where the plants are to remain. It is grown to a limited extent in America, has escaped from cultivation, but so far has not become obnoxious as a weed like water-cress and horse-radish. Consult Vol. II, p. 808, for botanical description. M. G. KAINS.

SCUTELLÀRIA (Latin, *dish;* referring to the form of the persistent calyx). *Labiàtæ.* SKULLCAP. Annual or perennial herbs, or decumbent or diffuse rarely tall and erect subshrubs or very rarely shrubs, suitable for outdoor planting.

Leaves opposite, frequently dentate, sometimes pinnatifid or entire; the floral lvs. similar or changed into bracts: fls. in opposite 2-fld. floral whorls or in some species a few at the top, sometimes disposed in all or the lower axils, sometimes in terminal racemes or spikes, blue, violet, scarlet, or yellow; calyx campanulate, 2-lipped; corolla-tube long-exserted, limb 2-lipped; stamens 4, ascending, all fertile, the anterior pair longer: nutlets subglobose or depressed.—About 140 species scattered over the world, mostly in the temperate regions and the mountains, a few in Trop. Afr., not known from S. Afr.

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KEY TO THE SECTIONS.

A. *Floral lvs. membranaceous: fls. 4-angled-spicate or subracemose, scarcely secund.*
Section I. LUPULINARIA. Species 1, 2.

AA. *Floral lvs. herbaceous: fls. secund.*
B. *Fls. not opposite, all or at least the uppermost remote.* Section II. HETERANTHESIA. Species 3.

BB. *Fls. opposite.*
C. *Infl. composed of fls. in terminal single or panicled racemes. (The delimitations between this and the following section are not well marked.)*
Section III. STACHYMACRIS. Species 4–11.

CC. *Infl. composed of fls. solitary in the axils or in axillary and terminal racemes.*
Section IV. GALERICULARIA. Species 12–18.

Section I. LUPULINARIA.

All Old-World species.

A. *Lvs. green on both surfaces or hardly crenate* ..... **1. alpina**
AA. *Lvs. hoary beneath, incise-dentate or pinnatifid* ..... **2. orientalis**

1. alpìna, Linn. A hardy spreading perennial, about 10 in. high, with ovate, serrately dentate lvs. and large, purple and white or somewhat yellowish fls. in dense, terminal racemes. July, Aug. Eu. R.H. 1889:12.—A handsome rock or low border perennial. Var. **álba,** Hort., a white-fld. form offered in the trade. Var. **cærùlea,** Hort., is offered in the trade. Var. **lupulìna,** Benth. (*S. lupúlina,* Linn. *S. lupúlina bícolor,* Hort.), is a form with yellow fls. Var. **rôsea,** Hort., is offered in the trade,

2. orientàlis, Linn. (*S. grandiflòra,* Sims, not Adams. *S. pulchélla,* Bunge). A hardy perennial, procumbent: lvs. long-petioled, ovate, dentate, tomentose: fls. purplish, with a yellow throat or almost entirely yellow. Altai Mts. B.M. 635.

Section II. Heteranthesia.

All American species.

3. Ventenátii, Hook. Perennial: sts. erect, branched, everywhere soft-slender-pubescent: lvs. long-petioled, rather thick, cordate-ovate, rather obtuse, coarsely serrate: racemes terminal, elongated, subsecund or subdistichous: calyx small; corolla scarlet, about 1 in. long, the upper lip deeply 4-cut. Colombia. B.M. 4271. G.C. III. 35:376.

Section III. Stachymacris.

A. *Lvs. subsessile or short-petioled, subentire, lanceolate or linear* ..... 11. **baicalensis**
AA. *Lvs. petioled, crenate or serrate, ovate to subrotundate.*
B. *Base of the lvs. narrowed, blades usually ovate-oblong or oblong-lanceolate.*
C. *Margins serrate* ..... 9. **montana**
CC. *Margins entire* ..... 10. **brevifolia**
BB. *Base of at least some of the lvs. truncate or cordate.*
C. *Floral lvs. sessile or shorter than the calyx.*
D. *Sts. procumbent or low, scarcely 1 ft. high.*
E. *Surface of lf. villous above and below: lvs. small, subrotundate* ..... 4. **indica**
EE. *Surface of lf. hispidulous above: lvs. ovate* ..... 5. **violacea**
DD. *Sts. erect, more than 1 ft. high* .. 6. **altissima**
CC. *Floral lvs. petiolate, equaling or exceeding the calyx.*
D. *Corolla purple to violet* ..... 7. **peregrina**
DD. *Corolla white* ..... 8. **albida**

4. índica, Linn. St. procumbent at base: branches ascending, 6 in. to 1 ft. high: lvs. small, petiolate, rotundate, crenate, base cordate, both surfaces minutely pubescent: raceme dense, subsimple, 3–4 in. long: fls. opposite, secund; calyx pubescent; corolla bluish, rather glabrous, the lower lip very broad. China and Japan. Var. **japónica,** Hort. (*S. japónica,* Morr. & Decne.), grows about 6 in. high: lvs. ovate, gray-green: fls. blue or lilac; corolla pubescent. Japan. P.M. 10: 123. F.S. 2:80. H.U. 5, p. 105. G.M. 57:791.

5. violàcea, Heyne. Herb, 6–12 in. high: st. erect or ascending, pubescent: lvs. petioled, cordate-ovate, 1–3 in. long, crenate, pubescent or glabrous beneath: racemes 4–5 in. long, lax, subsimple: fls. opposite, secund; calyx pubescent; corolla ½in. diam., violet. India and Ceylon. B.M. 8320. G.W. 14, p. 620.

6. altíssima, Linn. St. erect, branched: lvs. petioled, ovate or ovate-lanceolate, crenate, base broad-cordate, scarcely rugose: racemes elongated, somewhat branched, villous: fls. opposite, secund; calyx villous; corolla creamy yellow, 4 times as long as the calyx. S. E. Eu. and Caucasus.

7. peregrìna, Linn. Sts. procumbent: branches elongated, glabrous or pubescent near the ends: lvs. petioled, ovate, obtuse, crenate, base rotund-truncate, glabrous or slightly pubescent: racemes elongated, lax: fls. subsessile, opposite, secund; calyx large, somewhat pilose; corolla violet, pubescent outside. S. Eu. and the Orient.—The sts. and lvs. are frequently glabrous and dark purplish or reddish.

8. álbida, Linn. Branches elongated, pubescent: lvs. 1½ in. long, petioled, broad-ovate, coarsely crenate, base rotundate-truncate or the lowest cordate: racemes often more than 1 ft. long, lax: fls. opposite, secund, subsessile; calyx pilose; corolla ½in. long, dirty white, villous outside. S. E. Eu. and Cent. Asia.

9. montàna, Chapm. Perennial, tomentose-pubescent: st. simple, erect, 1–1½ ft. high: lvs. ovate or oblong-ovate, coarsely and sharply serrate, lowest subcordate, upper acute at both ends, petioled: raceme simple, few-fld.: fls. opposite; corolla large, 1¼–1½ in. long, blue. Mountains of Ga.

10. brevifòlia, Gray. A half-hardy, compact perennial, ½–1 ft. high: lvs. numerous, oblong, narrow, about ½in. long: fls. dark purple, about ¾in. long. Blooming season long; summer. Dry limestone banks, Texas.

Subsection Angustifoliæ.

11. baicalénsis, Georgi (*S. macrántha,* Fisch.). A hardy perennial herb, almost glabrous: st. half erect, about 1 ft. high: lvs. lanceolate, obtuse, ciliate: fls. blue, in many simple racemes; calyx-hood incurved. July, Aug. E. Asia. Var. **cœléstina,** Hort., has large spikes of bright blue fls. July. G.W. 9, p. 61.

Section IV. Galericularia.

A. *Fls. scarlet or red, irregularly arranged in axillary and terminal racemes: lax herbs or shrubs* ..... 18. **Mociniana**
AA. *Fls. blue or violet.*
B. *Infl. composed of axillary racemes: lax, strongly branched herbs* ..... 17. **lateriflora**
BB. *Infl. composed of solitary axillary fls. or the uppermost fls. subracemose.*
C. *Margins of lvs., at least the lower, crenate or dentate or the base hastate* ..... 13. **galericulata**
CC. *Margins of lvs. all entire.*
D. *Blades oblong-lanceolate or linear* ..... 12. **angustifolia**
DD. *Blades ovate*
E. *Lvs. petiolate, remote* ..... 16. **antirrhinoides**
EE. *Lvs. subsessile, approximate.*
F. *Plants without moniliform tubers* ..... 14. **resinosa**
FF. *Plants with moniliform tubers* ..... 15. **Brittonii**

Subsection Genuinæ.

12. angustifòlia, Pursh. A hardy perennial, about 6 in. high, with lvs. ½–1 in. long, narrowed at the base, and violet-blue fls. ¾–1 in. long, with the corolla-tube slender. Moist ground, N. W. U. S.

13. galericulàta, Linn. Hardy, perennial by filiform stolons, 1–3 ft. high: lvs. ovate to oblong-lanceolate, about 2 in. long: fls. solitary in the axils of the upper lvs., about 1 in. long. June–Sept. In moist ground throughout the U. S. and Eu. B.B. 3:83; (ed. 2) 3:109.

14. resinòsa, Torr. (*S. Wrìghtii,* Gray). Plants minutely glandular-pubescent: sts. herbaceous, low, erect and much-branched: lvs. about ½in. long, ovate or spatulate-oblong, very obtuse, both surfaces green, entire, base rotundate or subcuneate not cordate, resinous-glandular: fls. axillary, opposite, secund; calyx glandular-pubescent; corolla blue, densely villous. Kans. to Texas and westward to Ariz. B.B. (ed. 2) 3:108.

15. Brittonii, Porter. Glandular- or viscid-pubescent, branching from the base, 4–8 in. high: lvs. oblong or oval, sessile and entire or the lowest short-petioled and slightly crenulate: fls. solitary in the axils; corolla blue

(pale blue and white according to some). Wyo. and Colo., and probably W. Neb. B.B. (ed. 2) 3:108.—Allied to *S. resinosa.*

16. **antirrhinoìdes,** Benth. Resembles the larger-leaved forms of *S. angustifolia,* but has longer petioles and the lvs. mostly obtuse at base and also shorter and broader fls. 7–10 lines long. Shady ground, N. W. U. S.

Subsection Laterifloræ.

17. **lateriflòra,** Linn. A hardy perennial, increasing by slender stolons, 1–2 ft. high: lvs. ovate to lanceolate, 1–3 in. long: racemes axillary or terminal, narrow, leafy bracted: fls. blue to nearly white. Moist soil throughout the U. S. B.B. (ed. 2) 3:106.

Subsection Perilomioideæ.

18. **Mociniàna,** Benth. A tender, moderately low, shrubby plant, probably the most showy of the genus, with opposite, long-elliptical, acute lvs., and long, tubular, red fls. with a yellow throat, about 1½ in. long, in dense, terminal spikes. Autumn. Mex. R.H. 1872:350. G.W. 11, p. 127. G.Z. 13:2.—According to Gn. 10, p. 606, the plants are of easy cult. with warm greenhouse treatment and may be grown as bush specimens or in smaller pots with a single st., when they will flower at about 1 ft. in height. Cuttings are easily rooted.

S. aurantiaca, Hort., is offered in the trade.—*S. pulchélla,* Hort., not Bunge, belongs to Section III and is closely related to S. indica var. japonica, but the plant has more slender twigs, somewhat smaller lvs. which are short stiff-hairy on the upper surface and a looser raceme with somewhat darker blue fls. Hab.(?). Gt. 6:296.—*S. splèndens,* Link, Klotsch & Otto, belongs to Section II and has broad ovate, obtuse or scarcely acuminate, crenate lvs., with the base cordate and both surfaces hirsute: raceme elongated: fls. sparse; corolla scarlet. Mex. B.M. 4290 (as S. cordifolia).

F. Tracy Hubbard†

SCUTICÀRIA (Latin, *scutica,* lash or whip). *Orchidàceæ.* Orchids remarkable for their long whip-like leaves, which are channeled on one side.

No evident pseudobulbs formed, but each shoot terminating in a long, pendulous lf.: lvs. rather crowded on the short rhizome: fls. solitary or several, on short peduncles, in structure fls. resembling Maxillaria, but the plants are easily distinguished by the terete lvs.; sepals and petals similar, the lateral ones forming a mentum; labellum movable, 3-lobed, with large, erect, lateral lobes; pollinia on a transversely elongated stipe.—Two species from S. Amer.

3581. Scuticaria Steelii.

These plants require a temperature similar to cattleya and lælia, but should be grown on blocks or in shallow baskets in a mixture of equal parts peat fiber and sphagnum. *S. Steelii* does best on a block, as the plant grows downward in an inverted position. The compost should be kept moist, particularly while the plants are in action. They are propagated by division. (R. M. Grey.)

Steèlii, Lindl. Fig. 3581. Lvs. attain a length of 4 ft., as thick as a goose-quill: fls. on short scapes; sepals and petals oblong, connivent, pale yellow, with chocolate blotches; labellum large, cream-colored, striped with brownish purple, at all seasons. British Guiana. B.M. 3573. B.R. 1986 (both as *Maxillaria Steelii*).

Hádwenii, Planch. Lvs. 1½ ft. long: fls. with spreading sepals and petals oblong, sharply acuminate, yellowish green, blotched with brown; labellum obovate-cucullate, white with flesh-colored spots. Brazil. B.M. 4629. F.S. 7:731 (both as *Bifrenaria Hadwenii*). G.M. 41:558.

Heinrich Hasselbring.

SCYPHÁNTHUS (Greek, *beaker* and *flower,* alluding to the shape of the flower). Syn., *Grammatocárpus. Loasàceæ.* Climbing pubescent half-hardy annual herbs for outdoor border planting: lvs. opposite, 2–3-pinnatisect: fls. axillary, sessile, yellow; calyx-tube linear-elongate, lobes 5, spreading, linear-spatulate; petals 5, saccate, alternate, with smaller scales which are hooded, 3-aristate and at base have 2 calli; stamens very many, in 5 fascicles opposite the petals, staminodia 10, in pairs opposite the scales; ovary elongated, 1-celled: caps. linear, upright, longitudinally 3-valved.—One or 2 species, Chile.

élegans, Don (*Grammatocárpus volùbilis,* Presl). Sts. herbaceous, climbing and twining, frequently branched: lvs. opposite, rough with minute deflexed hairs, the lower ones bipinnatifid, the upper ones smaller and only pinnatifid, all the segms. oblong, 1-nerved; petiole short, channeled: fls. really sessile but appearing peduncled from the elongated inferior ovary, terminal or axillary, yellow, calyx-tube very long and incorporated with the ovary, limb of 5 spreading, spatulate, leafy segms.; petals 5, forming a cup, obovate-spatulate, deeply saccate below the middle. B.M. 5028. J.H. III. 44:272.

F. Tracy Hubbard.

SEAFÓRTHIA (Francis Lord Seaforth, patron of botany). *Palmàceæ.* A genus of palms, founded by Robert Brown on an Australian species, usually considered as synonymous with Ptychosperma. The *Seaforthia elegans* of cultivation, however, is said to be Archontophœnix, mostly *A. Cunninghamii* and perhaps some of it *A. Alexandræ;* the original species described by Brown as *S. elegans* becomes *Ptychosperma elegans,* Blume.

According to Dammer (G.C. III. 31, pp. 18–20) the true *Ptychosperma elegans* of Blume is met with but rarely in European gardens. What is cultivated under this name in most cases is either *Archontophœnix Cunninghamii* or *A. Alexandræ.* These archontophœnixes "are decorative hardy palms, forming on the Riviera very fine high-stemmed specimens. In youth they form bifid leaves, the blade almost horizontal. After having made some four to six such leaves, each larger than the foregoing, there appears a fully pinnate leaf, much differing in mode of growth from Phœnix and other pinnatisect-leaved palms." *Seaforthia elegans,* Hort., and *Ptychosperma elegans,* Hort., are apparently sometimes *Archontophœnix Cunninghamii* and sometimes *A. Alexandræ.* The last is very like *A. Cunninghamii,* but, according to Dammer, differs in its segments, which are green only above while underneath they are ashy-glaucous or white; it is well figured in G.C. III. 31:19; also in B.M. 4961 as *Seaforthia elegans. A. Cunninghamii* is figured in B.M. 7345 as *Ptychosperma elegans.* The true *Ptychosperma elegans,* Blume (*Seaforthia elegans,* R. Br., not Hort.), with pinnules erose rather than acuminate at apex, is figured in G.C. III. 31:21.

In a recent study, O. F. Cook separates the plant grown in California under the name of *Seaforthia elegans* into a new genus, Loroma, making the species *L. amethystina;* probably from Australia. He also retains the genus Seaforthia for *S. elegans,* R. Br.

SEA-KALE (*Crambe maritima,* Linn.) is a large-leaved strong cruciferous perennial, the young shoots of which are eaten in the spring, usually after having been blanched. The plant is little known in North America, but it is worthy of general cultivation in the home-garden, for it supplies an esculent of good quality

at a season when vegetables are scarce. Sea-kale demands a deep rich and rather moist soil, in order to give the best results and to maintain its vigor for a series of years. The plants require about as much room as rhubarb; that is, they should stand from 3 to 4 feet apart each way. The culture and general requirements are much the same as for rhubarb. The young shoots are blanched as they grow, in early spring. The blanching is accomplished by heaping fine loose earth over the crown of the plant, into which the shoots grow, or by covering the plant with an inverted box or flower-pot so that the light is excluded from the growing shoots. These shoots are eaten before the leaves have begun to expand to any extent, whilst crisp and tender. The vegetable is prepared as is asparagus.

Sea-kale is propagated by root-cuttings, and also by seeds. Quicker results are secured from cuttings. If strong cuttings, 4 or 5 inches long, are taken in early spring and grown in good and rather moist soil, the plants may be strong enough for cutting the following spring; but it is usually better not to cut them until two years from starting. The cuttings may be placed where the plants are to stand permanently, or they may be grown in drills in a seed-bed. The latter plan is usually to be preferred, since it allows the plants to receive better care. Seeds give plants that are strong enough for cutting about the third year. The seeds are really fruits or pods, and each fruit may produce two or three plants. Usually the fruits are sown without shelling. The seedlings are raised in the seed-bed and transplanted when one year old to permanent quarters. On good soil, plants of sea-kale should maintain their vigor for five to eight years after they have come to cutting age. As soon as they begin to show signs of decline, new plants should be propagated. Although the plant is hardy in the northern states, it is always benefited by a liberal dressing of litter or manure in the fall. Plants may be forced in hotbeds or under the greenhouse benches, as recommended for rhubarb. Sea-kale has large glaucous cabbage-like leaves which make it a striking plant for ornament early in the season. It also throws up a strong cluster bearing many rather showy white flowers. However, the plant is rarely propagated for its ornamental value. For botanical description, see Vol. II, p. 873.

L. H. B.

SEA-LAVENDER: *Statice.* **S.-onion:** *Urginea maritima;* also applied to *Ornithogalum caudatum* and *Scilla verna.* **S. pink:** *Armeria.*

SEBASTIÀNIA (from Antonio Sebastiani, a writer on Roman plants 100 years ago). *Euphorbiàceæ.* Tropical shrubs scarcely in cult.: juice milky: lvs. alternate, small, usually entire: infl. usually terminal: fls. apetalous; staminate calyx with 2–3 sepals free or connate at the base, imbricate; stamens 1–5; ovules 1 in each cell of the ovary: seed carunculate. About 75 very variable species, all tropical except *S. ligústrina,* Muell. Arg., in swamps from N. C. to Fla. *S. Pálmeri,* Rose, has very poisonous juice and the seeds are among the best known of the "Mexican jumping beans" which are inhabited by a small lepidopterous larva whose actions cause the springing motions of the seeds.

J. B. S. Norton.

SECÀLE (the ancient Latin name, said to be derived from *seco,* to cut; according to some applied to spelt). *Gramíneæ.* Spikelets with 2 perfect fls., sessile on opposite sides of a zigzag rachis, forming a terminal spike; glumes subulate, 1-nerved; lemmas keeled, long-awned.—Species 2, *S. fragile,* an annual of S. Russia, and *S. cereale,* the cult. rye, which, according to Hackel, is derived from a wild perennial form (*S. montanum,* Guss.), native in mountains, S. Eu. and Cent. Asia.

cereàle, Linn. Rye. Tall annual, commonly cult. in Eu., less so in U. S., as a cereal. Also cult. here for annual pasture. Dept. Agric., Div. Agrost., Bull. 20:163.

A. S. Hitchcock.

SÈCHIUM (probably from the Greek *sekos,* "to fatten in a fold," because it was fed to hogs). *Cucurbitàceæ.* A climbing sparsely hairy herb, with perennial tuberous roots, grown in tropical and subtropical regions for its large fruits, which somewhat resemble the summer squash in use and character.

Leaves membranaceous, 3-angled or -lobed, cordate at the base; tendrils 2–5-branched, opposite the lvs.: fls. small, monœcious, axillary, the pistillate solitary, the staminate in small clusters; calyx-tube saucer-shaped, the limb 5-lobed; corolla rotate, deeply 5-parted, the segms. ovate-lanceolate; filaments and styles connate into a central column, of which the anthers appear as lobes, while the stigmas are closely set together, forming a small head: fr. pear-shaped or globose, fleshy, 1-seeded.—One species, indigenous in Mex. and Cent. Amer. and widely planted.

edùle, Swartz (*Chayòta edùlis,* Jacq.). Chayote. Chayotli. Chouchoute. Chocho, Chuchu, or Xuxu. Choko. Chaiota. Mirliton. Christophine. Pipinella. Fig. 3582. Sts. herbaceous, annual, sometimes making a growth of 50 ft. in one season, if the

3582. Fruit of Sechium edule. (×½)

plant is grown on rich well-drained ground: large tuberous roots are formed the second season: lvs. 4–6 in. long, resembling those of the cucumber, deep green, somewhat rough, scarcely hairy; corolla greenish or cream-colored: fr. 3–8 in. long; seed single, flat, 1–2 in. long, attached at the upper end of the cavity. G.C. 1865:51; III. 24:476; 28:450.

The chayote is grown successfully in southern California and about New Orleans, where it is fairly common. In Florida it is not yet common, but its culture is being extended rapidly. It can probably be grown successfully in those parts of the South where the ground does not freeze in winter. The fruit is round to pear-shaped, smooth or corrugated, the surface sometimes covered with small soft spines. The color varies from nearly white to dark green, the flesh being firm, crisp, and more delicately flavored than the squash. The cooked fruit can be creamed, baked, or made into fritters, sauces, tarts, puddings, salads, or used like potatoes with other meats and vegetables. The young spring shoots, tender branches, and tuberous roots form palatable dishes, while the woody stems furnish a fine fiber, known in French as "paille de chouchou." The fruits, vines, and tubers are excellent fodder for stock.

The entire fruit is planted in early spring, and the vine should come into fruit after the rainy season, remaining in fruit (in the southern United States) until the plant is cut down by frost. Plants should be 8 to 10 feet apart, and trained on an arbor or trellis. In

Florida and the Carolinas, a vine may yield fifty to one hundred or more fruits in a season. The fruit can easily be shipped, and stored for two to four months at moderate temperatures. In tropical and subtropical regions there are numerous varieties, differing somewhat in flavor and value. NATHAN MENDERSON.

SECURINÈGA (Latin, *securis*, hatchet, and *negare*, to refuse, alluding to the hard wood). *Euphorbiàceæ*. Shrubs sometimes grown for the bright green foliage.

Deciduous: lvs. alternate, short-petioled, entire, stipulate: fls. dicœcious or moncœcious, apetalous, axillary, the pistillate solitary or few, the staminate in fascicles; sepals 5; stamens usually 5, with a 5-lobed disk at the base; pistillate fls. with entire disk; ovary 3-celled, with 3 2-lobed styles: fr. a 3-lobed dehiscent caps., 3–6-seeded.—About 10 species in temperate and subtropical regions of S. and Cent. Amer., Asia, Afr., and S. Eu.

The species in cultivation are bushy round shrubs with slender wand-like branches, rather small bright green foliage, inconspicuous greenish white flowers in axillary clusters or solitary and with small subglobose greenish capsules. They have proved fairly hardy at the Arnold Arboretum, usually only the tips of the young branchlets being winter-killed, and do not seem particular as to the soil. Propagation is by seeds which are usually freely produced when the two sexes are present, and by greenwood cuttings under glass.

ramiflòra, Muell. Arg. (*Géblera suffruticòsa*, Fisch. & Mey. *Flúggea suffruticòsa*, Baill. *Acidòton ramiflòrus*, Kuntze). Shrub, 3–6 ft. high, with greenish branchlets: lvs. short-petioled, oval or ovate to ovate-lanceolate, acute or obtuse, cuneate at the base, entire, bright or yellowish green, glabrous, thin, 1–2 in. long: staminate fls. about 1½ lines across, in 5–10-fld. clusters; pistillate solitary: fr. about ⅛in. across, greenish. July, Aug. S. Siberia to Amurland and N. China.

S. flueggeoides, Muell. Arg. (S. japonica, Miq.). Very similar to S. ramiflora: branchlets soon becoming brown or purple: lvs. usually more obtusish: pistillate fls. 2–5. Japan, Korea, N. and Cent. China. —*S. Leucopyrus*, Muell. Arg.=Fluggea Leucopyrus.

ALFRED REHDER.

SEDÁSTRUM (*Sedum* and *star*). *Crassulàceæ*. A genus founded in 1905 to include seven species, most of which had been theretofore referred to Sedum, but differing from that genus in having erect rather than spreading carpels, slender styles, and other characters. Mexican cespitose perennials, with numerous sts. arising from a dense basal rosette of lvs. and dying to base after flowering: st.-lvs. alternate, mostly broad, fleshy: fls. in a more or less paniculate leafy infl.; calyx green and deeply cleft; corolla white or whitish, with distinct spreading lobes. Probably none is regularly in cult., but at least *S. ebracteàtum*, Rose (*Sèdum ebracteàtum*, Moc. & Sesse), has been listed abroad: fl.-sts. about a foot long, ascending or procumbent, pubescent, leafy, somewhat branching, bearing sessile or short-pedicelled whitish fls.: basal lvs. obovate or spatulate, flattened and fleshy, hairy or at least ciliate on margins.

SÈDUM (Latin, *sedes*, to sit: the plants fix themselves on rocks and walls). *Crassulàceæ*. Succulent herbs, rarely subshrubs, mostly hardy and perennial, useful for rockeries and one species, *S. spectabile*, a frequent showy border plant. See *Succulents*, Vol. V, page 2672.

Plants glabrous or glandular-pubescent, fleshy, erect or decumbent, sometimes cespitose or moss-like: lvs. very variable, opposite, alternate or whorled, entire or serrate: fls. cymose in a few axils and solitary, white, yellow, or rose, rarely red or blue, hermaphrodite or unisexual by abortion; calyx 4–5-lobed; petals 4–5 (rarely 6–7), free; stamens 8–10 (rarely 12–14); ovary 4–5-carpelled: follicles 4–5, free, many- or few-seeded.—About 280 species, mostly natives of the temperate and colder regions of the northern hemisphere. The hardy sedums are monographed, from a horticultural point of view, by M. T. Masters in Gardener's Chronicle for 1878. Masters' descriptions and treatment have been partially followed in the present revision. The variability of the lf. is very noticeable both in thickness and breadth, some being thick and terete, others flat and thin, though all of them tending toward fleshy. Some are quite linear and from that they range to nearly 1½ in. broad. The margin is also variable from entire to deeply dentate. The synonymy of the species is much involved and in some groups, especially the Telephium group, the specific delimitation is very uncertain; in fact the whole genus needs monographic study. The present key is an attempt to differentiate the more prominent forms as they occur in horticulture and is based in part on literature and in part on herbarium specimens. It is unfortunately not altogether satisfactory but may prove of some value in separating the species.

Sedums are of the easiest culture. As a rule, they prefer sandy soil, and are very averse to a wet position in winter. Some are useful plants for carpeting poor and sandy waste places where few other things will grow. The little yellow-flowered plant with pulpy foliage that spreads in nearly every cemetery is *Sedum acre*. Sedums are also general favorites in all forms of rock-gardening. They are much used for carpet-bedding, especially the kinds with mealy or glaucous foliage, and those with various metallic shades of purple. In the hardy border, the more robust and bushy kinds, like *S. maximum* and *S. spectabile*, are preferred, though any of the lower-growing kinds are suitable for edgings and any of the evergreen kinds are welcome in winter when the hardy border shows few other bits of color or signs of life. As a rule, sedums like the sun, but a few of the species may help to solve the difficult problem of carpeting the ground underneath the trees where the soil is dry and shaded. Sedums are also favorites for baskets and vases, especially the kinds with trailing stems and minute leaves. For greenhouse decoration, *S. spectabile* is the favorite, as it is perhaps the showiest of the genus. It may be had in flower at any season of the year and remains in bloom a long time. It is also one of the favorite sedums for window-sills, balconies, and house-tops, especially in crowded cities. *Sedum acre*, however, is everybody's plant. A piece of it is often the only pleasant sight in an ugly city alley. Sedums can be propagated by seeds, but they are easily multiplied by the young offsets. These rosettes are somewhat bulb-like in nature and sedums could probably be propagated if it were worth while by using each leaf of a rosette. (Wilhelm Miller.)

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KEY TO THE SPECIES.

A. *Lvs. terete or subterete (that is, relatively thick as compared to breadth).*
B. *Fls. yellow (except a white-fld. variety of No. 1).*
C. *Lf.-blades broad as compared to length.*
D. *Petals without a dorsal awn....* 1. **acre**
DD. *Petals with a short dorsal awn..* 2. **Stahlii**
CC. *Lf.-blades narrow as compared to length (usually linear).*
D. *Apex of lvs. blunt.*
E. *The lvs. papillose-pilose.....* 3. **multiceps**
EE. *The lvs. glabrous.....* 4. **sexangulare**
DD. *Apex of lvs. acute or acuminate.*
E. *Base of lvs. membranaceous and dilated, abruptly tapered to a much narrower upper part.....* 5. **tenuifolium**
EE. *Base of lvs. not distinctly dilated, not abruptly tapered to a much narrower upper part.*
F. *Petals acute or acuminate.*
G. *Sepals subulate.....* 6. **stenopetalum**
GG. *Sepals ovate-lanceolate.*
H. *Apex of sepals acutish.* 7. **sarmentosum**
HH. *Apex of sepals blunt..* 8. **Forsterianum**
FF. *Petals blunt.*
G. *The lvs. incurved, those of the barren shoots forming dense conical rosettes.....* 9. **rupestre**
GG. *The lvs. reflexed, those of the barren shoots not forming such marked rosettes.....* 10. **reflexum**
BB. *Fls. white, pink, or purplish.*
C. *Lf.-blades broad as compared to length.*
D. *Sepals ovate.....* 11. **anglicum**
DD. *Sepals oblong or linear to linear-lanceolate.*
E. *Petals oblong and blunt.*
F. *Color of fls. blue (sometimes rosy lilac).....* 12. **cæruleum**
FF. *Color of fls. white with the midrib of the petals pink.* 13. **brevifolium**
EE. *Petals lanceolate and acute.*
F. *Plant farinose-pruinose...* 14. **farinosum**
FF. *Plant not farinose-pruinose though often more or less glaucous.*
G. *Sts. much branched at the base: branches diffuse: fls. less than ¼in. across.....* 15. **dasyphyllum**
GG. *Sts. rather simple: branches short and not diffuse: fls. nearly ⅜in. across.....* 16. **potosinum**
CC. *Lf.-blades narrow as compared to length.*
D. *Petals relatively rather broad, their base somewhat narrowed.*
E. *The lvs. oblong or oblanceolate-oblong.....* 17. **pilosum**
EE. *The lvs. linear.*
F. *Sts. viscid-pilose above: sepals ovate.....* 18. **villosum**
FF. *Sts. not viscid-pilose though somewhat glandular-pilose above: sepals deltoid..* 19. **hispanicum**
DD. *Petals relatively narrow, usually lanceolate, their base broad.*
E. *Barren shoots lacking.....* 20. **arboreum**
EE. *Barren shoots present.*
F. *Sepals lanceolate, relatively narrow.....* 21. **pulchellum**
FF. *Sepals deltoid, ovate, oblong or elliptic, relatively broad.*
G. *Infl. glandular.....* 22. **monregalense**
GG. *Infl. not glandular.*
H. *The infl. rather openly racemose-cymose....* 23. **Alberti**
HH. *The infl. more or less densely corymbose-cymose.*
I. *Buds 5-angled: fls. pinkish.....* 24. **lydium**
II. *Buds nearly terete, oblong: fls. white.* 25. **album**
AA. *Lvs. flat (that is, relatively thin as compared to breadth).*
B. *Fls. unisexual (diœcious).*
C. *Color of fls. yellow.....* 26. **Kirilowii**
CC. *Color of fls. greenish or reddish purple.....* 27. **roseum**
BB. *Fls. bisexual (hermaphrodite).*
C. *The fls. yellow or greenish yellow, one species orange-yellow (fls. of No. 30 become pink with age).*
D. *The lvs. commonly not twice as long as broad (in No. 29 just about half as broad as long).*
E. *Sepals ovate.....* 28. **dendroideum**
EE. *Sepals linear to lanceolate.*
F. *Margin of lvs. dentate above.* 29. **Woodwardii**
FF. *Margins of lvs. entire.*
G. *Petals united below.....* 30. **oreganum**
GG. *Petals not united below.*
H. *Apex of lvs. rounded or retuse.....* 31. **spathuli-** [**folium**
HH. *Apex of lvs. apiculate.* 32. **Palmeri**
DD. *The lvs. commonly much more than twice as long as broad (some specimens of No. 42 have the lvs. only twice as broad as long).*
E. *Margin of lvs. entire.*
F. *Lvs. in rosettes, at least those of the barren shoots.* 33. **obtusatum**
FF. *Lvs. scattered.*
G. *Petals oblong, boat-shaped.....* 34. **nicæense**
GG. *Petals lanceolate.*
H. *Sepals spatulate .....* 35. **formosanum**
HH. *Sepals oblong.....* 36. **japonicum**
EE. *Margin of lvs. dentate or serrate.*
F. *Plant spreading-pilose ....* 37 **Selskianum**
FF. *Plant glabrous (sometimes glandular in No. 39).*
G. *The sepals linear or linear-oblong.*
H. *Outline of petals fusiform with the base slightly broadened and the apex long-acuminate.....* 38. **Midden-** [**dorffianum**
HH. *Outline of petals lanceolate, apex acuminate .....* 39. **hybridum**
GG. *The sepals lanceolate or oblong-lanceolate.*
H. *Petals oblong.....* 40. **asiaticum**
HH. *Petals lanceolate.*
I. *Buds flask-shaped..* 41. **Maximowiczii**
II. *Buds conical.*
J. *Lvs. oblong-ovate: plant about 6–8 in. high.....* 42. **kamtschati-** [**cum**
JJ. *Lvs. oblong-lanceolate: plant usually 1½–2 ft. high.....* 43. **Aizoon**
CC. *The fls. white, pink, red, violet, or purple.*
D. *Lf.-blades ¾–1 in. or more broad in the widest place.*
E. *Plants pubescent or puberulent.* [**voides**
F. *Margin of lf. entire.....* 44. **sempervi-**

FF. *Margin of lf. dentate-crenate*.....45. **oppositifolium**
EE. *Plants glabrous.*
F. *Lvs. noticeably petioled*....46. **populifolium**
FF. *Lvs. sessile or nearly so.*
G. *Arrangement of lvs. in whorls of 3*.....47. **Sieboldii**
GG. *Arrangement of lvs. opposite or alternate (rarely in whorls of 3 in No. 49).*
H. *Base of lvs. more or less cordate-clasping*.48. **maximum**
HH. *Base of lvs. more or less cuneate.*
I. *The lvs. opposite, rarely in whorls of 3*.....49. **spectabile**
II. *The lvs. alternate (rarely opposite in No. 52).*
J. *Fls. greenish white; sepals broad-deltoid*...50. **alboroseum**
JJ. *Fls. some shade of pink.*
K. *Margin of lvs. nearly entire*.51. **telephioides**
KK. *Margin of lvs. strongly dentate.*
L. *Blades of lvs. oblong-ovate*.....52. **Telephium**
LL. *Blades of lvs. lanceolate or elongate-lanceolate*.53. **Fabaria**
DD. *Lf.-blades ½in. or less broad in the widest place.*
E. *Lvs. of the barren shoots in whorls of 3*.....54. **ternatum**
EE. *Lvs. not in whorls of 3.*
F. *Surface of lvs. densely papillose*.....55. **primuloides**
FF. *Surface of lvs. not densely papillose.*
G. *Arrangement of lower lvs. opposite.*
H. *Petals ovate-oblong*...56. **cyaneum**
HH. *Petals lanceolate to lanceolate-oblong.*
I. *Outline of lvs. suborbicular*.....57. **Ewersii**
II. *Outline of lvs. spatulate or obovate-cuneate*.....58. **stoloniferum**
GG. *Arrangement of lower lvs. alternate (rarely opposite in No. 63).*
H. *Sepals blunt, oblong or linear-oblong.*
I. *Apex of lf. retuse*...59. **Nevii**
II. *Apex of lf. deltoid-acute*.....60. **retusum**
HH. *Sepals acutish, lanceolate.*
J. *The lvs. oblong-spatulate*.....61. **Cepæa**
JJ. *The lvs. more or less orbicular.*
K. *Margin of lf. entire*.....62. **Anacampseros**
KK. *Margin of lf. crenate at the very obtuse apex*.....63. **stellatum**

1. àcre, Linn. (*S. negléctum*, Ten.). Stonecrop. Wall Pepper. Love Entangle. Fig. 3583. Perennial, glabrous, cespitose: barren sts. creeping, branched, about 2 in. long; fl.-sts. 2–3 in. high: lvs. minute, about ¼in. long, fleshy, ovate, crowded, gibbous at base, sessile: fls. yellow, about ½in. across, in 1-sided cymes, which have 2–5 forks; sepals lf.-like; petals lanceolate. Eu., N. Afr., E. Asia, and naturalized in N. Amer. Gn. 27, p. 316.—This is the commonest native species in England and one of the commonest in cult. Thrives best in poor soil and is a good ledge-plant and is frequently used for covering rather arid spots which would otherwise be bare. The lvs. have an acrid taste. Var. **álbum,** Hort., is a white-fld. form. Var. **aùreum,** Mast., has the lvs. and shoot-tips bright golden yellow in spring. The yellow tint is lost later in the summer, but the variety is never so robust as the green form. Excellent for spring bedding, to give a bit of color. Var. **élegans,** Mast., has the tips and young lvs. pale silvery. More delicate than var. *aureum* and not so effective. Var. **hawaiànum,** Hort., is offered in the trade. Var. **màjus,** Mast., is larger and more robust than the type: lvs. in 7 rows, deltoid-ovoid, scarcely auricled at base: fls. ¾in. across, in a 2-parted cyme, with a central sessile fl.; sepals linear-oblong. Morocco. Var. **Maiveàna,** Hort., is said by the trade to be the same as var. *hawaiànum*. Var. **sexangulàre,** Hort., is offered in the trade; it probably is *S. sexangulare*.

2. Stáhlii, Solms. Perennial, trailing, much branched, puberulent: sts. green or pinkish; fl.-sts. 4–6 in. high: lvs. opposite or nearly so, sessile, nearly round in cross-section, ovoid or ellipsoid, ¼–½in. long: fls. yellow, 7–9 lines across, in few-branched terminal cymes, the branches of which are recurved; sepals puberulent, linear-oblong; petals lanceolate, with a short dorsal awn just below the apex. Mex.

3. múlticeps, Coss. & Dur. Perennial, about 2–6 in. high, base subshrubby, much branched: barren shoots flexuous or erect, bearing dense rosettes of lvs. at their tips; fl.-sts. usually taller, erect: lvs. ⅛–¼in. long, glaucous or pruinose, pinkish and papillose, linear or oblanceolate, subterete: fls. pale yellow, about ½in. across, 5-merous, in many-branched, 2–6-fld., scorpioid cymes; sepals linear-oblong; petals oblong-lanceolate; anthers pale yellow. Algeria. G.C. II. 10:717.

4. sexangulàre, Linn.? (*S. ácre* var. *sexangulàre*, Godr. *S. boloniénse*, Lois. *S. Forsteriànum*, Reichb., not Smith. *S. pulchéllum*, Hort., not Michx.). Perennial, glabrous: barren shoots ascending 2–3 in., branched; fl.-st. erect, 2–3 in. high, very slender: lvs. densely crowded in 6–7 rows, about 2 lines long, linear-cylindrical, slightly gibbous at base: fls. yellow, ½in. across, in a 3–5-branched umbellate cyme, 1–3 in. diam.; sepals linear-oblong; petals lanceolate. Eu. The Linnean material probably differs very little from *S. acre*, but the horticultural material (especially the European) may be distinct.

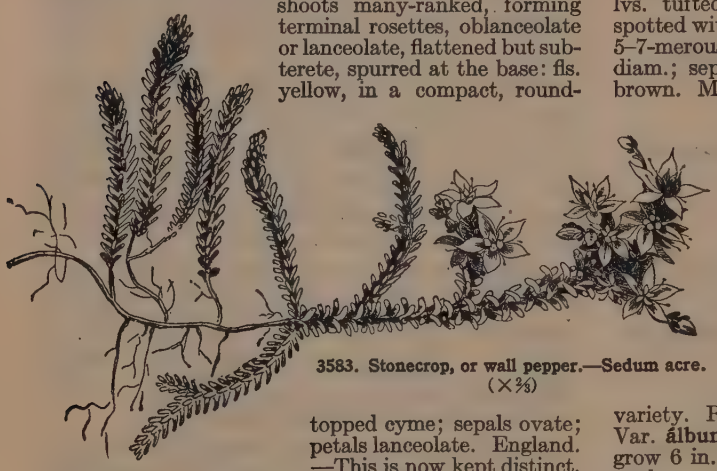
5. tenuifòlium, Strobl. (*S. amplexicaùle*, DC. *Sempervìvum tenuifòlium*, Sibth. & Smith). Perennial, glabrous, evergreen: barren branches 2–4 in. long, slender, wiry, ascending; fl.-sts. decumbent, ascending, about 6–9 in. high.: lvs. of the barren shoots dilated and membranous at base, gradually tapering to a long awl-like point; of the fl.-sts. alternate, sessile, ½in. long, terete, with a membranous auricle at base: fls. numerous, golden yellow, secund in 2-forked cymes, with a sessile fl. in the fork; sepals ovate, oblong, acute, united below into a cup-shaped tube; petals oblong-lanceolate, ¼in. long, keeled; filaments greenish, anthers yellow. Medit. region.—There are often 6–10 petals in this species.

6. stenopétalum, Pursh. Perennial, tufted, glabrous: sts. 3–6 in. high, erect from a decumbent base: lvs. crowded on the barren shoots, sessile, linear or lanceolate, ½in. long, terete: fls. bright yellow, in much-branched scorpioid cymes; sepals subulate; petals linear-lanceolate, acuminate. Alberta to S. D., Neb., New Mex., and Calif.

7. sarmentòsum, Bunge. Perennial, glabrous: shoots slender and prostrate: lvs. crowded, opposite or whorled, ½–¾in., linear, terete or slightly flattened: fls. bright yellow, ¼in. across, numerous, in a flat-topped, umbellate, 3–5-forked cyme, with a solitary fl. in the forks; branches recurved, the fls. on the upper surface only;

sepals ovate-lanceolate, fleshy; petals lanceolate; stamens yellow. China. Var. **cárneum,** Hort. (*S. cárneum variegàtum*, Hort.), has pink sts.: lvs. with a marginal stripe of white or cream-color.—A good greenhouse plant and also good for edging.

8. **Forsterianum,** Smith. Perennial, forming small tufts, glabrous or slightly glaucous: lvs. of the barren shoots many-ranked, forming terminal rosettes, oblanceolate or lanceolate, flattened but subterete, spurred at the base: fls. yellow, in a compact, round-topped cyme; sepals ovate; petals lanceolate. England.—This is now kept distinct, but it has been referred to *S. rupestre* and also to *S. pruinatum*, a species which does not seem to be in cult. and it has also been treated as a variety of both these species. Var. **glanduliferum,** Hort., is offered in the trade.



3583. Stonecrop, or wall pepper.—Sedum acre. (×⅔)

9. **rupéstre,** Linn. Perennial, glaucous, reddening with age and drought: barren shoots numerous, creeping, 1–3 in. long; fl.-sts. ascending or erect, 6–12 in. high: lvs. ½in. long, in numerous rows, linear, subulate, incurved, flattened above, forming dense conical rosettes which are ¾–1 in. diam., at the ends of the sterile shoots: fls. numerous, yellow, barely ½in. across, 5–7-merous, in umbellate, 3–5-forked, ultimately hollow-topped cymes; sepals ovate, oblong; petals ovate, oblong; anthers yellow. W. Eu. Closely allied to and confused with *S. reflexum*. Var. **spirale,** Hort., is offered in the trade.

10. **refléxum,** Linn. (*S. collinum*, Willd.). Perennial, glabrous: sts. trailing; fl.-sts. erect, 8–10 in. high: lvs. in 6 or 7 rows, crowded on the barren shoots into a conical mass, but not forming so marked a rosette as in typical *S. rupestre*, ½–¾in. long, linear-subulate, reflexed, terete, gibbous at base: fls. 4–8-merous, yellow, ¾in. across, in a decurved, many-fld. umbellate cyme which is many-branched, with a fl. in each fork; sepals oblong-lanceolate; petals linear; anthers yellow. Eu. Also escaped in N. E. N. Amer. Var. **albéscens,** Mast. (*S. albéscens*, Haw. *S. glaùcum*, Smith), is glaucous: lvs. rarely in rosettes: fls. ½in. across, 6-merous. Eu. and N. Afr. Var. **cristàtum,** Mast. (*S. monstròsum*, Hort. *S. robústum*, Hort.), has the sts. fasciated so as to form a crest like a cockscomb. Var. **viréscens,** Mast. (*S. viréscens*, Willd.), is similar to var. *albescens*, but has pale sulfur-yellow fls.—This species and its varieties are treated by some authorities as a part of *S. rupestre*.

11. **ánglicum,** Huds. Perennial, about 3 in. high, glabrous, evergreen: barren shoots trailing or erect, forming dense masses; fl.-sts. about 2 in. high: lvs. crowded, alternate, on the fl.-sts. somewhat opposite and less crowded, ⅛–¼in. long, ovate or ovate-lanceolate, green, becoming red-tinged: fls. white or rosy tinted, about ⅜in. across, in few-fld. dichotomous cymes; sepals ovate; petals lanceolate; anthers red, becoming black. W. Eu. Gn. 79, p. 366.—A good plant for the rockery, though rather difficult to grow.

12. **cærùleum,** Linn.; also spelled *cæruleum* (*S. azùreum*, Desf.). Fig. 3584. Annual, glabrous, or pilose in the infl.: sts. 2–3 in. high, branched from the base: lvs. tufted, ¼in. long, oblong, obtuse, pale green, spotted with red: fls. pale blue to rose-lilac, ¼in. across, 5–7-merous, in a lax, many-fld. cyme, which is 1 in. diam.; sepals oblong; petals oblong; anthers reddish brown. Medit. region. B.M. 2224. B.R. 520. Gn. 27, p. 315.—Said to thrive in a sandy soil, and to be adapted to carpet-bedding.

13. **brevifòlium,** DC. Perennial, said to grow about 4 in. high, glaucous, tufted: lvs. crowded in 4 rows, about $\frac{1}{10}$in. long, ovoid, subglobose, pinkish, densely mealy pubescent: fls. white, ¼in. across, in an umbellate, 2–3-forked cyme, with a pedicellate fl. in the center of each fork; sepals oblong-lanceolate, whitish with a pink midrib; petals oblong, with a pink midrib; anthers pink. France and Medit. region.—Closely related to *S. dasyphyllum* of which some authorities have made it a variety. Rather tender and sensitive to root-moisture. Var. **álbum,** Hort., is said to have bronzy lvs. and to grow 6 in. high. Var. **Pőttsii,** Hort., is offered in the trade as a form with tiny round lvs., covered with white meal.

14. **farinòsum,** Lowe. Perennial, glaucously pruinose, glabrous: sts. tufted, creeping, much branched: lvs. crowded in 4–6 rows, deciduous, ½ x ¼in., oblong, very obtuse: fls. white or flesh-color, nearly sessile, ½in. across, crowded in a 2–3-parted cyme, 5–7-merous; calyx-tube very short, segms. linear-oblong, pink-tipped; petals lanceolate, acute, keeled; anthers purplish brown. Madeira.—Masters says that most of the material cult. under this name is really *S. album*.

15. **dasyphýllum,** Linn. (*S. glaùcum*, Lam.). Perennial, about 2–4 in. high, glabrous: sts. tufted, slender, branching: lvs. crowded, sessile, spreading, oblong-acute or suborbicular, thick, studded with crystalline pimples: fls. white to pinkish, about ⅓in. across, in lax, few-fld., corymbose cymes; sepals oblong, fleshy; petals lanceolate; anthers black. Eu., N. Afr.—The material cult. under the name of *S. glaucum* probably belongs here; see also *S. rupestre* and *S. hispanicum*. Var. **glanduliferum,** Moris (*S. córsicum*, Duby), has minute gray-green lvs. which are more or less densely glandular-pubescent: fls. white. Corsica and N. Afr. B.M. 6027. There is a form of this offered in the trade under the name of *S. córsicum* var. *grandiflòrum*, Hort.

3584. Sedum cæruleum. (Natural size)

16. **potosìnum,** Rose. Sts. low and weak, at first erect, but soon prostrate or at most ascending; fl.-sts. 2–4 in. high, slender: lvs. crowded, rhomboid-subspherical, nearly terete, ¼–⅜in. long, obtuse, pale green, glabrous, papillose(?), slightly glaucous: fls. white or tinged pink, terminal and few; sepals linear; petals lanceolate, acuminate, widely spreading. Mex.—A rare species.

17. pilòsum, Bieb. (*S. Regèlii*, Hort., not Kuntze). Fig. 3585. Biennial, 2–3 in. high, glandular-pubescent: st. leafy: lvs. ⅓–½in. long, oblong or oblanceolate-oblong; radical densely rosulate; cauline alternate, rather close together: fls. rose-pink, clustered in a corymbose cyme, ¾–1½ in. diam.; sepals oblong; petals elliptic-lanceolate, narrowed to a broad claw; anthers red. Caucasus and Asia Minor. B.M. 8503. G.C. III. 49:347. G.M. 58:37.

18. villòsum, Linn. Annual, 3–4 in. high: sts. rather simple, erect, viscid-pilose above: lvs. alternate, subterete, rather remote, linear, obtuse: fls. dull rose or white, in a small, rather loose, few-fld., terminal cyme; sepals ovate and green; petals ovate, rather acute. Alpine and N. Eu.—One of the few species that likes a moist situation, suitable for a bog or similar location.

19. hispánicum, Linn. (*S. glaùcum*, Waldst. & Kit., not Smith. *S. pállidum*, Ten., not Bieb.). Annual or biennial (Masters says perennial), glaucous, glabrous or glandular-pilose above: barren shoots 2 in. long, branched; fl.-sts. 3–4 in. high, reddish: lvs. densely crowded, about ¼in. long, linear, greenish gray, becoming reddish, studded with fine hyaline pimples at the tips: fls. 6-merous, pinkish white, in 3–7-branched, umbellate cymes; sepals deltoid; petals oblong, narrowed at base. Cent. and S. Eu., Spain is uncertain.—Commonly grown under the name of *S. glaucum;* see also *S. dasyphyllum* and *S. rupestre*.

20. arbòreum, Mast. Perennial, subshrubby, about 4–6 in. high, glabrous, evergreen; branching from near the base, with no separate barren shoots: lvs. of the older shoots deltoid, subulate, terete or somewhat 4-sided, ⅛in. long, horizontally spreading; of the younger shoots more or less crowded, linear, terete: fls. white, 5-merous, about ½in. across, in many-fld. terminal cymes; sepals linear-oblong; petals lanceolate, keeled; filaments white. Hab.(?).

21. pulchéllum, Michx. (*S. pùlchum*, DC.). Perennial, glabrous, trailing or ascending: branches slender, 3–6 in. long: lvs. in several rows, linear, scarcely ½in. long, terete, pointed, gibbous at base: fls. rosy purple, ½in. across, in a 3–4-branched cyme, with fls. erect and crowded in 2 rows along the upper surface, each with a leafy bract; sepals lanceolate, obtuse; petals lanceolate; anthers orange. Va. to Ga., Ind., Mo., and Texas. B.M. 6223. Gn. 27, p. 315. G.C. II. 10:685.—The minute lvs. assume rich tints of red, brown, and purple. The branches of the infl. are 3–4 in. long and gracefully arched.

22. monregalénse, Balb. (*S. cruciàtum*, Desf.). Perennial, glabrous except the infl., which is glandular: barren shoots spreading, erect, or creeping, 1–4 in. long: lvs. of barren shoots crowded, linear or obovate-oblong, ⅛–¼in. long; those of the flowering shoots scattered, narrower and often spotted pink: fls. white, ¼in. across, 5-merous, in a terminal, lax, many-fld. panicled cyme; sepals deltoid, pink-spotted; petals deltoid-lanceolate, acuminate, pinkish brown beneath; anthers pinkish. N. Italy and Corsica. L.B.C. 5:464.

23. Álberti, Regel. Perennial: sts. procumbent, creeping, branched, terete; sterile branches short, densely leafy; flowering much elongated, laxly leafy: lvs. linear-oblong, ¼–½in. long, semi-terete below, glabrous: fls. white, about ½in. across, short-pedicelled, in an erect corymb, dichotomously erect-spreading, branched; sepals elliptic; petals lanceolate. Siberia, Turkestan. G.M. 56:189. Gt. 29:1019.

24. lȳdium, Boiss. Perennial, glabrous, cespitose: barren shoots 2–3 in., erect, reddish; fl.-sts. 4–5 in. high: lvs. crowded, ¼in. long, linear, subterete, greenish or red-tipped, base auricled, with numerous fine pimples at the tip when seen under a lens: fls. pinkish, $\frac{1}{10}$in. across, in a many-fld., corymbose cyme; buds 5-angled; sepals oblong, reddish; petals lanceolate, rather obtuse; anthers reddish. Asia Minor. G. 37:25.—A good plant for rockeries. Some of the material grown in gardens as *S. pulchellum* and *A. anglicum* are really this species. Var. **aûreum,** Hort., was offered in the trade. Var. **glaûcum,** Hort., is offered in the trade as a glaucous-lvd. form.

25. álbum, Linn. Perennial, about 4–6 in. high, glabrous, cespitose: barren sts. erect or creeping, rooting, olive-brown; fl.-sts. erect, pinkish: lvs. alternate, spreading, linear-oblong, about ½in. long, obtuse: fls. white, about ¼in. across, in corymbose cymes, which are much branched, about 2–3 in. diam.; calyx-tube cup-shaped, segms. broadly ovate to subrotund, obtuse; petals lanceolate; anthers reddish. Eu., Temp. Asia, and N. Afr. Gn. 27, p. 315. G.M. 57:469.—Some of the plants grown as *S. neglectum* probably belong to this species.

26. Kirilòwii, Regel. Perennial, rhizome destitute of shoots of preceding years, green, glabrous: sts. up to 1½ ft. high, slender: lvs. spreading, elongate-linear, 2–3 in. long, attenuate, more or less serrate toward the tip: fls. dicœcious, yellow, 5-merous, rather small, in a dense, many-fld., corymbose cyme, which is commonly leafy; sepals and petals linear. Soongaria, China, and Turkestan.—Allied to *S. roseum*.

3585. Sedum pilosum. (×¼)

27. ròseum, Scop. (*Rhodìola ròsea*, Linn. *S. Rhodìola*, DC.). Perennial, 4–8 in. high: rootstock thick, fleshy, exhaling a perfume of rose-water: sts. annual, several from the same stock, erect and unbranched: lvs. scattered, glaucous, 1 x ¼in., sessile, flat, spatulate, obovate or oblong, obscurely 1-nerved, slightly toothed at apex: fls. dicœcious, greenish or reddish purple, in a terminal flat-topped, subglobose cyme, about 1 in. diam.; sepals 4, lanceolate or oblong; petals 4, linear-oblong; stamens 4 in the male, lacking in the female fls. Eu., N. Amer., and Himalaya. Gt. 12:403 (as var. *lanceolatum*). B.B. (ed. 2) 2:207.—A neat-growing species well adapted to the rockery. Var. **linifòlium,** Hort., is offered in the trade.

28. dendroídeum, Moç. & Sessé. Shrub, 4–12 in. high, much branched, smooth: lvs. flat, fleshy, obovate or spatulate, sessile, ¾–1½ in. long: fls. sessile or nearly so, bright yellow, in a paniculate cyme, numerous; calyx-lobes ovate; petals lanceolate. Mex.

29. Woòdwardii, N. E. Br. Perennial, glabrous: sts. simple, about 1 ft. high, green: lvs. alternate, lax, 1½–2½ x ¾–1¼ in., obliquely cuneate-obovate, irregularly and obtusely dentate above, green, flat: fls. yellow, sessile, about ½in. across, in dichotomously branched, 2–5-parted, rather flat, rather lax cymes, which are 2½–4 in. diam.; sepals linear-subulate; petals lanceolate. China(?).—Resembles *S. Aizoon*, but differs in the obliquely obovate, obtusely toothed lvs. and larger, looser cymes.

30. oregànum, Nutt. (*Gormánia oregàna*, Brit.). Perennial, glabrous: fl.-sts. erect, simple, 3–6 in. high: lower lvs. about ¾in. long, all spatulate-cuneate, rounded at apex: fls. yellow, changing with age to pink, in a compound cyme; sepals lanceolate to ovate-lanceolate; petals linear-lanceolate, long-acuminate, more than ½in. long. Alaska to N. Calif.

31. spathulifòlium, Hook. Fig. 3586. Perennial with slender rootstocks, glaucous, ultimately reddish: barren shoots creeping or ascending, 3–4 in. long; fl.-sts.

ascending, sometimes 4–8 in. high, simple or sometimes branched: lvs. of barren shoot forming a terminal rosette 1–1½ in. diam. and producing offsets from the base; lower lvs. obovate-spatulate, ½ x ⅜in.; cauline smaller and clavate: fls. numerous, yellow, ½in. across, in terminal forking cymes, with 3–5 principal branches about 3 in. long, these are 2-divided and bear fls. only on the upper side; sepals lanceolate or oblong-lanceolate; petals lanceolate, keeled; anthers yellow. N. W. N. Amer. G.C. II. 5:821; 10:377. Gn. 24:462. Gt. 21:741.—Questionable whether it is hardy in the E.

32. **Pálmeri,** Wats. Perennial, caulescent, about 6 in. high, erect and branching, glabrous and glaucous: lvs. thick, flattened, 1–1½ x ¾in., spatulate-oboyate, slightly apiculate: fls. deep orange, in a racemose panicle whose branches are 1–2 in. long; sepals narrowly lanceolate; petals narrowly lanceolate. Mex.

33. **obtusàtum,** Gray (*Gormánia obtusàta,* Brit.). Perennial, glaucous or green: sts. prostrate or ascending, 2½–6 in. high; fl.-sts. erect, terete, reddish, ultimately leafless: lvs. rosulate, 1 x ⅜in., spatulate, entire, glaucous, becoming reddish green: fls. yellow, ¼in. across, in terminal, spreading, umbellate cymes, 1½–2 in. diam.; sepals oblong-acute; petals lanceolate; anthers yellow. Calif.

34. **nicæénse,** All. (*S. ochroleùcum,* Chaix. *S. altíssimum,* Poir.). Perennial, glabrous and glaucous: rootstock thick and woody: sts. 6–8 in. long, at first prostrate, afterward ascending; fl.-sts. erect, 10-12 in. high: lvs. of barren shoots ascending or spreading, ½–¾in. long, glaucous, reddish when old, ovate-lanceolate or oblanceolate, scarcely auricled; of flowering shoots appressed, lanceolate, distinctly auricled: fls. greenish yellow, 5–6-merous, ½in. across, in terminal many-fld., leafless umbellate cymes; sepals deltoid-lanceolate; petals oblong, boat-shaped; anthers yellow. Medit. region. G.M. 57:473.—*S. ochroleucum* is kept distinct by some but does not seem to differ very much.

3586. Sedum spathulifolium. (×⅓)

35. **formosànum,** N. E. Br. Annual, about 6 in. high, glabrous: st. repeatedly dichotomously or trichotomously branched from near the base, indistinctly 4-sided: lvs. 1–3 in whorls at the branchings of the sts., with 1–3 on the long internodes, 1–1¼ x ⅛in., flat, spatulate: fls. sessile, yellow; sepals green, fleshy, spatulate; petals lanceolate; anthers at first red, finally black. Formosa.—Intro. into S. Calif.

36. **japónicum,** Sieb. Perennial, 4–6 in. high, glabrous: sts. diffuse: lvs. scattered or opposite, elliptical to spatulate, flat and somewhat reticulate veined, entire, bright green, channeled above: fls. yellow, ½in. across, in loose, terminal and lateral, panicled, many-fld. cymes; sepals oblong; petals lanceolate. Japan.—It is extremely doubtful whether this species is or has been common in cult.; most of the material so named is probably *S. alboroseum.* Var. **aùreo-marginàtum,** Hort., probably is the same as *S. kamtschaticum* var. *aureo-marginatum.* Var. **macrophýllum,** Hort., is offered in the American trade as a compact bush, 15 in. high, with waxy white fls., the centers of which are light pink; presumably this is also *S. alboroseum.* Var. **variegàtum,** Hort., mentioned in American trade is presumably *S. alboroseum* var. *variegatum,* which is a large-lvd. plant with decided yellow-blotched lvs.

37. **Selskiànum,** Regel & Maack. Perennial, spreading, pilose: sts. 1–1½ ft. high, erect: lvs. sessile, ascending, upper 1½ by less than ½in., lanceolate from a broad base, ciliate, apical third serrate-margined: fls. numerous, yellow, about ¼in. across, in a many-branched terminal cyme which is hollow-topped and leafy; sepals linear; petals lanceolate; anthers yellow. Amurland, Manchuria. Gt. 11:361.—Close to *S. Aizoon,* but differs in the pilose sts. and the narrower and pilose lvs.

38. **Middendorffiànum,** Maxim.; also spelled *Middendorfii.* Perennial, 4–16 in. high, cespitose, glabrous: lvs. ½ to nearly 3 in. long, lowest spatulate; the rest linear-spatulate, upper part serrate, upper surface channeled: fls. yellow, ⅜–⅝in. across, in many-fld. cymes; sepals linear-oblong; petals fusiform, base rather broad, apex long-acuminate; anthers dark purple. Amurland.—Some of the taller material grown under this name probably does not belong to this species. Var. **hýbridum,** Hort., a form said to have fine autumn tints, is offered in the trade.

39. **hýbridum,** Linn. Perennial: sts. creeping, glabrous or glandular: lvs. alternate, petioled, about 1 or more by ½in., spatulate, upper half coarsely toothed, lower part entire and tapering; teeth red-tipped: fls. numerous, yellow, in terminal, much-branched, umbellate, inversely pyramidal cymes which are 2–3 in. diam.; sepals linear; petals apiculate; anthers orange. Siberia and China.

40. **asiáticum,** Spreng. (*S. Wallichiànum,* Hook.). Perennial, 6–12 in. high: sts. annual, erect, unbranched, glabrous, slender: lvs. opposite, decussate, sessile, ¾–1 in. long, linear, oblong, coarsely and irregularly toothed: fls. numerous, greenish yellow, bisexual, in compact, terminal, globose cymes; sepals oblong-lanceolate; petals oblong; anthers orange-brown. Himalayas.—Readily distinguished by its almost pinnatifid foliage. In India the fls. are said to be sometimes red. It seems to suffer from wetness in winter and probably should be wintered under glass or otherwise protected from the wet.

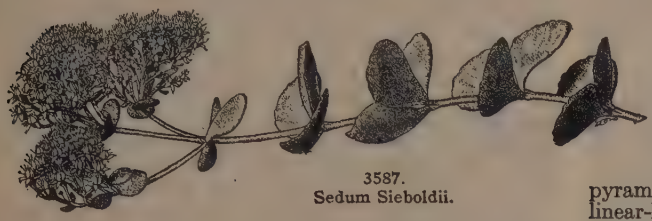
41. **Maximòwiczii,** Regel. Perennial, about 1 ft. high, glabrous: sts. erect, terete or somewhat 4-sided, greenish: lvs. subopposite or alternate, subsessile, 1–1½ in. long, oblong-ovate or oblong-lanceolate, regularly toothed; upper lvs. longer and narrower: fls. yellow, numerous, in a dense flat spreading cyme; buds flask-shaped; sepals unequal in size, lanceolate, rarely somewhat spatulate at apex; petals lanceolate. Japan, Amurland. Gt. 15:528. Gn. 19, p. 203; 27, p. 316.—Similar to *S. Aizoon* and by some considered a variety of it. Differs in having unequal sepals and the peculiar flask-shaped buds. A good border plant. *S. Lèhmannii* of some gardens belongs here.

42. **kamtscháticum,** Fisch. & Mey. Perennial, glabrous: branches 6–10 in. long, greenish or pinkish; fl.-sts. erect, 4–6 in. high: lvs. alternate or opposite, about 1¾ x ½in., oblong-ovate, deep green, coarsely but regularly toothed above the middle, tapering gradually to the petiole: fls. numerous, yellow, ¾in. across, in terminal, umbellate inversely pyramidal cymes which are 1–3 in. diam.; sepals greenish, deltoid; petals lanceolate, apiculate, keeled; anthers subglobose, orange. Kamschatka, Korea, and Japan. Var. **aùreo-marginàtum,** Hort., is offered in the trade; *S. japonicum* var. *aureo-marginatum* probably is the same thing. Var. **variegàtum,** Hort., is offered in the trade as having variegated lvs. and yellow fls. By some dealers the fls. of the plants are said to be purple and the material so named is undoubtedly misnamed and is probably some form of *S. Telephium* or one of its close allies.

43. **Aizòon,** Linn. Perennial, glabrous, 1 ft. or more high, usually 1½–2 ft.: sts. several, unbranched, erect, subangular: lvs. alternate, sessile, distant, oblong-lanceolate, 2½ x ¾in., coarsely and irregularly toothed:

fls. numerous, yellow, ½in. across, in a loose panicled cyme, 1–3 in. diam.; sepals lanceolate; petals lanceolate. Siberia.—An old garden plant, suitable for rockeries or borders.—Some of the material grown as *S. Wallichianum* probably is this species.

44. **sempervivoìdes,** Fisch. (*S. Sempervìvum,* Ledeb.). Biennial, pubescent, 2–8 in. high: basal lvs. in a rosette of 40–50, obovate, cuneate, pubescent and ciliate, about 1 x ¾in., cauline clasping, greenish red, oblong, acute:



3587.
Sedum Sieboldii.

fls. scarlet, in a many-fld., panicled cyme, which is 2–4 in. diam.; sepals deltoid, acute, pilose; petals lanceolate, ¼in. long. Asia Minor and Caucasus. Gt. 16:551; 33:1155. Gn. 19:354. R. H. 1846:5.—Apparently rare in cult., but said to be very showy; the fl.-color is almost unique in the genus.

45. **oppositifòlium,** Sims. Perennial, trailing, puberulent: fl.-sts. erect, 6 in. high: lvs. opposite, decussate, 1½ x ¾–1 in., obovate-spatulate, dentate-lobulate or crenate, slightly puberulent: fls. white, ½–¾in. across, in a terminal dichotomous cyme; sepals lanceolate; petals oblong-lanceolate; anthers orange according to Masters. Caucasus and Persia. B.M. 1807 (anthers shown as yellow).—Closely allied to *S. stoloníferum,* but the lvs. are brighter green and more regularly decussate.

46. **populifòlium,** Pall. Subshrub, with fibrous roots, glabrous: sts. 6–10 in. high, greenish or purplish, slender, branched: lvs. alternate, distant, 1½ x 1 in., petioled, ovate, acute, base cordate, coarsely and irregularly toothed; petiole ¾–1¼ in. long: fls. numerous, nearly ½in. across, whitish or pinkish, in terminal, much-branched, corymbose cymes; sepals lanceolate; petals lanceolate, 1-nerved; anthers purple. Siberia. B.M. 211. Gn. 27, p. 316. R.H. 1857, p. 150.—Readily distinguished by the long-petioled, poplar-like lvs. A good border or rockwork plant, also useful as a pot-plant.

47. **Sièboldii,** Sweet. Fig. 3587. Subshrubby, 6–8 in. high, glaucous: branches terete, slender, purplish, erect, afterward decurved: lvs. in whorls of 3, sessile or nearly so, suborbicular, sinuate, about ¾–1 in. diam., bluish green, margins pinkish, base cuneate: fls. pink, ½in. across, numerous, in much-branched umbellate cymes; sepals ovate-acute; petals lanceolate; anthers pinkish. Japan. B.M. 5358. G. 34:831.—Very useful for rockeries and borders. Var. **variegàtum,** Hort. (*S. variegàtum,* Hort., not Wats. *S. Sièboldii spléndens variegàtum,* Hort.), has white variegated lvs. I.H. 10:373 (lvs. green-margined, center yellow).

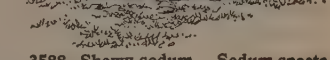
48. **máximum,** Suter (*S. macrophýllum,* Hort. Vilm.). Perennial, stout and bushy: sts. 1–2 ft. high, erect, green or purple: lvs. opposite, sessile, spreading, st.-clasping, 2½ in. long, ovate-acute, more or less cordate, crenate or dentate: fls. whitish, in terminal and lateral cymes, on long peduncles, forming a loose panicle; cymes rather globose and many-fld.; sepals deltoid-lanceolate; petals lanceolate, with the tips spotted with red; anthers reddish, projecting. Eu., Caucasus, and N. W. Asia. Gn. 27, p. 316.—A very variable species and occurs in many forms. A fine border plant, but is apt to become straggly in the fall and to need support. Var. **hæmatòdes,** Mast. (*S. atropurpùreum,* Hort., not Turcz. *S. máximum* var. *atropurpùreum,* Hort. *S. macrophýllum* var. *atropurpùreum,* Hort.), has sts. erect, glabrous, 1½–2½ ft. high; lvs. opposite, oblong-ovate, bronzy or dark purple; petals whitish, red-tipped. G.C. II. 10:337. Var. **purpùreum,** Hort. (*S. macrophýllum* var. *purpùreum,* Hort.), is a purple-lvd. form questionably different from the preceding variety. Var. **variegàtum,** Hort., has been offered in the trade as a form with green-and-gold foliage. Var. **versícolor,** Van Houtte (*S. Rodígásii,* Hort.), is a form with pink sts. and lvs. heavily variegated with white, their margins pink. F.S. 16:1669.

49. **spectâbile,** Bor. (*S. Fabària,* Hort., not Koch). Showy Sedum. Fig. 3588. Perennial, robust and glaucous: sts. 18–24 in.: lvs. opposite, decussate or in whorls of 3, 3x2 in., flat, scarcely petioled, ovate or spatulate, entire or obscurely sinuate-dentate: fls. numerous, ½in. across, pink, in large flat-topped, inversely pyramidal, leafy and umbellate cymes; sepals whitish, linear-lanceolate; petals slightly concave; anthers orange. Japan(?). Gn. 27, p. 315. I.H. 8:271. Gt. 21:709.—The fls. are said to vary from rose to purple and perhaps to white. This is the showiest of the sedums and is an excellent border and garden plant. It is said to thrive best in stiff clay and not to do so well in lighter soils. Var. **âlbum,** Hort., a white-fld. form is offered in the trade. Var. **atropurpùreum,** Hort., is a form with rosy crimson fls. Var. **purpùreum,** Hort., is offered in the trade. Var. **ròseum,** Hort., is offered in the trade. Var. **rùbrum,** Hort., is a form with crimson fls. There is also a form with variegated lvs.

50. **alboròseum,** Baker (*S. erythrostíctum,* Mast., not Miq. *S. japónicum,* Hort., not Siebold. *S. macrophýllum,* Hort., not Hort. Vilm.). Perennial, glaucous: sts. several, ascending, about 1½ ft. high, glabrous: lvs. up to 2½ x 1¼ in., alternate in 4 ranks, slightly convex below, oblong-spatulate, upper margin incised-crenate: fls. greenish white, in a dense corymbose cyme, 3–4 in. diam.; sepals deltoid; petals lanceolate; anthers pinkish: carpels rosy pink. Japan. Gt. 21:709.—A fine plant for the border or rockery. Var. **variegàtum,** Hubb. (*S. erythrostíctum* var. *variegàtum,* Mast. *S. japónicum* var. *variegàtum,* Hort. ex W. Mill.), has the lvs. irregularly blotched yellow in the center. Gt. 21:709.

51. **telephioìdes,** Michx. Perennial, glabrous: sts. 6–10 in. high: lvs. scattered, 2 x 1 in., oblong or obovate, nearly entire or sparingly toothed, base cuneate: fls. numerous, flesh-colored, in small, dense, compound cymes, 1–1½ in. diam.; sepals lanceolate; petals lanceolate, falcate, hooded at the tip. S. Pa. to W. N. Y., to S. Ind., N. C., and Ga.—Not common in cult.

52. **Telèphium,** Linn. Orpine. Live-forever. Fig. 3589. Perennial: sts. erect, 12–18 in. high: lvs. scattered, rarely opposite, 2–3 x 1–1¼ in., oblong-ovate, dentate; lower wedge-shaped at base; upper somewhat rounded: fls. numerous, pink, red-spotted or sometimes pure white, in dense terminal and lateral, pedunculate cymes; sepals lanceolate; petals lanceolate, 2–2½ lines long, somewhat recurved. Cent. Eu. to Siberia and naturalized in N. Amer.(?). (The American material may be another species which it is almost impossible to distinguish horticulturally, namely *S. purpureum,* Tausch., and which is referred to *S. Telephium* by many authors.) Var. **Bórderi,** Mast. (*Anacámpseros Bórderi,* Jord. & Fourr. *S. Bórderi,* Hort. *S. Anacámpseros* var. *Bórderi,* Hort.), has reddish sts.: lvs. distinctly petioled, oblong, tapering at base: fls. pink, in



3588. Showy sedum.—Sedum spectabile. Clusters 4 inches across.

a flat-topped, corymbose cyme. Var. **hýbridum,** Hort., is offered in the trade. Var. **purpurâscens,** Hort., is offered in the trade. Var. **purpûreum,** Hort. (not to be confused with *S. purpureum,* Tausch.), is offered in the trade as a purple-lvd. form; very possibly this is the same as *S. maximum* var. *purpureum.* Var. **rûbrum,** Hort., is offered in the trade.—The species and all of its varieties are excellent border and garden plants, also well adapted to the richer parts of the rock-garden. A very variable and confusing species.

3589. Live-forever.—Sedum Telephium. (×½)

53. **Fabària,** Koch (*S. Telèphium* subsp. *Fabària,* Mast.). Perennial: sts. upright, 8–16 in. high: lvs. grass-green, alternate, flat, elongate-lanceolate or lanceolate, dentate-serrate, base cuneate, lower petioled: fls. lilac-purple, smaller than those of *S. Telephium,* in a dense, terminal cymose corymb; buds 5-angled; sepals lanceolate; petals lanceolate. Cent. Eu.—Very close to *S. Telephium* and botanically speaking probably only a well-marked variant of that species, but horticulturally fairly distinct, as the lvs. are narrower and the fls. smaller.

54. **ternàtum,** Michx. Fig. 3590. Perennial by rootstocks, glabrous, tufted: barren shoots 6–8 in. long, prostrate and creeping; fl.-sts. erect: lvs. ½in. long, in whorls of 3, flat, obovate to suborbicular spatulate, crowded in rosettes at end of the barren shoots; those of the fl.-sts. scattered, oblong, acute: fls. white, ½in. across, 4-merous, in 1-sided, leafy, terminal, 3–5-parted cymes; sepals oblong; petals oblong, acute; anthers reddish. N. Y. and N. J. to Ga., Ind., Mich., and Tenn. B.M. 1977. B.R. 142. G.M. 57:840.

55. **primuloìdes,** Franch. Rhizome thick, branched: branches of st. short and fastigiately clustered: lvs. clustered in a terminal rosette, densely papillose, more or less long-petioled, broad-spatulate, 5–10 lines long including the petiole, entire: peduncles 1-fld., short: sepals narrowly lanceolate; petals white, broadly ovate, about ⅓in. long. China. G.M. 57:212.—Apparently rare in cult.

56. **cyàneum,** Rudolph. Perennial, 2–3 in. high, glaucous, lilac above: sts. solitary or cespitose: lvs. opposite, few, entire, glabrous; radical oblong or obovate-oblong, somewhat rosulate; cauline oblong- or oblong-linear: fls. purplish pink, about ¼in. across, in a simple or compound corymbose cyme; sepals lanceolate; petals ovate-oblong. Siberia. Gt. 27:972.

57. **Èwersii,** Ledeb. (*S. azùreum,* Royle not Desf.). Perennial, glabrous: st. thick, giving off many trailing or ascending shoots, rather woody at base, 4–12 in. high: lvs. opposite, sessile, about ½–1 in. diam., suborbicular, cordate, amplexicaul, entire or slightly sinuate: fls. numerous, pink or pale violet, in dense globose cymes; sepals linear-lanceolate; petals oblong-lanceolate; anthers purplish. Siberia, N. India, Kashmir, and Thibet. Gt. 9:295.—Said to be tender, but well worth pot-culture. Var. **turkestânicum,** Hort., is said to grow 4 in. high and to have deep violet fls. and furthermore to be hardy in Mass.; little known to gardeners.

58. **stoloníferum,** Gmel. (*S. ibéricum,* Stev. *S. spùrium,* Bieb.). Perennial: barren shoots trailing, glabrous, rooting at the nodes; fl.-sts. ascending, 6 in. high, reddish: lvs. opposite, ¾–1¼ in. long, spatulate or obovate-cuneate, coarsely toothed above, short-petioled: fls. numerous, ½–¾in. across, pink or white, in terminal umbellate cymes, 2 in. diam.; sepals linear-oblong; petals lanceolate; anthers reddish, speckled. Asia Minor and Persia, also escaped in N. Maine and Newfoundland. B.M. 2370. Gn. 27, p. 315. R.H. 1891, p. 523.—*S. spùrium,* Bieb., is maintained as a species by some authorities, but there seem to be no good characters by which to distinguish it. A showy species, common in European gardens and well adapted to rockeries. Var. **coccíneum,** Hort. (*S. spùrium* var. *coccíneum,* Hort.), is offered, in the trade.—The following trade names also appear: *S. spùrium* var. *álbum,* Hort., *S. spùrium* var. *ròseum,* Hort., *S. spùrium* var. *rùbrum,* Hort., and *S. spùrium* var. *spléndens,* Hort.

59. **Nèvii,** Gray. Perennial, cespitose, tufted, glabrous: barren shoots prostrate; fl.-sts. erect, 2–5 in. high: lvs. of barren shoots crowded in terminal rosettes, ¾ x ⅜in., alternate, obovate-spatulate, tapering to a short petiole, auricled at the base, sprinkled with pink dots; those of the fl.-sts. scattered, alternate, similar, but appressed: fls. numerous, white, nearly ½in. across, in forked cymes whose branches are 1–1½ in. long and recurved; sepals greenish, oblong; petals lanceolate; anthers brownish purple. Mountains of Va. to Ala. and Ill., but hardy as far north as Mass. B.B. (ed. 2) 2:210.

60. **retûsum,** Hemsl. Shrubby, glabrous: branches thick and fleshy: lvs. alternate, small, about ½in. long, oblong-oval or spatulate, sessile, flat, fleshy, usually retuse: fls. white, subsessile, in a few-fld. cyme; sepals linear-oblong; petals oblong, acute, keeled on the back. Mex.

61. **Cepàea,** Linn.; also spelled *cæpium.* Annual, 10–12 in. high, glabrous: sts. tufted, simple or loosely branched: lvs. alternate, ½–¾ x ½in., oblong-spatulate, narrowed to the petiole; cauline opposite, whorled or scattered, narrower: fls. white, ¼–½in. across, in a loose many-fld. paniculate cyme which has purple-spotted, spreading branches; calyx-tube very short, sepals lanceolate; petals lanceolate, with pink midnerves and often a few pinkish spots; anthers purplish. W. and S. Eu.—Cult. specimens are sometimes said to be pink-fld.

62. **Anacámpseros,** Linn. (*S. rotundifòlium,* Lam.). Perennial, glaucous, evergreen: branches terete, rooting at the nodes; fl.-sts. erect, reddish, about 6–8 in. high: lvs. alternate, orbicular or obovate-obtuse, cordate, auricled, margins reddish: fls. numerous, pale

3590. Sedum ternatum. (×½)

violet, ¼in. across, in dense, terminal, globose cymes; sepals lanceolate; petals oblong-lanceolate. Cent. Eu. B.M. 118.—Suitable for edging and rockeries, but the fls. are comparatively rarely produced. Var. **Bórderi,** Hort., equals *S. Telephium* var. *Borderi.*

63. **stellàtum,** Linn. Annual, glabrous: sts. erect, 3–4 in. high, branched at the base: lvs. of the barren shoots in a rosette, suborbicular, crenate, flat; cauline alternate or rarely opposite, petioled, ¼–½in. long, obovate, crenate: fls. reddish or purplish, in lax, few-fld., terminal cymes; sepals lanceolate; petals lanceolate. S. Eu.—Probably rare in cult.

S. Àdolphii, Hamet. Perennial: fl.-sts. erect, robust, branched: lvs. alternate, sessile, obovate, lanceolate, or broadly obovate, ¾–1¼ in. x 6–7 lines, flat, entire: fls. in a rather dense corymbose cyme; sepals broad-deltoid; petals ovate-lanceolate. Mex.—*S. álbidum,* Hort., is offered in the trade as a form growing 6 in. high, with white fls.—*S. allantoìdes,* Rose. Perennial, 8–12 in. high, woody below: lvs. almost at right angles to the st., terete, clavate and somewhat bowed, glaucous: fls. greenish white, in an open terminal panicle; sepals ovate, acute; petals lanceolate, acute. Mex.—*S. atrosanguíneum,* Hort., is offered in the trade.—*S. béllum,* Rose (S. farinosum, Rose, not Lowe). Perennial plants, at first forming dense elongated rosettes: fl.-st. weak, ascending or spreading: lvs. flat but thickish spatulate: infl. a broad open cyme; petals white, spreading, lanceolate. Mex. In its wild state this species grows on cliffs among mosses. It has been in cult. in Washington since 1906, and deserves a place in every good succulent collection.—*S. Braùnii,* Hort., is offered.—*S. Bròwnii,* Hort., is offered in the trade.—*S. calábricum,* Ten., is a name without description applied to some Italian species which is offered in the trade.—*S. coccíneum* Hort., not Royle, is a name mentioned in horticulture; possibly it is S. stoloniferum var. coccineum.—*S. Còckerellii,* Brit. Perennial, 8 in. or less high, glabrous, branched: basal lvs. not known; cauline lanceolate to oblong-lanceolate, ½–1 in. long, sessile, acute: fls. white, subsessile, in cymes which are ¾–2½ in. diam.; sepals nearly linear; petals linear-lanceolate to linear-oblanceolate; anthers and styles pink. New Mex. This species is in cult., but cannot be placed in the key owing to lack of sufficient data.—*S. crassifòlium,* Hort., is offered in the trade.—*S. cristagálli,* Hort., is offered.—*S. cruéntum,* Hort., is offered in the trade.—*S. diversifòlium,* Rose. Perennial: barren shoots short; fls.-sts. elongated, weak: lvs. of barren shoots flattened ovate, small, rough, somewhat recurved: fls. pale yellow, terminal, solitary, short-peduncled; sepals obtuse; petals ovate, acute or even apiculate. Mex.—*S. Douglasii,* Hook., grows 4 in. high: lvs. lanceolate, ¼–½in. long, acute, and has yellow fls.; probably not in cult.—*S. Dùrgidum,* Hort., is offered in the American trade as a compact grower and bright green; not known botanically.—*S. Eichlámii,* Hort., is offered in the trade.—*S. glaùcum* var. *aùreum,* Hort., is offered as a golden yellow variety; not placed satisfactorily.—*S. grandiflòrum,* Hort., is offered as a strong grower with yellow fls.—*S. himaldàicum,* Hort., is offered as a form with rich yellow fls.; not known botanically.—*S. Maweànum,* Hort., is offered as growing 4 in. high: fls. yellow.—*S. muràlis,* Hort., is said to have dark lvs. and white fls. with a pink center; not known botanically.—*S. níveum,* Hort., is offered in the trade.—*S. pállidum,* Bieb. Perennial, glabrous or glandular-pubescent above: sts. usually branched: lvs. semi-terete, linear, rather obtuse: fls. white or rose in a lax branched scorpioid cyme; sepals triangular, acute: petals puberulent, cuspidate. Asia Minor, Persia, and India. Closely allied to S. hispanicum. This is the true species but the name has also been applied to several other plants and it is uncertain which form is in cult.—*S. pállidum* var. *ròseum,* Hort., is in the trade but cannot be satisfactorily identified.—*S. pruinàtum,* Brot. Perennial, glaucous, pruinose: barren shoots 6–8 in. long, trailing and ascending; fl.-sts. erect, 1 ft. high: lvs. in many rows, sessile, more or less terete, glaucous, tips often rose-pink, about ¾in. long, linear-oblanceolate, aristate: fls. bright yellow, ½in. across, in an umbellate, many-branched, flat-topped cyme; sepals oblong, acute; petals oblong, obtuse. Eu. Closely allied to S. rupestre and included in it by some authorities.—*S. rariflòrum,* N. E. Br. Perennial: sts. numerous, decumbent, up to 6 in. long, glabrous: lvs. alternate, flat above, slightly convex beneath, ¾–1½ in. long, linear, acute, green: fls. white, in a lax 2–3-branched infl.; sepals spreading, linear, acute; petals oblong-lanceolate, acuminate. China.—*S. retrovivum,* Hort., is offered in the trade.—*S. Sempervivum,* Hort., not Ledeb.=Cotyledon Sempervivum.—*S. sexemfidum,* Hort., is offered in the trade; perhaps an error for sexifidum which is a synonym of S. hispanicum.—*S. spathulàtum,* Hort., is a trade name of a species said to grow several feet high, botanically unknown.—*S. speciòsum,* Hort., is still offered in the trade, but is unknown botanically. Var. *rùbrum,* Hort., is offered in the American trade as growing 6 in. high and having dark red fls. in July. Var. *spléndens,* Hort., is offered as a form growing 6 in. high, with deep red fls.—*S. tectòrum,* Scop.=Sempervivum tectorum.—*S. turkestànum,* Hort., is possibly a trade error for turkestanicum which is a variety of S. Ewersii.—*S. undulàtum,* Hort., is offered in the trade.

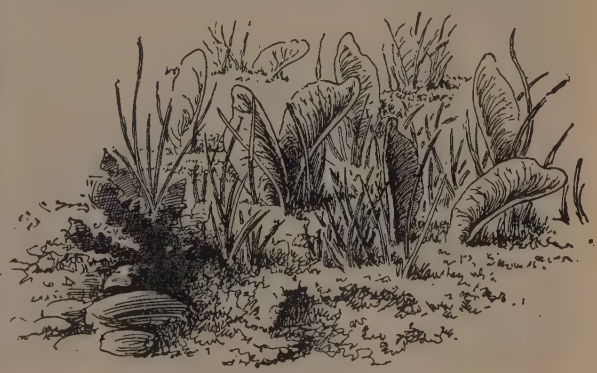
F. Tracy Hubbard.†

SEEDS AND SEEDAGE. A seed is a ripened embryo, and its integuments and storage supplies, resulting from fertilization in the flower. Seedage is a term used to include all knowledge respecting the propagation of plants by means of seeds or spores. The word was first used, so far as the writer is aware, in 1887. It is equivalent to the French *semis,* and is comparable with the words graftage, layerage, and cuttage. See *Spores.*

In general literature and common speech, a seed is that part of the plant which is the outcome of flowering and which is used for propagating the species. In the technical or botanical sense, however, the seed is the ripened ovule. The seed contains an embryo, which is a miniature plant. The embryo has one or more leaves (cotyledons), a bud or growing-point (plumule) and a short descending axis (caulicle). From the caulicle or stemlet, the radicle or root develops. This embryo is a minute dormant plant. Each embryo is the result of a distinct process of fertilization in which the pollen of the same or another flower has taken part. The ovule is contained in the ovary. The ripened ovary is the seed-case or pericarp. The pericarp, with the parts that are amalgamated with it, is known technically as the fruit. In many cases there is only one seed in the fruit; and the seed and its case may adhere and form practically one body. Many of the so-called seeds of horticulturists are really fruits containing one or few seeds. Such are the seeds of beet, lettuce, and sea-kale. The winged seeds of elms, hop-tree (Fig. 3591), and ashes are really fruits containing a single seed. Acorns, walnuts, butternuts, and chestnuts are also fruits; so are grains of corn, wheat, and the "seeds" of strawberry. The keys of maple are double fruits, with two seeds (Fig. 3592). Beans and peas are true seeds; the fruit part is the pod in which they are borne. Seeds of apples and pears are also true seeds, the fruit being the fleshy part that surrounds them.

3591. Seed-like fruit of hop-tree. (Natural size)

Germination is the unfolding and the growing of the dormant or embryo plant. The first visible stage in germination is the swelling of the seed. Thereafter the integument is ruptured, and the caulicle appears. When the caulicle protrudes, the seed has sprouted; and this fact is taken as an indication that the seed is viable (Fig. 3593). Germination is not complete, however, until the young plant has made vital connection with the soil, has developed green assimilative organs and is able to support itself (Fig. 3594). See, also, Figs. 5395 and 3596. Seeds that have sufficient life to sprout may still be too weak to carry the process to complete germination. The ideal test for the viability of seeds is to plant them in soil in conditions that somewhat nearly approach those in which they are finally to be planted. This test eliminates the seeds which are very weak and are not able to grow under ordinary



3592. Natural planting of maple seeds.

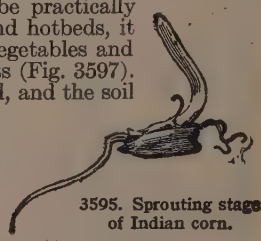
conditions and to push themselves through the soil. The sprouting test made in a specially prepared device, in which all conditions are regulated to a nicety, may be of the greatest value for purposes of scientific study and investigation and for the making of comparative tests between various samples, and the greater the sprouting test, the greater the germinating power; but one must not expect that the actual germination will always be as great as the percentage of sprouting. The test for sprouting shows only which seeds are alive. In many cases, the differences in results between the sprouting test in a specially prepared device and the germination tests in well-prepared soil in the open may be as great as 50 per cent. Viability varies with seasons and other conditions. While it is true as a general statement that the older the seed the less the viability, yet the reverse may be true within narrow limits. Sometimes lettuce and melons that germinate only 50 per cent in December, germinate 70 to 80 per cent in April. For a discussion of technical methods of seed-testing, see Vol. II, "Cyclopedia of American Agriculture," and other works.

3593. Sprouting stage.—Castor bean.

In order that seeds shall germinate, they must be supplied with moisture and be given a definite temperature. The requisite temperature and moisture vary with the different kinds of seeds, and these factors are to be determined only by experience. Seeds may be planted in any medium that supplies these requisite conditions. Although seeds are ordinarily planted in the ground, such practice is not necessary to germination. They may be planted in coconut fiber, moss, or other medium. However, the ground may supply the requisites for germination, and it also supplies plant-food for the young plantlet when it begins to shift for itself; and, furthermore, the plants are in the position in which it is desired they shall grow. In the case of many seeds, germination is more rapid and certain when the seeds are sown in coconut fiber or other medium, for the conditions may be more uniform. As soon as germination is fairly complete, the plants are transplanted to the soil.

The depth at which seeds shall be sown depends on many conditions. Out-of-doors they are planted deeper than in the house, in order to insure a uniform supply of moisture. A depth equal to twice the diameter of the seed is an old gardeners' rule. This applies well to the sowing of most seeds under glass when the soil is well prepared and is kept moist, but in the open ground three to four times this depth is usually necessary. The finer and moister the soil, the shallower the seeds may be planted, other things being equal. Better results in germination are secured when the seeds are sown in a specially prepared seed-bed. The conditions may then be better, the gardener is able to protect the young plants from cold and from insects and fungi, and he is enabled also to economize time and labor. In transplanting from the seed-bed to the field, the gardener unconsciously chooses only the best plants and thereby the crop is improved. The seed-bed may be in a forcing-house or hotbed, or in the open. If it is in the open, it should be near the buildings, where it can be visited frequently and where water may be applied as needed. If the bed is to be used late in the season when the soil is naturally dry, it is well to cover it the previous spring or fall with a coating of not too rich manure. This retains the moisture, and the leaching from the manure adds plant-food to the soil, thereby enabling the young plants to secure an early start. When the seeds are to be sown, the manure is removed and the surface is then in perfect condition. In the handling of young plants in seed-beds, one must take pains that the plants are not too thick and that they do not suffer for light, else they may become "drawn" and be practically worthless. In greenhouses and hotbeds, it is well to handle common vegetables and flower seeds in gardeners' flats (Fig. 3597). These flats are easily handled, and the soil is so shallow that it can be kept in uniform conditions of temperature and moisture. The seeds of some of the finer and rarer kinds of ornamental plants require special treatment. These treatments are usually specified in the articles devoted to those plants. Details of the handling of very delicate seeds are well discussed in the article on *Orchids;* see the article *Palm* and others, and the discussion of propagation of conifers, page 360, Vol. I.

3594. Germination complete.—Castor bean.



3595. Sprouting stage of Indian corn.

As a rule, seeds germinate best when they are fresh, that is, less than one year old. Some seeds, however, of which those of melons, pumpkins, and cucumbers are examples, retain their vitality unimpaired for a number of years, and gardeners do not ask for recent stock. Seeds of corn-salad should be a year old to germinate well. Very hard bony seeds, as of haws and viburnums, often do not germinate until the second year. In the meantime, however, they should be kept moist. Seeds of most fruit and forest trees should be kept moist and cool, otherwise they lose vitality; yet if kept too moist, and particularly too close or warm, they will spoil. Nuts and hard seeds of hardy plants usually profit by being buried in sand and allowed to freeze. The freezing and the moisture soften and split the integuments. Sometimes the seeds are placed between alternate layers of sand or sawdust: such practice is known technically as stratification.

L. H. B.

Seed-breeding and -growing.

Seed-breeding may be considered from at least two very distinct viewpoints: first, the origination and development of new and improved varieties, either through selection or cross-breeding; and second, the development and raising of truer purer stocks of strains of proved value. See *Breeding of Plants*, Vol. I.

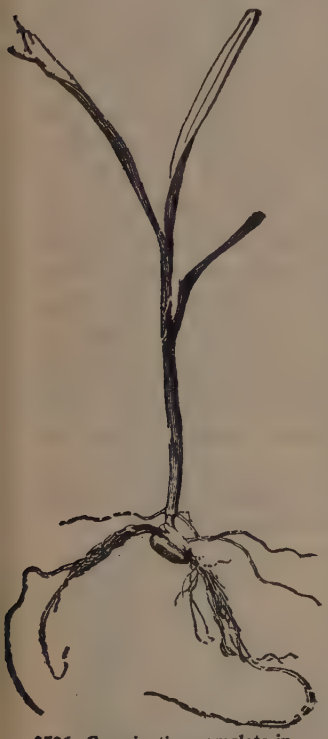
The first, as a rule, seems the most attractive inversely to one's knowledge and experience, but the growing of better and purer strains of the sorts which have proved best suited to one's local conditions and individual requirements is of far greater practical value. An important consideration of success in raising new varieties is the widest obtainable knowledge not only of the varietal forms of the species generally grown, but of the many stocks which at different times and in different locations have been found to be of so little practical value that they have never come into general cultivation. A second requisite is familiarity with the growing habits of the plant, and those of similar species, and the dexterity which can come only through practice in the crossing of the flowers and securing good growth and development of the fruits. There should also be developed a capacity for a quick judgment as to the probable correlation between conspicuous variations with others less discernible by the eye but which may effect the cultural value. Lastly, the development of new varieties of real value can come only through the practice of almost infinite patience which makes one content to throw into the dump thousands upon thousands of plants, many of which had seemed most promising, and to be satisfied if after years of labor one

CIV. Seed-growing in California.—Above, drying and turning lettuce stalks on the sheets. Below, cutting onion heads.

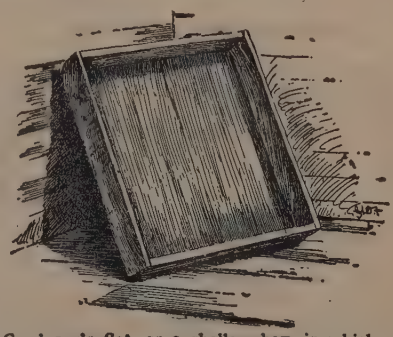
secures but a single variety or marked form of real value to the cultivator.

The second, and perhaps the most important branch of seed-breeding, is the raising of purer strains of stocks of proved value. An illustration of the need of work in this direction can be drawn from a recent trial planting of garden beets in which it was found that practically every root grown from 2-rod plantings of each of 214 samples of seed purchased under distinct varietal names from the most reputable seedsmen of America and Europe could be grouped into not over twenty distinct forms, and the roots so thrown together show as little variation as the crop from any one of the twenty most uniform samples in the trial. Often the only difference between two lots sold under different names would be in the proportion of the roots of each lot that conformed to the same varietal form. It is thought that seed-stocks of most species of garden vegetables would show similar variation, though possibly not to the same degree, and this is not so generally due to carelessness in growing or handling as to the want of adherence on the part of the seed-grower to clear-cut ideals of varietal form. Every plant grown from seed has a certain definite and changeless character which was inherent in the seed from which it was grown and is made up of a balanced sum of different tendencies, potentialities, and limitation of development inherited in different and varying degrees from each of its ancestors for an indefinite number of generations, plus more or less influence from climatic and other conditions effecting the development of the seed-producing plant. Generally the influence of the immediate parent is the dominant one, but not infrequently a characteristic of an ancestor which has been transmitted unexpressed for many generations appears in such strength as to change the whole character of the plant.

Under these conditions, a necessary preparation for the growing of better stocks is the formation of a very clear and comprehensive conception of the exact varietal character of the stock to be grown, and a rigid adherence to that ideal in the selection of seeding plants from year to year, never giving way to the ever-present temptation to use some superlative individual which differs in any respect from the original ideal of the stock. A most important aid, if not a requisite, for such persistence is the writing out and placing on file for frequent reference the fullest practical description of the exact varietal character of the sort. With this in hand, a few plants which come as near as possible to that ideal are selected, and the seed of each saved separately. The next season samples of each of these lots are planted in a preliminary trial. As they develop, and with the written description of the desired form in hand, they are carefully compared and the lots which most uniformly adhere to the described form are selected. The next season the reserved seed of the lots which seemed the best in the preliminary trial are planted in blocks as far as possible from each other, or any plants of the species, and the seed raised used for larger plantation for use as stock seed, in the meantime starting another selection from individual plants to take the place of the first, as it deteriorates. An illustration will show the value of careful selection and the necessity for constant renewal of even the purest of stocks. A very carefully bred strain of a variety of watermelon was used to plant a 20-acre field grown for seed. When about three-fourths of the fruit was ripe, several hours were spent in looking over the field for "off" stock and less than fifty fruits were found which should be removed. Fully 75 per cent of the fruits were so near alike that they could not be distinguished from each other. Seed from this field was used for planting seed crops and it was so good that little attention was paid to the stock; as a result, some years later, a crop grown in the same vicinity from seed of the same strain, but several generations removed, instead of less than fifty "off" fruits on 20 acres, had fully 75 per cent of the fruits more or less distinctly "off" and less than 20 per cent were as uniformly ideal of the variety as were 99 per cent of those of the first crop.



3596. Germination complete in Indian corn.



3597. Gardener's flat, or a shallow box, in which seeds are sown and small plants handled. A good size for a flat is 16 x 20 inches, and 3 inches deep.

What might be termed commercial seed-growing has developed very rapidly in America in the past ten years, and there has not only been an increase in quantity, but an improvement in the varietal quality of the seed grown. Seed dealers having secured, sometimes at great cost, desirable stocks, enter into contracts with farmers located in sections where soil and climate are most favorable for the development of the best qualities of the sort and the securing of a full crop of the seed, to plant a given area and deliver to them the entire seed product. This the farmer does, often with little regard to selection, only taking the requisite pains to guard against contamination and mixture with other crops.

The United States Census of 1910 gives the total valuation of the vegetable- and flower-seed crop grown in the United States in 1909 at $1,411,013 (see page 3136), but it is thought that the amount actually produced was much larger, seed-dealers and -growers generally being inclined to depreciate the extent and profit of the business in order to lessen competition. Since then the amount grown and listed has increased materially, an estimate by a very experienced dealer of the area devoted to vegetable-seed crops in 1915 being as follows:

	Acres
Seed beans	50,000
Cabbage for seed	2,000
Sweet corn	15,000
Cucumbers	15,000
Onions	2,600
Muskmelons	6,000
Watermelons	6,000
Garden peas	50,000
Radish	4,000
Tomatoes	50,000

This is the estimated area contracted for by growers especially for seed, but in the case of many crops, such as melons and peas, the amount of seed grown is greatly increased by crops which were originally planted with the intention of selling them as green vegetables, but which because of market conditions are allowed to ripen and are harvested and sold as seed.

WILL W. TRACY.

The seed trade of America.

The history of the seed business in colonial times is largely one of importation from Holland and England, when small hucksters carried a few boxes of popular seeds with an assortment of drygoods, foodstuffs, or hardware. Corn, barley, peas, onions, fruits, and vegetables, necessaries in fact for direct use, first claimed the attention of the colonists. Toward the end of the eighteenth century we begin to find references to the saving of stock seeds, and in the newspapers of the day are a number of advertisements of shopkeepers who dealt in seeds. Agricultural seeds were an article of commerce as early as 1747 (Pieters), clover, onions, beans, peas, carrots, cabbage and cauliflower, and others, being raised for seed in the colonies at that time, though chiefly imported. At that time Boston did most of the business. Among the earliest advertisers of seeds for sale were Nathaniel Bird, 1763, a bookdealer of Newport, R. I.; Gideon Welles, "on the Point," 1764; Samuel Deall, a dealer in general merchandise in New York in 1776; William Davidson of New York in 1768, while in Philadelphia, in 1772, we find one Pelatiah Webster advertising clover and duck-grass seed; James Loughead, "colly-flower" seed in 1775, while David Reid kept a general assortment.

It was not until the opening of the nineteenth century that America began to find that seeds could be grown here as profitably as they could be imported. Grant Thorburn, in New York, and David Landreth, of Philadelphia, seem to have been the largest dealers at that time. Thorburn's was perhaps the first business of importance devoted entirely to stock seeds, although this honor is disputed by the descendants of David Landreth. Thorburn, in his autobiography, says that he began his business by buying out the stock of one George Inglis for $15, Inglis agreeing to give up the market and to devote himself to the raising of seeds for Thorburn. This is but one of many small beginnings from which has grown a trade which now amounts to many millions; and this relation between seedsmen and growers is largely typical of relations which have obtained in the trade ever since.

With the development of the railway and the postal service the business grew rapidly, new land was found suitable for different varieties of seed, and a letter could carry to the countryman the garden seeds for his yearly consumption. There is probably no trade which has been more widely benefited by cheap postage and improved mail facilities, but of late years the distribution by Congressmen has tended to negative this benefit. The originally beneficent distribution of free seeds to pioneers and needy settlers was a form of agricultural encouragement against which there could be no criticism, but it has degenerated into an abuse, which is estimated to have taken a trade of some $4,000,000 during the past two or three decades out of the hands of the men who have built up the business.

Grant Thorburn's catalogue of 1822 was the first to be issued in pamphlet form, and it was the pioneer of the many finely and carefully illustrated catalogues with which we are familiar today. These catalogues have been largely instrumental in facilitating the specialization of the industry and its subdivision in the hands of the country dealer, who buys seeds at wholesale, combining as they do the most complete lists and illustrations of varieties with directions as to methods, conditions, and seasons for planting. They are distributed in hundreds of thousands. Up to 1844 the wording on the bags was written by hand, a laborious and expensive process, which of itself is an indication of the small volume of the trade at that date.

With regard to the export of seeds, A. J. Pieters' admirable report for 1899 in the Yearbook of the Department of Agriculture may be taken as the best information up to that date, and it indicates the development of the business in its earlier years. He says in part: "The statistics of exports date from 1855, and no separate records of imports of seeds were kept before 1873. Clover and grass seeds, especially timothy, have always taken the lead in the seed export trade, and until recent years garden seeds have not been a considerable factor in the total values. In 1825 some 10,000 bushels of clover seed were exported to England within a few months. How long this trade had existed we do not know. From 1855 to 1864 there is no record of any seeds exported except clover, but the value of exports increased from $13,570 in 1855 to $2,185,706 in 1863, the war apparently having no effect on the trade. The total value of the clover seed exported during this period aggregates $5,393,663. In the ten years ending with 1880, clover seed was not separately entered except in the last year, but the total exports of seeds amounted during that period to $20,739,277. The aggregate was increased by more than $3,000,000 before the end of 1890. From 1891 to 1898 there has been a slight reduction in the average annual value of seed exports and also in the amount of clover and timothy seed sent abroad." The value of "flower and vegetable seeds" reported in the Thirteenth Census (for 1909) is $1,411,013 as against $826,019 for 1899, an increase of above 70 per cent. Aside from this are grass seed to a value of $15,137,683 in 1909, not including beans, peas, and miscellaneous seeds. "Other grains and seeds" altogether (aside from "cereals") had a value in 1909 of $97,536,085. (See Tracy, page 3135).

The importation of staple garden seeds had largely decreased by 1870, and with the exception of a few staples in agricultural and flower seeds, America may be said to have become to a great extent self-supplying. The greatest development of this industry has taken place since the close of the war. In 1878 J. J. H. Gregory estimated that there were in all 7,000 acres devoted to garden seeds, while the census of 1890 showed that there were 596 seed-farms, containing 169,850 acres. Of these farms, 200 were established between 1880 and 1890, and it is likely that about 150 more were started during the same period. The census returns, however, do not give the actual acreage devoted to growing seeds. As many seeds are grown by those not regularly in the business, it is probable that census returns as to acreage are under rather than over the mark. The statistics available in the United States Census are very imperfect, partly owing to the lack of a continuous system in presentation, both in the returns of home industry and also in custom-house returns, but chiefly to the reluctance of seedsmen and growers to make public the results of their business methods or even the methods themselves.

The following table will give as close an estimate as can be made of the present annual cost of the chief staple garden seeds handled in America:

Garden peas	$1,500,000
Garden beans	400,000
Onion seed	500,000
Lettuce seed	250,000
Cabbage seed	200,000
Sweet corn	300,000
Tomato seed	150,000
Radish seed	125,000
Turnip seed	60,000
Beet seed	25,000
Celery seed	6,000
Miscellaneous seeds and flower seeds	250,000
Sweet peas, flowering	200,000
Probable invoice cost of imported garden seeds.	2,000,000

The seeds usually offered by seedsmen in their catalogues, or in the seed-stores throughout the country, are secured from various parts of the world, and the seedsman who sells seed at retail to the planter direct seldom grows his own seed, although some of the larger firms now conduct seed-farms on which they grow certain specialties, and most of them conduct trial and experimental grounds.

The wholesale seed business is divided into two distinct lines, one of so-called grass-seed dealers, who buy from the farmers such things as grass seeds, clover seeds, and farm seeds used for planting large areas; the other line is the general seed-dealer who carries a limited stock of grass seeds, clover seeds, and the like, and specializes on vegetable seeds and flower seeds. He is usually not a grower of seed, but buys from seed-growers who specialize on a few things.

A large part of the vegetable and flower seed used in America is imported from England, France, Germany, Holland, and Denmark, especially such things as beets and mangels, cabbage and cauliflower, turnip and rutabaga, and the small flower seeds. In Germany, the seed-growers usually own or lease their own seed-farms, while in other countries, especially France, much of the seed-growing is conducted on the subcontracting plan, the grower keeping an agent in a certain locality and letting out small contracts with the farmers. The finer vegetable seeds and flower seeds, as well as the larger lines, are grown in this way.

In America, the smaller vegetable seeds and sweet peas are grown principally in California, where the growers own or lease their seed-farms, and practically all of their capital is invested in the seed business. What are considered the "smaller vegetable seeds" and "California specialties" are carrot, endive, leek, lettuce, onion, parsnip, parsley, radish, salisfy, and flowering sweet peas. The preëminent California specialties are lettuce, onion, and sweet pea seed. There are no less than 5,000 acres, principally in the coast counties of central California, devoted to these three things. Pole beans, culinary peas, and some vine seeds are also produced in central California. These are grown on the subcontracting plan, much as in other places. Peas are now grown largely in Utah, Idaho, and Montana, as well as in Wisconsin, Michigan, and northern New York. Sweet corn and vine seeds are grown largely in Nebraska, northern Ohio, New York and New England. Watermelon seed is grown largely in the South; also okra. The best cabbage seed is produced in Long Island and to some extent in the country about Puget Sound in Washington. Pepper and eggplant, and some tomato seeds, are grown in New Jersey, and tomato seed is also grown in Michigan and California. Various other items are grown in greater or less quantities in various sections, such as beet and parsnip in New England, radish in Michigan, turnip in Pennsylvania, but the main sources of supply of these last-named articles are the European countries previously mentioned.

Seed-growers who subcontract their crops, usually operate large farms for the production of their stock seeds, where they do their selecting and developing and where they grow the seeds which they send out to the farmer to produce crops for them. Such crops as are subcontracted are "rogued" and inspected throughout the season by the grower's agent. Seed-growing, as it affects vegetable and flower seeds, is conducted more or less scientifically and represents a very high state of intense farming, perhaps the highest known out-of-doors.

Seeds must be produced in regions where they can be grown not only profitably on account of climatic conditions and abundant labor, but also in sections where the quality can be maintained. Climates with a cold winter are usually required for biennial crops, such as carrot, beet, onion; when grown in California, the strains must be often renewed. Certain other crops require a dry summer climate, such as lettuce and sweet peas; other kinds require a moist or wet summer climate, as cabbage and cauliflower.

Many seed-growers now specialize on one or two lines, and there are large growers who raise nothing but tomato; others nothing but cabbage; others who raise only sweet corn; others field corn; and others confine themselves to watermelon. Owing to the frequency of crop failures in seed production, as in other farm crops, most seedsmen contract with at least two sources of supply and usually both widely separated.

Commission box assortments comprise one of the principal methods pursued in America for the sale of seed. This plan places with merchandise and grocery stores an assortment of staple seeds in flat papers and cartons. These assortments are usually sold on commission, but some firms sell the assortments outright. The boxes and unsold seed are collected every year and returned to the home firm, where the papers are torn, the seed tested and repapered with a proportion of new seed. Some twenty firms are engaged in this line of seed distribution, and one firm has nearly 150,000 customers to whom it consigns these assortments. Many of the merchants who take these commission boxes also carry small lots of staple seeds in bags to sell in bulk and are therefore seed merchants in a small way. They usually rely for their base of supply on the seed-houses who consign them the box.

Dealers in garden seeds are also large dealers in flowering bulbs, such as hyacinths, tulips, narcissi, crocus, and the like. These are chiefly imported from Holland, south of France, Italy, and Japan.

The trade is divided into the main branches of garden and flower seeds and bulbs, and agricultural seeds. The latter is practically a business by itself, devoted to such seeds as blue-grass, timothy, clover, red-top and alfalfa, some of which are exported or imported as the exigencies of the season's product demand.

Flower seeds are subjected to no import duties, while on garden seeds there is a tariff figured on a specific basis. It is a moot point whether this tariff at the present time operates to the advantage of the trade, the principal seedsmen being generally of the opinion that it tends to stimulate over-production in this country.

The main business of the country is in the hands of about 150 firms, but practically every groceryman in country towns and villages carries a stock during the spring season. These men, however, deal as a rule with the larger houses, and constitute the principal class of middlemen for retail trade.

The seed-growing and merchandizing industry is represented by the American Seed Trade Association.

J. M. Thorburn & Co.
C. C. Morse & Co.

SEEMÁNNIA (named for Berthold Seemann, 1825–1871). *Gesneriàceæ.* Strigose-pubescent perennial herbs with rhizomes, suitable for the warmhouse: sts. stout, simple: lvs. verticillate, in 3's or 4's, very short-petioled, frequently canescent below; the upper ones reduced to bracts: pedicels solitary in the axils: fls. red-purple; calyx-tube turbinate, adnate, lobes 5, narrow; corolla-tube bent downward, broadly and obliquely subcampanulate, the limb with very short erect-spreading lobes; disk annular, undulate and not divided; ovary almost entirely inferior: caps. nearly inferior.—Two species, S. Amer. *S. silvática,* Hanst. (*S. ternifòlia,* Regel). Plant 3–4 ft. high: lvs. 3–4 in a whorl, very shortly petioled: fls. solitary, bright scarlet: calyx with 5 narrow lobes; corolla short-gibbous at base Winter. Peru. Gt. 4, p. 182.

SELAGINÉLLA (diminutive of Latin *Selago,* old name of a club moss). *Selaginellàceæ.* Club Moss. A large group of mostly tropical plants with small scale-like leaves and of diverse habit, ranging from minute prostrate annuals to erect or even climbing perennials.

Easily recognized by the production of two kinds of spores—powdery microspores from which the male prothallus arises and larger microspores produced 4 in a sporangium just within the axil of the terminal lvs. of the st. which often form a 4-angled spike. In all our cult. species the lvs. are in 4 ranks, the 2 upper smaller and pressed against the st., giving it a flattened appearance. Selaginellas are graceful fern-like greenhouse plants, often known to gardeners as lycopodiums. The botany of the genus is in an uncertain state, both as to nomenclature, and the limits of species. They are plants of the Pteridophyta or fern allies.

Selaginellas are favorite plants in every good conservatory, being greatly admired for their feathery moss-like foliage. They have various shades of green, and some of them are remarkable for metallic and iridescent tints, especially bronze and bluish colors, the latter being very unusual among plants in general. *S. Willdenovii* is a very choice large-growing species of the bronze and blue class. Another is *S. uncinata*, often called "rainbow moss." Selaginellas are often grown for their own sake as specimen plants, but they are also very commonly used as edging for greenhouse beds, for covering unsightly spots under the benches, and for hiding the surface soil of large tubs, orchid pots, and the like. (See Fig. 3598.) They are also delightful subjects for table decoration when grown in pans or jardinières. For this purpose a well-grown selaginella should be a dense compact mass of fluffy and feathery green, not a weak thin straggling plant, as compared in Figs. 3599 and 3600. Selaginellas are also employed in bouquets of flowers, fronds being used for "green" instead of asparagus or fern. Occasionally a fancier of the more difficult species grows a large specimen in a Wardian case for exhibition. In general, selaginellas are of easy culture. As a rule they prefer shade and moisture and are somewhat tender in foliage compared with some of the commonest of commercial ferns. *S. denticulata*, *S. Kraussiana*, *S. Martensii*, and some other

3598. A selaginella used to cover the soil of an orchid pot.—S. denticulata. (×¼)

commercial favorites may be rapidly propagated without any preliminary treatment in the cutting-bench. Cuttings of these species about an inch and a half long may be inserted directly into small pots of light sandy soil, placed in a shady position. Syringe them lightly three or four times a day for a week, at the end of which time they will take root. They will soon grow into salable plants. The popular *S. Emmeliana*, which is generally considered by florists a variety of *S. cuspidata*, requires different treatment. It is much slower and sometimes requires about nine months from the making of cuttings until the young plants are ready for potting. Fill regular fern-boxes with fern soil, adding one part in five of sand, and press firmly. Choose mature fronds of the *S. Emmeliana*, cut them into pieces half an inch long, scatter thinly over surface of soil, and put just enough finely screened soil on top of the cuttings to attach some small portion of them to the soil. Water thoroughly, cover with glass, and place in a temperature of 70° F. In this condition they will soon form roots and little plants at almost every joint. When sufficiently large they should be separated and transplanted singly an inch apart into boxes, where they may be left until large enough to be potted. The following list of selaginellas for special and general purposes is not designed to be complete, but merely suggestive. For commercial purposes, *S. denticulata*, *S. Kraussiana*, *S. Martensii*, and *S. Emmeliana;* for carpeting the soil, *S. denticulata;* for table decoration, *S. Emmeliana* and *S. Martensii;* for cutting, the commercial kinds; for veranda-boxes, *S. Braunii;* for bronze and blue colors, *S. Willdenovii* and *S. uncinata;* for specimen plants and exhibitions, *S. Braunii*, *S. Lyallii*, *S. viticulosa*, *S. Wallichii*, and *S. Willdenovii*. Also the following, which are generally considered more difficult subjects: *S. atroviridis*, *S. hæmatodes*, and *S. molliceps;* for curiosity, *S. serpens* and *S. lepidophylla*. The curiosities of the genus call for special mention. *S. serpens* is remarkable for its changes of color during the day. In the morning the foliage is bright green; during the day it gradually becomes paler as though bleached by the light; toward night it resumes its lively green hue again. For *S. lepidophylla*, see *Resurrection Plants*. The following species also deserve a few running notes: *S. Braunii* is an old favorite which is often incorrectly labelled *S. Willdenovii* in collections. Its branches, or "foliage" in the popular sense, are exceptionally tough and wiry for the genus. Variegated forms appear in *S. Martensii*, *S. Kraussiana*, and *S. involvens*, the last-named species being prolific in singular forms. *S. viticulosa* is better adapted for use as a pot-plant than for mingling in a fernery, because of its strong-growing erect fern-like habit. The branchlets are thrown up from creeping stems and do not root readily, so that this species is usually propagated by division or spores. (W. H. Taplin and N. N. Bruckner.)

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KEY TO THE SPECIES.

A. *Lvs. all similar, many-ranked: native species* . . . . . 1. **rupestris**

AA. *Lvs. 4-ranked, of two sorts, forming an upper and a lower plane: mostly hothouse exotics.*

B. *Foliage of the spikes uniform.*

C. *Main st. decumbent, usually rooting throughout.*

D. *Plants perennial: lvs. firm.*

E. *Sts. continuous, i. e., without joints.*

FF. *Branches ⅛ in. or less wide: sts. 6–9 in. long* ..... 2. denticulata
3. serpens
4. patula
FF. *Branches ¼ in. or more wide: sts. 1–2 ft. long* ... 5. uncinata
6. plumosa
7. concinna
EE. *Sts. articulated* ..... 8. stolonifera
9. Kraussiana
DD. *Plants annual; lvs. and st. weak and flaccid* ..... 10. Cunninghamii
11. brasiliensis
12. apus
13. albo-nitens
CC. *Main sts. ascending, branched nearly or quite to the base.*
D. *Roots confined to the lower half of the sts.*
E. *Plants perennial, with continuous sts.*
F. *Color of lvs. and st. pale or bright green* ..... 14. atroviridis
15. californica
16. Martensii
FF. *Color of lvs. dark green, becoming red: st. reddish brown* ..... 17. rubella
EE. *Plants annual* ..... 18. Poulteri
DD. *Roots confined to the base of the sts.*
E. *Sts. crowded in rosettes, curling closely when dry* ..... 19. involvens
20. lepidophylla
21. cuspidata
EE. *Sts. 6–12 in. high, not curling in rosettes* ..... 22. Emmeliana
EEE. *Sts. elongated (2 ft. or more), not crowded.*
F. *Lvs. equal-sided at base* .... 23. Wallichii
24. Victoriæ
FF. *Lvs. produced on upper side at base* ..... 25. gracilis
26. Lobbii
CCC. *Main sts. climbing* ..... 27. Willdenovii
CCCC. *Main sts. erect, the branches confined to the upper portion, naked below.*
D. *Sts. not jointed.*
E. *Color of sts. straw-colored, or at most only pink-tinted.*
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1. **rupéstris,** Spring. A small, rock-loving perennial, with branching sts. 4–5 in. long, many-ranked lvs. ending in a white awn, and square, 4-angled spikes. Native of the eastern half of the U. S., but replaced by many allied species in the Rocky Mts. and on the Pacific coast. The writer has separated 6 of these and Dr. Hieronymus, at Berlin, has also characterized 10 others.

2. **denticulàta,** Link. Fig. 3598. Sts. less than 6 in. long, matted: lvs. of the lower plane slightly spaced, denticulate, cordate on the upper side at base and imbricated over the st.; lvs. of upper plane cuspidate. Medit. region throughout.—Trade names are vars. **aùrea** and **fòliis variegàtis.**

3. **sérpens,** Spring. Sts. 6–9 in. long, trailing, bright green, copiously branched: lvs. of lower plane crowded, obtuse, spreading, ciliated at the rounded base; lvs. of upper plane obliquely oblong, acute. W. Indies.—Long in cult.

4. **pâtula,** Spring (*S. sarmentòsa,* A. Br.). Sts. slender, trailing, pale green, 6–9 in. long, with long, tail-like tip, and fewer short pinnate branches: lvs. of lower plane crowded, erect-spreading, oblong-lanceolate, somewhat acute; lvs. of upper plane one-third as long, acute. Jamaica.

5. **uncinàta,** Spring (*Lycopòdium cæsium* and *Selaginélla cæsia,* Hort.). Sts. 1–2 ft. long, extending in a somewhat naked tip beyond the branches, doubly grooved above, with short, alternate branches: lvs. thin, blue-green, with a distinct midrib, slightly more produced on the upper side; lvs. of upper plane cuspidate, much imbricated. China.—In 1893 John Saul offered "*S. cæsia arborea*" with the remark that *S. lævigata* was a synonym thereof.

6. **plumòsa,** Baker. Sts. 6–12 in. long, flat above, often forked near the base: lvs. of lower plane close, bright green, much more produced on upper side of midrib, ciliated on both sides at base; lvs. of upper plane half as long, ovate, much imbricated. India, Ceylon, China, Malay Isls.

7. **concínna,** Spring (*S. serrulàta,* Spring). Sts. 1 ft. or more long, copiously pinnately branched, with more or less fan-shaped compound branches: lvs. of lower plane crowded, bright green, glossy, much dilated and rigidly ciliate on the upper side at base; lvs. of upper plane one-third as long, long-cuspidate, much imbricated. Mascarene Isls.—Var. **fòliis variegàtis,** Hort., is cult.

8. **stolonífera,** Spring. Sts. a foot or more long, with a more or less naked tip, angled above and below, with short, compound branches: lvs. of lower plane closely set, rigid, acute, short-ciliate and minutely auricled at base. W. Indies.

9. **Kraussiàna,** A. Br. Sts. 6–12 in. long, flat on the back, rounded on the face, copiously pinnate, with compound branches: lvs. of upper plane spaced on the branches and main st. acute, slightly imbricated over the st.; lvs. of upper plane obliquely ovate, acute. Afr., Madeira.—*S. Bròwnii,* Hort., is a dwarf form from the Azores. Vars. **aùrea** and **variegàta** are American trade names.

10. **Cúnninghamii,** Baker. Sts. copiously pinnate, the lower branches compound: lvs. of lower plane ovate or oblong, cordate and very unequal-sided at base, much imbricated over the st.; lvs. of upper plane distinctly cuspidate. Brazil.

11. **brasiliénsis,** A. Br. Sts. copiously pinnate, the lower slightly compound: lvs. of lower plane mostly spaced, acute, cordate at base, ciliate and imbricated over the st.; lvs. of upper plane half as long, cuspidate. Brazil.—Similar to preceding, but with longer lvs.

12. **àpus,** Spring. Sts. 1–4 in. long, angled above, with short, simple or forked branches: lvs. of lower plane pale green, serrulate but not ciliate, cordate on the upper side; lvs. of the upper plane ovate. Canada to Texas.—*Lycopodium densum,* cult. at the Harvard Botanic Garden, is said to belong here.

13. **álbo-nìtens,** Spring. Sts. slender, trailing, the lower branches slightly compound: lvs. of lower plane spaced on main st., short-ciliate, bright green; lvs. of upper plane one-third as long, cuspidate. W. Indies.

14. **atrovíridis,** Spring. Sts. 6–12 in. long, ascending, doubly grooved above: lvs. of lower plane spuriously 3-nerved, firm, broadly rounded; lvs. of the upper plane half as long, long-cuspidate, much imbricated. India.

15. **califórnica,** Spring. Sts. 4–6 in. long, 4-angled, copiously pinnate: lvs. of lower plane ovate, minutely cuspidate, denticulate on the upper side at the base; lvs. of the upper plane very small, ovate-oblong. Said to come from Low. Calif. but not known at Kew and doubtfully in cult. in this country.

16. **Mártensii,** Spring. Fig. 3599. Sts. 6–12 in. long, flat or rounded below, angled above: lvs. of lower plane oblong-lanceolate, serrulate but not ciliate, slightly imbricated over the st. at base; lvs. of upper plane obliquely oblong, long-cuspidate. Mex.—Exists under many varieties in cult.

17. **rubélla,** Moore. Sts. 1 ft. long, somewhat erect in habit, reddish brown, with 2 grooves on the upper face: lvs. of lower plane dark green, becoming reddish with age, obtuse or obscurely cuspidate, ciliated and imbricated over the st. at the upper side of base; lvs. of upper plane ovate-cuspidate. Native country not known.—Has been in cult. since 1870. Var. **variegàta,** Hort., is cult.

18. **Pôulteri,** Hort. Veitch. Sts. densely tufted, slender, suberect, 2–3 in. long, 3–4 times dichotomously forked: lvs. of lower plane spaced, suborbicular, obtuse, bright green; lvs. of upper plane nearly as long, but ovate and acute. Azores.

19. **invôlvens,** Spring. Sts. densely tufted, 2–6 in. long, deltoid, branched nearly to the base: lvs. of lower plane crowded, ovate, with a distinct cusp, bright green, thick, rigid, serrulate on both margins; lvs. of upper plane nearly as long, ovate-lanceolate, cuspidate. Japan to India and the Philippines.

20. **lepidophýlla,** Spring. Resurrection Plant. Sts. 2–4 in. long, densely tufted, spreading in a close spiral so as to form a flattish expanse, curling closely into a ball when quite dry: lvs. of lower plane oblique, obtuse, minutely ciliated, green on the face, paler below; lvs. of upper plane nearly as long, obliquely ovate, obtuse. Texas and Mex. to Peru.—Often sold dry under the name of "resurrection plant" (which see), as the absorption of water will cause the ball with a dull brown exterior to expand and show its bright green upper face of the sts. long after the plant is dead.

21. **cuspidàta,** Link. Sts. densely tufted, 6 in. or more long, branched nearly to the base, with copiously compound branches: lvs. of lower plane obliquely ovate, cuspidate, dilated and ciliated on the upper side at the base, pale green edged with white; lvs. of upper plane nearly as long, obliquely ovate, cuspidate. Cuba and Mex. to Venezuela.—A plant occurring under the horticultural name *Lycopodium cordifolium* has the st. a foot or more long and simple in its lower part, and doubtless represents a distinct species.

3599. Poorly grown specimen of club moss, unsuitable for table decoration.—Selaginella Martensii. (×⅓)

22. **Emmeliàna,** Hort. Fig. 3600. Sts. 6–12 in. high, the primary branches ascending, bipinnate: lvs. of lower plane close, obliquely ovate, those of the branchlets narrower and minutely spinulose; lvs. of upper plane raised above those of the lower one-half as large, spinulose-serrulate, short-cuspidate. S. Amer.(?).—Named for Th. Emmel, a German gardener. Var. **aûrea** is a yellow form. This species and its variety are most commonly seen in the American trade. They require a constant supply of moisture. If allowed to dry, the tips of the fronds turn brown and do not recover.

23. **Wállichii,** Spring. Sts. 2–3 ft. long, with lanceolate branches and simple crowded branchlets: lvs. of lower plane crowded, smaller toward the end of the pinnules; lvs. of upper plane one-fourth as long, cuspidate: spikes ½–1 in. long. India and the E. Indies.—Highly ornamental.

24. **Victòriæ,** Moore. Sts. 3–4 ft. long, with lanceolate-deltoid, caudate branches, with the lower branchlets forked or slightly pinnate: lvs. of lower plane crowded, a line long, truncate at base and obscurely petioled; lvs. of lower plane one-fourth as long, short-cuspidate: spikes 1–2 in. long. Borneo and Fiji Isls.

25. **grácilis,** Moore. Sts. 2–3 ft. long, somewhat roughened, with lanceolate branches and simple branchlets: lvs. of lower plane ovate-falcate, adnate to st. on lower side at base; lvs. of upper plane ovate-lanceolate, cuspidate. Polynesia.

26. **Lôbbii,** Moore (*S. cognàta,* Hort.). Sts. 3–4 ft. long, with lanceolate-deltoid branches and contiguous simple or forked branchlets: lvs. of lower plane oblong-lanceolate, acute, bright green, truncate at base; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Borneo and Sumatra.

27. **Wíldenovii,** Baker. Sts. reaching a length of many feet, with spreading deltoid branches and much compound branchlets, the ultimate short and contiguous: lvs. of lower plane crowded, ovate or oblong, tinted with blue, obscurely petioled; lvs. of upper plane one-third as long, obliquely oblong, not cuspidate. India and the E. Indies.

28. **grándis,** Moore. Sts. 1½–2 ft. long, branched above: lvs. of lower plane crowded, lanceolate, acute, rather firm; lvs. of upper plane one-third as long, ascending, much imbricated. Borneo.

29. **viticulôsa,** Klotzsch. Sts. with deltoid 2–3-pinnate branches: lvs. of lower plane ascending, acute, short-ciliated and much imbricated over the st.; lvs. of upper plane one-third as long, obliquely ovate, cuspidate. Cent. Amer.

30. **cauléscens,** Spring (*S. amœna,* Hort.). Sts. stiff, erect, the short final branchlets curling when dry: lvs. of lower plane crowded, ovate, falcate, bright green; lvs. of upper plane one-third to one-fourth as long, cuspidate. Japan, China, and E. Indies. Var. **argéntea,** Hort., is advertised.

31. **Braûnii,** Baker. Sts. deltoid and flexuous above, with deltoid erect-spreading pinnæ, the pinnules short, deltoid and spaced: lvs. of lower plane ovate-rhomboid, usually revolute at both edges; lvs. of lower plane short-cuspidate. W. China.

32. **flabellàta,** Spring. Sts. erect, deltoid, decompound, with contiguous final branchlets: lvs. of lower plane obliquely ovate, acute, broadly rounded and ciliated at the base; lvs. of upper plane obliquely ovate, cuspidate. Widely distributed in tropical regions.—One of the forms of this is cult. as *S. crispa,* Hort.

33. **Vôgelii,** Spring (*S. africàna,* A. Br. *S. Pervillei,* Spring). Sts. decompound above, the lower pinnæ deltoid, petioled, 3–4-pinnate: lvs. of lower plane lanceolate, ascending, often revolute on both edges, truncate at base; lvs. of upper plane minute, strongly cuspidate. Afr.

34. **Lŷallii,** Spring. Sts. deltoid above, the lower pinnæ bipinnate, the final divisions ½–1 in. long, ⅛–⅙

in. wide: lvs. of lower plane oblong-lanceolate, falcate, acute; lvs. of upper plane minute, acute. Madagascar.

35. **erýthropus,** Spring. Sts. under a foot long, deltoid and decompound above, the lower pinnæ 3-pinnate, the ultimate divisions $\frac{1}{12}$–$\frac{1}{8}$in. wide: lvs. of lower plane oblong-lanceolate, acute, strongly ciliated; lvs. of upper plane one-half as long, cuspidate. Trop. Amer.—*S. setòsa,* Hort., is said to be a starved form.

36. **hæmatòdes,** Spring (*S. filicìna,* Spring). Sts. 1–2 ft. long, the deltoid pinnæ 3–4-pinnate, the ultimate

3600. Well-grown specimen of Selaginella Emmeliana. Suitable for table decoration. (×¼)

divisions $\frac{1}{8}$–$\frac{1}{6}$in. wide: lvs. of lower plane ascending, oblong-rhomboid, acute, dilated on upper side at base, not ciliated; lvs. of upper plane minute, cuspidate. Venezuela to Peru.

37. **geniculàta,** Spring (*S. elongàta,* Kl.). Sts. 2–3 ft. long, decompound, with lower pinnæ 3-pinnate, the divisions ascending and pinnately arranged: lvs. of lower plane ovate, acute; lvs. of upper plane one-third as long, ovate-lanceolate. Costa Rica to Peru.

38. **cordifòlia,** Spring (*S. cordàta,* Kl.). Sts. trailing, a foot long, with short branches often ending in whip-like tips: lvs. of lower plane acute, pale green, ciliated on the upper edge, dilated and subcordate; lvs. of upper plane ovate-lanceolate, cuspidate. W. Indies.

39. **mólliceps,** Spring (*S. rubricaùlis,* A. Br.). Sts. erect, 6–9 in. long, bisulcate above, much compound: lvs. of lower plane oblong-lanceolate, dark green, very unequal-sided, serrulate on the upper edge; lvs. of upper plane one-half to one-third as long, ovate or ovate-lanceolate, cuspidate. Afr.

The following American trade names can not be satisfactorily accounted for as species: *S. acaùlis* is said to be one of the most important commercial species cult. in Amer.—*S. circinàta* is cult. at Harvard Botanic Garden.—*S. Lageriàna* was intro. from Colombia and probably belongs to species already described from that country. It is said to be a very light green plant and a strong grower, whereas S. Pitcheriana is of dwarfer habit and with sts. and under surface of fronds red and upper surface dark green.—*S. Mandiàna* is a recent intro. by W. A. Manda which can not be satisfactorily placed.—*S. paradóxa.* Offered by John Saul, 1893.—*S. Pitcheriàna.* Consult S. Lageriana. Colombia.—*S. rubicúnda* and *S. triangulàris* were offered by Saul in 1893.—*S. umbròsa.* Once cult. by Pitcher & Manda, of the United States Nurseries.

L. M. Underwood.
R. C. Benedict.†

SELÈNIA (probably from the Greek *moon;* said to refer to the round seeds). *Cruciferæ.* Small annual herbs sparingly grown in gardens: lvs. pinnatisect: racemes terminal, leafy: fls. yellow; sepals spreading, colored, subequal; petals erect: silique stipitate, oval berry much compressed or turgid, acute at the base, valves reticulate.—Three species, N. Amer.

aùrea, Nutt., is a hardy annual of the mustard family, a native of the U. S. from Ark. and Texas to the base of the Rockies. It is not known to be cult. in Amer., but it seems to be one of the prettiest of our few native ornamental crucifers. It has small yellow fls. about ½in. across, each of the 4 petals having a central band of red. It is also interesting for its finely cut foliage and its flat pods through which the seeds may be vaguely seen, as in the case of lunaria, or "honesty." It grows about 9 in. high. B.M. 6607.

F. Tracy Hubbard.†

SELENICÈREUS (*moon goddess* and *cereus*). *Cactàceæ.* Cacti with slender trailing hanging or climbing sts., more or less epiphytic: ribs several, usually low, with closely set areoles bearing small short or acicular spines: fls. large, nocturnal, fragrant; ovary and fr. covered with clusters of small spines often accompanied by long hairs.—More than 20 species are known. This genus contains a number of easily grown species which are great favorities in cult. on account of the great size and beauty of the fls. Some of the species are reported to possess medicinal properties. These plants have been referred to *Cereus.*

A. *Fl.-tube and ovary without long hairs.*

B. *Spines on sts. acicular.*

vàgans, Brit. & Rose (*Cèreus vàgans,* Brandeg.). Sts. slender, numerous, clambering over rocks in the wild state, but in cult. ascending: ribs low: spines rather short, yellowish: fls. 6 in. long; tube, including throat, about 4 in. long, slightly curved, brownish, with small scattered bracts bearing in their axils clusters of 5–8 acicular spines; throat narrow, 2 in. long; sepals linear, the outer ones brownish, the inner ones greenish white, 2½ in. long; petals white, oblanceolate, 2½ in. long with a short acuminate tip, the margins, especially above, undulate or toothed; ovary covered with acicular spines. West coast of Mex.

BB. *Spines on sts. not acicular.*

spinulòsus, Brit. & Rose (*Cèreus spinulòsus,* DC.). Slender climbing vine, 10–14 ft. long: ribs usually 5, not very conspicuous in age: spines about 8, very short, usually dark: fls. 4½–5 in. long, white, with a pink tinge; ovary and fl.-tube bearing small clusters of acicular spines but no long hairs. Common in N. E. Mex. and S. E. Texas, but not found in the W. Indies. Blühenden Kakteen, pl. 53.

AA. *Fl.-tube and ovary bearing long hairs among the spines.*

B. *Spines of the sts. acicular.*

C. *Color of spines white.*

Donkelàri, Brit. & Rose (*Cèreus Donkelàri,* Salm-Dyck). A slender epiphytic plant, much branched, clinging to the bark of trees by aërial roots, commonly in company with orchids: branches long, slender, nearly terete, about ⅜in. diam. with 6–8 low, almost inconspicuous ribs; spines 10–15, very short, snow-white, closely appressed to the st. Brazil.

CC. *Color of spines brownish.*

grandiflòrus, Brit. & Rose (*Cèreus grandiflòrus,* Mill.). Creeping or clambering vines: sts. stout, often 1 in. diam., bluish green: ribs 7 or 8, low: spines acicular, yellowish brown or brownish: fls. very large, fragrant, 6–8 in. long. Jamaica, but said also to be native of Mex., which is doubtless wrong. B.M. 3381.—A number of species resembling *S. grandiflorus* in a general way, but specifically distinct, are often to be found under this name in collections; they need further study. This species is used in the manufacture of a heart-tonic.

BB. *Spines of the sts. not acicular.*

C. *Sts. blue-green.*

pteránthus, Brit. & Rose (*Cèreus pteránthus*, Link & Otto. *Cèreus nycticàlus*, Link). Stout, suberect, or clambering vines: branches much elongated, bluish green, 4- or 6-angled: spines 1–4, short: fls. large, white, very fragrant, 7 in. long, the ovary covered with long white hairs intermixed with the short acicular spines. Mex. Lem. Cact. f. 11. Gesamtb. Kakteen f. 35.—One of the commonest and best night-blooming cacti.

CC. *Sts. deep green.*

D. *Knobs on ribs terete and low.*

MacDónaldiæ, Brit. & Rose (*Cèreus MacDónaldiæ*, Hook.). Clambering vines of rapid growth, freely branching: branches deep green: the ribs rather low, obtuse, somewhat interrupted: spines 1 or 2, short, porrect, dark: fls. very large, 14 in. long, white. Honduras, probably, but some recent writers claim it came originally from Argentina. B.M. 4707. Cact. Journ. 2:135.—One of the largest-flowered species of the cactus family and one of the best of the night-blooming kind.

DD. *Knobs on ribs flattened, rather high and reflexed.*

hamàtus, Brit. & Rose (*Cèreus hamàtus*, Scheidw. *C. rostràtus*, Lem.). Sts. often weak and sprawling or climbing and clambering, bright green, about 8 in. diam.: ribs usually 4, interrupted by flattened reflexed knobs bearing small areoles: spines 5 or 6, bristle-like, white; hairs more or less deciduous: fls. large, 10–12 in. long, white. Cent. Mex. Monatsschr. Kakteenk. 9:23. Gesamtb. Kakteen Nachtr. f. 7.—Numerous hybrids have been made by crossing some of these species, especially *S. grandiflorus*, *S. MacDonaldiæ*, and *S. hamatus*, with certain species of related genera. Some of these hybrids have been given distinct names in Cereus, such as *C. Màynardii*, *C. Regèlii* and *C. uràmos*.

Cèreus inérmis, Otto. Sts. slender, climbing, 4–5-angled, deep green: areoles small, naked except on juvenile shoots and then bearing several white bristles: fls. said to be large, probably nocturnal, but not often appearing on cult. plants. This is a rather insignificant plant. Intro. from Venezuela many years ago. This is not a true Cereus, and without seeing fls. or fr. its real status can not be definitely stated. Karl Schumann, however, associated it with this group, and if of this alliance, it should be placed near S. hamatus.

J. N. Rose.

SELENIPÈDIUM. For the species included in this genus in "Cyclopedia of American Horticulture," see *Phragmopedilum*. The true Selenipediums (or Selenipedilum) are few and seem not to be in cult.

SELENOCYPRIPÈDIUM (compounded from *Selenipedium* and *Cypripedium*). *Orchidàceæ*. A name proposed to designate hybrids between Selenipedium and Cypripedium. *S. Malhoùitri*=S. (Phragmopedilum) Schlimii × C. (Paphiopedilum) Harrisianum.

SELF-HEAL: *Brunella*.

SELF-STERILITY OF FRUITS: *Pollen and Pollination*.

SELÌNUM (Greek name for parsley). *Umbelliferæ*. Branched perennial herbs, glabrous, tall or rarely low, of little horticultural value: lvs. pinnately decompound: umbels compound, many-rayed; fls. white or rarely yellowish green; calyx-teeth obsolete or rarely noticeable; petals cuneate or broad, emarginate or 2-lobed: fr. ovoid or nearly quadrate.—About 35 species, mostly in the northern hemisphere but 1 from the mountains of Colombia and 1 from S. Afr.

tenuifòlium, Wall (*Oreócome Candòllei*, Edgew.). A hardy perennial with finely cut fern-like foliage and st. often 8 ft. high, branched, with numerous umbels of white fls.: ultimate segms. of lvs. narrowly lanceolate, acute: fr. 2–3 lines long, much compressed dorsally, 4–6 times as broad as thick; lateral ridges much the broadest. India. Gn. 38, p. 221.—Offered as a novelty in Amer. in 1899 and recommended as a foliage plant for single lawn specimens. F. Tracy Hubbard.†

SELLIÈRA (named for Natale Sellier, a French engraver who worked for Cavanilles). *Goodeniàceæ*. Two creeping and rooting perennial herbs of Austral. and New Zeal. and one of them extending to Chile: plant glabrous: lvs. entire, alternate or fascicled: fls. small, axillary, sessile or stalked; calyx 5-lobed; corolla oblique, split at the back, 5-lobed; stamens 5; ovary 2-celled or imperfectly so: fr. fleshy and indehiscent. The plants are probably not regularly in cult., but *S. radicans*, Cav., has been listed abroad as an aquatic: it grows in muddy or marshy and rocky places near the sea in New Zeal., Austral., and S. Amer.: sts. sometimes creeping several feet, forming matted and interlaced patches: lvs. very small to 4 in. long, nearly linear to obovate-spatulate, obtuse, entire, narrowed into long petiole: fls. 1 or 2 on the peduncle, ⅓in. long, white: fr. about ¼in. long, ovoid or obovoid. See Krause, in Engler's Pflanzenreich, hft. 54 (IV. 277 & 277a). 1912.

SELLIGUÈA (personal name, from Selligue, naturalist and mechanician). *Polypodiàceæ*. A group of ferns referred by Diels (Engler & Prantl, Die Natürlichen Pflanzenfamilien) to Polypodium. Only *P. Féei*, Mett. (*Selliguèa Féei*, Bory. *Gymnográmma Féei*, Hook.), appears to be listed. It is described by Schneider as a small stove species of the Malay Isls., Java, and Borneo: fronds entire, from a creeping rhizome, the barren ones 3–4 in. long and 2 in. or less broad, the fertile ones narrower and longer-stalked.

SEMECÁRPUS (Greek, *mark* and *fruit*, referring to use of fruit-juice). *Anacardiàceæ*. Trees, sometimes grown in the warmhouse, or in the open far S.: lvs. alternate, simple, leathery: fls. small, polygamous, in terminal or lateral, branched, bracteate panicles; calyx 5-cleft, segms. imbricated and deciduous; petals 5, spreading, somewhat unequal; disk annular and rather broad; stamens 5; ovary superior, sessile, 1-celled: nut or drupe reniform.—About 35 species, Trop. Asia and Austral.

Anacárdium, Linn. f. Marking-Nut Tree. A moderate-sized deciduous tree with large, oblong or obovate-oblong lvs. 8–24 in. long by 5–10 in. wide: fls. greenish white, ¼in. across, nearly sessile, in stout branching panicles about the same length as the lvs.: drupe 1 in. long, smooth, black. India.—The black acid juice of the nut is used for printing cotton cloth. Cult. in S. Fla.

SÉMELE (named for the mother of Bacchus). *Liliàceæ*. Climbing Butcher's Broom. A warmhouse plant, hardy outdoors in the extreme S.: st. shrubby and branched, high-climbing over trees attaining a height of 50–60 ft., cladodia lf.-like, alternate or few, solitary at the axils of fuscous-membranaceous scales, ovate-lanceolate, acuminate, leathery: fls. small, yellow, fascicled, the fascicles on the margins of the cladodia; perianth persistent, tube very short, turbinate, almost hemispherical; crown none; ovary sessile in the perianth-tube, 3-celled: berry globose, pulpy, indehiscent.—One species, Canary Isls. What appear to be lvs. are technically "cladophylla," i. e., lf.-like branches. They are organs which have the form and function of lvs. but not the morphology. Semele belongs to the small group of 4 genera known as the Asparagus tribe, all the members of which have cladophylla. Semele differs from the butcher's broom (Ruscus) in having 6 anthers instead of 3 and in having the fls. borne on the margin of the cladophylla instead of along the midrib. Asparagus differs from both in having the fls. not borne on the cladophylla and the filaments free instead of grown into an urn-shaped body.

andrógyna, Kunth (*Rúscus andrógynus*, Linn.). Scandent, branching: cladodia ovate or ovate-lanceolate, acuminate, leathery: fls. small, yellow, clustered; ovary 3-loculed: berry globose, indehiscent. B.M. 1898 and 3029 (as *Ruscus androgynus*). R.H. 1894, p. 546.

Gn. 72, p. 432. G.M. 31:477, 479; 37:261.—The members which have the position of lvs. are minute scales, in the axil of which are borne the cladophylla, the latter being 3–4 in. long. It is grown in the open in S. Calif. and is said to look like a gigantic smilax and to have dark green tropical foliage likely to be mistaken for some of the Indian climbing palms.

F. Tracy Hubbard.†

SEMIBEGONIÉLLA is a recent genus of the Begoniaceæ, differing from Begonia in having a tubular male flower (Symbegonia has a tubular female flower), apparently not in cult. *S. Sodiroi*, C. DC., from Ecuador was described, and the genus founded, in 1908.

SEMPERVÌVUM (Latin, *living forever*). *Crassulàceæ*. Houseleek. Thick fleshy usually stemless, perennial herbs or subshrubs which are used for carpet-bedding, rockeries, and the like. See *Succulents* (p. 2672, Vol. V) for culture.

Leaves alternate, thick-fleshy, often revolute: cymes panicled, usually densely: fls. white, rose, green, yellow, or purple; calyx 6- to many-cleft or -parted, rarely 5-cleft; petals 6 to many, free or connate at the base, oblong or lanceolate; stamens double as many as the petals, rarely the same number, free; ovary with as many carpels as petals, free or the base or up to the middle immersed in the calyx-tube: fr. many-seeded follicles.—About 65 species, widely scattered in the mountains of the Old World. The genus was monographed (horticulturally) by J. G. Baker in Gardener's Chronicle for 1879, and his treatment has been followed here to some extent with the addition of several species and slight modifications to meet more recent knowledge of the genus. Sempervivum is closely related to Sedum, but the floral parts are multiples of 6 or some larger number, while the floral parts of Sedum are in 5's. The genus is a difficult one for the botanist, and the specific limits are very uncertain and unsatisfactory, no two authors agreeing. The key given will undoubtedly prove faulty, but is an attempt to simplify the determination of the species.

Sempervivums are mostly hardy perennials and stemless, and increase by rosettes (Fig. 3602) which are sent out from the parent plant, thereby suggesting the popular name "hen-and-chickens." The leaves are thick, short, and succulent. The flowers, which are borne in panicled cymes, are mostly yellow, greenish yellow, or some shade of rose or purple, rarely white. The individual flowers are larger than those of sedum, but the clusters are less showy. Houseleeks are cultivated more for foliage than for flowers. They are not used for as great a variety of purposes as sedums, but they are popular for carpet-bedding, rockwork, and covering dry banks and bare sandy wastes. They are of the easiest culture and are quickly multiplied by means of the offsets or rosettes. They may be used alone for permanent carpet-beds, and for this special purpose are preferable to the more popular but tender echeveria. The foliage remains green all winter. The leaves are often spotted with red toward the tip, and this color is brighter if the plants have full sunlight. The names "houseleek" and "hen-and-chickens" are loosely applied to the whole genus. If these names are to be restricted, the former should be used for *Sempervivum tectorum* and the latter for *S. soboliferum*. The common species, which grows on the roofs of houses in Europe, is *S. tectorum*. In the case of *S. soboliferum* the young rosettes are attached to the parent plant by a more slender thread than usual and more easily detach themselves and roll about. The spider-web species, of which *S. arachnoideum* is the commonest, are the prettiest of them all, by reason of the webs that cover the young rosettes. These coverings are made by the plants themselves and are incidental to development, but in some species are not strongly developed and in all the group are less noticeable in the old rosettes.

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KEY TO THE SPECIES:

A. *Plants without secondary rosettes on offshoots: fls. usually yellow.*
B. *St. herbaceous, with the basal lvs. in a rosette* . . . . . 1. **poculiforme**
BB. *St. shrubby, with the lvs. in a rosette at the end of the branches.*
C. *Surface of lvs. villous* . . . . . 2. **canariense**
CC. *Surface of lvs. glabrous.*
D. *Lvs. obovate-spatulate or roundish ovate.*
E. *Petals elliptical; calyx-segms. ovate* . . . . . 3. **arboreum**
EE. *Petals linear-lanceolate; calyx-segms. short-triangular* . . . . 4. **chrysanthum**
DD. *Lvs. oblong-spatulate.*
E. *Margin of lvs. ciliate* . . . . . 5. **tabulæforme**
EE. *Margin of lvs. papillose* . . . . . 6. **spathulatum**
AA. *Plants with secondary rosettes on offsets or sessile.*
B. *Fls. usually 6-merous; not widespreading at maturity.*
C. *The fls. small; petals not fimbriated on the margin and keel.*
D. *Segms. of calyx linear-oblong; petals linear-oblong* . . . . . 7. **Heuffelii**
DD. *Segms. of calyx lanceolate; petals lingulate* . . . . . 8. **Reginæ-[Amaliæ**
CC. *The fls. large; petals fimbriated on the margin and keel.*
D. *New rosettes rolled up into round balls.*
E. *Lvs. obovate-cuneate* . . . . . 9. **soboliferum**
EE. *Lvs. oblanceolate* . . . . . 10. **arenarium**
DD. *New rosettes not rolled up into round balls* . . . . . 11. **hirtum**
BB. *Fls. usually 12-merous (9–14-merous); widely expanded at maturity.*
C. *Color of fls. yellow or yellowish.*
D. *Surface of lvs. glabrous.*
E. *The lvs. obovate-cuneate* . . . . . 12. **Wulfenii**
EE. *The lvs ovate-lanceolate* . . . . . 13. **albidum**
DD. *Surface of lvs. more or less hairy.*
E. *Blade of lf. ensiform, lingulate, or oblanceolate* . . . . . 14. **Pittonii**
EE. *Blade of lf. more or less obovate-cuneate.*
F. *Segms. of calyx oblong* . . . . 15. **rupicolum**
FF. *Segms. of calyx lanceolate.*
G. *Petals linear-lanceolate, acute, green-striate externally* . . . . . 16. **globiferum**
GG. *Petals lanceolate, acuminate, not green-striate externally* . . . . . 17. **grandiflorum**
CC. *Color of fls. reddish or purplish.*
D. *Inner lvs. of rosette with their tips connected by fine hairs like a spider's web. (The following 5 species are very closely related.)*

E. *Rosette lvs. glabrous or merely puberulent at apex.*
F. *Calyx-segms. lanceolate-linear, acute: cauline lvs. lanceolate-linear*.....18. **hetero-**
FF. *Calyx-segms. linear, obtuse: cauline lvs. oblanceolate to oblong*.....19. **Moggridgei** [**trichum**
EE. *Rosette lvs. more or less hairy.*
F. *Segms. of calyx linear*.....20. **arachnoideum**
FF. *Segms. of calyx ovate to lanceolate.*
G. *Cauline lvs. lanceolate; rosette lvs. oblanceolate.*21. **Doellianum**
GG. *Cauline and rosette lvs. lingulate*.....22. **Laggeri**
DD. *Inner lvs. of rosettes not connected by fine hairs like a spider's web.*
E. *Tips of lvs. with a tuft of hairs.*
F. *Lvs. ovate*.....23. **Hausmannii**
FF. *Lvs. oblanceolate.*
G. *Cusp of lf. distinct: fls. rose-red*.....24. **Pomelii**
GG. *Cusp of lf. obscure: fls. bright red*.....25. **fimbriatum**
EE. *Tips of lvs. without a tuft of hairs.*
F. *Surface of lvs. of the rosettes pubescent.*
G. *Stamens two-thirds as long as petals*.....26. **assimile**
GG. *Stamens half as long as petals.*
H. *Barren rosettes not more than 1 in. diam.*.....27. **pumilum**
HH. *Barren rosettes more than 1 in. diam.*
I. *Fls. numerous, mauve or red-brown*.....28. **montanum**
II. *Fls. few (4–8), bright red*.....29. **flagelliforme**
FF. *Surface of lvs. of the rosettes glabrous.*
G. *Rosette lvs. more or less ovate or obovate.*
H. *Lf.-blade broadest toward the base.*
I. *Color of lvs. dark green*.....30. **Schnitt-** [**spahnii**
II. *Color of lvs. gray-green*.....31. **Mettenianum**
HH. *Lf.-blade broadest toward the apex.*
I. *Petals lanceolate*....32. **blandum**
II. *Petals linear.*
J. *Sepals linear-lanceolate*.....33. **Lamottei**
JJ. *Sepals lanceolate.*34. **tectorum**
GG. *Rosette lvs. oblanceolate-cuneate.*
H. *Red-brown tip of rosette lvs. none or obscure.*
I. *Young rosettes on peduncles 1 in. or more long*.....35. **Funckii**
II. *Young rosettes sessile or nearly so.*
J. *Lvs. glaucous*....36. **glaucum**
JJ. *Lvs. pale green but not glaucous.*
K. *Cauline lvs. green-tipped: petals rose*...37. **Verlotii**
KK. *Cauline lvs. claret-tipped: petals white-margined*....38. **atlanticum**
HH. *Red-brown tip of rosette lvs. distinct.*
I. *The cauline lvs. red-brown throughout.*39. **triste**
II. *The cauline lvs. partly green.*
J. *Rosette lvs. glaucous.*
K. *Outer lvs. of rosette ¾–1 x ½ in.: fls. about ½ in. across*..40. **Greenii**
KK. *Outer lvs. of rosette 1–1¼ x ⅜ in.: fls. about ¾ in. across*.....41. **calcareum**
JJ. *Rosette lvs. not glaucous. (The following species are frequently kept distinct but no distinguishing key characters can be detected from the descriptions.)*
42. **arvernense**
43. **Boutigny-** [**anum**
44. **alpinum**
45. **Boissieri**

1. **poculifórme,** Berger & DeWild. St. simple, erect, more or less elongated: basal lvs. in a rosette, oblong-lanceolate, cuneate at the apex, serrate-ciliate, otherwise glabrous; cauline lvs. obovate-spatulate: fls. 9-merous, in a glabrous panicle; calyx glabrous, segms. lanceolate-triangular subacute; petals lanceolate, acute. Canary Isls.(?).

2. **canariénse,** Linn. Subshrub: st. short, thick: lvs. in a flattened rosette, obovate-spatulate, mucronate, attenuate to a petiole, villous; cauline lvs. obovate-rotundate: fls. 7–9-merous, pale yellow or whitish, in a lax thyrsoid elongated panicle; calyx very villous, segms. ovate-lanceolate; petals linear, acute. Canary Isls.

3. **arbòreum,** Linn. St. arborescent, with terete branches: rosettes concave: lvs. spreading, obovate-spatulate, obtuse, mucronate, base cuneate, rather glabrous: fls. golden yellow in a many-fld. leafy panicle; calyx-segms. ovate, rather acute; petals spreading, 10–12, elliptical. Medit. region.

4. **chrysánthum,** Hochst. Subshrub, 1–2 ft. high: st. thick: lvs. pectinate-ciliate, on barren shoots rosulate, roundish ovate; cauline lvs. obovate-oblong, rounded above, apiculate: fls. about 8-merous, yellow, or white(?), in a thyrsoid corymb; calyx-segms. short-triangular; petals linear-lanceolate. Abyssinia.—Closely allied to *S. arboreum* and possibly not distinct from it.

5. **tabulæfórme,** Haw. Shrubby: sts. erect-branched: lvs. oblong-spatulate, base attenuate, flat, ciliate, gathered at the tips of the branches in a flat rosette: peduncles minutely glandular: petals linear-lanceolate, very pale sulfur. Canary Isls.

6. **spathulàtum,** Hornem. (*S. barbàtum,* C. Smith. *Æònium barbàtum,* Webb & Berth.). Shrubby: sts. stout; branches horizontal near the st., then arched and erect: rosettes flat, not dense: lvs. of the rosettes oblong-spatulate, acute, margin papillose, both surfaces with linear, red-brown markings; cauline lvs. linear-lanceolate, acuminate: fls. 8–10-merous, in rather open panicles, the fls. on the upper side of the branches; calyx-segms. deltoid; petals oblong-lanceolate, acute. Canary Isls.—Some of the material grown under this name is certainly not the species above described, but probably a form of *S. tectorum.*

7. **Heúffelii,** Schott (*S. pátens,* Griseb. & Schenk). Barren rosette 1½–2 in. diam., the young rosettes not peduncled: lvs. 30–40 to a rosette, obovate-cuneate, distinctly cuspidate, glabrous, lower part pale green, upper third or even half tinted bright red-brown, margin crowded, stiff, white-ciliate, outer lvs. ¾–1 x ⅜ in.;

cauline lvs. close, red-brown, lanceolate, ¾–1 in. long: fl.-st. including the infl. 6–8 in. high, densely short-pubescent: fls. 6-merous, pale straw-color, in a dense panicle 2½–3 in. diam.; calyx-teeth linear-oblong, finely glandular-pubescent on the back and red-brown when old; petals ⅜in. long, linear-oblong, obtuse, with 3 small cusps, keeled and finely glandular outside. Transylvania and Greece in the mountains.—One of the latest in flower.

8. **Reginæ-Amàliæ,** Heldr. & Sart. Rosettes about 3 in. diam., the new ones sessile: lvs. 100 or more to a rosette, obovate-cuneate, distinctly cuspidate, all bright purplish brown in the upper half, green only toward the base, glabrous, margin ciliate, outer lvs. 1–1¼ x ½–⅝in.; cauline lvs. crowded, lanceolate, brown, slightly pubescent: fl.-st. including infl. 6 in. high, densely pubescent: fls. 6–7-merous, pale yellow, in a dense many-fld., capitate panicle; calyx finely glandular-pubescent, segms. lanceolate; petals lingulate, obtuse, obscurely tricuspidate, densely glandular externally. Mountains of Greece.

9. **soboliferum,** Sims (*S. globíferum*, Linn. as to synonyms and many other authors, not Linn. as to plant cited). Hen-and-Chickens. Houseleek. Barren rosettes globose, 1–1½ in. diam., the copious new rosettes sessile and attached to the parent only by a slender thread and easily becoming detached from it and rolling about: lvs. 60–80 to a rosette, obovate-cuneate, obscurely cuspidate, pale light green, glabrous, margin minutely ciliate, outer ones tinted with red-brown especially on their back, ¾–1 x ¼–⅜in.; cauline lvs. very densely crowded, ovate-lanceolate, acute: fl.-st. including infl. 6–9 in. high, very robust, finely pubescent: fls. 6–7-merous, pale yellow, in a short, dense, many-fld. panicle, which is 3–4 in. diam.; calyx-segms. lanceolate, nearly glabrous on the back, margins strongly ciliate; petals lanceolate, ⅛in. long, obscurely tricuspidate, margins conspicuously fimbriate. Mountains of Austria. B.M. 1457.—Unless the young rosettes are thinned out the plants are not so apt to flower.

10. **arenàrium,** Koch. (*S. Neilreìchii*, Schott, Nym. & Kotschy). Rosettes globular, deciduous: lvs. 60–80 to a rosette, oblanceolate, acute, bright green, glabrous, outer lvs. slightly tinted red-brown on the back, ½–¾in. long; cauline lvs. ovate-lanceolate: fls.-sts. including the infl. 6–9 in. high, crowded, leafy and finely pubescent: fls. 6-merous, pale yellow, many in a dense head, 2–3 in. diam.; sepals lanceolate; petals lanceolate, ½–⅝in. long, distinctly tricuspidate with a linear end tooth. Tyrol. Gn. 49, p. 220.

11. **hírtum,** Linn. (*S. Alliònii*, Nym. *S. cornùtum*, Hort.). Developed barren rosettes 1–1¼ in. diam., the new ones not rolled up into balls and breaking away as in *S. soboliferum:* lvs. about 50 to a rosette, obovate-cuneate, not distinctly cuspidate, pale gray-green, surfaces finely glandular-pubescent, margins glandular-ciliate, outer lvs. faintly tinted red, ½–¾ x ⅛in.; cauline lvs. crowded, pubescent, the upper cordate-ovate: fl.-st. including infl. 6–9 in. high, densely pilose: fls. usually 6-merous, pale yellow, in a few- to many-fld. panicle which is 1½–4 in. diam.; calyx-segms. lanceolate, hairy on their back; petals ½–¾in. long, lanceolate, tricuspidate, the middle tooth conspicuous, keel prominent, tinted greenish red and is densely glandular. S. Eu.

12. **Wúlfenii,** Hoppe. Developed rosettes 1½–2 in. diam., the new ones nearly sessile: lvs. about 50 to a rosette, obovate-cuneate, cuspidate, slightly glaucous, with only a faint tint of red-brown at the very tip, outer lvs. ¾–1 x ⅜in.; cauline lvs. lanceolate, 1–1½ in. long: fl.-st. including infl. 6–9 in. high, densely pilose upward: fls. 12–14-merous, pale yellow, in a short dense panicle which is 2–3 in. diam., its branches densely pilose; calyx short-pilose, segms. lanceolate; petals linear, densely glandular-puberulent externally. Mountains of Cent. Eu.

13. **álbidum,** Schnittsp. & Lehm. Rosettes large, the young ones 1–3 in. away from the old one: lvs. of rosettes ovate-lanceolate, narrowed at their base, apex rather long-acuminate, glabrous, finely ciliate, dark grass-green, tips reddish brown; cauline lvs. equally broad, long-acuminate: fls. whitish, racemose paniculate; petals linear-lanceolate. Hab.(?).

14. **Píttonii,** Schott., Nym. & Kotschy. Rosettes 1–1½ in. diam., always open, the young ones sessile: lvs. 60–80 to a rosette, ensiform, lingulate or oblanceolate, apex abruptly deltoid-pointed, pale green with large light red blotches, outer lvs. ¾in. long; cauline lvs. dense, lanceolate, red-blotched and purple-tipped, densely glandular-hairy: fl.-st. including infl. 4–6 in. high, glandular-hairy ending in a 3-branched, dense corymbose infl.: fls. 12–20, small, 9–12-merous, yellowish white; petals linear-lanceolate, about ⅜in. long, glandular-hairy on the margin and back. Styria.—Rare in cult.

15. **rupícolum,** Kern. Rosettes 1½–2 in. diam., the young ones on glandular-hairy peduncles which are 1½–2½ in. long: lvs. elongated-obovate, ½–1¼ x ¼–⅜in., narrowed gradually from the upper one-third to the reddish base, cuspidate, slightly scattered glandular-hairy; cauline lvs. ovate-lanceolate, ⅜–¾in. long, tip reddish: fl.-st. slender, glandular-hairy: fls. 12-merous, pale greenish yellow, striped red; calyx-segms. oblong; petals narrowly linear-lanceolate, acute. Tyrol. —Probably a hybrid; *S. montanum* × *S. Wulfenii.*

16. **globíferum,** Linn. in part, excl. synonymy (*S. ruthénicum*, Koch). Rosette 1½–3 in. across, rather flattened, the young ones globular, borne on scaled peduncles which are rather stout and about 1½–3 in. long: lvs. obovate-cuneate to elliptical, gray-green, cuspidate; cauline lvs. oblong, acute, about 1¼ x ⅛in., tip often red-brown: fl.-st. about 1 ft. high, including infl., densely short-hairy: fls. pale yellow, 12–14-merous, about ¾–1 in. across; calyx-segms. lanceolate, acute; petals linear-lanceolate, acute, externally glandular-hairy and green-striate, margins glandular-ciliate. Russia in Eu.—As Koch points out in Flora 18, part 1:209, t. 1 (1835), the synonymy given by Linnæus undoubtedly refers to *S. soboliferum*, a 6-merous species, but that the one plant Linnæus cites and his "habitat in Rutheno. D. Gmelin" undoubtedly refer to the 12-merous plant which Besser knew under the name *S. globíferum* and which he, Besser, sent to Koch in 1834.

17. **grandiflòrum,** Haw. (*S. globíferum*, Sims, not Linn.). Rosettes about 1½ in. diam., the new ones on decumbent peduncles 1–2 in. long, which have small lvs.: lvs. about 40 to a rosette, obovate-cuneate, obscurely cuspidate, pale green, pubescent, only the tip obscurely red-brown tinted, outer lvs. ¾–1 x ¼–⅛ in.; cauline lvs. crowded, lanceolate, ¾–1 in. long: fl.-sts. including infl. 3–8 in. high, densely pubescent: fls. 12–14-merous, 1¼–1½ in. across, pale yellow, subsessile in a dense paniculate head; calyx pubescent, segms. lanceolate; petals lanceolate, acuminate, back glandular. Hab.(?). B.M. 507; 2115(?).

18. **heterótrichum,** Schott. Rosettes 1–1½ in. diam.: fl.-sts. 3–6 in. high, puberulent pubescent: lvs. of the rosette spatulate-linear, apex acute, with a tuft of hairs and also long web-hairs connecting the lf.-tips, puberulent at the apex above, glabrous beneath, glaucous; cauline lvs. lanceolate-linear, puberulent on both sides: infl. puberulent; fls. 9–12-merous, rose, in a racemose panicle; calyx-segms. lanceolate-linear, acute; petals lanceolate, acuminate, ciliate, apex barbulate. S. Eu.—Closely allied to *S. Doellianum* and *S. arachnoideum.*

19. **Moggridgei,** De Smet. Rosettes 2 in. diam.: lvs. about 100 to a rosette, ¾in. long, elongate-cuneate or oblanceolate, green, glabrous, margins minutely ciliate,

tips acute and hairy tufted; cauline lvs., the lower oblanceolate, ¾in. long, tips bearded, pale green, tips reddish, the upper more oblong: cyme 3–4 times forked: fls. 10–12-merous, ¾in. diam.; calyx glandular-pubescent, segms. linear, obtuse; petals lanceolate, acuminate, apiculate. S. Eu. B.M. 6610.—Allied to *S. arachnoideum*.

20. **arachnoídeum,** Linn. (*S. Haùsmannii,* Auersd., not Lehm. & Schnittsp. *S. piliferum,* Jord.). Cobweb or Spider-web Houseleek. Fig. 3601. Barren rosettes ½–¾in. diam., the new ones crowded and sessile: lvs. about 50 to a rosette, oblong-cuneate, obscurely cuspidate, pale green, tips of nearly all the lvs. connected with long soft white hairs, outer lvs. tinted with red-brown on the back, about ⅜in. long; cauline lvs. oblong-lanceolate, small, tips with a dense tuft of hairs: fl.-sts. 3–4 in. high including the dense few-fld. panicle: fls. 9–12-merous, about 1 in. across; calyx-segms. linear; petals lanceolate, bright red. S. Eu. B.M. 68. G.L. 26:201. Gn. 78, p. 437. Var. **tomentòsum,** Cariot (*S. tomentòsum,* Schnittsp. & Lehm. *S. Webbiànum,* Hort.), has white tomentose rosettes, with more obovate-cuneate lvs. and the rosettes are flatter and more compact. Var. **Hoòkeri,** Hort., is offered in the trade. Var. **mìnor,** Hort., is offered in the trade. Var. **rûbrum,** Hort., is offered in the trade.

3601. Sempervivum arachnoideum. (×½)

21. **Doelliànum,** C. B. Lehm. Barren rosettes ½–¾in. diam., the new ones shortly peduncled: lvs. 40–50 to a rosette, oblanceolate, obscurely cuspidate, pale green, surface slightly hairy, the tips of only the inner ones connected by a few arachnoid threads, the outer ¼–⅜in. long, tinted with red on the back; cauline lvs. lanceolate, ½–¾in. long, with only an obscure tuft of short hairs at the tips: fl.-st. including infl. 4–6 in. high: fls. 9–10-merous, bright red, in a compact, few-fld. panicle; calyx densely pubescent, segms. lanceolate; petals lanceolate, ⅛in. long. Switzerland and Tyrol.—Closely allied to *S. arachnoideum,* by some authorities considered a variant of it.

22. **Lâggeri,** Schott (*S. arachnoìdeum* var. *Lâggeri,* Rouy. & Fouc.). Rosettes up to ⅞in. diam., open, the young ones close to the old ones or on peduncles up to 1¼ in. long: lvs. gray-green, red-violet at the tip, short glandular-hairy, at least above, lingulate, about ⅛in. long, apex blunt, suddenly apiculate; cauline lvs. ⅝–⅞in. long, rather close, hairy, tip tufted hairy and red- or black-violet and red- or black-violet-dotted: fls. bright rose, in a rather dense panicle borne on a reddish st.; calyx-segms. ovate-elongated, acute; petals oval-lanceolate with the midnerve darker. Switzerland. Gn. 78, p. 470.—Closely allied to *S. arachnoideum* and considered a variety of it by some authorities. There is a strong-growing variant of this species offered in the trade under the name *S. arachnoìdeum* var. *Lâggeri gigantèa,* Hort.

23. **Haûsmannii,** Lehm. & Schnittsp. Rosette medium-sized, somewhat flat: lvs. of the rosette ovate, cuspidate, glabrous, margins ciliate, tip ciliate-tufted, green, brownish at the tip: fl.-st. 5–6 in. high, erect: fls. 12–14-merous, rose-red in a dense many-fld. panicle; calyx-segms. ovate-lanceolate, acute, glandular-ciliate; petals ovate to linear-lanceolate, lower surface keeled, margin glandular-ciliate. Tyrol.

24. **Pómelii,** Lamotte; also misspelled *Poemlii.* Barren rosette 1½–1¾ in. diam., the new ones nearly sessile: lvs. 50–60 to a rosette, oblanceolate, with a distinct cusp, a few hairs on both surfaces, the cusp furnished with an inflexed tuft of hairs, outer lvs. ¾–1 x ¼in., tinged with red; cauline lvs. much imbricated, lanceolate, hairy, the lower 1–1½ in. long: fl.-st. including infl. 6–9 in. high, densely pilose: fls. 10–12-merous, about 1 in. across, rose-red, in a panicle 3–4 in. diam., its simple branches 6–12-fld.; calyx densely pilose, segms. linear-lanceolate, glandular; petals linear-lanceolate. France.

25. **fimbriàtum,** Schnittsp. & Lehm. Barren rosette 1–1½ in. diam., the new rosettes nearly sessile: lvs. 50–60 to a rosette, oblanceolate, obscurely cuspidate, green, margins deflexed hairy, tip with a tuft of hairs, outer lvs. becoming red, ½–¾in. long; cauline lvs. pilose, lanceolate, red-tinted, much imbricated, lower ones 1–1½ in. long: fl.-sts. including infl. 6–10 in. high, densely glandular-pilose: fls. about 12-merous, 1 in. across, bright red, in an open few-branched panicle; calyx glandular-pilose, segms. linear-lanceolate; petals lanceolate. Pyrenees and Tyrol. Gn. 78, p. 47.

26. **assímile,** Schott. Rosettes of barren lvs. 1½–2 in. diam., the new ones nearly sessile: lvs. 60–80 to a rosette, obovate-cuneate, cuspidate, pale glaucous green, not red-tipped, margin short-ciliate, surface minutely pubescent, outer lvs. ¾–1 in. long: fl.-sts. including the infl. about 6 in. high: fls. 12-merous, about ¾in. across, pale rose; calyx-segms. lanceolate; petals linear. Transylvania.

27. **pùmilum,** Bieb. (*S. anómalum,* Hort.). Barren rosette at most 1 in. diam., the copious new rosettes shortly peduncled: lvs. 30–40 to a rosette, oblanceolate, cuspidate, green, pubescent, end mucro obscure, outer lvs. only tinted red-brown, ⅜–½ x ⅛in.; cauline lvs. lanceolate, hairy all over, tinted red-brown, the lowest ½–¾in. long: fl.-st. including infl. not more than 3–4 in. high: fls. few (4–8), about 12-merous, 1 in. across, bright mauve-purple, in a dense head, all sessile or subsessile; calyx very hairy, segms. lanceolate; petals acuminate, very hairy outside. Caucasus.

28. **montànum,** Linn. Barren rosette 1½–1¾ in. diam., the few new rosettes on red pilose peduncles 1–1½ in. long: lvs. closely packed, 60–80 to a rosette, oblanceolate-cuneate, cuspidate, green up to the tip, both surfaces slightly pilose, outer lvs. ¾–1 x ⅛in.; cauline lvs. densely imbricated, lanceolate, tinted with red-brown toward the tip, the lower 1–1½ in. long; fl.-st. including infl. 3–6 in. high: fls. 12–14-merous, bright mauve-red, in a very dense panicle, which is 1½–2 in. diam.; calyx very hairy, segms. lanceolate; petals ½–⅝in. long, linear-acuminate. Alps and Pyrenees. Var. **glaciàle,** Lagg. (*S. Lèhmannii,* Schnittsp.). Lvs. linear-lingulate, base somewhat narrowed, apex bluntly pointed, upper surface weakly glandular-pubescent; cauline lvs. similar but shorter and brown-tipped: fls. dirty red-brown, 10–12-merous; calyx-segms. linear-lanceolate; petals linear. Switzerland.

29. **flagellifórme,** Fisch. Barren rosette 1–1½ in. diam., with the lax new rosettes on long spreading peduncles and the small lvs. not aggregated into a dense erect head: lvs. 40–50 to a rosette, oblanceolate, obscurely cuspidate, surface minutely downy, pale green without a tint of red-brown at the tip, margin ciliate, outer lvs. ¾ x ¼in.; cauline lvs. imbricated, lanceolate,

hairy, lowest about 1 in. long: fl.-st. 3–4 in. high including the infl.: fls. about 12-merous, about 1 in. across, bright red, about 6–8 in a dense head, sessile, or nearly so; calyx densely pilose, segms. lanceolate; petals linear, acuminate, densely glandular-pilose outside. Siberia(?).

30. **Schnîttspahnii,** Lagg. (*S. Fúnkii*, Lej.). Rosette medium-sized, open, the young ones on straight peduncles ½–1 in. long: lvs. of rosette ovate-lanceolate, with a short hair point, glabrous, margin white-ciliate, dark green, tip red-brown, keeled beneath; cauline lvs. lanceolate: fl.-st. erect, furrowed, at top slightly winged, white-hairy: fls. brown-rose, later rose, more than 6-merous; petals broadly lanceolate. Switzerland.

31. **Metteniânum,** Schnittsp. & Lehm. (*S. parviflòrum*, Lehm. & Schnittsp.). Rosettes flat, 1¼–2 in. diam., the young ones on peduncles 3–4 in. long, which are commonly lvd. below: lvs. ovate-lanceolate, cuspidate, base narrowed, glabrous, margin ciliate, gray-green marbled with grass-green, tip red-brown; cauline lvs. long, straight-acuminate, appressed: fl.-st. spreading, white-hairy, bearing a racemose panicle: fls. rose; petals linear-lanceolate. Cent. Eu. G.M. 57:847.—Allied to *S. tectorum*.

32. **blándum,** Schott (*S. rubicúndum*, Schur). Sts. 7–10 in. high, they and the branches of the propagations densely puberulent: rosettes 1½–2 in. diam.: lvs. of the rosettes obovate-spatulate, short-cuspidate, margin ciliate, glaucous; cauline lvs. spreading, linear-oblong, apiculate-cuspidate, both surfaces softly-puberulent: infl. puberulent and pilose: fls. 12-merous, pale rose; sepals lanceolate, acute; petals lanceolate, acuminate, midnerve deeper colored. Transylvania.

33. **Lamôttei,** Bor. Barren rosettes 3–4 in. diam., the copious young rosettes sessile: lvs. obovate-cuneate, cuspidate, glabrous, marginal cilia stiff, outer lvs. 1¼–1½ x ½–¾in., green or faintly glaucous, with only the faintest tint of red-brown at the tip: fl.-st. including infl. often more than 1 ft. high, densely glandular-pilose: fls. 12–16-merous, 1 in. across, pale pink, in a panicle with the main branches often bifid; calyx densely pilose, segms. linear-lanceolate; petals narrow. France.—Has been referred to *S. tectorum* by some authors.

34. **tectòrum,** Linn. (*S. robústum*, Jord. & Fourr. *S. purpuráscens*, Schott). Houseleek. Old-Man-and-Woman. Fig. 3602. Developed barren rosettes 3–4 in. diam., abundantly stoloniferous, the new rosettes crowded and sessile: lvs. 50–60 to a rosette, obovate-cuneate, cuspidate, 1½–2 or finally 3 x ⅝–¾in., pale green, with a distinct red-brown tip; cauline lvs. oblong-lanceolate, acute: fl.-st. including infl. about 1 ft. high, densely pilose: fls. 11–15- mostly 12-merous, ¾–1 in. across, pale red, in a scorpioid, 10–12-branched panicle 5–6 x 3–4 in.; calyx densely pilose, segms. lanceolate; petals linear, keeled, the keel deeper red. Eu. and Orient. C.L.A. 25, March, p. 54.—Variable. Var. **cûpreum,** Hort., is said to have large rosettes which are glaucous and rose-colored; it flowers rarely. Var. **expánsum,** Hort., is said to have broader lvs. and more open rosettes than the type. Var. **pyrenàicum,** Hort., is offered in the trade. Var. **rùbrum,** Hort., has been grown in botanic gardens. Var. **violàceum,** Hort., has been grown in botanic gardens.

35. **Fúnckii,** F. Braun; also spelled *Funkii*. Barren rosettes 1½–2 in. diam. surrounded by a dense circle of young ones on bright red decumbent peduncles, which are 1 in. or more long and densely rosulate at their tip: lvs. 80–100 to a rosette, oblanceolate-cuneate, cuspidate, green and glabrous or slightly pilose when young, outer lvs. ½–¾ x ¼in., lower cauline lvs. about 1 in. long: fl.-st. including infl. 6–9 in. high, densely pilose: fls. 11–12-merous, about 1 in. across, bright red-purple, in a panicle 2–3 in. diam.; calyx-segms. lanceolate; petals glandular-pubescent outside. S. Eu.—Allied to *S. montanum*.

36. **glaûcum,** Tenore (*S. Comóllii*, Rota. *S. acuminàtum*, Schott, not Jacquem. *S. Schóttii*, Baker, not Schnittsp. & Lehm. *S. Schlèhanii*, Schott). Barren rosettes 2–3 in. diam., the copious young ones sessile or nearly so: lvs. oblanceolate-cuneate, cuspidate, glabrous, glaucous, with a slight red-brown tip, outer lvs. 1–1¼ x ⅜–½in.; cauline lvs. oblong-lanceolate, red-tinted, lowest 1–2 in. long: fl.-st. including the infl. 6–12 in. high, densely pilose, at least above: fls. 12–14-merous, about 1 in. across, pale or bright red, in a short compact panicle, 2–3 in. diam.; calyx densely pilose to glandular-pilose, segms. lanceolate; petals somewhat keeled. Cent. Eu.—The synonymy is much involved and by some authorities *S. Comollii* is said to be a hybrid, *S. acuminatum* and *S. Schottii* synonymous and distinct, and *S. Schlehanii* also distinct, but the differences seem extremely weak.

37. **Verlôttii,** Lamotte. Barren rosettes 1½–2 in. diam., the new ones nearly sessile: lvs. about 50 to a rosette, oblanceolate-cuneate, cuspidate, glabrous, pale green, faintly glaucous, only the very tip tinged with red-brown, margin stiff-ciliate, outer lvs. ¾–1 x ¼–⅓in.; cauline lvs. oblong-lanceolate, acuminate, lowest about 1 in. long: fl.-st. including the infl. 6–9 in. high: fls. 12–14-merous, ¾–⅞in. across, rose-red, in a panicle 3–4 in. diam., simple glandular-pilose branched, each branch with 8–12 fls.; calyx densely glandular-pilose; petals densely ciliated on the back. Alps of Dauphiné.

38. **atlânticum,** Baker (*S. tectòrum* var. *atlánticum*, Ball). Barren rosettes 2–3 in. diam., the young rosettes nearly sessile: lvs. oblanceolate-cuneate, cuspidate, pale green, glabrous when mature, hardly at all tipped with red-brown, outer lvs. 1–1½ in. long, ½in. broad above the middle; cauline lvs. oblong-lanceolate, noticeably claret-red-tipped: fls.-st. including infl. nearly 1 ft. high: fls. 12-merous, pale red, 1 in. across, in a short panicle, 3–4 in. diam.; calyx densely pilose; petals linear, acuminate. Morocco. B.M. 6055.

3602. Rosette and offsets of a houseleek.—Sempervivum tectorum. (×½)

39. **tríste,** Hort. Barren rosettes 2–3 in. diam.: lvs. oblanceolate-cuneate, cuspidate, glabrous, margin short-ciliate, lower part dull drab-green, the whole upper part bright red-brown; cauline lvs. red-brown throughout, lower ones 2–3 in. long: fl.-st. robust as in *S. tectorum:* fls. about 1 in. across, bright red, in a panicle 6 x 3–4 in.; calyx moderately hairy, deeply tinted with red-brown. Hab.(?).—A rare form allied to *S. tectorum*. Var. **bícolor,** Hort., is offered in the trade.

40. **Greènii,** Baker. Barren rosette about 1½ in. diam., the new ones nearly sessile: lvs. 40–50 to a rosette, oblanceolate-cuneate, cuspidate, glabrous, glaucous with a distinct red-brown tip ⅛–⅙in. long, margins decurved ciliate, outer lvs. ¾–1 x ¼in., cauline lvs. much imbricated, lanceolate, hairy, red-tinted, ¾–1 in. long: fl.-st. including infl. 6 in. high: fls. 11–12-merous,

about ½in. across, pale red, in a panicle 1½–2 in. diam.; calyx densely pilose; petals densely ciliated. Habitat unknown, possibly the French Alps.

41. **calcàreum,** Jord. (*S. califórnicum,* Hort.). Barren rosettes about 2 in. diam., young ones nearly sessile: lvs. oblanceolate-cuneate, cuspidate, very glaucous, with a very distinct red-brown tip, glabrous, outer lvs. 1–1½ x ⅜in.; cauline lvs. densely imbricated, oblong-lanceolate, 1–1½ in. long: fl.-st. less than 1 ft. high, including the infl.: fls. 10–12-merous, ¾in. across, pale red in a panicle 3–4 in. long, with 8–12 simple scorpioid branches; calyx densely pilose, segms. lanceolate; petals greenish down the keel, densely ciliate. France on the calcareous alps of Dauphiné.

42. **arvernénse,** Lecq. & Lamotte. Barren rosette 1½–2½ in. diam., copiously stoloniferous: lvs. about same number as in *S. tectorum,* oblanceolate-cuneate, cuspidate, bright pale green, glabrous, tips of lvs. with a distinct red-brown blotch ⅛–1/16in. long, outer lvs. 1–1¼ in. long: fl.-st. including infl. 6–8 in. high, densely pilose: fls. pale pink, in a panicle 2–3 in. long and broad, the lower fls. distinctly pedicelled; calyx-segms. lanceolate; petals linear. France.

43. **Boutignyànum,** Bill. & Gren. Barren rosette 2–3 in. broad, copiously stoloniferous: lvs. oblanceolate-cuneate, cuspidate, glabrous, green, with a distinct, decurrent red-brown tip, outer lvs. 1–1¼ in. long; cauline lvs. lanceolate, 1 in. or more long: fl.-st. including infl. 6–8 in. long, short-pilose: fls. 12–14-merous, about ¾in. across, pale rose, in a panicle 2–3 in. diam. which has 8–12 crowded fls.; calyx-segms. lanceolate; petals densely glandular-ciliate. Eu.—Botanically probably a variant of *S. arvernense.*

44. **alpìnum,** Griseb. & Schenk. Rosettes 2–3 in. diam.: lvs. of rosettes oblanceolate, base cuneate, apex short-acute, glabrous, green, red-tipped; cauline lvs. oblong to lanceolate, acuminate, sparsely pilose beneath: fls. purple-reddish in a panicle, star-like, expanded; petals 12, linear-lanceolate, glandular-ciliate, dorsally obscurely striate. Eu.—Botanically it is probably only a variant of *S. arvernense,* though referred by some authorities to *S. montanum.*

45. **Boissieri,** Hort. Barren rosette very dense, 2–2½ in. diam., composed of about 100 lvs.; new rosettes short-peduncled: lvs. oblanceolate-cuneate, cuspidate, broadest near the middle, glabrous, green, noticeably red-brown-tinted at the tip, 1–1¼ in. long; cauline lvs. closely imbricated, red-tinted, oblong to lanceolate: fl.-sts. including the infl. 8–9 in. high.: fls. pale red, 12–14-merous, about 1 in. across, in a panicle about 2 in. diam. Hab.(?).

S. affine, Lamotte, is offered in the trade as having dark green rosettes marked with rose: fls. red. Eu. The botanical description is not available and the species is not treated in recent European floras.—*S. atropurpùreum,* Hort., is offered in the trade as having rosettes washed with purple: fls. red.—*S. chrysanthoìdes,* Hort., is offered in the trade as a form with white fls.—*S. ciliòsum,* Craib. Barren rosettes more or less flat, up to 1¼ in. diam.: lvs. oblong-lanceolate, more or less acuminate, up to ¾in. long, keeled beneath, conspicuously long white-ciliate toward the apex, pubescent above, outer lvs. red-tinted; cauline lvs. imbricate, tip red-suffused: fl.-sts. about 2 in. high, bearing about 6 subsessile fls.: fls. about 1 in. across, pale green, 9–11-merous; calyx-segms. oblong-lanceolate, acute, glandular-pubescent; petals linear, glandular-pubescent externally. Hab.(?). Grown in botanic gardens.—*S. cólchicum,* Hort., is offered in the trade.—*S. commutàtum,* Hort., is offered in the trade.—*S. Delpóntii,* Hort., is a trade name.—*S. élegans,* Lagg. Rosettes small, about ½in. diam., the young ones on short shoots forming a mat: lvs. linear-lanceolate, cuspidate, short-villous, weakly cobwebbed, pale green, slightly ciliated; cauline lvs. numerous, slightly separated, oval-lanceolate, brown toward their tip and tufted ciliate: fl.-st. weak, almost prostrate on the ground during flowering and glandular-hairy; petals oval-lanceolate, acuminate. Switzerland. Not treated in any of the recent Swiss floras but offered in the trade.—*S. hispánicum,* Willd., is a doubtful species with subulate, semi-terete, ciliate, imbricated lvs.; possibly a Sedum.—*S. hispánicum,* Pourr., equals Sedum nicæense.—*S. hispídulum,* Hort., is offered in the trade.—*S. híspidum,* Hort., is a horticultural name.—*S. hùmilum,* Hort., is a horticultural name.—*S. kopaonikénse,* Panc., is said to be related to S. Heuffelii by Pancic, but is not well known and it is suggested that it is only a form of that species by recent authors. Serbia.—*S. Lággei,* Hort., is presumably an error for Laggeri.—*S. leucánthemum,* Hort., is probably an error for leucanthum.—*S. leucánthum,* Panc., is described as a form with rather small rosettes, 12-merous fls. and white petals, grown in gardens, now questionably referred to S. tectorum.—*S. marginàtum,* Hort., is offered in the trade.—*S. pilòsum,* Hort., is a trade name.—*S. pyrenàicum,* Lamotte, is offered in the trade as having handsomely formed and dark red rosettes. Eu. The botanical description is not available and the recent European floras do not treat this species.—*S. rùbens,* Hort., is offered in the trade.—*S. rubrùm,* Hort., is offered as having a dark base to the lvs., possibly the same as S. tectorum var. rubrum.—*S. rupéstre,* Hort., is a trade name, perhaps a form of S. tectorum.—*S. Scherzeriànum.* Hort., is offered in the trade.—*S. speciòsum,* Lamotte, is offered in the trade. Eu. The botanical description is not available and none of the recent European floras mentions it.—*S. spinòsum,* Hort., is a trade name.—*S. spinulifòlium,* Hort., is offered in the trade and also occurs in botanic gardens.—*S. Thómsonii,* Lindsay (S. arachnoideum × S. tectorum), is offered in the trade; no description of the hybrid is available.—*S. umbìcilum,* Hort., is a trade name. Var. *spinòsum,* Hort., is a trade name perhaps the same as the plant offered in the trade as S. spinosum.—*S. úrbicum,* C. Smith. Shrubby: st. erect, 3 ft. high, simple, stout, covered with lf.-scars: lvs. many, rosulate at the top of the st., 4–6 x 1½ in., narrowly spatulate, cuspidate, very thick, pale green, margins erosely serrulate, sessile or short-petioled: panicle very large, pyramidal, 3 ft. high and nearly as broad, many-branched; fls. 10-merous, pale yellow, ¾in. across; calyx cup-shaped; petals lanceolate, acute. Canary Isls. B.M. 7893. Belongs to the same group as S. arboreum. A very showy species but tender.—*S. violàceum,* Hort., is offered in the trade; possibly the same as S. tectorum var. violaceum.—*S. Zelébori,* Schott. Barren rosette more than 2 in. diam., the young ones borne on densely puberulent peduncles: lvs. spatulate-oblanceolate to spatulate-lingulate, apex apiculate and purple, short-ciliate, both surfaces densely puberulent, glaucous; cauline lvs. smaller, linear-lingulate, apiculate and puberulent: fl.-st. minutely glandular and densely hirsute: fls. 11–12-merous, pale yellowish; calyx-segms. lanceolate; petals linear-lanceolate, acuminate, viscid hirtellous dorsally. Serbia. By some authorities referred to S. Pittonii, by others to S. globiferum; apparently distinct from both of them.

F. Tracy Hubbard.

SENEBIÈRA (after Johann Senebier, a naturalist of Geneva). *Crucíferæ.* Annual or biennial herbs, very diffusely branched from the ground, hardy: lvs. alternate, entire or pinnatisect: racemes short; fls. minute, white, rarely purple; sepals short, spreading; stamens free: silique small, didymous, laterally compressed; valves shut, subglobose, rugose or crested.—About 15 species in the temperate and warmer regions of the world.

The oldest name of the genus and the one now accepted by those following the International rules is **Coronòpus** (Greek *crow* and *foot,* alluding to the form and arrangement of the deeply cut lvs.). **C. dídymus,** Smith (*Senebièra dídyma,* Pers. *S. pinnatífida,* DC. *Lepídium dídymum,* Linn. *Caràra dídyma,* Brit.). Plant 6–12 in. high: lvs. 1–2-pinnately parted: fls. white, small, numerous: pods notched at the apex, rough-wrinkled. Widely distributed as a cosmopolitan weed.

SENÈCIO (Latin name for plants of this genus, ultimately from *senex,* "old man;" said to be in allusion to the hoary pappus). *Compósitæ.* Groundsel. A various group, some of the herbaceous members of which are grown as border plants for their mostly yellow heads and sometimes for the striking habit; others are climbers, grown mostly indoors, as the so-called German ivy; the shrubby kinds are little known in cultivation.

Senecio is probably the largest genus of plants, comprising some 1,200 species in all parts of the world. A genus comprising so many members and being so widely distributed is necessarily variable and therefore practically impossible of concise definition. A distinguishing mark of the senecios lies in the character of the involucre,—scales or bracts in one series, and usually reinforced at the base by shorter scales or bracteoles that give the head the appearance of having a small calyx. Heads usually radiate, the ray-florets pistillate and fertile, but sometimes the rays absent and then the head is homogamous (florets all of one kind, i. e., perfect); disk-florets tubular, 5-toothed; style-branches subterete, truncate, rounded-obtuse, occasionally terminated by a small penicillate tuft of hairs; receptacle usually naked: achenes mostly terete and ribbed; pappus of soft whitish, often copious bristles. Most of

the senecios are yellow-rayed. Of the vast number of species, very few have gained prominence in horticulture.

To Senecio belong the genera known to gardeners as Jacobæa, Kleinia, and Cineraria. The latter is a Senecio, although the florist's cineraria is described under that name in Vol. I of this work. Bentham & Hooker refer to Senecio the genus Cacalia, which is kept distinct by American botanists. Hoffman (in Engler & Prantl's Natürl. Pflanzenfamilien) refers the garden genus Emilia to Senecio, but keeps Ligularia (including Farfugium) and Cineraria (not the florist's cineraria) distinct. See *Emilia;* also *Ligularia.*

If the greenhouse cineraria (which is technically a Senecio as understood by Bentham & Hooker) is omitted, the most popular species are *S. mikanioides* or German ivy, *S. elegans* or purple ragwort, *S. pulcher,* and *S. Cineraria,* one of the plants commonly known as dusty miller. Various other plants are known as dusty miller, and one of them, *Artemisia Stelleriana,* is sometimes confounded with *Senecio Cineraria.* Most other species are of very minor importance to the horticulturist. Several species are found in the European trade, and of the sixty or more species native to the United States and Canada, about a half dozen have been offered by dealers in native plants, but they are practically unknown horticulturally. Most of the species are wholly herbaceous, but in South Africa, Australia, Central and South America many species are shrubby. Some species are even arborescent; others are climbers. In South Africa and the Canaries is a small series of species that has been separated as Kleinia, distinguished mostly by their habit, being for the most part fleshy shrubs or herbs, with terete or angular stems and whitish or pale yellow rayless flowers. Species of this group are sometimes seen in collections of succulents. *S. vulgaris,* Linn., from Europe, is a common annual weed in various parts of this country.

Since senecios afford both greenhouse and hardy border plants, it is impossible to give general cultural directions. The species are not difficult to manage, however, and most of them propagate readily by means of greenwood cuttings and seeds; the hardy species may be divided. Most of the tender species require coolhouse conditions.

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KEY TO THE SPECIES.

A. *St. and lvs. more or less fleshy: heads rayless.*
B. *Lvs. flat, laciniate.* ..... 1. articulatus
BB. *Lvs. terete, undivided.* ..... 2. radicans
AA. *St. and lvs. not fleshy: heads rayless or radiate.*
B. *Habit climbing.*
C. *Heads rayless.* ..... 3. mikanioides
CC. *Heads radiate.*
D. *Plants pubescent.* ..... 4. scandens
DD. *Plants glabrous.*
E. *Lvs. not conspicuously auricled at the base.* ..... 5. macroglossus
EE. *Lvs. conspicuously auricled at the base.* ..... 6. auriculatissimus
BB. *Habit not climbing.*
C. *Annuals.*
D. *Lvs. 1–3 cm. long, deeply pinnatifid.* ..... 7. elegans
DD. *Lvs. 4–10 cm. long, lobate-dentate.* 8. pulcher
CC. *Perennials.*
D. *Lvs. pinnately veined.*
E. *The st. herbaceous: plants not densely white-tomentose.*
F. *Rays purple.* ..... 9. grandiflorus
FF. *Rays yellow.*
G. *All lvs. undivided.*
H. *Plants glabrous: involucral bracts not black-tipped.*
I. *Lvs. glaucous.* ..... 10. Doria
II. *Lvs. not glaucous.* ..... 11. macrophyllus
HH. *Plants more or less pubescent.*
I. *Involucral bracts black-tipped.*
J. *Pubescence floccose-woolly.*
K. *Lower lvs. closely dentate.* ..... 12. Doronicum
KK. *Lower lvs. remotely denticulate.* ..... 13. lugens
JJ. *Pubescence of hirsute, jointed hairs.* ..... 14. exaltatus
II. *Involucral bracts not black-tipped.* ..... 15. saxifragoides
GG. *All lvs. or some of them divided.*
H. *St.-lvs. once-pinnate.*
I. *Height of plants 6 in. to 3 ft.: basal lvs. undivided.*
J. *Involucral bracts 13, usually pubescent.* ..... 16. Bolanderi
JJ. *Involucral bracts 21, glabrous.* ..... 17. aureus
II. *Height of plants 4–7 ft.: lvs. all pinnatifid.*
J. *Infl. corymbose.* ..... 18. Faberi
JJ. *Infl. paniculate.* ..... 19. tanguticus
HH. *St.-lvs. 2–3-pinnatisect.* ..... 20. Jacobæa
EE. *The st. herbaceous or distinctly woody: plants usually white-tomentose throughout (sometimes glabrous in S. Douglasii).*
F. *Heads solitary.* ..... 21. uniflorus
FF. *Heads several to many.*
G. *Lvs. all undivided.*
H. *Shape of lvs. oblanceolate.*
I. *Sts. not leafy.* ..... 22. fastigiatus
II. *Sts. leafy.* ..... 23. Palmeri
HH. *Shape of lvs. oblong to ovate; glabrous above.* ..... 24. Greyii
GG. *Lvs. all or some of them divided.*
H. *Lf.-divisions broad, obtuse; bracteoles inconspicuous.* 25. Cineraria
HH. *Lf.-divisions narrow, acute; bracteoles conspicuous.* ..... 26. Douglasii
EEE. *The st. woody: shrubs or undershrubs, not white-tomentose.*
F. *Length of lvs. 3–5 in.*
G. *Rays yellow.* ..... 27. magnificus
GG. *Rays white.* ..... 28. Kirkii
FF. *Length of lvs. 6–18 in.* ..... 29. grandifolius
DD. *Lvs. palmately veined.*
E. *Heads rayless.* ..... 30. Prainianus
EE. *Heads radiate.*
F. *St. woody.*
G. *Lvs. 4–20 cm. broad: heads numerous.* ..... 31. Petasitis
GG. *Lvs. 1–3 cm. broad: heads solitary.* ..... 32. Heritieri
FF. *St. herbaceous.* ..... 33. cruentus

1. **articulàtus,** Schz. Bip. (*Klèinia articulàta,* Haw.). CANDLE PLANT. Plant branching, glabrous and fleshy, 1–2 ft. high, the branches swollen at intervals: lvs. flat and fleshy, petiolate, laciniate or runcinate, with acuminate lobes: heads discoid and all the florets perfect, white, in small corymbs on naked peduncles: achenes downy. S. Afr.—Perhaps the commonest kleinia in cult., being grown with coolhouse succulents. *S.*

(*Kleinia*) *Anteuphorbium*, Schz. Bip., is sometimes seen in collections, although it is not known to be in the American trade. It is a glabrous shrub 3–4 ft. high, with fleshy sts. constricted at the joints, small, erect, fleshy, entire lvs. that are decurrent on the st., and solitary cylindric yellow-fld. heads (with rose tinge) an inch long. B. M. 6099. According to J. D. Hooker, this

3603. Senecio radicans.

plant "is one of the oldest Cape plants in cult. having, according to Dodonaeus, been brought to Eu. in 1570, and cult. in England in Gerard's garden in 1596. The name Anteuphorbium was given because of its being a reputed antidote against the acrid poison of the Cape Euphorbium." The names *Klèinia spinulòsa*, *K. péndula*, and *K. suspénsa* have appeared in the American trade, but they are unidentifiable.

2. **radìcans,** Schz. Bip. (*Cacàlia radìcans*, Linn. f. *Klèinia radìcans*, Haw.). Fig. 3603. Sts. prostrate, readily rooting from the nodes: lvs. fleshy, cylindrical, straight or somewhat curved, 1 in. or less in length, ¼in. thick, acute, narrowed at the base into a short petiole: peduncle terminal, bearing a single rayless head. S. Afr.—A desirable plant for the rockery; it grows freely among cacti and other fleshy plants.

3. **mikanioìdes,** Otto (*S. scándens*, DC.). German Ivy. Fig. 3604. Slender and glabrous, tall-twining: lvs. ovate or deltoid-ovate in outline, mostly with a deep basal sinus, sharply 5–7-angled or angle-lobed: heads small, discoid, yellow, in close clusters on axillary and terminal branches; bracts of the involucre shorter than the disk-fls. S. Afr. G. 35:343.—Very common conservatory and window-garden plant, easily prop. by cuttings.

4. **scándens,** Buch.-Ham., not DC. A hardy plant with woody climbing sts. reaching a height of several feet: branches slightly hirsute: lvs. short-petiolate, elliptic-lanceolate in general outline, undivided or bearing two or more divisions at the base of the blade, triangular-dentate, grayish green and finely pubescent on both surfaces: infl. a terminal panicle; heads radiate, rays commonly 8, yellow. China. R.H. 1909, p. 407.—Intro. by de Vilmorin, Verrières-le-Buisson, France.

5. **macroglóssus,** DC. Cape Ivy. An herbaceous glabrous climbing perennial: lvs. petiolate, deltoid-hastate, 1–1½ in. long and broad, usually with 2 salient acuminate basal lobes, entire or subdentate, cordate to almost truncate at the base: flowering branches 1–3-headed: heads radiate with 8–12 yellow rays; disk-fls. 40–50: achenes glabrous. S. Afr. G. 26:26.—A coolhouse climber.

6. **auriculatíssimus,** Brit. A perfectly glabrous climbing perennial, freely branching with divaricately spreading branches: lvs. petiolate, transversely oblong to subreniform, 2–3 in. broad, coarsely crenate-dentate, bright green above, paler beneath; petioles 1–2 in. long, slender, channeled above, abruptly dilated at the base into 2 broad auricles completely clasping the st.: heads radiate, about 1 in. diam., disposed in loose terminal corymbose cymes; ray-fls. about 13, rays yellow: achenes 5-ribbed, puberulent along the ribs. Brit. Cent. Afr. G. C. III. 27:133, desc. B.M. 7731.—On account of the peculiar foliage and bright yellow fls. it is a striking plant and well worthy of more general cult.

7. **élegans,** Linn. (*S. purpùreus*, Hort. *Jacobàea élegans*, Moench). Purple Ragwort. Annual, viscid-pubescent, erect or diffuse, 1–2 ft. high: lvs. various, mostly oblong in outline, pinnate, lobed or toothed, the sinuses chiefly broad and rounded, clasping at the base: heads in loose corymbs, the rays purple; disk-fls. yellow. S. Afr. B.M. 238. Var. **eréctus,** Harv. St. slender but erect: lvs. pinnate or 2-pinnatifid.—*S. elegans* is an old garden plant. A common form of it has double fls. Var. **álbus,** Hort., has white fls.

8. **púlcher,** Hook. & Arn. Robust, 2–4 ft. high, white-cobwebby: st. simple or nearly so and scarcely leafy: lvs. oblong-lanceolate, 4–10 in. long, thick, shallow-lobed and crenate-toothed: heads 2–3 in. across, with many long, red-purple rays and a yellow disk. Uruguay and Argentina. B.M. 5959. R.H. 1877, p. 94; 1896, p. 329. Gn. 49, p. 122. G.M. 40:745. G. 31: p. 489, desc.—A very bold species, with striking erect habit and large fls. in summer. Perennial, although it has been described as annual. In protected places and well-drained soils, it is hardy in S. New England.

9. **grandifiòrus,** Berg. (*S. venùstus*, Ait.). An herbaceous perennial 4–5 ft. high: st. simple or sparingly branched, virgate, striate, glabrous or nearly so, rather leafy except toward the infl.: lvs. sessile, pinnately parted into linear divisions with revolute margins, glabrous or sparingly pilose: heads numerous, radiate, strongly calyculate, disposed in a loose nearly naked corymbose cyme; rays purple; disk-fls. yellow: achenes striate, glabrous or puberulent in the furrows. S. Afr. B.R. 901. Var. **álbidus,** Harv. (*S. álbidus*, Mey.). Both ray- and disk-fls. pale or whitish.

10. **Dòria,** Linn. Erect, 3–4 ft. high: radical lvs. oval-oblong or oblanceolate, 6–15 in. long, dentate, glabrous and glaucous, gradually narrowed into a winged petiole; st.-lvs. oblong-lanceolate, sessile and somewhat decurrent: heads yellow, with 5 or 6 rays. Eu.—Hardy perennial.

11. **macrophýllus,** Bieb. (*Jacobàea macrophýlla*, Mey.). A stout herbaceous perennial, 3–4 ft. high, glabrous or nearly so: lower lvs. obovate-oblong or oblanceolate, 6–18 in. long, 1–4 in. broad, gradually narrowed into a winged petiole, pale green, not glaucous; upper st.-lvs.

3604. Senecio mikanioides, usually called German ivy. (×⅙)

sessile, semi-amplexicaul and somewhat decurrent on the st.: heads radiate, disposed in a terminal compound corymbose cyme. Eu.—Closely related to the preceding. Not infrequent in European gardens and occasionally offered in trade catalogues.—Not the same as *Ligularia macrophylla*, DC.; see supplementary list.

12. **Dorónicum,** Linn. Leopard's Bane. A hardy herbaceous perennial, floccose-tomentulose to glabrous: lvs. thickish, ovate to lanceolate, 2–7 in. long, ½–1½ in. broad, the lower usually rather coarsely dentate and narrowed into a winged petiole, the upper much reduced, sessile and entire: heads few, large, including the bright yellow or orange-colored rays 1–2½ in. diam.; bracts of the involucre as well as the bracteoles attenuate, black-tipped: achenes striate, glabrous. S. Eu.—Frequently offered by European dealers, but seldom grown in American gardens.

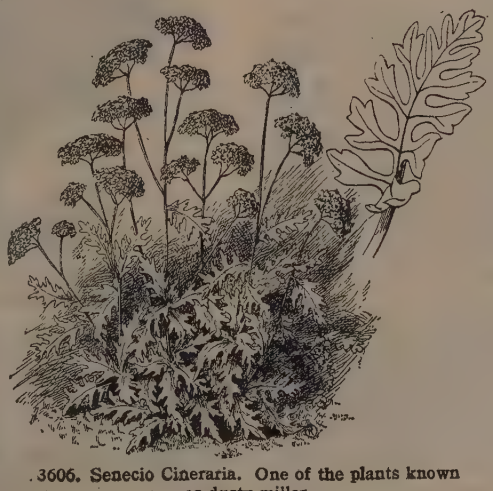
3605. Senicio aureus.

13. **lùgens,** Richards. An herbaceous perennial, floccose-woolly when young but becoming nearly or quite glabrous: st. practically naked above: lvs. oblong-obovate to lanceolate, 1½–6 in. long, ½–1 in. broad, repand-denticulate, the lower narrowed into a winged petiole: heads relatively few, radiate, including the yellow rays ½–1¼ in. diam.; bracts of the involucre as well as the subtending bracteoles acute, black-tipped: achenes striate, glabrous. W. N. Amer. in the Rocky Mts. from Mont. to Alaska.—A species very little known horticulturally.

14. **exaltàtus,** Nutt. An herbaceous perennial: st. simple, erect, 8 in. to 3 ft. high, striate, glabrous, or somewhat pubescent with long flaccid jointed white hairs: lower lvs. oblong-ovate to lanceolate, including the narrowly winged petiole 3–8 in. long, ½–2 in. broad, entire to unequally dentate, glabrous or more or less crisp-hirsute; upper st.-lvs. much reduced, sessile: heads nearly ½in. high, few to many, radiate with yellow rays. Mont. to Ore., Wash. and adjacent Canada.—Little known in horticulture.

15. **saxifragoìdes,** Hook. f. A perennial herb from a stout rootstock: st. about 1 ft. high, branched, covered at the base with a long silky-woolly tomentum and clothed above with white hairs intermixed with purple setæ: radical lvs. petiolate, oblong-elliptic to nearly orbicular, 3–5 in. long, 1¾–4 in. broad, denticulate, appressed-villous, setose near the margin, and more or less glabrous above, hoary-woolly beneath: heads several, corymbose, radiate; rays 18–20, yellow; disk-fls. numerous: achenes glabrous. New Zeal. B.M. 8394.—Intro. into England in 1908 and brought to flower two years later at Kew; it is a strikingly beautiful plant worthy of cult.

16. **Bolánderi,** Gray. A slender herbaceous perennial: st. ascending or erect from a creeping rootstock, 6–20 in. high: radical and lower st.-lvs. undivided and crenately lobate-dentate to pinnately divided into oblong-obovate to almost rotund divisions, glabrous above, usually pubescent beneath, including the petiole 2–6 in. long, ½–1¼ in. broad: heads few, radiate, disposed in a corymbose cyme; involucre of about 13 bracts, commonly tawny-pubescent; ray-fls. 5–8, rays yellow; disk-fls. 25–40: achenes glabrous. Calif. and Ore., near the coast.



3606. Senecio Cineraria. One of the plants known as dusty miller.

17. **aùreus,** Linn. Golden Ragwort. Fig. 3605. An herbaceous perennial: sts. 1 to several from a rootstock, 1–2 ft. high, glabrous or not infrequently white-tomentulose in the lf.-axils, along the margins of the petioles, and in the infl.: lower lvs. petiolate, undivided and rotund-ovate, somewhat triangular-ovate to oblong-ovate, ½–6 in. long, two-thirds to nearly or quite as broad, crenate to doubly serrate-dentate, usually deeply cordate at the base, green on both surfaces or tinged with purple beneath, glabrous or occasionally slightly tomentulose and soon glabrate; petioles ½–10 in. long; st.-lvs. variable, petiolate to sessile and amplexicaul, lyrate to pinnatisect, reduced toward the infl. sometimes to linear entire bracts: infl. a terminal several- to many-headed corymbose cyme; heads ⅓–½in. high, radiate; involucre campanulate, calyculate, glabrous or occasionally slightly tomentulose; bracts of the involucre 13–21, linear, acute; ray-fls. 8–12, rays yellow; disk-fls. numerous: achenes glabrous. Lab. to Ga., west to N. D. and Ark. B.B. 3:544.—Frequently grown in American gardens.

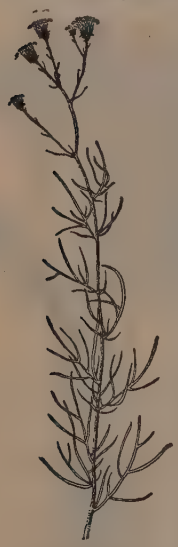
3607. Senecio Cineraria—the typical form with rays.

18. **Fàberi,** Hemsl. A stout coarse herb, glabrous or glabrescent: sts. several, 4–5 ft. high, striate-angled, hollow: lvs. pinnatifid, coarsely dentate, expanding at the base into 2 large auricles partially clasping the st.; the lowermost lvs. becoming 2 ft. in length: infl. a many-headed corymbose cyme 6–8 in. diam.; heads radiate with 3–5 deep yellow rays; disk-fls. 8–12, yellow. W. China. G.C. III. 40:43, desc.—Originally intro. by Veitch & Sons, and more recently by E. H. Wilson, who has traveled in China.

19. **tangùticus,** Maxim. (*S. Hénryi,* Hemsl.). A tall stout herbaceous perennial, glabrous or nearly so: st. 6–7 ft. high, branched above, leafy: lvs. broadly ovate or deltoid in general outline, 5–7 in. long and broad, pinnately divided into lanceolate coarsely and remotely toothed divisions, dark green above, paler beneath; petioles of the lower lvs. long and dilated below into an amplexicaul base: heads very numerous, radiate, disposed in a terminal pyramidal panicle; ray-fls. 3 or 4, rays yellow; disk-fls. 3 or 4, corolla-lobes revolute. W. China. B. M. 7912. Gn. 64, p. 237.—A con-

spicuous and attractive species; flowers in Sept. and Oct. Frequently offered by American dealers.

20. **Jacobæa,** Linn. TANSY RAGWORT. STINKING WILLIE. An erect biennial or perennial herb: st. 1–3 ft. high, leafy: basal lvs. petiolate, sublyrate; st.-lvs. sessile, 1½–6 in. long, ¾–2¾ in. broad, 2–3-pinnatisect: heads numerous, radiate with yellow rays. Eu. Naturalized in N. E. Amer. along the coast.—Occasionally cult. in gardens.



3608. Senecio Douglasii. (×⅓)

21. **unifldrus,** All. A low herbaceous perennial, densely white-tomentose throughout: st. 2–5 in. high, usually terminated by a solitary head: lvs. mostly radical, spatulate to oblong, entire to incised-dentate, 1–2 in. long, ½in. or less broad: heads radiate; rays yellow. S. Eu.—An alpine plant, occasionally grown in Amer. and desirable for the rockery.

22. **fastigiàtus,** Nutt. An herbaceous perennial, floccose-tomentulose throughout, somewhat glabrate: st. 1–2 ft. high: lower lvs. narrowly oblong-oblanceolate, including the long slender petiole 3–6 in. long, ½in. or less broad, entire or nearly so, usually with revolute margins; upper st.-lvs. much reduced: heads radiate; commonly several in a terminal corymbose cyme; ray-fls. about 8, rays yellow. Idaho, Ore., and Wash.

23. **Pálmeri,** Gray. Suffruticose, about 3 ft. high, branching, densely white-tomentose throughout: lvs. oblong-oblanceolate, 1½–4 in. long, ¼–1 in. broad, entire to slightly sinuate-dentate, narrowed below into a more or less winged petiole: heads about ½in. high, radiate, disposed in terminal subcorymbose cymes; ray-fls. 12–18, rays yellow. Guadalupe Isl., Low. Calif.—Intro. by Franceschi, Santa Barbara.

24. **Grèyii,** Hook. f. A small spreading shrub 1½–3 ft. or more high: branchlets, under surface of lvs., and petioles densely covered with a soft white tomentum: lvs. oblong or oblong-ovate, 1½–3½ in. long, obtuse, entire, nearly glabrous on the upper surface: heads radiate, disposed in large terminal corymbose cymes; ray-fls. 12–15, rays golden yellow. New Zeal. Gn. 54, p. 434.—A hardy perennial grown in the gardens of Veitch & Son, Exeter, England.

25. **Cinerària,** DC. (*Cinerària marítima,* Linn. *Senècio acanthifòlius,* Hort.). Figs. 3606, 3607. Perennial, 2½ ft. or less tall, branching from the base, very white-woolly throughout: lvs. pinnatifid, with oblong and obtuse segms.: heads usually radiate, ¼–½in. high, disposed in small, compact cymes. F.M. 1872:52. Var. **candidíssimus,** Hort., has very white foliage. Var. **aùreo-marginàtus,** Hort., has lvs. bordered with orange-yellow.—*S. Cineraria* is an old-fashioned garden plant, sometimes known as "dusty miller," and at the present time it is much used in American gardens for ribbon-beds and margins; the commoner "dusty miller" is *Lychnis Coronaria,* and still another one is *Artemisia Stelleriana.*

26. **Doúglasii,** DC. Fig. 3608. A tufted perennial, white-floccose tomentose throughout to essentially glabrous: sts. 1–3 ft. high, distinctly woody below, leafy: lvs. undivided and linear or narrowly linear-lanceolate to pinnatifid with few to several linear-attenuate divisions: infl. a terminal open corymbose cyme; heads about ½in. high, radiate; involucre campanulate, composed usually of 21 bracts subtended by numerous attenuated bracteoles; ray-fls. commonly 13, rays yellow; disk-fls. 50–70: achenes pubescent. S. **Utah to** Ariz., west to Calif., and northern Lower Calif.—First collected in Calif. by Douglas in 1833.

27. **magníficus,** F. Muell. A tall stout undershrub, glabrous and glaucous; st. sparingly branched, terete, leafy: lvs. thickish, sessile, oblong-lanceolate or oblanceolate, 2–6 in. long, coarsely remotely and saliently dentate: heads relatively few, radiate, disposed in terminal corymbose cymes; ray-fls. 8–12, rays golden yellow; disk-fls. numerous. Austral. B.M. 7803.—Intro. by J. H. Maiden in 1899 and brought to flower at Kew in Oct., 1900.

28. **Kirkii,** Hook. f. (*S. glastifòlius,* Hook. f. *Solidàgo arboréscens,* A. Cunn.). An erect stoutly branching shrub, 7–15 ft. high, glabrous throughout: lvs. variable, narrowly oblanceolate to oblong-obovate, 2–5 in. long, ⅓–2 in. broad, entire or sinuate-dentate, narrowed into a slender petiole or cuneate at the base: heads numerous, large, radiate, disposed in a terminal compound corymbose cyme; ray-fls. 10–12, rays ¾–1 in. long, white; disk-fls. yellow. New Zeal. B.M. 8524.—The white rays and yellow disk-fls., and the profuseness of bloom, render this species a very unusual member of its genus; it should prove an interesting plant in horticulture.

29. **grandifòlius,** Less. (*S. Ghiesbréghtii,* Regel). A leafy shrub, 3–15 ft. high: lvs. petiolate, ovate or ovate-oblong, 6–18 in. long, one-half to two-thirds as broad, acute, sinuate-dentate and remotely callous-denticulate, dark green and glabrous or nearly so above, somewhat tawny-tomentulose beneath, cordate to rounded at the base; petioles stout, 1½–5 in. long: infl. a terminal many-headed subcorymbose cyme; heads radiate; ray-fls. about 5, rays yellow; disk-fls. about 10: achenes glabrous. S. Mex. Gt. 9:296. J.H. III. 60:313.—An attractive leafy winter-flowering shrub.

30. **Prainiànus,** Berger. Shrub, about 3 ft. high: lvs. long-petiolate, ovate-deltoid, or suborbicular, 5–7 in. broad, palmately 7–9-lobed, cordate at the base, somewhat hispid above, pubescent on the prominent nerves beneath: infl. a terminal much-branched drooping panicle; heads rayless. S. Mex. G.C. III. 50, p. 82

3609. The florist's cineraria, a very large show specimen.—Supposed to have been developed from Senecio cruentus.

(whence the above description, and from which the plant would seem to be a Cacalia).—Said to be a very ornamental plant resembling the following species.

31. **Petasìtis,** DC. (*Cinerària Petasìtis,* Sims). VELVET GROUNDSEL. CALIFORNIA GERANIUM. A robust perennial 3–8 ft. high, somewhat hirsute-velutinous on the younger parts: lvs. petiolate, broadly ovate or suborbicular, 2–7 in. broad, cordate to subtruncate at the

base, sinuately 9–13-lobed, callous-denticulate, hirtellous above, more or less grayish-tomentose beneath: infl. a terminal many-headed panicle; heads radiate, about ½in. high; ray-fls. usually 5, rays yellow; disk-fls. about 15: achenes glabrous. S. Mex. B.M. 1536. G.W. 9, p. 137.—A useful plant for winter decoration, and rather common in greenhouse cult.

32. **Heritièri,** DC. A low suffruticose perennial, seldom more than 1 ft. high: st. ascending or erect, at first white-tomentose, later glabrate: lvs. petiolate,

3610. Senecio cruentus var. Webberianus, one of the early forms of the garden cineraria.

suborbicular, ½–1¾ in. broad, 5–7-lobed, araneous-tomentulose in the young stages above but soon glabrate, densely and permanently white-tomentose beneath: heads radiate, mostly solitary on an elongated nearly naked pedunele; ray-fls. about 13, rays purple. Teneriffe. B.M. 53 (as *Cineraria lanata*). G.C. III. 50:333.—First brought into cult. about 1793.

33. **cruéntus,** DC. (*Cinerària cruénta*, Mass.). Short-stemmed perennial, floccose-woolly: lvs. large, cordate-ovate to cordate-triangular, angled or undulate and sinuate-toothed, rather long-stalked: fls. purple-red. Canary Isls. B.M. 406.—The supposed parent of the florists' cinerarias (Fig. 3609), for discussion of which see p. 771, Vol. II. According to The Garden, March 1, 1890, it was in 1777 that the type of the florists' cineraria was first intro. from the Canary Isls. by Masson. Whether the present highly improved races of cinerarias are direct descendants of *S. cruentus* or the result of hybridization is not now determined. The garden or modified race began to develop very early. Fig. 3610 is *Cineraria Webberiana*, Paxt. (*Senecio cruentus* var. *Webberianus*, Hort.), copied from The Garden, which "was raised in the spring of 1841 by Mr. Smithers, gardener to Mr. R. Williams, and has bright green leaves and boldly coloured flowers—a form that would give delight in these days." It is said that the first double cineraria is thought to have been Mrs. Thomas Lloyd, certificated in March, 1880.

Several species which have been described under the genus Senecio, some being of rather recent intro., seem to the writer to be more satisfactorily treated under the genus Ligularia. Among those appearing to be of considerable importance from a horticultural standpoint are the following: *Ligulària clivòrum*, Maxim. (Senecio clivorum, Maxim.). A robust herbaceous perennial, 4 ft. high, at first tawny-pubescent, glabrate: radical lvs. long-petiolate, reniform or subrotund, sometimes 20 in. diam., sharply mucronate-dentate: heads large, many-fld., radiate with orange-yellow rays; disk-fls. dark brown. Japan and China. G.M. 51:675. Flowers Aug. and Sept.—*Ligulària macrophýlla*, DC. (Cineraria macrophylla, Ledeb. —Senecio Ledebourii, Schz. Bip.); for description see p. 1859, Vol. IV.—*Senècio Pùrdomii*, Turrill. St. erect, sulcate, densely tawny-pubescent: radical lvs. long-petiolate, broadly orbicular, about 12 in. long, 15 in. broad: infl. paniculate; heads rayless. China. Intro. into England in 1914 by Veitch & Sons. Not yet known in American gardens. Needs further study.—*Ligulària stenocéphala*, Greenm. comb. nov. (Senecio stenocephalus, Maxim. Bull. Acad. St. Petersb. 16:218. 1871. S. cacaliæfolius var. stenocephalus, Franch.). Radical lvs. long-petiolate, reniform, about 9 in. long, 16 in. broad, deeply cordate, coarsely toothed, glabrous on both surfaces: infl. racemose. 12 in. or more long, 2¾ in. wide at the base; heads radiate; ray-fls. 1–5, rays yellow; disk-fls. 5–6. China. B.M. 8472.—*Ligulària Veitchiàna*, Greenm. comb. nov. (Senecio Veitchianus, Hemsl. G.C. III. 38:212. 1905). A very stout perennial herb with simple flowering st. 3–6 ft. high; radical lvs. 15–16 in. long, 10–11 in. broad, sharply dentate: heads very numerous, about 2½ in. diam.; ray-fls. 10–12, rays yellow. China. G.M. 50:741.—*Ligulària Wilsoniàna*, Greenm. comb. nov. (Senecio Wilsonianus, Hemsl. G.C. III. 38:212. 1905). Giant Groundsel. A robust herbaceous perennial with a flowering st. 3–5 ft. high: radical lvs. long-petiolate, the blade reniform-cordate, 10–20 in. long, 9–10 in. broad, sharply dentate: infl. an elongated columnar-like spike, branched at the base; heads very numerous, radiate, about 1 in. diam.; ray-fls. 6–8, rays yellow. China. G. 34:113. G.C. III. 42:201. This and the preceding one are desirable plants for ditch-borders and bog-gardens.

J. M. Greenman.

SENNA: *Cassia.* **S., Bladder:** *Colutea.*

SENSITIVE FERN: *Onoclea sensibilis.* **S. Plant:** *Mimosa pudica.*

SEQUÒIA (after Sequoyah, otherwise George Guess, a Cherokee half-breed of Georgia, about 1770–1843, originator of the Cherokee alphabet). *Pinàceæ.* Big Trees of California. Redwood. Tall massive often gigantic forest trees, grown as ornamental evergreens in Europe, in California, and to a limited extent in the eastern states; of chief interest because of their great age and large size. *S. gigantea* is the most massive of all trees, although exceeded in girth by several others, notably the African baobab. *S. sempervirens* holds the record as the tallest tree in the world, at least so far as actual measurements have been made, one specimen in Humboldt County, California, measuring 340 feet, according to Sargent. Greater heights assigned to species of Eucalyptus were erroneous (see note under *E. amygdalina* var. *regnans*, Vol. II, p. 1157).

Large trees with thick red fibrous and deeply grooved bark: heartwood dark red, soft, durable, straight-grained; sapwood thin and nearly white: lvs. persistent, alternate, linear or awl-shaped or scale-like, often dimorphic: fls. monœcious; staminate catkins axillary and terminal, each of the numerous spirally arranged stamens bearing 2–5 pollen-sacs; pistillate catkins terminal, composed of many spirally arranged scales, each with 4–7 ovules at base: cone woody, persistent, the divergent scales widened at summit which is rhomboidal, wrinkled, and with a depressed center; seeds flattened; cotyledons 2.

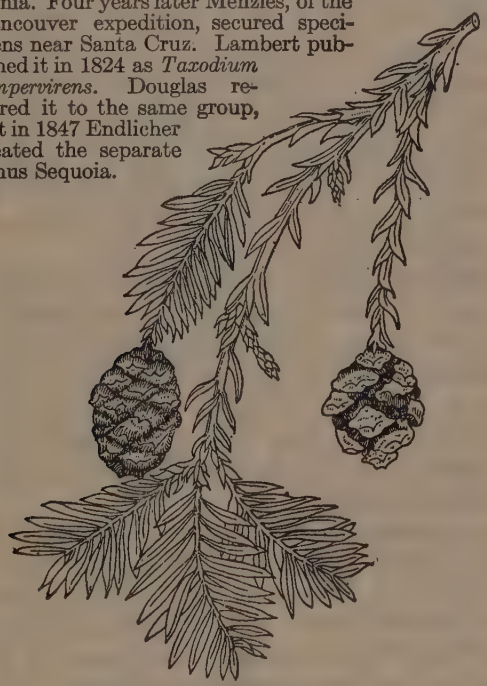
sempérvirens, Endl. California Redwood. Fig. 3611 (adapted from Amer. Forestry xx:323). Tree 100 to 340 ft. high, with trunk 10–25 ft. in diam. and often clear of limbs for 100 ft. in mature specimens, the narrow crown with horizontal or downward-sweeping branches: lvs. linear, mostly ½–1 in. long, 1–1¼ lines wide, spreading in flat sprays, or the upper lvs. and those on main st. of the branches often only 1–5 lines long and awl-shaped: cone oval, ¾–1⅛ in. long, ½–¾in. broad, maturing the first autumn; scales 14–26; seeds elliptic, narrowly margined, 2 lines long. Confined to northern and central Coast Ranges of Calif. on slopes exposed to sea influences. Gn. 76, p. 172. G.W. 13, p. 331; 14, p. 511.—Reproduces by seeds and by stump-sprouts, the latter numerous and remarkably persistent, often producing merchantable lumber. Var. **glaùca,** Hort. Foliage with a decidedly bluish cast.

gigantèa, DC. (*S. Wellingtònia,* Seem. *S. Washingtònia,* Sudw.). California Big Tree. Fig. 3612. Tree 150–325 ft. high, with trunk 10–30 ft. in diam.: crown pyramidal on young trees, rounded at summit or much broken in age: branches pendulous, cord-like: lvs. scale-like, ⅛–½in. long, sharp-pointed, adherent to the st. which they thickly clothe, the tip free: cone ovoid, 2–3¾ in. long, 1½–2 in. broad, opening only slightly, maturing the second summer, persistent; scales 25–45; seeds oblong or somewhat ovate, wing-margined, 2½–3 lines long. Western slopes of Sierra Nevada. C. L. A. 7:364. G.C. III. 27:374; 34:401. G.F. 10:515 (adapted in Fig. 3612). R.H. 1913, p. 55. J.H. III. 67:348. G.W. 2, p. 195; 3, p. 77; 6, p. 397; 13, p. 331. —Reproduces in nature only by seeds. As usually grown the trunk is clothed to the ground with short slender up-curved branches, making a very ornamental tree, but in mature native specimens the trunk is clear of limbs up to 80–200 ft. Var. **péndula,** Hort. Weeping Big Tree. A form in which the branches are strongly recurved, closely covering the st. and producing a narrow cylindric effect similar to that of Italian cypress. Originated in Eu. and prop. by grafting upon normal *S. gigantea.* G.C. III. 31:388. R.H. 1906, p. 395. Var. **glaûca,** Hort. Foliage bluish green; said to be of slow growth.

Harvey Monroe Hall.

The sequoias.

The two great sequoias of California have a place of their own in science, history, and literature. Haenke, the botanist of the Malaspina expedition of 1791, first collected *S. sempervirens,* the coast redwood of California. Four years later Menzies, of the Vancouver expedition, secured specimens near Santa Cruz. Lambert published it in 1824 as *Taxodium sempervirens.* Douglas referred it to the same group, but in 1847 Endlicher created the separate genus Sequoia.



3611. Sequoia sempervirens. (×⅜)

Two living sequoias, *S. sempervirens* and *S. gigantea,* are all that remain of many species that flourished in Tertiary times over a large part of the northern hemisphere. More than forty fossil species have been discovered, but there is still much confusion in regard to the botany of the extinct kinds. They have been found, however, from Italy north to Spitzbergen, and across northern Asia. Several now extinct species, such as *S. angustifolia, S. Heerii,* and *S. Langsdorfii,* grew in California and Oregon in Miocene times. Asa Gray and others have told the story of the rise and fall of this great family of conifers, which was once as abundant as any tree-group in the world, but was cut off, swept away, destroyed by the glacial age, and survived only in parts of California. The *S. sempervirens* seems to be a descendant of the fossil *S. Langsdorfii; S. gigantea* appears related to the fossil *S. Sternbergii.* The famous petrified forest of Arizona was a species of Sequoia, according to the United States Geological Survey. These Arizonian giants which grew millions of years ago, went down under a permanent ocean, were covered with sandstone, and rose again with the present continent. In like manner vast periods of time lie between the present forests of sequoias and their ancient representatives. The value and interest of these wonderful trees are greatly increased by reason of their botanical and historical importance.

At the present time the coast redwood occupies only a narrow belt of country near the Pacific Ocean, nor is it continuous even there; the giant redwood, or California big tree, exists only in a few small and isolated groves, scattered over less than 60 square miles in all, extending along the western side of the Sierra Nevada range. Compared with the enormous territory once occupied by now extinct species of sequoia, the modern representatives of this ancient and honorable family are reduced to a very small area.

The first-known of the sequoias, and much the more valuable species, economically speaking, was *S. sempervirens,* the coast redwood of California. This is one of the most important timber trees of the world, and its forests, comparatively limited in area, have yielded and are still yielding, the most easily obtained, the most durable and profitable fencing and building lumber of the Pacific coast. The reproductive powers of the tree are enormous; no other known conifer so persistently sprouts from the stump, so rapidly makes new forests, or so well resists fire. But it does not thrive farther inland than the limits of the sea-fog, and a large part of the original area covered by this noble tree has been denuded by successive fires and destructive lumbering methods. Small redwood forests occur in Monterey County, but the most southern forests of commercial importance are in Santa Cruz. The belt, broken by the Bay of San Francisco, extends north through Marin, Sonoma, Mendocino, Humboldt, and Del Norte, and a few miles across into the southern borders of Oregon, which state contains about 400 acres of redwoods. The real redwood forests are all contained within a strip of coastlands 450 miles long and rarely more than 20 miles wide. The actual bodies of redwood within this region are merely a chain of isolated groups separated by clearings or by large areas on which redwoods never grew. A small grove, now practically destroyed, existed fifty years ago on the east side of the Bay of San Francisco, in Alameda County. Well-borers have found redwood logs in a perfect state of preservation in various parts of the Coast Range far south of where the trees now grow, even to Los Angeles and San Diego, showing that in some former period of greater rainfall and more sea-fog, redwood forests extended much farther down the coast.

The climate where the redwood thrives is comparatively equable, marked by fogs and cool summer winds from the southwest. The tree delights in rich sheltered mountain valleys and fertile slopes, in dripping fogs and in heavy winter rains. Going east from the ocean, in the redwood region, one suddenly comes to the top of a ridge, to overlook oaks and pines, and at once reaches the plainly marked edge of the *S. sempervirens* forest.

While *S. sempervirens* is sometimes called second in size among the giant conifers of the Pacific coast, the tallest tree yet authentically measured is 340 feet high, exceeding in height the tallest living tree of the Sierra

species, and it is probable that trees exist which rise to nearly 400 feet, and therefore deserve to take first place among the conifers. Many trees of 20 and even 22 feet in diameter at 5 feet from the ground, and from 300 to 325 feet in height, are still standing in the redwood forests. The finest groves of redwoods contain many specimens that range from 150 to 250 feet or more in height and have a diameter of 12 to 18 feet. In such forests the trunks rise in clear red-brown shafts to a height of 75 to 150 feet before they branch; they stand so close that the masses of timber that exist on each acre are greater than are found in any other known forest, and through their far-distant tops the sun seldom reaches the warm sheltered soil of the Coast Range cañons. With proper management, under the principles of scientific forestry, the redwood region as it exists today could be maintained, and its future yield greatly increased, but otherwise in forty or fifty years the commercial value of the entire area will be practically destroyed.

The annual output of the redwood forests of California has steadily increased in recent years until now (1916) it approximates 25,000,000 feet, board measure (The Pioneer Lumberman statistics). Stands of 250,000 feet, board measure, to the acre are not uncommon. One tree is on record as having yielded 480,000 feet of merchantable lumber.

Nearly all of the coast redwood is in private hands, but the state of California in 1901 appropriated $250,000 to create a "redwood park" in the famous Big Basin of Santa Cruz County. Here, at the present time (1916) the state owns and cares for 3,800 acres, 1,500 of which are dense virgin forest, and much of the rest is thinly timbered. The possibilities of this superb and easily accessible park are very great. It was secured for the people by the efforts of many organizations and individuals, chief among which were the Sempervirens Club, and the late Professor Dudley of Stanford.

The Muir Grove of 295 acres is a fine forest in Redwood Cañon, Marin County, on the south side of Tamalpais, which was the gift of the Hon. William Kent to the nation. The Bohemian Club Grove on Russian River will probably remain uncut for generations. The beautiful Armstrong Woods in the same region have been offered to the state of California, but have not yet been purchased.

The *S. sempervirens*, even more than *S. gigantea*, is connected historically with many and great names. Not only Haenke, Menzies, and Douglas, but also Coulter and Hartweg aided in its introduction to Europe, where numerous horticultural varieties are in cultivation. *S. sempervirens* var. *adpressa*, Carr., is a smaller tree than the type form, with creamy white younger leaves and more glaucescent older leaves. It is called in California the "white redwood" and the "silverleaf redwood." Other horticultural varieties in cultivation are known as *S. gracilis*, *S. taxifolia*, *S. picta*, *S. albo-spica*, and *S. glauca*. The golden forms found in many other conifers occasionally appear, but cannot yet be called fixed. No really dwarf redwood is yet extant. Larger-leaved or more compact forms can be selected from the forest, and the tree responds easily to selection and culture. It thrives in gardens in the Sacramento Valley, in the Sierra foothills, and in many parts of southern California, so that its range for ornamental uses can be greatly extended on the Pacific coast. It has been largely planted in Europe, particularly in English parks, and, as was to have been expected, does best in well-drained rich soil near the ocean but sheltered from cold winds.

The most famous of the sequoias and certainly the most widely known of all living conifers is the great redwood of the Sierras, *S. gigantea*. It is undoubtedly one of the rarest of all living species of trees and one of the most easily visited and studied. It is the best living representation in the whole world of a past geologic age, and it is the most noble and impressive of trees. The interest attached to this sequoia is therefore distinctly international, and an immense body of literature has gathered about it.

Jepson, in his "Silva of California," 1910, lists thirty-one known groves of big trees in the California Sierras, containing 86,499 trees. While private owners control much of these areas, still a large part is in the National

3612. Sequoia gigantea.

Forests and Parks, where, under protection, the safety of the tree is assured and reproduction is excellent. In the Fresno grove, for example (Sierra National Forest), thousands of young trees are now growing. The low vitality of the seeds of *S. gigantea*, long a matter of complaint among nurserymen, appears to be less marked than formerly, and nearly all the groves show young trees.

The measurements of standing trees and the age-estimate made in the last decade have materially altered former conclusions. Sudworth has published an excellent table of measurements in the Calaveras Grove, and Jepson has supplemented them with measurements elsewhere. Sudworth measured thirty trees which were from 9 to 19½ feet in diameter 6 feet above the ground, and from 237 to 325 feet high. Former measurements were generally taken at the surface of the ground and hence were most misleading. A tree in Giant Forest, on the Kaweah, for example, measured (in circumference) at the surface of the ground 72 feet, but at 11 feet, where the bulge ceased, and the true shaft began, was but $57\frac{5}{12}$ feet in circumference. The famous Boole tree, in Fresno County, girths $109\frac{9}{12}$ feet at the surface, and 77 feet at 10 feet from the ground.

The problem of the age of the sequoias has long occupied the attention of students; popular literature has reveled in extravagant statements on this subject, so that many persons believe that trees now standing were in existence before the pyramids were built. As regards the coast redwood, so many trees have been cut and the rings counted that its age is now well known; this species lives from 400 to 1,300 years, or may possibly reach 1,500 years in a few cases. In respect to the Sierra redwoods, *S. gigantea*, the heavy logging done in recent years on private lands has enabled foresters to make careful age-determination. They find that mature trees range from 400 to 1,500 years. It remains to determine the resisting powers of mature trees. A few old fallen trees have been found whose rings showed ages of 2,200 to 2,300 years. John Muir estimated a partly burned tree at 4,000 years, but this is open to discussion.

The economic value of the coast redwood is so high that every principle of wise conservation requires more careful management of private forests, more complete reproduction and the reforesting of cut-over areas. Little attention has yet been paid to the by-products

from the present waste which technical chemists are able to make profitable. This is also true of the *S. gigantea* when lumbered on private lands; the beauty and durability of the timber, and the value of its possible by-products make care in reforesting eminently desirable. Pencil manufacturers are beginning to use the wood of selected trees of *S. gigantea*. The rapidity of growth of both sequoias when young, and when favorably situated, is so great that the forestry of the future is likely to extend rather than diminish these forests.

CHARLES HOWARD SHINN.

SERÀPIAS (ancient name of an orchid, derived from Serapis, an Egyptian divinity). *Orchidàceæ*. Terrestrial herbs with the habit of Orchis: sepals connivent in the form of a helmet; petals included, small; labellum not spurred, with erect lateral lobes and a larger undivided, middle lobe; pollinia with a common viscid disk; rostellum laterally compressed.—Four or 5 species are known from the Medit. region. Keep the plants partially dry during winter months. Give plenty of water when in vigorous growth. Pot in leaf-mold, loam, and sand.

The above is the genus Serapias as formerly understood and known to horticulturists. With the recent use of this name for the Cephalanthera-Epipactis group, however, the following species are thrown in the genus Serapiastrum, taking the names *S. cordigerum*, A. A. Eaton, and *S. Lingua*, A. A. Eaton. See Vol. III, p. 1357.

Língua, Linn. St. erect, up to 1 ft. high, bearing several narrow, acute lvs.: sepals lanceolate, greenish or purplish labellum much longer; lateral lobes rounded, erect middle lobe oblong-lanceolate, acuminate, smooth, red. Medit. region. B.M. 5868, B. G.C. III. 48:482.

cordígera, Linn. Resembles the preceding species in habit: labellum brownish red, middle lobe ovate, acuminate, subcordate at the base, pilose. Medit. region. B.M. 5868, A. R.H. 1892:390. G.C. II. 20:341.

S. Helleborine, Linn., of Eu. and very local in this country, is not a horticultural subject.

HEINRICH HASSELBRING.
L. H. B.†

SERENÒA (after Sereno Watson, distinguished American botanist, 1826–1892). Also written *Serenèa*. *Palmàceæ*. Low shrubby or tree-like, more or less armed palms.

Caudex creeping, branched, clothed with the fibrous bases of the lf.-sheaths: lvs. terminal, orbicular, coriaceous, deeply plicate-multifid, glaucous beneath, with narrow bifid infolded segms.; rachis none; ligule short; petiole plano-convex, dentate on the margins: spadix long, tomentose, the flexuous rachis covered with deeply obliquely fissured, tubular sheaths, the spreading branches forked, the alternate branchlets very slender: spathes many, sheathing the peduncle: bractlets minute: fls. white: fr. ovoid, black, an inch long.—Species 2, Fla. to S. C. Cult. in the temperate house, or outdoors from Charleston southward.

The saw palmetto is the native creeping fan-leaved palm. Those who are clearing land in Florida consider it a nuisance. It is, however, of great interest to northern tourists, many of whom like to take home a small Florida palm in a pot or tub. This species does very well in pots, though it is of slow growth. Relatively speaking, it is very hardy, as it will stand a temperature of 10° F. The leaves of the saw palmetto, both fresh and dried, are sent north in great quantities for Christmas decoration. The "crowns" are also largely used for the same purpose and deserve a greater popularity. Crowns are whole tops cut off; they have no roots, and only a part of the stem. They give the effect of the whole plant and are therefore much more desirable for some purposes than single leaves. They will last for weeks, if kept moist, in the shade and free from drafts. Crowns 3 to 5 feet high are considerably used for large decorations. (E. N. Reasoner.)

serrulàta, Hook. f. SAW PALMETTO. A shrub: st. creeping, branching, 4–8 ft. long: lvs. 2–4 ft., erect, circular in outline, fan-shaped, shorter than the slender, spiny-edged petiole; segms. slightly cleft at the apex, without thread-like filaments: spadix densely tomentose, shorter than the lvs.: drupe black, ⅔–¾in. long. Summer.

arboréscens, Sarg. Tree, 30–40 ft. high, with 1 or several erect or decumbent sts.: lvs. semi-orbicular, truncate at base, yellowish green above, bluish green below, 2 x 2 ft., divided nearly to the base into narrow linear-lanceolate lobes: spadix drooping, about 3 ft. long, the fls. yellow-green. S. Fla.—Differs from foregoing in arborescent habit, more elongated spadix, much smaller fls. and smaller, globose fr. and seeds.

N. TAYLOR.†

SERICOCÁRPUS (Greek, *silken fruit*). *Compósitæ*. Five species of perennial herbs from N. E. U. S. closely allied to Aster and scarcely distinguishable from the section Biotia of that genus. The achenes are not so strongly compressed as in Aster. The fl.-heads have white rays and pale yellow disks which sometimes become purplish. They are erect perennials with alternate lvs. and medium-sized heads of white ray- and disk-fls. *S. rígidus*, Lindl., the only western representative of the group (Brit. Col. to Calif.) was once offered.

SERICÓGRAPHIS: *Jacobínia.*

SERÍSSA (from the Indian name). *Rubiàceæ*. Branched shrub, glabrous or the branches puberulent, fetid when bruised, adapted to the greenhouse: lvs. rather small, opposite, subsessile, ovate; stipules persistent: fls. rather small, axillary or terminal, solitary or fascicled, white; calyx-tube obconical, limb 4–6-parted, the lobes subulate-lanceolate; corolla funnel-form, tube and throat pilose inside, limb 4–6-lobed, short, the lobes obtusely 3-lobed; stamens 4–6; ovary 2-celled: fr. subglobose.—One species, S. E. Asia.

fœtída, Lam. (*S. japónica*, Thunb.). About 2 ft. high: lvs. rather leathery, ovate, acuminate: fls. white. Japan. B.M. 361 (as *Lycium japonicum*). Var. **variegàta,** Hort., has yellow-margined lvs. F. TRACY HUBBARD.

SERJÀNIA (named in honor of Paul Serjeant). *Sapindàceæ*. Climbing or twining shrubs adapted to the warmhouse, and grown in the open in warm countries: lvs. alternate, without stipules (or with minute stipules), ternate, twice-ternate or odd-pinnate, frequently pellucid-punctate: racemes or panicles axillary, frequently bearing 2 tendrils; fls. yellowish, irregular, polygamous; sepals 5 (or 4, 2 connate), imbricate, the outer ones smaller; petals 4, the fifth seat vacant; disk undulate, swollen into 4 glands, 2 larger and 2 smaller, sometimes obsolete; stamens 8; ovary 3-celled, sessile or short-stipitate: samaræ 3, indehiscent.—About 190 species, Trop. and Subtrop. S. Amer. Probably very little cult.

cuspidàta, Cambess. (*Urvíllea ferrugínea*, Lindl.). Climbing: branches acutely triangular, the angles densely brown-pilose: lvs. ternate; lfts. somewhat cordate at base, generally ovate in outline, somewhat 3-lobed, irregularly and coarsely toothed, the terminal lft. somewhat decurrent on the petiolule: fls. rather large for the genus; petals usually glabrous: fr. large, ovate, 3-winged. Brazil. B.R. 1077. Gt. 63, p. 325.

fuscifòlia, Radlk. Tall climbing rufous-pubescent shrub with costate branches: lvs. biternate, the lfts. ovate or ovate-lanceolate, acute or somewhat obtuse, simply or double serrate, more or less rufous pubescent beneath and on the nerves above, minutely pellucid-punctate, the terminal one contracted into a petiolule and the lateral ones sessile: fls. small, somewhat pedicellate, sepals tomentose: fr. ovate-elliptic, mostly puberulent or velutinous. Brazil.—Cult. in Calif.

F. TRACY HUBBARD.

SERRADELLA is an annual leguminous plant valuable as a fodder crop on dry and sandy sterile soils. See *Ornithopus*.

SERRÁTULA (from *serra*, alluding to the roughly toothed leaf-margins). *Compósitæ*. A horticulturally unimportant group of composites consisting of about 30 species of herbaceous thistle-like perennials grown for their purple or violet fls.: sts. simple or branched: lvs. alternate, dentate, or much cut into sharp but usually unarmed segms., green both sides or sometimes pale and canescent beneath: infl. of a single pedunculate head or, as in the following, of a lax corymb; heads equal-fld., the involucral bracts in many series, narrowly acuminate at the apex, but not as in many thistles, spiny; fls. purple, but not very showy. Cult. in open border, but perhaps not in Amer. outside botanic garden collections. Eu., N. Afr., to China and Japan.

tinctòria, Linn. A much-branched, freely flowering perennial, about 2–3 ft. tall: lvs. very variable, usually deeply pinnately cleft or divided and generally lanceolate in outline; the upper sometimes undivided and petioled, the basal usually divided and nearly sessile: fls. in a dense corymbiform infl. or thin, frequently sparse and lax, purple. Cent. Eu. July and Sept.

S. atriplicifòlia, Benth. & Hook. Of vigorous growth: lvs. large, heart-shaped: heads globular, attaining height of 5 ft.: fls. purple. Cent. China.

N. Taylor.

SÉSAMUM (Greek name taken by Hippocrates from the Arabic). *Pedaliàceæ*. Herbs, erect or prostrate, scabrous or rarely glabrous, suitable for the warmhouse, and for the open in the S.: lowest lvs. opposite, the upper and almost all alternate, petioled, entire, incise-dentate, 3-cleft or pedately cut: fls. pale or violet, solitary in the axils; calyx rather small, 5-parted; corolla-limb 2-lipped and 5-lobed; stamens 4, didynamous; ovary 2-celled: caps. oblong or ovoid.—About 20 species, Trop. and S. Afr., E. Asia. The only species of importance is *S. indicum*, which has been extensively cult. in the tropics from ancient times. The seeds are sold in Amer. under the name of bene. They yield about half their weight of oil-of-sesame (known also as benne-, gingili-, or teel-oil), which is odorless and does not easily become rancid. This oil is universally used in India for cooking and anointing. Large quantities of oil and seed are imported from India to Eu. for the manufacture of soap and adulteration of olive-oil. Also cult. in northern states as a medicinal herb, the mucilaginous lvs. being used in dysentery and diarrhea of children. The oil of sesamum, however, which is expressed from the seeds is in large doses a laxative.

índicum, Linn. (*S. orientàle*, Linn.). Plant 1–2 ft. high: lvs. variable, 3–5 in. long, oblong or lanceolate, the lower often 3-lobed or parted: corolla pale rose or white, 1 in. long, tubular, 5-cleft, the 2 lobes of the upper lip shorter. July. Tropics. B.M. 1688.—White- and black-seeded varieties have been known for at least two centuries. Runs wild in the extreme S. Wilhelm Miller.

SESBÀNIA (from *Sesban*, the Arabian name of *S. ægyptiaca*). Syns., *Daubentònia*, *Glottídium*. *Leguminósæ*. Herbs or shrubs, sometimes arborescent, but short-lived, suitable for the warm- and coolhouse, and for outdoor planting in the far South.

Leaves abruptly pinnate; lfts. many-paired, very entire; stipels minute or none: racemes axillary, lax; fls. yellow, red-purple, variegated, or white, slender-pedicelled; calyx broad, tube truncate, toothed or subequally lobed; standard orbiculate or ovate, spreading or reflex, wings falcate-oblong, keel incurved, obtuse or obtusely acuminate, with long claws; stamens free from the standard; ovary often stipitate: legume linear or rarely oblong, compressed, 4-angled or 4-winged.—About 30 species, widely distributed in the warmer regions of both hemispheres.

ægyptìaca, Poir. A much-branched, pale green, glabrous shrub, 5–10 ft. high: lvs. nearly sessile; lfts. 10–20 pairs, glabrous, glaucous, oblong-linear, blunt with a faint mucro: fls. bright yellow, standard round, emarginate, more or less clotted with purple: pod 6–8 in. long, distinctly torulose. July, Aug. Tropics of the Old World.—Often cult. in European gardens.

grandiflòra, Poir. A short-lived, soft-wooded tree, 20–30 ft. high: lvs. 6–12 in. long; lfts. 41–61, linear-oblong, pale green, glaucous: fls. rose-red, white, or rusty red, 2–4, in short axillary racemes; standard oval-oblong: pod 1 ft. or more long, falcate, firm, not torulose. July, Aug. Mauritius, India to N. Austral. G.Z. 29, p. 170.

punícea, Benth. (*Daubentònia punícea*, DC.). Shrub or small tree, several feet high, somewhat glaucous and glabrous: lfts. commonly 8–9 pairs, ½–¾in. long, narrowly oblong; stipules small: fls. 8–10 lines long, bright red-purple, in lax racemes; calyx truncate, teeth small; standard broadly rotundate: pod 2–4 in. long, thick, 4-angled, wings leathery, about 2 lines broad. Brazil. —Intro. into S. Calif.

Tripétii, Hort. (*Daubentònia Tripétii*, Poit. *D. Tripetiàna*, Poit.). Shrub or small tree, about 6 ft. high: lvs. pinnately compound, dull green above, glaucescent beneath: fls. orange-red, rather large, in drooping racemes; standard scarlet, much paler on the inner face, with a yellow spot on the claw; wings and keel paler. Argentina.

F. Tracy Hubbard.

SÉSELI (old Greek name for an umbelliferous plant). *Umbellíferæ*. Meadow Saxifrage. Perennial and biennial herbs in the temperate and cold regions of the Old World, of perhaps 50–60 species, sometimes mentioned in horticultural literature as acceptable border plants. Erect and branched, with lvs. decompound or 2–3-pinnate, and compound umbels of small white fls., the involucres of few or many bracts or sometimes wanting; calyx-teeth either prominent or minute; petals notched; styles very short: fr. nearly terete, ovoid or oblong. *S. Libanòtis*, Koch, of wide distribution in Eu., is perhaps most likely to appear as a cult. plant: perennial, 1–2 ft., erect and stout, glabrous or slightly pubescent: lvs. bipinnate, the lfts. ovate and sessile: umbel rounded, with many pubescent rays, and many-bracted involucres and involucels.

SESÙVIUM (derivation unknown). *Aizoàceæ*. Erect or prostrate, branched, succulent herbs or subshrubs, adapted to the warm- or coolhouse: lvs. opposite, somewhat fleshy, linear or oblong: fls. axillary, sessile or pedunculate, solitary, clustered or rarely subcorymbose, frequently flesh-colored or purple, with 2 bracts or bractless; calyx-tube turbinate, the lobes 5, oblong, obtuse, colored inside; petals none; stamens 5; ovary free: caps. oblong, membranaceous, 3–5-celled, circumscissilly dehiscent.—About 13 species, warmer temperate and tropical regions of the world, usually littoral. *S. Portulacástrum*, Linn. A diffuse procumbent or prostrate herb often wholly blood-red or purple: lvs. succulent, linear to oblanceolate or obovate-oblong, much narrowed at the base: fls. axillary, purplish or rose, peduncles equaling or shorter, rarely longer than the fls.; calyx deeply 5-lobed, the lobes ovate-lanceolate, obtuse with a mucro just below the apex behind; ovary usually 3-celled. Tropics and warmer regions of both hemispheres.—Sometimes used as a pot-herb.

SETÀRIA (Latin, *seta*, a bristle). *Gramíneæ*. Annual or sometimes perennial grasses with bristly spike-like panicles: spikelets as in Panicum, but subtended by 1 to several bristles that extend beyond the spikelet and persist after the spikelet falls: the fr., that is, the mature fertile floret, usually transversely wrinkled.—Species about 40 in the warmer regions of the world.

Several species are annual weeds, such as YELLOW FOX-TAIL (*S. glaùca*, Beauv.) with oblong yellow spikes, and 5 or more bristles below each spikelet, and GREEN FOX-TAIL (*S. víridis*, Beauv.), with somewhat pointed green spikes and 1–3 bristles below each spikelet. Many American botanists use the name Chætochloa instead of Setaria. (Dept. Agric., Div. Agrost., Bull. 21, is devoted to this genus.) The setarias are scarcely horticultural subjects, being primarily forage plants; but they are so widespread in cult. and the forms are so confused that a somewhat full discussion of them may be inserted here.

A. *Plant perennial.*

macrostàchya, HBK. (*S. Alopecùrus*, Fisch. *S. alopecuroìdes* var. *nìgra*, of the trade). An erect or ascending perennial: spike slender, tapering at apex; bristles 1 or sometimes 2, ½–1 in. long; spikelets $\frac{1}{12}$in. long; first glume one-third to one-half, second two-thirds to three-fourths as long as the equal sterile lemma and fr.; first glume inflated about the base of the spikelet. Texas to S. Amer.

AA. *Plants annual.*

mágna, Griseb. A coarse stout native, resembling common millet: spike ½in. thick, as much as a foot long, tapering above and below; bristles 1–3, scarcely ½in. long; spikelets $\frac{1}{12}$in. long, elliptical; first glume one-third as long as second glume and sterile lemma, equaling the spikelet; fertile lemma smooth. Marshes of Gulf States as far north as Md.

itálica, Beauv. COMMON MILLET of the U. S. (but not of Eu., this being *Panicum miliaceum*); also called GERMAN MILLET and HUNGARIAN GRASS. Culm 3–5 ft. high: spike yellow or purple, compound, more or less glomerate; bristles 1–3, often shorter than the spikelet. Thought to have been derived from *S. viridis*. Gn. 12, p. 69.—The cult. of millet dates from prehistoric times. At present it is raised extensively in parts of Asia as a food-plant. In the U. S. millet is raised for fodder. The "Japanese millets" belong to *S. italica*, while the "Japanese barnyard millets" are *Echinochloa Crusgalli* or *E. frumentacea*.

The forms of *S. italica* may be distinguished from *S. viridis* by the articulation of the fruit (fertile floret), or what is commercially known as the seed. In the former species the fruit at maturity disarticulates above the glumes and falls away free from them. In *S. viridis* the fruit falls away surrounded by the glumes. The varieties of *S. italica* have been classified by Hubbard (Amer. Journ. Bot. 2:187.1915) as follows:

A. *Fr. yellowish to straw or light brown.* (*Stramineofructa.*)

B. *Bristles green.*

C. *Panicle more or less open-lobulate.*

Subsp. **stramineofrùcta,** Hubb. Bristles noticeably longer than spikelets: a large plant with heads 4–12 in. long, and as much as 2 in. wide, usually strongly lobed. This is one of the forms cult. as German millet. Forma **brevisèta,** Hubb. Bristles shorter than the spikelets or barely exceeding them. Cult. as Golden Wonder millet.

CC. *Panicle dense or slightly lobulate at base.*

Subvar. **germánica,** Hubb. Bristles noticeably longer than spikelets: head usually 2–3 in. long, ¼–½in. broad. One of the forms cult. as common millet.

BB. *Bristles purple.*

C. *Panicle more or less lobulate.*

Var. **Hòstii,** Hubb. Head large, lobulate, purple. Cult. as German millet.

CC. *Panicle dense or slightly lobulate at base.*

Subvar. **Métzgeri,** Hubb. Bristles noticeably longer than spikelets. Cult. as common millet, a common form. Sometimes called Hungarian grass, a name that should apply to var. *atra* (see below).

BBB. *Bristles brown.*

Var. **brunneosèta,** Hubb. Head large, lobulate, brown. Aino millet, occasionally cult. Subvar. **dénsior,** Hubb. Head compact, scarcely lobulate. Another form of Aino millet.

AA. *Fr. reddish or orange.* (*Rubrofructa.*)

Subsp. **rubrofrùcta,** Hubb. The form cult. in U. S. is var. *purpureosèta*, Hubb., with lobulate head and purple bristles. Turkestan millet. Subvar. **violàcea,** Hubb., with dense head and purple bristles. Kursk millet. Siberian millet.

AAA. *Fr. blackish, brownish black or purplish black with pale yellowish straw lines intermingled, these sometimes predominating.* (*Nigrofructa.*)

Subsp. **nigrofrùcta,** Hubb. The common form cult. in U. S. is var. *atra* with small dense heads, 1–3 in. long, with purple-brown bristles. Commonly cult. as Hungarian grass.

Many other varieties are cult. in the Old World.

A. S. HITCHCOCK.

SEVERÍNIA (named for M. A. Severino, a Neapolitan). *Rutàceæ*, tribe *Cítreæ*. Small woody plants distantly related to the orange.

Spiny shrubs or small trees with short and stiff branches: spines single, at one side of the bud in the axils of the lvs.: lvs. simple, conspicuously veined, borne on short apterous petioles: fls. 5-merous, occurring 2 or 3 together in the axils of the lvs.; petals small, white; stamens 10, free; ovary 2-celled, with 1 ovule in each cell: fr. a small nearly globular berry, black when mature.—Only one species is known, usually called *Atalantia buxifolia*, native to S. China and Formosa. See Swingle, in Journ. Wash. Acad. Sci., Vol. 6, No. 19. 1916.

buxifòlia, Ten. (*Citrus buxifòlia*, Poir. *Limònia biloculàris*, Roxbg. *Scleróstylis buxifòlia*, Benth. *Atalántia buxifòlia*, Oliver). A spiny shrub or dwarf tree native to S. China, intro. into cult. in Eu. late in the 18th or early in the 19th century and often considered by botanists to belong to the genus Atalantia, from which it differs widely in the character of the fr. which is a black berry, the ovary walls becoming succulent as the fr. ripens: lvs. simple, obovate-oblong, very obtuse or emarginate, 1½ in. long, having numerous fine veins; spines solitary: fls. axillary, in fascicles or solitary, small, subsessile; stamens 10, free: fr. a true berry, becoming more or less fleshy at maturity, turning black, 2 (or sometimes 3) -celled, each cell containing a single seed, cells not filled with gum or pulp vescicles; seedlings with subterranean cotyledons, first lvs. very small, spirally arranged. Ill. Seemann, Bot. Voy. Herald, pl. 81; Penzig, Studi bot. sugli agrumi, Atl., pl. 11, figs. 6–17; Swingle in Journ. Wash. Acad. Sci., Vol. 6, No. 19. 1916.—This plant, which has lvs. resembling the box (*Buxus sempervirens*) is common in S. China and Hongkong, and occurs also in Formosa. It is grown in botanic gardens and Eu. and has been intro. in this country. It is erroneously listed by some nursery firms as *Triphasia monophylla*. It is sometimes used as a hedge-plant in La. and other Gulf states, and is well adapted for this purpose, as it does not grow to large size and has very spiny forms that can be prop. from cuttings. It is being tested by the Dept. Agric. as a stock for the cult. citrous frs., as it is able to thrive in soils too salty to permit Citrus to grow.

WALTER T. SWINGLE.

SEYMÈRIA (named in honor of Henry Seymer, an English naturalist). *Scrophulariàceæ*. Erect branched annual or perennial, mostly hardy herbs, used for bedding on account of their fls.: lvs. mostly opposite, incise-dentate or dissected, the uppermost floral ones reduced

to entire bracts: fls. in interrupted racemes or spicate, the pedicels solitary and without bracts, yellow; calyx campanulate, with 5 narrow, entire or denticulate lobes; corolla-tube short and broad, rarely exserted, the throat broad, 5-lobed, the lobes broad or oblong, spreading; stamens, 4, subequal: caps. globose at base, the apex frequently compressed, acuminate or beaked.—Ten species, 9 from N. Amer., Texas-Mex. region and 1 from Madagascar. Seeds are sown in a well-drained bed of rather light rich soil. *S. pectinàta*, Pursh. About 1 ft. high, minutely viscid-pubescent or glabrate: lvs. pinnately parted into rather few short- or oblong-linear divisions or the upper incisely few-toothed or entire: calyx-lobes linear; corolla hairy outside. N. C. to Fla. and Ala., perhaps to Texas. *S. tenuifòlia*, Pursh. About 2–4 ft. high, very slender: lvs. copiously 1–2-pinnately parted: fls. on filiform pedicels; calyx-lobes setaceous; corolla very deeply cleft, the lobes oblong. N. C. to Fla. and Texas.

SHAD-BUSH: *Amelanchier.*

SHADDOCK. A name used in the West Indies and Florida for the forms of the pummelo, *Citrus grandis*, supposed to have been introduced from India into the West Indies sometime in the seventeenth century by a Captain Shaddock.

The shaddocks are large usually pear-shaped fruits with a thick peel and have a firm pulp of rather poor flavor. The leaves have very broad, winged petioles and the twigs are usually more or less hairy, especially when young. Shaddocks were formerly grown in Florida but have been superseded by the grapefruit (see page 1391, Vol. III) as the latter finds more favor in American markets. Pummelos, very like shaddocks, are still grown in India, China, and the East generally. See *Pummelo* (page 2857, Vol. V).

WALTER T. SWINGLE.

SHAGBARK: *Hickory.*

SHALLOT is *Allium ascalonicum*, Linn., native of Syria. It is grown chiefly for the small oblong-pointed gray bulbs (into which the parent bulb separates after harvesting in summer), which are used in cookery for flavoring; the leaves are sometimes eaten in a green state. The bulbs are of mild flavor. Shallots are little known in North America. They are grown as are garlics (see *Garlic*), the bulbs or cloves being separated and planted early in spring in any good garden soil. Each bulb produces several, all cohering by the base. The mature bulbs are 2 inches or less long and only about half that in diameter. The leaves are small, terete, and hollow. The plant is hardy. The bulbs will keep several months or even a year. Small onions are sometimes sold as shallots.

L. H. B.

SHAMROCK. Half the world is sure that shamrock is the wood-sorrel, *Oxalis Acetosella*. The other half is equally certain that the true shamrock is white clover, *Trifolium repens*. In the time of Spenser's "Faerie Queene," shamrock was said to be good to eat. This applies to the former plant, but not to the latter. Moreover, according to Sowerby, the wood-sorrel is in perfection on Saint Patrick's Day, while white clover is not. The wood-sorrel is sent in great quantities from Ireland to London for Saint Patrick's Day. On the other hand, it is said that clover is the plant most commonly used in Ireland. Half a dozen other plants have their followers, and these are all plants with three leaflets. Nevertheless there are those who deny that Saint Patrick used the shamrock as a symbol of the trinity. These declare that the water-cress is the true shamrock. The question will always remain an open one. See Dyer's "Folk-Lore of Plants."

WILHELM MILLER.

SHAMROCK, INDIAN: A name found in some English books for the *Trillium*. **S. Pea:** *Parochetus communis.*

SHEPHÉRDIA (named for John Shepherd, an English botanist). *Elæagnàceæ*. Shrubs, or small trees with scurfy scales, two of which are in cultivation, one for its striking appearance, the second for its edible fruit.

Leaves opposite, petiolate, oblong and entire: fls. small, dicœcious, in very short spikes or racemes, opposite to small bracts along the rachis, male spikes many-fld., female 2-fld. in the axils of lvs. or often sessile at leafless nodes; calyx of male fls. 4-parted, of female fls. urn-shaped, 4-cleft; stamens in male fl. 8, alternating with 8 lobes of a thick disk; ovary becoming a nut or achene and invested by the fleshy calyx, forming a drupe-like fr.—Three species, N. Amer. The genus Shepherdia was founded by Nuttall in 1818. Rafinesque's Lepargyræa, 1817, is equivalent, and the species have been placed under this name; it is not accepted under the International Rules. In *S. argentea*, the buffalo berry, the fr. is edible when made into jellies and conserves, and is much prized in the upper plains region for household uses.

The shepherdias are hardy plants, withstanding extremes of cold and drought. They are of easy culture, and grow readily from stratified seeds. For ornamental planting, they are prized for bold positions in front of shrubbery masses, where their gray or white colors afford excellent contrasts. *S. canadensis* is particularly well adapted for planting on dry rocky sterile banks, where most bushes find great difficulty in securing a foothold. *S. argentea* succeeds better in the upper Mississippi Valley than in the eastern states. Staminate and pistillate plants of it have different forms of buds.

A. *Lvs. green above.*

canadénsis, Nutt. (*Lepargyræa canadénsis*, Greene). Spreading twiggy bush 3–6 or even 8 ft. tall, the young branches brown-scurfy: lvs. ovate, oval, or elliptic, rather thick, green above but rusty beneath: fls. yellowish, in short clusters at the nodes: fr. small (¼in. or less long), oval, red or yellow, insipid. Along streams and on lake-banks, Newfoundland to Brit. Col. and in the northern tier of states, and southward in the mountains to Utah.—The yellow-fruited form has been distinguished as f. *xanthocárpa*, Rehd.

AA. *Lvs. silvery above.*

argéntea, Nutt. (*L. argéntea*, Greene). BUFFALO BERRY. Fig. 680, Vol. I. Upright shrub, or sometimes almost tree-form, reaching 18 ft. tall, thorny, the young growth silvery tomentose: lvs. oblong, cuneate-oblong or oblong-lanceolate, silvery on both sides: fls. yellowish, in dense small fascicles at the nodes: fr. globular or ovoid, about ¼in. long, red or yellow, acid, edible. Kans. to Minn., west and north. See *Buffalo Berry.*

S. rotundifòlia, Parry, from Utah, is a silvery tomentose and scurfy evergreen bush: lvs. round-oval or ovate, mostly somewhat cordate, short-petioled: fls. stalked in the axils of the lvs., the staminate mostly in 3's and the pistillate solitary: fr. globular, scurfy, ripening in July.

L. H. B.

SHERWOÒDIA: *Shortia.*

SHÓRTIA (named for Dr. Charles W. Short, a botanist of Kentucky). *Diapensiàceæ*. Two acaulescent herbs, with the habit of galax.

Rootstocks creeping: lvs. evergreen, round-cordate: fl. solitary on a slender leafless scape, the calyx with scaly bracts, the corolla bell-shaped and obtusely 5-lobed; stamens 5, the filaments adnate to the corolla, alternating with 5 scale-like staminodia; pistil 3-angled and 3-loculed; style filiform and stigma 3-lobed: fr. a globular caps. From this, Schizocodon is distinguished by linear-elongated staminodia and fringed corolla. Allied genera mentioned in this Cyclopedia are Galax, Pyxidanthera, and Schizocodon. Diapensia has two alpine and boreal species, one in the Himalayas and the other in N. Eu. and N. Amer. Berneuxia, the remaining genus, has a single species in Thibet, not in the American trade. *Shortia californica* of seedsmen

will be found under *Actinolepis*. Of the little family Diapensiaceæ, with its 6 genera and 9 species, *Shortia galacifolia* is historically the most interesting. Michaux collected the plant in 1788 in the high mountains of Carolina, but as his specimen was in fr. rather than in fl., Richard, the author of Michaux's Flora Boreali-Americana, did not describe it. Asa Gray examined Michaux's specimen, preserved in Paris, in 1839, and afterward founded the genus Shortia on it. Great search was made for the plant in the mountains of Carolina, but it was not rediscovered until 1877. The history of the efforts to find the plant is one of the most interesting chapters in American botany. For historical sketch, see Sargent, Garden and Forest, vol. 1, p. 506 (1888). Torrey & Gray founded the genus Shortia in 1842. In 1843, Siebold & Zuccarini founded the genus Schizocodon, from Japan. To this genus Maximowicz added a second Japanese species, *S. uniflorus;* the fls. of this plant, as of Shortia, were unknown when the plant was first recognized. It transpires, however, that *S. uniflorus* is really a Shortia, thus adding another instance to the growing list of bitypic genera that are endemic to Japan and E. N. Amer.

Shortia, like most plants considered rare, is really not so rare as local, though the few stations where it is

3613. Shortia galacifolia. (×½)

found abundantly do not seem to present special conditions not to be found elsewhere, and it is hardly understood why it should, in common with certain other plants, have remained strictly local, in an indigenous state. For the successful culture of shortia, humus and leaf-mold seem to be absolutely required, and it should either be planted where these conditions are natural or else be constantly supplied with this food. This suggestion, if carried out with many plants, such as galax, pyrola, chimaphila, and probably *Epigæa repens*, will ensure success, where if ordinary garden treatment only is given the entire disappearance of the plants may be expected in a season or two. Semi-double and pink-flowering plants are not rarely found, and it seems likely that cultivation may bring out several worthy varieties. In England shortia is often grown successfully as a pot-plant, and is far more appreciated than in America. It is difficult to procure seed, as the flowering-stem usually withers away before maturing, though shortia is readily propagated by division and runners. It is a shade-loving plant and is a choice addition to the ericaceous bed, where it will thrive under rhododendrons and kalmias. (Harlan P. Kelsey.)

galacifòlia, Torr. & Gray (*Sherwoòdia galacifòlia*, House). Fig. 3613. Lvs. all radical, long-petioled, the blades orbicular or broadly ovate-orbicular, often slightly cordate, at the apex obtuse or even retuse, the margin repand-serrate: peduncles slender, 3–8 in. tall, 1-fld., bracted near the top: fl. inclined or nodding, white, 1 in. across, the obtuse lobes undulate. Mountains of N. C. B.M. 7082. G.C. II. 15:596; III. 5:397; 17:453. G. 34:521; 36:121; 37:309. Gn. 38:204; 67, p. 285; 71, p. 7; 73, p. 189. J.H. III. 30:299; 58:373. G.M. 34:353. G.F. 1:509 (adapted in Fig. 3613). Gn.W. 7:605; 20:295. A.G. 12:287. Mn. 6, p. 83. C.L.A. 17:414. F.S.R. 3:8.—A very attractive plant with the look of a pyrola; very local. Var. **ròsea,** Hort., has rose-colored fls.

uniflòra, Maxim. (*Sherwoòdia uniflòra*, House). Very like *S. galacifolia:* lvs. cordate, broader than long and deeper toothed,—sinuate-toothed in *S. uniflora* and only repand-toothed in *S. galacifolia*. Japan. B.M. 8166. G.C. III. 31:337; 43:220, 221. G. 36:803. Gn. 67, p. 192; 71, p. 310; 72, p. 202. F.S.R. 3, p. 247.—Offered by importers of Japanese plants, but little known horticulturally. Var. **grandiflòra,** Hort., has larger fls. than the type, being as much as 1¾ in. across. G. 32:253. Gn. 74, p. 164; 78, p. 177. G.M. 53:205. L. H. B.

SHRUBBERY: *Planting*, Vol. V.

SHÙRIA: *Scheeria.*

SIBBÁLDIA (named for Robert Sibbald, Scotch naturalist). *Rosàceæ.* Low and depressed perennials, hardy and rare in cult., sometimes used in alpine-gardening: lvs. 3-foliate, alternate; stipules prominent: fls. cymose, yellow, small; calyx flattish, 5-cleft and with 5 bractlets; petals 5, linear-oblong, minute; stamens 5, alternate with the petals: achenes 5–10.—About 5 species, natives of the colder parts of the North Temperate Zone. Reduced by Bentham and Hooker to a section of Potentilla, but separated by most authorities.

procúmbens, Linn. Lfts. 3, wedge-shaped, 3-toothed at the apex: petals yellow. Ranges from the arctic regions to the summits of the White Mts. and in the Rockies comes as far south as Utah. It is also found in arctic and alpine Eu. and Asia. B.B. 2:217.—This plant is recommended by some persons, but is not known to be advertised for sale in Amer.

F. Tracy Hubbard.†

SIBIRÆA (named for the habitat of the plant, Siberia). *Rosàceæ*, subfam. *Spiræeæ*. Two shrubs from N. E. Asia and W. China closely allied to Spiræa, but differing in the narrow entire lvs., the polygamo-dicœcious fls. disposed in panicled racemes and in the 2-seeded carpels connate at the base. *S. lævigata* is a deciduous upright shrub with rather stout branches, with alternate, entire, generally oblong lvs. and with small short-stalked white fls. in spike-like racemes crowded into terminal panicles. It possesses no particular ornamental qualities and is rarely cult.: hardy N. The hardiness of the recently intro. *S. tomentosà* has not been sufficiently tested. Prop. is by seeds sown in spring or by layers. **S. lævigàta,** Maxim. (*S. altaiénsis*, Schneid. *Spiræa lævigàta*, Linn.). Shrub, 5 ft. high, with stout upright branches: lvs. cuneate-oblong, bluish green, glabrous, 1½–3½ in. long: fls. polygamous, greenish white, in terminal panicles, 3–5 in. long, those of the staminate plant somewhat showier. May. Siberia. G.O.H. 89. Var. **angustàta,** Rehd. Lvs. narrow-lanceolate, 1–4 in. long and rarely more than ½in. broad: infl. pubescent. W. China. Var. **croàtica,** Schneid., from S. E. Eu., is similar to the preceding variety, but the lvs. are obtuse and the infl. not pubescent. It is not yet intro. **S. tomentòsa,** Diels. Low shrub, to 2 ft.: lvs. oblong-obovate to oblanceolate, acutish and mucronulate, with silky silvery white tomentum beneath while young, glabrous above, 2–3 in. long: fls. greenish yellow in dense panicles about 2 in. long. S. W. China. Alfred Rehder.

SIBTHÓRPIA (named in honor of John Sibthorp, 1758–1796). *Scrophulariàceæ*. Hardy or greenhouse perennial herbs, often rooting at the nodes, grown mostly for the flowers.

Leaves alternate or fascicled, petioled, orbiculate-reniform, coarse-crenate or incise-pinnatifid: pedicels axillary, solitary or fascicled: fls. yellow, yellowish rose or red; calyx campanulate, 4–8-cleft, the lobes slightly unequal; corolla-tube short or very short, rotate, limb spreading; anthers sagittate: caps. membranaceous, compressed, loculicidally dehiscent, the valves splitting to the middle.—About 7 species, E. Eu., Trop. and N. Afr., mountains of India and S. Amer.

europæa, Linn. A hardy trailing perennial with very slender sts.: lvs. orbicular, less than ½in. across, 7–9-lobed: fls. small, on rather short pedicels, the 2 upper lobes of the corolla yellowish, the 3 lower pink. Deep woods, Eu. Var. **variegàta,** Hort., a form with bright golden green foliage, is cult. abroad.

peregrìna, Linn. Tender trailing greenhouse perennial: lvs. much crenated: peduncles frequently fascicled, 2 in. long: fls. yellow, 5–8-parted; stamens slightly shorter than the corolla. June. Mauritius. B.M. 218 (as *Disandra prostrata*). F. TRACY HUBBARD.

SICÀNA (Peruvian name). *Cucurbitàceæ*. Annual slender subglabrous tall-climbing vines, used out-of-doors in the S. for ornament: lvs. palmately 5–9-lobed, very glabrous and shiny; tendrils 3–5-cleft, the branches adhering at the tip: fls. rather large, yellow, monœcious, all solitary; calyx-tube short-campanulate, 5-lobed, the lobes ovate-lanceolate, recurved; corolla inflated-campanulate, 5-lobed above the middle, the lobes broad-ovate; stamens 3 in the male fl.: fr. large, fleshy, many-seeded, fragrant and edible.—Three species, Trop. Amer. Allied to Cucurbita, but differing in having wide-spreading or reflexed calyx-lobes and the anthers not united.

odorífera, Naudin, the CURUBA and PEPINO ANGOLO of the tropics, has been intro. in the U. S. as the CASSABANANA. Fig. 3614. It is a very quick-growing and interesting ornamental vine: plant glabrous, the sts. angled: lvs. large (often 1 ft. across), nearly orbicular in outline, deeply cordate at the base, strongly about 5-lobed and the lobes repand-toothed or angled: fls. solitary, monœcious, the corolla small and yellowish, urn-shaped, with small reflexed lobes; stigmas 3, each 2-lobed: fr. like a slender vegetable marrow, 1–2 ft. long, smooth, nearly cylindrical, orange-crimson, with a very strong aromatic odor. R.H. 1890:516.—Probably native to Brazil, but occurring also in Mex. and the W. Indies. The curuba seems to be grown in the tropics as an ornamental plant, although it is said to afford edible preserves. The plant climbs 30–50 ft. It is well worth growing on summer arbors, or under glass if one has room for it. The frs. are very interesting, fragrant, and ornamental. Perennial.

S. atropurpùrea, André. Has shorter subpyriform, brilliant violet-purple frs., and purple-tinted under surfaces of the lvs. Perhaps a form of S. odorifera. Uruguay. R.H. 1894:108.—*S. sphérica*, Hook. f. Fls. large and spreading, more like those of Cucurbita: lvs. reniform, 3–5-lobed: fr. globose, size of a small orange. Jamaica. B.M. 7109. L. H. B.

SÍCYOS (Greek name for the cucumber). *Cucurbitàceæ*. Climbing or prostrate annual herbs useful for ornamental purposes, one especially for covering walls and the like: lvs. membranaceous, angulate or lobed, rarely deeply 3–5-lobed; tendrils 3-cleft: fls. small or minute, whitish, monœcious, the sterile and fertile mostly from the same axis, the former corymbed, the latter in a capitate cluster, long-peduncled; petals 5, united below into a bell-shaped or flattish corolla; ovary 1-celled: fr. ovoid, dry, and indehiscent, 1-seeded.—About 50 species, warmer parts of N. and S. Amer., Pacific islands, and Austral.

angulàtus, Linn. BUR CUCUMBER. Annual climbing herb: lvs. very broadly rhombic-ovate, more or less shallow, 5-angled or lobed, palmately veined; the lobes rather broad-deltoid, the midlobe abruptly and narrowly acuminate, the lateral lobes apiculate, base somewhat halberd-shaped with a rounded rather narrow sinus; the petiole slender and glandular-pilose. S. Maine and W. Que. to Fla. and west to Minn., E. Kans., and Texas.—Used on account of its rapid growth for screening walls, lattice-work, and the like.

SÌDA (from the old Greek name for *Nymphæa alba*; given without explanation by Linnæus). *Malvàceæ*. Herbs or shrubs with the indumentum frequently soft or tomentose, adapted to the warm- or coolhouse or some of them hardy; one species, *S. rhombifolia*, now cultivated in India for its fiber.

Leaves simple or lobed, usually serrate or dentate: fls. sessile or pedunculate, solitary or glomerate, axillary or in terminal racemose spikes or heads, various colored and sometimes showy, often small, yellow or whitish; calyx 5-toothed or 5-cleft; staminal column divided at the top into numerous filaments: carpels 5 or more, when ripe separating from the axis, generally 2-awned at the summit; seed 1 to a carpel and pendulous.—About 120 species, widely distributed in Afr., Asia, Austral., and N. and S. Amer.

3614. Sicana odorifera, the cassabanana. (×¼)

A. *Lf.-blades palmately lobed: fls. white.*

hermaphrodìta, Rusby (*S. Napæa*, Cav. *Napæa hermaphrodìta*, Linn.). A hardy herbaceous perennial 5–8 ft. high, from a stout root: lvs. 3–8 in. long, 3–7-lobed; lobes triangular, long-acuminate, irregularly serrate: fls. perfect, white, about 1 in. across, in terminal corymbose panicles. June–Aug. S. Pa., W. Va., and Va. B.B. 2:422.—Cult. same as for hollyhocks; prop. by seed. Index Kewensis refers the above species to *Napæa dioica*, Linn., but according to Gray's Synoptical Flora of North America the two species belong to separate genera, the fls. of the first being hermaphrodite, of the second dicœcious. *Napæa dioìca* is a strong-growing perennial 5–9 ft. high, with large radical lvs. often 1 ft. across and 9–11-cleft, the segms. cut into lanceolate serrate lobes: fls. dicœcious, white, smaller than in *Sida Napæa*. For pictures of the two plants, see B.B. 2:420, 422.

AA. *Lf.-blades merely toothed: fls. of various colors.*

B. *Lvs. ovate to cuneate or lanceolate.*

rhombifòlia, Linn. Shrubby or subshrubby: lvs. very variable, rhomboid-lanceolate to lanceolate, lower surface usually paler or even hoary: fls. axillary, solitary, pale yellow, rarely white, the petals blotched with red at the base. Tropics and subtropics of both hemispheres.—Yields a good fiber, and its cult. for this purpose has recently been encouraged in India. Probably of little value for ornament.

BB. *Lvs. linear or linear-oblong.*

Élliottii, Torr. & Gray. A hardy perennial herb, slender, 1–3 ft. high, with lvs. 1 in. long and yellow fls. Sandy soil in the southern coast states. Offered by western collectors in 1881. B.B. (ed. 2) 2:520.

F. TRACY HUBBARD.†

SIDÁLCEA (compound of *Sida* and *Alcea*, related genera). *Malvàceæ.* Some of the sidalceas are annuals, but those in cultivation are hardy perennials, being recommended for the herbaceous border.

Leaves palmately cleft or parted, stipular: fls. often showy, pink, purple, or white, in terminal racemes or spikes, mostly without bracts or involucels beneath; stamens united into groups in a double series: carpels 5–9, reniform, separating at maturity.—About 30 species, natives of W. N. Amer. For monograph, see Gray, Syn. Fl. N. Amer., vol. 1, p. 302. Of easy cult. Prop. by seeds or division.

3615. Sidalcea candida. (×½)

A. *Fls. white, with bluish anthers.*

cándida, Gray. Fig. 3615 (adapted from Pacific R. R. Report). Plant erect, from more or less creeping root-stocks, the sts. somewhat branched above, 2–3 ft. tall, glabrous or nearly so: radical lvs. nearly orbicular, cordate, obtusely lobed or deeply crenate; st.-lvs. 5–7-parted, the divisions narrow and often notched: fls. 1 in. or more across, white, in an erect spike-like raceme. Rocky Mts. Gn. 24, p. 396; 28, p. 29. G.M. 49:316. Gn.W. 24:299 (as *S. malvæflora*). J.H. III. 56:451. R.H. 1891, p. 356.

AA. *Fls. normally colored (rarely white forms).*

B. *Mature carpels smooth (not reticulated).*

spicàta, Greene (*S. Murrayàna*, Hort.). One or 2 ft. tall, sparingly branched or simple, often more or less hirsute: upper lvs. parted into linear and often lobed divisions: fls. rather small, purplish, in an oblong, more or less interrupted spike, the pedicels short or almost none. Calif., Nev., and Ore.

BB. *Mature carpels conspicuously reticulated.*

malvæflòra, Gray. Sts. erect or ascending, 1–6 ft. or even more, sparingly hirsute: lvs. green, small, incised-crenate, the upper ones 5-cleft or 5-divided, segms. narrow and entire or broader and pinnate-lobed: fls. 2 in. or less across when fully expanded, purple. Calif. H.U. 2, p. 65 (as *Nuttallia malvæflora*). Var. **atropurpùrea,** Hort. (*S. atropurpùrea*, Hort.), grows 2–3 ft. high, with large, open, purple fls. Var. **Lísteri,** Hort. (*S. Lísteri*, Hort.), known also as "pink beauty," has satiny pink fls. It is of European origin.

neo-mexicàna, Gray. One to 8 ft. high: sts. hirsute-pubescent, more or less branched: radical lvs. orbicular, 5–9-lobed or incisely crenate; cauline lvs. parted, segms. 3-lobed: raceme many-fld.: fls. rose; calyx hirsute: carpels smooth and glabrous. Mountains of New Mex. and Ariz. northward to Wyo.

campéstris, Greene. Two to 5 ft., often branching above, glabrous or sparingly hirsute-pubescent: lvs. green, the lower ones rounded and variously lobed, the upper ones 5–7-parted into narrow divisions: fls. about 1½ in. across, in strict spike-like racemes, purplish, the petals often laciniate. N. Calif. to Brit. Col.

oregàna, Gray. Less hairy than *S. campestris*, the racemes becoming branched and paniculate: fls. smaller. Ore. and Wash.

The following are offered in the trade, but unknown botanically: *S. mariàna*, Hort., growing 3 ft. high: fls. bright pink.—*S. mexicàna*, Hort., a strong grower, 3 ft. high, with satiny rose fls. borne on wiry sts.

F. TRACY HUBBARD.†

SIDERÌTIS (Greek, *iron;* the plants were supposed to have a healing power for wounds caused by iron. Dioscorides also used the name for other plants credited with the same ability). *Labiàtæ.* Herbs, subshrubs, or shrubs frequently lanate or softly pilose, mostly hardy or half-hardy but some of them coolhouse plants: lvs. entire or toothed, the floral ones reduced to bracts or similar to the lower cauline: fls. in axillary clusters of 6 to many fls. or in interrupted or dense spikes, small, often yellowish; calyx tubular, 5–10-nerved, with 5 erect somewhat spiny teeth, or rarely muticous; corolla-tube included, bare or with a pilose ring inside, the limb 2-lipped, the posterior somewhat flat, entire, emarginate or 2-cleft, the anterior spreading, 3-cleft; stamens 4, didynamous: nutlets ovoid, smooth, obtuse, not truncate at the top.—About 60 species, Medit. region, Canary Isls., and the Orient. Probably the commonest is *S. scordioìdes*, Linn., a hardy subshrub, about 1 ft. high, with ovate, oblong, or oblong-linear, incised-toothed lvs., spikes which are 1–3 in. long of yellowish fls. with the upper lip of the corolla paler or white. S. Eu. Variable.

Other species which have been mentioned are: *S. canariénsis*, Linn. A greenhouse shrub several feet high, with ovate, crenate lvs. which are cordate at the base, and subglobose whorls of 20–30 fls. Canary Isls.—*S. cándicans*, Ait. A greenhouse shrub about 3 ft. high, covered with white wool, with ovate lvs. which are truncately cordate at the base, whorls of about 10 subsessile fls., the lower ones distant. Madeira and Canary Isls.—*S. íncana*, Linn. A half-hardy subshrub about 1 ft. high, with white-woolly branches, sessile, oblong-linear, obtuse, white-woolly lvs. and distant whorls of about 6 fls. Spain.—*S. perfoliàta*, Linn. A half-hardy subshrub about 1–1½ ft. high, with half-clasping, ovate-oblong or lanceolate softly villous lvs. and distant whorls of sessile fls. S. Eu.—*S. taùrica*, Willd., is a half-hardy shrub about 1½ ft. high with thick oblong-lanceolate or spatulate lvs., the lower ones crenulate, densely white-woolly. Caucasus region and Asia Minor.

F. TRACY HUBBARD.

SIDERÓXYLON (Greek, *iron* and *wood*, referring to the hardness of the wood). *Sapotàceæ.* Trees and shrubs, with simple lvs. and small fls. in axillary clusters: fls. 5-merous or rarely 6-merous; calyx-lobes roundish or ovate, usually obtuse, nearly equal; corolla more or less bell-shaped; stamens attached to the tube at the base of the lobes and opposite to them; staminodia scale-like or petaloid; ovary usually 5-loculed: berry ovoid or globose.—About 110 species, mainly tropical, a few extra-tropical. S. Afr., Austral., and New Zeal.

Mastichodéndron, Jacq. Tree, to about 50 ft., with somewhat variable lvs. usually oval or ovate-oblong, 2–8

in. long, and small yellow fls.: fr. about ¾in. through. W. Indies; cult. in S. Calif.—Said to yield a sort of chewing-gum. Wood useful in furniture-making.

F. W. Barclay.

SIEVEKÍNGIA (named for Dr. Sieveking). *Orchidàceæ*. Pseudobulbous orchids suitable for the warmhouse; of secondary importance.

Pseudobulbs usually clustered, 1-lvd.: lf. usually petioled: labellum immobile, angled with the column, ventricose, either simple or tridentate at the apex.—About 3 species, natives of Cent. and S. Amer. Allied to Lacæna.

Reichenbachiàna, Hook. f. Pseudobulbs clustered, 1 in. long, ovoid or obpyriform, blotched with blood-red when old: lf. single, 4–5 in. long, petioled, elliptic-lanceolate, acuminate at both ends, dark green, strongly 5-ribbed: fls. about 6 in a pendulous corymb, about 1¼ in. across; sepals subequal, ovate, pale straw-colored; petals linear, acute, golden yellow, they and the lip margined with long flexuous golden hairs; lip spread out, side lobes large, dimidiate-ovate, subfalcate, golden yellow, blotched with blood-red, midlobe small, linear, lacerate. Ecuador. B.M. 7576.

suàvis, Reichb. f. Pseudobulbs pyriform, approximate: lf. petioled, cuneate-oblong, acute, plicate: fls. about 3 in a pendulous raceme; sepals greenish yellow, ovate; petals and lip deep yellow, the latter with a few minute blackish dots inside and some larger ones on the basal crest. Costa Rica.

There is a third species in the trade, *S. peruviàna*, Rolfe, but while mentioned in Orchid Review it seems never to have been described. A native of Peru.

F. Tracy Hubbard.

SIGMATÓGYNE (Greek *S* and *female*, referring to the S-shaped gynostemium, the peculiar column of the orchids). *Orchidàceæ*. Epiphytic herbs with perennial 2-lvd., small pseudobulbs: lvs. perennial, membranaceous: scape various-fld.(?), rising below the pseudobulb, 1-fld.: fls. perfect, small, diaphanous; perianth spreading, upside down, withering; sepals 3, free, the dorsal keeled, the lateral almost straight forward and symmetrical; petals 2, rather similar to the sepals; labellum free, inserted at the base of the S-bent rather broad gynostemium, somewhat mobile; column broad, thick, much shorter than the labellum; pollinia 4, in pairs; rostellum (beak) little bent down: caps. unknown. Two species, Himalayas. *S. Pantlingii*, Pfitz. Plant small: scape scarcely exceeding the narrowly ovate pseudobulbs: sepals scarcely ⅔in. long, oblong, the dorsal carinate, acute, the lateral concave at base; petals similar, narrower; labellum entire, oblong, slightly dilated toward the apex. Assam.—The color of the fl. is not described and the scape including the fl. is only about 1¼ in. long.

F. Tracy Hubbard.

SIGMATÓSTALIX (Greek *S* and *stake*). *Orchidàceæ*. Low herbs with very short, few-lvd. sts., covered with distichous sheaths and terminated by a 1-lvd. pseudobulb, suitable for the warmhouse: fls. in racemes, short-pedicelled, pendulous, medium-sized or small; sepals free, about equal, spreading, acute or acuminate; petals similar to the sepals only narrower; labellum long-clawed, 2-keeled; column elongated, very narrow; pollinia 2: caps. ovoid, 3-edged, beakless.—About 12 species, Trop. Amer. *S. bicornùta*, Rolfe. Cespitose, about 2 in. high: pseudobulbs elliptic-oblong, apex 1-lvd., base 4-lvd.: lvs. linear, subobtuse or minutely denticulate: scapes lateral, slender, few-fld.: fls. small, yellow with deep purple-red stripes; sepals linear-lanceolate, reflexed; petals linear-lanceolate, with 2 fleshy conical horns; labellum sessile, somewhat spreading, reniform-orbicular. Peru. *S. Èliæ*, Rolfe. Pseudobulbs compressed, ovate-oblong, apex 1-lvd., base 2–3-lvd.: lvs. oblong and very short bidentate, base attenuate: scapes slender, many-fld.: fls. yellow, spotted with red-dish brown; sepals and petals oblong-lanceolate, acute, reflexed; labellum spreading, broad-clawed, 3-lobed, midlobe reniform-orbicular, lateral lobes reflexed, linear-oblong. Colombia. *S. peruviàna*, Rolfe. Cespitose, about 2–3 in. high: pseudobulb ovoid or ovoid-oblong, apex 1-lvd., base 4-lvd.: lvs. linear, subobtuse, or minutely denticulate, base conduplicate: scapes lateral, slender, few-fld.: sepals and petals straw-colored with purple band at base of dorsal sepal and the petals, lip light yellow with a shiny orange-yellow crest; sepals oblong spreading; petals suberect, oblong; labellum subsessile, deltoid-reniform, undulate. Peru.

F. Tracy Hubbard.

SILÈNE (Greek name of one of Bacchus' companions described as covered with foam, also connected with *sialon*, saliva; referring to the stickiness of the stem and calyx of some species). Including *Heliospérma* and *Melándrium* in part. *Caryophyllàceæ*. Catchfly. Campion. Erect, cespitose, decumbent or diffusely climbing annual, biennial, or perennial herbs, some of them tender and grown in the greenhouse, others hardy and planted outdoors for their ornamental effect; often excellent plants for the rock-garden.

Leaves opposite, entire: fls. solitary or variously cymose, white, through pink to rose and purple; calyx 5-toothed, 10- to many-nerved, naked at the base; petals mostly crowned with a scale at the base of the blade; stamens 10; styles 3, rarely 4: pod 1-celled, sometimes 3-celled.—Over 400 species described, widely scattered over the world. There is a monograph of Silene, with a key, in the Journal of the Linnæan Society, vol. 32 (1896), by F. N. Williams, with 390 good species. Williams refers the common *S. virginica* and *S. pennsylvanica* as well as the European *S. viscosa* to the genus Melandrium, characterized by a strictly unicellular caps. with no trace of septation at the base. Only a few of the known species are in cult.

Silenes are of easy culture. They mostly bloom in summer, and a few continue well into autumn. By good management the season of bloom may be continued through spring and summer. Toward this end the seeds of the common annual kinds should be sown in early autumn, instead of spring. As a rule, the common kinds prefer a sandy loam and full sunlight, but the rock-garden kinds require special treatment, and other suggestions for cultivation are given after the specific descriptions. The most popular kinds are the pink and rose annuals, *S. Armeria* and *S. pendula*. Of the perennials the most popular among the white-fld. kinds are *S. maritima* and *S. alpestris*, while *S. virginica*, *S. pennsylvanica* and *S. Schafta* are amongst the most popular kinds with colored flowers. A good horticultural review of the kinds in cultivation is found in The Garden, vol. 11, pp. 10–13 (1877).

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KEY TO THE SPECIES.

A. *Duration annual or biennial.*
B. *Plants glabrous, although viscid above in No. 1.*
C. *All except the lowest lvs. ovate or ovate-lanceolate from a subcordate, clasping base* ..... 1. **Armeria**
CC. *All except the lowest lvs. oblong or oblong-lanceolate from a connate base* ..... 2. **compacta**
BB. *Plants pubescent or tomentose.*
C. *Sts. simple* ..... 3. **viscosa**
CC. *Sts. dichotomously branched, at least above.*
D. *Fls. sessile, white* ..... 4. **dichotoma**
DD. *Fls. pedicelled, finally pendulous, usually flesh-colored to purple but white in one variety.* 5. **pendula**
AA. *Duration perennial.*
B. *Height 1 ft. or more (Nos. 8, 12, 17, and 18 are usually less than 1 ft.; No. 9 is placed here with uncertainty as its height is not definitely stated).*
C. *Nerves of the calyx 20.*
D. *Sts. erect: base of lvs. cordate...* 6. **fimbriata**
DD. *Sts. procumbent or ascending: base of lvs. narrowed.*
E. *Fls. several to a st.: sts. ascending* ..... 7. **latifolia**
EE. *Fls. 1 or few to a st.: sts. procumbent* ..... 8. **maritima**
CC. *Nerves of the calyx 10.*
D. *Plants glabrous.*
E. *Lvs. linear-oblong* ..... 9. **tatarica**
EE. *Lvs. lanceolate-spatulate*.....10. **Asterias**
DD. *Plants pubescent or at least puberulent or pruinose-scabrous.*
E. *The lvs. in whorls of 4 (the uppermost and lowest sometimes opposite)* .....11. **stellata**
EE. *The lvs. not in whorls of 4.*
F. *Blades linear or narrowly lanceolate or oblanceolate.*
G. *Sts. more or less decumbent or geniculate at the base.*
H. *Fls. solitary on the peduncles* .....12. **multicaulis**
HH. *Fls. mostly in 3-fld. cymes.*
I. *Calyx oblong or obovate: fls. white or pink* .....13. **Douglasii**
II. *Calyx long-cylindrical, pink, green-nerved: fls. bright carmine* .....14. **laciniata**
GG. *Sts. erect.*
H. *Fls. erect* .....15. **Fortunei**
HH. *Fls. nodding* .....16. **Scouleri**
FF. *Blades broader, usually ovate or obovate, sometimes broadly lanceolate or oblanceolate.*
G. *Sts. more or less decumbent or procumbent.*
H. *Infl. leafy and borne in the forks of the branches* .....17. **Menziesii**
HH. *Infl. not leafy, usually at least partly terminal.*
I. *Petals obcordate: fls. rose* .....18. **rosiflora**
II. *Petals 4-cleft or 4-lobed: fls. scarlet*..19. **californica**
GG. *Sts. erect, usually stout..*
H. *Fls. crimson or scarlet.*
I. *Lvs. thin, spatulate or oblanceolate; apex blunt or abruptly acute* .....20. **virginica**
II. *Lvs. thick, ovate-lanceolate; apex acute or acuminate* ....21. **regia**

HH. *Fls. white, greenish white, or bright green.*
I. *The fls. erect: lvs. tomentose* .....22. **gigantea**
II. *The fls. nodding: lvs. pubescent but not tomentose.*
J. *Base of calyx gradually attenuate to the pedicel* ..23. **viridiflora**
JJ. *Base of calyx truncate and umbilicate* .....24. **mellifera**
BB. *Height 2–10 in. (Nos. 8, 12, and 18 occasionally reach 1 ft.; No. 17 is often 1 ft. or more high; No. 9 may belong here but is probably taller than 1 ft.).*
C. *Nerves of the calyx 20.*
D. *Plant not cespitose* .....25. **Zawadskii**
DD. *Plant cespitose.*
E. *Lvs. linear: plant dwarf, 2–4 in. high* .....26. **pumilio**
EE. *Lvs. lanceolate or ovate-lanceolate: plant 8–16 in. high*.. 8. **maritima**
CC. *Nerves of the calyx 10.*
D. *Blades linear or narrowly lanceolate (the lowest lvs. of No. 30 are somewhat spatulate, the others linear).*
E. *Species strictly glabrous.*
F. *Peduncles 5–11-fld.* .....27. **Lerchenfeldi-**
FF. *Peduncles 1-, rarely 2-fld..* **[ana**
G. *Sts. lacking or almost so: plants not more than 2 in. high* .....28. **acaulis**
GG. *Sts. present: plants 4–6 in. high* .....29. **dianthifolia**
EE. *Species more or less pubescent or at least viscid above.*
F. *Petals 4-lobed.*
G. *Fls. solitary or in 3's*...30. **quadrifida**
GG. *Fls. in panicles.*
H. *Color of fls. white*.....31. **alpestris**
HH. *Color of fls. cardinal-red* .....14. **laciniata var.**
FF. *Petals 2-lobed or 2-cleft.* **[Purpusii**
G. *Calyx glabrous.*
H. *Claws of the petals dilated and glabrous; calyx-teeth alternately oblong, obtuse and lanceolate, acute*....12. **multicaulis**
HH. *Claws of the petals ciliate; calyx-teeth ovate, obtuse* .....32. **Saxifraga**
GG. *Calyx pubescent.*
H. *Tube of calyx campanulate* .....33. **odontopetala**
HH. *Tube of calyx clavate or tubular becoming oval.*
I. *Fls. rose* .....34. **Elizabethæ**
II. *Fls. white.*
J. *Infl. cymose, few-fld* ..... 5. **ciliata**
JJ. *Infl. racemose-paniculate.*
K. *Fls. erect*.....36. **repens**
KK. *Fls. nodding*...37. **Reichen-**
DD. *Blades broader, when lanceolate, relatively broad as compared with the length.* **[bachii**
E. *Plant glabrous* .....38. **rupestris**
EE. *Plant pubescent or at least velvety.*
F. *Lvs. lanceolate, oblong-lanceolate, or ovate-lanceolate, blade broadest at or below the middle.*
G. *Fls. white.*
H. *Infl. leafy, borne in the forks of the branches* .....17. **Menziesii**
HH. *Infl. terminal on a st. ascending from below the rosette*.....39. **caucasica**

GG. *Fls. rose or rose-purple.*.18. **rosiflora**
FF. *Lvs. obovate or more or less spatulate, at least the lower, blade broadest above the middle.*
G. *Claw of petal ciliate.*
H. *Petals bifid*.....40. **vallesia**
HH. *Petals 4-cleft*.....41. **Hookeri**
GG. *Claw of petal glabrous.*
H. *Apex of petal 4-toothed*.....42. **pusilla**
HH. *Apex of petal 2-lobed or notched.*
I. *Calyx long-cylindrical: fls. 1–5, axillary and terminal, solitary*.....43. **Schafta**
II. *Calyx clavate: fls. in small dense terminal cymes*.....44. **pennsylvanica**

1. **Armèria,** Linn. Sweet William Catchfly. Fig. 3616. Annual, glabrous, viscid above: sts. 1–1½ ft. high, erect, simple or slightly branched: lowest lvs. spatulate, the others ovate or ovate-lanceolate, from a subcordate, clasping base: fls. pink or rose, in dense cymes, corymb-like, often dichotomous; calyx 10-nerved, cylindrical, clavate in fr.; petals obovate-cuneate, subretuse: caps. oblong. July–Sept. S. Eu. B.B. (ed. 2) 2:66. Var. **álba,** Hort., is a white-fld. form.

2. **compácta,** Fisch. Biennial, glabrous, glaucescent: sts. about 1½ ft. high, stout, simple or slightly short-branched above: lowest lvs. spatulate-lanceolate, the others oblong or oblong-lanceolate from a connate base: fls. pink, crowded in dense, sessile heads, with the uppermost lvs. involucrate; calyx clavate; petals obovate, entire: caps. oblong. July. E. Eu., Asia Minor. L.B.C. 17:1638.—Most of the material cult. under this name is *S. pendula* var. *compacta.*

3. **viscòsa,** Pers. Biennial, somewhat tomentose, very viscid: sts. stout, leafy, simple: lvs. somewhat undulate, radical oblong; cauline lanceolate, acute: fls. white, in short-peduncled, opposite cymelets, forming a long verticillate raceme; calyx very viscid, long-cylindrical, 10-nerved, in fr. clavate; petals deeply 2-parted into obovate-oblong segms.: caps. oblong. June, July. Eu., N. Asia. Var. **plèna,** Hort., is said to grow 1 ft. high and to have bright rose double fls.—Use basal cuttings.

3616. Silene Armeria. (×½)

4. **dichótoma,** Ehrh. Annual or biennial, minutely pubescent: sts. strictly dichotomous: lower lvs. spatulate, the others lanceolate, acuminate: peduncles very short, racemes in pairs, many-fld.: fls. white, sessile; calyx 10-nerved, the nerves green, more or less hirsute, oblong-cylindrical; petals 2-parted to the middle or more, the segms. obovate-oblong: caps. oblong. Eu., also intro. in N. Amer. and extensively escaped. B.B. (ed. 2) 2:67.

5. **péndula,** Linn. (*S. grèca,* Hort., not Boiss. *S. ròsea,* Hort.). Fig. 3617. Annual, crisp-pubescent: sts. 6–10 in. high, decumbent at base, dichotomously branched above: lvs. oblong-spatulate to lanceolate; floral lvs. oblong-lanceolate: fls. flesh-colored or rosy, in lax racemes, finally pendulous; calyx hirsute, reddish, 10-nerved, somewhat inflated after anthesis; petals large, obovate or 2-parted: caps. ovate. May–Aug. Medit. region. B.M. 114.—A variable species whose varieties seem to be nomenclatorially in confusion as the same form appears to bear several names; some of the forms offered in the trade are: Var. **álba,** Hort., is a white-fld. form. Var. **Bónnettii,** Hort. (*S. Bónettii,* Hort.), has brownish red sts. and lvs.: fls. shiny purple-red or dark purple. Var. **cárnea,** Hort., is a flesh-colored form of which there is a double variant known in the trade as *cárnea plèna.* Var. **compácta,** Hort., is probably a compact-growing strain rather than a true variety; occurring in several color variations and both single and double.

3617. Silene pendula. (×⅙)

G.C. III. 43:345; 55:174. Gt. 49, p. 555. G.Z. 18:32. A good bedding plant. Var. **lilácina,** Hort., is a form with rather lilac-purple fls. Var. **rubérrima,** Hort., Vilm., is a form with brownish red branches and bright rose or carmine fls. (R.H. 1884, p. 113); there is also a variation of this known in the trade as *rubérrima Bónnettii,* with reddish purple sts. and lvs. and rose-red fls., probably the same as var. *Bonnettii.*

6. **fimbriàta,** Sims. Perennial, about 2 ft. high, pubescent: sts. erect, leafy and sometimes branched from the axils: lvs. large, ovate, base more or less cordate, margin undulate; the upper lvs. lanceolate, all dark green: infl. a dichotomous panicle: fls. white; calyx whitish, inflated, ovate-campanulate, teeth short-triangular; petals cuneate at base, obovate above, deeply many-cut and fringed. Caucasus. B.M. 908.

7. **latifòlia,** Brit. & Rendle (*Cucubálus latifòlius,* Mill. *S. Cucubálus,* Wibel. *S. inflàta,* Sm. *S. venòsa,* Aschers. *S. vulgàris,* Garcke. *S. Zawádskii,* Hort., not Herbich). Bladder Campion. Bladder Catchfly. Cowbell. White Ben. Perennial, 1–3 ft. high, glaucescent, usually glabrous: sts. ascending: lvs. elliptical or lanceolate, acuminate, base narrowed: fls. polygamous-dicœcious, numerous, white or pinkish, drooping, in corymbose cymes or panicles; calyx campanulate to subglobose, 20-nerved, glabrous, strongly inflated; petals narrow, 2-cleft: caps. ovate-globose. Eu., N. Afr., Asia, and naturalized in N. Amer. B.B. (ed. 2) 2:64.—The young shoots are said to be eaten by the poor folk of England as a substitute for asparagus; they taste something like green peas.

8. **marítima,** With. Perennial, cespitose, gray-green, 8–16 in. high: sts. numerous, the barren shoots procumbent, the flowering ascending: lvs. lanceolate or ovate-lanceolate, margin cartilaginous or crenate: fls. white, 1 or few to a st., but numerous, paniculate; calyx 20-nerved, inflated after anthesis; petals somewhat cleft and with 2 small scales at the base. June–Aug. Eu., N. Afr. Gn. 57, p. 372. G.M. 52:273.—The seaside form is said to be more glaucous than the mountain form. Allied to *S. latifolia,* but fewer- and larger-fld. Var. **plèna,** Hort. (*S. marítima* var. *flòre-*

plèno, Hort.), grows 4–10 in. high and has fewer fls. than the type, but they are much larger, extremely double and remain in bloom longer. Niven says, "This variety makes a lovely rock-plant, and ought always to be placed in such a position that its stems, borne down by the weight of blossoms, may hang over the ledge of a rock; otherwise, if planted in a border, they get besprinkled with soil after every shower of rain." Niven adds that this variety produces no seed and is more easily prop. by cuttings than by division. Gn. 11, p. 12; 57, p. 126. R.H. 1906, p. 181. Var. **ròsea,** Niven, grows about 6 in. high and is said to have a less rambling habit and rose-colored fls. Origin unknown. This desirable form seems unknown in Amer.

9. **tatárica,** Pers. Perennial, glabrous: sts. geniculate, approximate, densely leafy: lvs. linear-oblong, attenuate toward the base, margin serrulate, glabrous: fls.

3618. Silene virginica. (×½)

in secund racemose panicles; peduncles opposite, 1–3-fld.; calyx subclavate, obscurely 10-striate, glabrous; petals 2-cut, the segms. oblong-linear, obtuse: caps. elliptical. E. Eu., W. Asia.

10. **Astèrias,** Griseb.; also misspelled *Asteris*. Perennial, glabrous, 3–4 ft. high: sts. tall, simple, rather viscid: lvs. lanceolate-spatulate, 4–5 in. long, obtuse, base attenuate; the uppermost oblong, elliptic-lanceolate: fls. purple, subsessile, in a many-fld., capitate cyme; calyx membranaceous, reddish, obconic-cylindrical; petals oblong, entire: caps. oblong. Macedonia and Roumania. Var. **grandiflòra,** Hort., is about 3 ft. high and has the crimson-scarlet fls. in globose heads. Balkan Mts.

11. **stellàta,** Ait. Starry Campion. Perennial, 2–3 ft. high: sts. erect, branched, pubescent: lvs. in whorls of 4 (the uppermost and lowest sometimes opposite), ovate-lanceolate, acuminate, 2–3 in. long: fls. white, nodding, in an open panicle; calyx campanulate, pubescent, inflated; petals laciniately cleft, unappendaged. Woods, Mass. to Neb., south to Ga. and Texas. B.M. 1107 (as *Cucubalus stellatus*). B.B. (ed. 2) 2:63.

12. **multicaùlis,** Guss. (*S. Waldsteìnii*, Griseb. *S. Kitaibèlii*, Vis.). Perennial, 1 ft. or less high: caudicles prostrate: sts. ascending, pruinose-scabrous below, viscid above: lvs. linear-lanceolate, acute: fls. solitary on the peduncles, greenish white; calyx pale, glabrous, cylindric-clavate, base strongly attenuate; petals linear-cuneate, 2-cut: caps. oblong. S. Eu.

13. **Doúglasii,** Hook. Perennial, 1 ft. or more high, finely pubescent, scarcely viscid: sts. very slender, decumbent and geniculate at base: lvs. remote, long, linear to narrowly lanceolate-linear, 2–3 in. long: fls. white or pink, borne mostly in 3-fld., long-peduncled cymes; calyx oblong or obovate, rather narrow at base; petals 2-lobed, appendaged. June–Sept. Utah to Cent. Calif. north to Mont. and Brit. Col.—A variable species. Var. **Macoùnii,** Rob. (*S. Lyallii*, Wats.), is minutely pubescent: lvs. tapering gradually from near apex to base: calyx oblong, teeth purple-tipped. Wash. and Brit. Col., summits of the Rocky and Selkirk Mts.

14. **laciniàta,** Cav. Perennial, 1½ ft. high: sts. pubescent, decumbent and erect-branched: lvs. large, lanceolate to narrowly linear, acute, attenuate at base, subsessile: fls. axillary and terminal, paniculate, somewhat nodding, bright carmine, about 1 in. across; calyx long-cylindrical, pink with 10 green nerves, slightly inflated after anthesis; petals 4-cleft to about their middle, lobes acute. Mex. B.R. 1444. P.M. 1:267. Var. **Purpùsii,** Hort., is a dwarf, spreading plant, 6–8 in. high: lvs. narrow, green, somewhat woolly: fls. rich cardinal-red. Mex.

15. **Fôrtunei,** Vis. Perennial, 1½–3 ft. high, woody at base, scaberulous-pubescent: sts. numerous, erect: lvs. linear-lanceolate, acute, attenuate to a ciliate petiole: fls. racemose with short cymose or approximate single-fld. branches, rose or white; calyx elongate-tubular, glabrous, striæ netted above, teeth ovate, broad white-margined; petals with 2-auricled claws, blade 2-parted, the lobes more or less deeply incised: caps. oblong. China. B.M. 7649. Var. **nàna,** Hort., a dwarfer form with more deeply colored fls. Var. **ròsea,** Hort., has more brilliant pink fls. than the type.

16. **Scoùleri,** Hook. Perennial, 1½–2½ ft. high, pubescent, glandular-viscid above: root stout: sts. simple, erect: lvs. narrowly oblanceolate or lanceolate-linear, acuminate: fls. white or purplish, verticillately spicate or the lower ones in short appressed cymes; calyx clavate, nerves definite, teeth membranous and ciliate margined; petals auricled-clawed, bifid. Mountains of Ore., Idaho, and Mont., northward to Vancouver Isl.

17. **Ménziesii,** Hook. Perennial, 6 in. to 1 ft. or more high, finely glandular-pubescent: sts. weak, leafy, dichotomously branched above: lvs. ovate-lanceolate, acuminate at both ends, thin: fls. white, very small for the genus, borne in the forks of the branches and forming a leafy infl.; calyx obconical, obovate, or oblong, 2½–4 lines long; petals 2-cleft, commonly appendaged: caps. small. Mo. and Neb. to Assiniboia, westward and southward to Vancover Isl., S. Calif. and New Mex. B.B. (ed. 2) 2:68.

18. **rosiflòra,** F. K. Ward. Perennial, 6–12 in. high, branched: sts. suberect or procumbent, densely pubescent: lvs. scarcely petioled, up to 1 in. long, lanceolate, base slightly attenuate, apex acute, sparsely puberulous above, densely so beneath, margin ciliate: infl. terminal, laxly dichotomously cymose-corymbose: fls. rose; calyx tubular, 10-nerved, purple-saturated, densely glandular-pubescent; petals about ¾in. long, clawed, blade broadly obcordate.

19. **califórnica,** Durand. Perennial, 1–4 ft. high, hirtellous-pubescent: root vertical, simple, 2–3 ft. long: sts. procumbent or suberect, leafy: lvs. lanceolate or

ovate-elliptic, more or less narrowed at base, acuminate, rarely obtusish: fls. scarlet, large, 1 in. or more across, scattered; calyx funnelform-clavate; petals 4-lobed, commonly with 2 broad ones flanked by 2 narrower ones: caps. ovoid, concealed until dehiscence by the rather broad calyx. Coast Range, Ore. to N. and Cent. Calif.—Doubtful whether in cult.

20. **virgínica,** Linn. Fire Pink. Fig. 3618. Perennial, 1–2 ft. high, viscid-pubescent: sts. striate, single, simple: lvs. spatulate or oblanceolate, the lower narrowed to ciliate-fringed petioles, the upper sessile: fls. very large, 1 in. or more across, crimson or scarlet, loosely cymose, commonly nodding or reflexed after anthesis; calyx clavate or oblong; petals broadly lanceolate, 2 (rarely 4) -toothed at the apex. Open woods and rocky hills, N. Y. to Minn., south to Ga. and Ark. B.M. 3342. Gn. 22, p. 375. G. 8:417. B.B. (ed. 2) 2:64.

21. **règia,** Sims (*S. Bérgeri*, Hort., not Schott). Royal Catchfly. Perennial, 3–4½ ft. high: st. erect, stout, slightly viscid and rough-pubescent: lvs. sessile all but the lowest, thick, ovate-lanceolate, acute, 2–3 in. long: fls. numerous, deep scarlet, in a narrow cymose panicle, about 1 in. across; calyx oblong-tubular; petals emarginate or laciniate, crowned. July. Ohio to Ala., Tenn., and Mo. B.M. 1724. B.B. (ed. 2) 2:65.

22. **gigantèa,** Linn. Perennial, 3–4 ft. high: st. tall, stout, 4-angled below, viscid-pubescent: lvs. tomentose, the radical densely rosulate, thick, obovate, mucronate; the floral lvs. minute, linear-lanceolate: panicle long, raceme-like, with the cymes densely many-fld., remotely whorled and the uppermost sessile: fls. white; calyx hairy, obconical, 10-nerved; petals 2-parted into oblong segms.: caps. large, ovate. E. Medit. region.

23. **viridiflòra,** Linn. Perennial, 1–2 ft. high: sts. simple or branched above, soft-pubescent, very viscid above: lvs. petioled, ovate-oblong, acute: fls. greenish white, in loose, elongated panicles, few, nodding; calyx glandular, reticulately green-nerved, narrowly cylindrical; petals deeply 2-cut into linear segms.: caps. oblong. S. Eu.

24. **mellífera,** Boiss. & Reut. Perennial, cespitose, 1½–2½ ft. high: sts. erect, stout, very short-puberulent below, very viscous above: lvs. acute, pubescent, the lower and rosette lvs. oval or spatulate-lanceolate, attenuate to a long petiole; the upper lanceolate or linear: fls. small, bright green, in long lax cymose panicles; calyx umbilicous, clavate, green-striate; petals clawed, the limb deeply 2-lobed, cuneate: caps. ovate-conical. Spain, Portugal, and Algeria.

25. **Zawádskii,** Herbich. Perennial, 4–8 in. high: sts. rather erect, hirtellous-pubescent, densely villous above: lvs. rosulate, lanceolate, acuminate, narrowed to the ciliate base, densely punctulate-ciliate; cauline lvs. few, linear-lanceolate: fls. white, in a few-fld. raceme; calyx broadly ovate-campanulate, densely pubescent; petals bifid: caps. ovate. Austria.

26. **pumílio,** Wulf. Dwarf perennial: sts. a few inches high, cespitose, glabrous: lvs. linear, obtuse, ciliate: fls. solitary, rose, 1½ in. across, on slender pedicels; calyx faintly 20-nerved, oblong-campanulate, pubescent, somewhat inflated after anthesis, green or violaceous green; petals undivided or notched: caps. ovate-cylindrical. June. Austrian Alps.—A rare and choice plant. Niven says it has hard woody roots which are easily damaged in transit, and therefore those who wish the species should secure seeds.

27. **Lerchenfeldiàna,** Baumg. Low cespitose perennial, glabrous and glaucous: sts. decumbent ascending: lvs. rosulate below, long-lanceolate, acute, attenuate at base; cauline lvs. oblong: fls. 5–11, in terminal corymbose cymes, rose; the peduncles short; calyx glabrous, hyaline-membranaceous, cylindrical-clavate; petals narrow-elongate, linear, retuse: caps. ovate. S. E. Eu.

28. **acaùlis,** Linn. Cushion Pink. Moss Campion. Fig. 3619. Moss-like tufted perennial, about 2 in. high, glabrous: sts. almost lacking: lvs. clustered at the end of the much-branched rootstock, green, short, linear-subulate: peduncles 1-fld.: fls. reddish purple, ½in. across; calyx campanulate, 10-nerved, glabrous; petals slightly notched, obovate, with a small scale at the base: caps. long-cylindrical or oval. May–Aug. Eu. L.B.C. 6:568. Gn. 75, p. 285; 76, p. 614. B.B. (ed. 2) 2:63.—According to Niven, this species is readily increased by division or by seeds, which it produces sparingly. The fls. have a tendency to become dicœcious. Var. **álba,** Hort., forms dense cushions and has snow-white fls. somewhat smaller than the type. Var. **aùrea,** Hort., has golden foliage and bright rose fls. Var. **exscàpa,** Koch (*S. exscàpa*, All.), has dense bright green cushions and paler pink (according to the trade sometimes white) fls. Var. **grandiflòra,** Hort., forms moss-like tufts with crimson fls. June, July. Var. **plèna,** Hort. (*S. acaùlis* var. *flòre-plèno*, Hort.), has dense cushions of light green foliage and double bright rose fls.

29. **dianthifòlia,** J. Gay. Perennial, densely cespitose, 4–6 in. high, glabrous: sts. erect, 1 (rarely 2) -fld.: lvs. ciliate at the broadened base, narrowly linear, acute, the lower congested, the upper shorter; calyx reddish nerved, short obconic-cylindrical, teeth ovate; petals 2-parted above the middle into linear-oblong segms.: caps. ovate. Asia Minor.

30. **quadrífida,** Linn. (*S. quadridentàta*, Pers.). Perennial, 2½–4 in. high, rather glabrous, cespitosely many-stemmed: sts. slender, rather viscid, dichotomous: lower lvs. spatulate; the others linear: fls. solitary or in 3's; peduncles long and capillary, white; calyx oblong-turbinate; petal glabrous-clawed, blade obovate-spatulate, obtusely 4-lobed: caps. globose. S. Eu.

31. **alpéstris,** Jacq. Perennial, 4–6 in. high, cespitose, more or less viscid above: sts. dichotomous: lvs. mostly radical, lanceolate-linear, rather obtuse: fls. white, rather large, shining, in corymbose panicles; calyx

3619. Silene acaulis. (×½)

short, campanulate-clavate, not inflated, 10-nerved; petals obovate, 4-lobed at the apex, and with 2 teeth at the base of each petal. May–Aug. Mountains of E. Eu. Gn. 63, p. 231.—It forms a dense mass of underground sts. and is easily prop. by division or seeds. Var. **grandiflòra,** Hort., is a large-fld. form offered in the trade. G.C. III. 55:442. Var. **Richentreìchii,** Hort., is offered in the trade as a smaller form, about 6 in. high.

32. **Saxífraga,** Linn. (*S. petræa*, Waldst. & Kit., not Adams). Perennial, somewhat shrubby, densely cespitose, bright green: sts. numerous, 3–10 in. high, ascending, filiform, glabrous or scabrous-puberulent, viscid above: lvs. linear or linear-lanceolate, acute, glabrous or scabrous-puberulent, margin serrulate-ciliate: fls. whitish, very often solitary or in 2–3-fld. cymes, erect on very long pedicels; calyx tubular-clavate, glabrous, 10-striate, striæ green or reddish, puberulent; petals 2-parted, the lobes oblong: caps. ovoid-oblong. Eu. and Asia Minor. L.B.C. 5:454.

33. **odontopétala,** Fenzl. Perennial, densely pubescent: sts. 4–6 in. long, leafy, subsimple, glandular-villous above: lvs. lanceolate or linear-lanceolate, 1-nerved, acute or somewhat obtuse: fls. cymose, 1–7-fld., white; calyx pubescent, rather viscid, whitish, campanulate; petals 2-lobed: caps. ovate. Asia Minor and Syria.

34. **Elízabethæ,** Jan. Perennial, 4–6 in. high: sts. tufted, erect or ascending, viscid-pubescent: lvs. narrowly lanceolate, acute, the lower 2–3 in. long, gradually becoming smaller upward: panicle terminal; fls. bright rose to rose-purple, 1½ in. across; calyx tubular, at first cylindrical, at length oval and bladdery, pale dull green, veined and margined purple; petals 2-lobed, white-clawed, blade cuneate-flabellate, margin crenate-dentate. Italy. B.M. 5400. G. 8:412.

35. **ciliàta,** Pourr. Perennial, 3–6 in. high, pubescent, cespitose from a woody rhizome: sts. slender, simple, or slightly branched, nearly naked: lvs. of the rosette and lower st. linear-lanceolate or linear, the upper shortened and gradually narrowed from a broadened base: fls. in a few-fld. cincinnus, pedicelled, white or ivory-white; calyx clavate, short-pubescent, green-, red-brown-, or purplish striate; petals 2-lobed. Eu.

36. **rèpens,** Patrin. Perennial, 8–10 in. high, with a long repent root: sts. several, erect, simple or branched, more or less scabrous-pubescent: lvs. narrowly oblong or lanceolate, acute: fls. white, racemose-paniculate on opposite, axillary, 1–5-fld. peduncles; calyx cylindrical-clavate, inflated, 10-striate, pubescent-villous; petals 2-cut, the segms. oblong, obtuse, the claw glabrous. Russia, E. Siberia, Caucasus, China and Japan, and in N. Alaska.

37. **Reìchenbachii,** Vis.; also spelled *Reichenbachiàna* in the trade. Perennial, miniature, shrub-like, tufted: sts. somewhat woody at base, puberulent below, glabrous, somewhat viscid above: lower lvs. oblanceolate-spatulate, acute, ciliate on the ribs and margin; upper lvs. linear, acute: fls. white, racemose-paniculate, nodding; peduncles usually 1-fld.; calyx linear-clavate, 10-nerved, nerves red or green, margin of teeth lanuginous; petals obovate, 2-parted: caps. oval-oblong. Dalmatia.

38. **rupéstris,** Linn. Perennial, 2–8 in. high, loosely cespitose, glabrous: sts. numerous, erect from a branched base, 1½–7 in. high: lvs. lanceolate, acute, the lower attenuate at base: fls. flesh-color, in repeatedly dichotomous cymes, numerous, long-pedicelled; the pedicels filiform; calyx obconical, base slightly umbilicate; petals obovate, deeply emarginate: caps. ovoid-oblong. Eu.

39. **caucásica,** Boiss. Perennial, 4–5 in. high, velutinous: caudicles filiform, nude: sts. ascending from below the rosette: lvs. in a rosette, oblong-lanceolate, elongated; cauline lvs. abbreviated: fls. 1, often 2–3 to a st., subsessile, white; calyx rather softly glandular-hairy, 10-nerved, narrowly cylindrical; petals obovate. Caucasus.—Closely allied to *S. vallesia,* from which it differs in being velvety instead of glandular, in having shorter cauline lvs. and almost sessile, instead of long-peduncled fls. and not inflated calyx.

40. **vallèsia,** Linn. Perennial, cespitose, about 4 in. high, viscid-pubescent: sts. assurgent, slightly branched: lowest lvs. spatulate, others lanceolate; cauline lvs. long: fls. long-peduncled, terminal, rarely in pairs; calyx very long, glandular-pubescent, somewhat inflated after anthesis; petals bifid, rose-violet above, greenish beneath, claw ciliate. High Alps.

41. **Hoòkeri,** Nutt. Perennial, tomentose-pubescent: sts. many, decumbent, 6–10 in. high, slender: lvs. 2–3 in. long, the lower elliptic-spatulate, narrowed to the petiole; the remainder elliptic-lanceolate, acute, both surfaces pubescent: fls. solitary in the lf.-axils or sometimes in terminal or axillary few-fld. cymes, 2½ in. across, pale pink; calyx soon turgid, 10-nerved, veins obscure green, with membranaceous edges; petals ciliate-clawed, limb broad, 4-cleft. Ore. and Calif. B.M. 6051. F.S. 20:2093. G.C. III. 52:44. G. 34:643. Gn. 79, p. 389.

42. **pusílla,** Waldst. & Kit. Perennial, dwarf, villous on the petioles and at the base of the sts., viscous above, cespitose, many-stemmed: sts. low, slender, leafy, dichotomous: lvs. radical, spatulate, the others short-lanceolate: peduncles long, capillary, 1 (rarely 2) -fld.: calyx glabrous or minutely glandulose, turbinate; petals glabrous-clawed, blade white, obtuse, 4-toothed: caps. ovate-globose. S. Eu.—Considered by some to be only a variety of *S. quadrifida.*

43. **Schâfta,** Gmel.; also spelled *Schaftæ.* Perennial, 3–6 in. high, pubescent-scabrous: roots woody: sts. many, arising laterally from the rosettes, weak and procumbent, short, simple or slightly branched: lvs. rosulate, small, obovate-oblong, acute: fls. rose or purple, 1–5, axillary and terminal, solitary; calyx somewhat hirsute, reddish, 10-nerved, long, cylindrical, not inflated; petals broadly obovate, notched, with 2 scales at their base, claw glabrous. June–Oct. Caucasus. B.R. 32:20. F.S. 3, p. 286C. Gn. 78, p. 135.

44. **pennsylvánica,** Michx. (*S. caroliniàna,* Walt.?). Wild Pink. Perennial, 6–9 in. high, from a strong taproot, viscid-pubescent: sts. few: lvs. mostly basal, spatulate or oblanceolate, acutish, base tapering to the long, ciliate petioles; cauline lvs. 2–3 pairs, shorter, lanceolate or narrowly oblong: fls. rose or white, in small, dense, terminal cymes; calyx purplish, clavate; petals obovate, claw glabrous, appendaged, 2-lobed. Apr., May. E. N. Amer., New England to S. C. and Ky. B.R. 247. L.B.C. 1:41 (as *S. incarnata*). B.B. (ed. 2) 2:65.—*S. caroliniana* is accepted by some authors as the name of this species, but there is considerable doubt as to the identity of Walter's species and it is questionable whether the plant he described is *S. pennsylvanica.*

S. Cháffta, Hort., is probably a misspelling of S. Schafta.—*S. Correvoniàna,* Hort., is offered as a rare plant growing in "compact tufts, with rosy pink fls. which almost resemble minute roses."—*S. graminifòlia,* Hort., is not recognizable, as there are three plants going under that name.—*S. Kitabeliàna,* Hort., may be S. multicaulis.—*S. orientàlis,* Mill., is according to Miller a plant with st. erect, hirsute: lvs. nerved: fls. purplish; calyx conical. It is not treated botanically by Williams, DeCandolle, Boissier, Nicholson, or Voss, but is offered in the trade as a perennial, 2–2½ ft. high: fls. bright rose, in a head. Var. *álba,* Hort. and var. *compácta,* Hort., are also offered.—*S. ptèris grandiflòra,* Hort., is offered in the trade; the species is unknown botanically.—*S. Wárdii,* Hort., is likened to S. Schafta on a large scale: said to grow about 1 ft. high, to have a loose graceful habit and an abundance of bright pink fls. Offered in the trade.

F. Tracy Hubbard.†

SILK-COTTON TREE: *Ceiba.* **S. Flower:** *Albizzia.* **S. Oak:** *Grevillea robusta.* **S. Tree:** *Albizzia Julibrissin.* **S. Vine:** *Periploca græca.* **S.-weed:** *Asclepias.*

SÍLPHIUM (from the Greek name of an umbelliferous plant of northern Africa). *Compósitæ.* Rosinweed. Tall-growing hardy perennial herbs native of the United States which are grown for their rather large sunflower-like heads of flowers which, except in one species, are yellow.

Leaves opposite, alternate or verticillate, often forming water-holding cups by perfoliation of the st.: heads many-fld.; involucre of thick, somewhat foliaceous bracts; ray-fls. or at least their ovaries in more than 1 series, fertile, and with elongated exserted deciduous ligules: achenes much flattened, falling free or only with the subtending bract.—About 25 species. Silphiums are of easy cult. in any good soil. They require full sunlight and are prop. by division or seed.

A. *Foliage much cut.*

laciniàtum, Linn. Compass Plant. St. about 6 ft. high, leafy at the base, much less so above, very rough: lvs. 1 ft. long or more, once or twice pinnately parted, the lobes oblong or lanceolate: fl.-heads several, sessile or short-peduncled, 2–5 in across; rays 20–30.

July–Sept. Ohio, west and south. B.B. (ed. 2) 3:461.—It is said of this species that the st.-lvs. tend to point north and south.

AA. *Foliage not cut.*

B. *St.-lvs. small.*

terebinthinàceum, Jacq. PRAIRIE DOCK. St. about 6 ft. high, nearly or quite smooth: lvs. nearly all basal, usually 1 ft. long, ovate, cordate, dentate: fl.-heads 1½–3 in. across; rays 12–20. July–Sept.—Ont. and Ohio to Iowa and La. B.B. (ed. 2) 3:462.—A striking and decorative herb.

BB. *St.-lvs. large.*

C. *Lvs. connate-perfoliate.*

perfoliàtum, Linn. (*S. erythrocaùlon,* Bernh.). CUP PLANT. INDIAN CUP. St. square, usually dentate, branched above, about 6 ft. high: lvs. thin, ovate or deltoid-ovate, the lower contracted into margined petioles, the upper opposite, connate-perfoliate: fl.-heads 2–3 in. across, with 20–30 rays. July, Aug. Ont. to S. D. and Ga. B.B. (ed. 2) 3:460. G.W. 11, p. 473.

CC. *Lvs. petioled or simply sessile.*

integrifòlium, Michx. St. 2–6 ft., obtusely 4-angled to terete, corymbosely branched above: lvs. lanceolate-ovate to ovate-lanceolate, opposite: fl.-heads numerous, 1–2 in. across, with 15–25 rays. Aug., Sept. Western prairies. B.B. (ed. 2) 3:460. N. TAYLOR.†

SÍLYBUM (an old Greek name applied by Dioscorides to some thistle-like plants). *Compósitæ.* Erect, glabrous herbs, sometimes grown in European gardens for ornament and also for the edible heads, roots, and lvs.: lvs. alternate, white-maculate above, sinuate-lobed or pinnatifid, the teeth and lobes spiny: heads large, solitary, terminal, nodding, homogamous; involucre broadly subglobose, the bracts in many rows: fls. purplish, all perfect; corolla-tube slender, limb 5-cleft to the middle or base: achenes smooth, obovate, oblong.—Two species, Eu., Afr., and Asia.

Marìanum, Gaertn. (*Cárduus Marìanus,* Linn. *Marìana láctea,* Groves). ST. MARY'S, BLESSED, or HOLY THISTLE. Annual or biennial, shining: st. 1–4 ft. high, grooved not winged: lvs. large, with strong spines: heads 1–2 in. diam.; involucral bracts leathery with a spine ½–¾in. long, the outermost mucronate; receptacle fleshy: fls. rose-purple: achenes tranversely wrinkled or smooth, black or gray. S. Eu., N. Afr., and Asia, also intro. in many places, including N. Amer.; naturalized on the Pacific coast. F. TRACY HUBBARD.

SIMARÙBA (the Caribbean name of *S. amara*); also spelled *Simarouba. Simarubàceæ.* Evergreen trees sometimes grown in the warmhouse, or hardy outdoors in the far S.: lvs. alternate, abruptly pinnate; the lfts. alternate, entire, leathery: fls. somewhat cymose, in axillary or terminal elongated and branched panicles, dicœcious; calyx small, 5-lobed, imbricated; petals 5, spreading at the top, imbricated; stamens 10 in the male fl.; ovary deeply 5-parted in the female fl.: drupes 1–5, sessile, spreading.—About 7 species, Trop. Amer.

amàra, Aubl. (*S. officinàlis,* DC.). A tall tree: lfts. oblong or oblong-lanceolate, mucronate with a bluntish point, green on both surfaces, glabrous or pubescent beneath: panicle exceeded by the lvs.: fls. yellowish white; petals spreading. W. Indies (probably not Porto Rico) and Trop. Amer.—This yields the drug known as simaruba-bark.

Tùlæ, Urban. A tree 25–50 ft. high: lfts. elliptic-oblong, short-pointed: branches of the corymb (as well as the petioles) purple-tinted: fls. bright carmine; petals much longer than *S. amara,* and having smooth, staminal scales. Porto Rico. Gt. 36:1298.
F. TRACY HUBBARD.

SIMMÓNDSIA (for the naturalist, F. W. Simmonds). *Buxàceæ.* Evergreen shrubs, sometimes cult. for ornament or for the oily seed and edible fr.: lvs. opposite: fls. dicœcious, in the lf.-axils, apetalous; sepals imbricate; staminate fls. in clusters; stamens numerous; pistillate fls. single; ovary 3-celled, 1 ovule in each cell. A single species. Related to Buxus.

californica, Nutt. PIGNUT. JOJOBA. A much-branched shrub, 5–15 ft. high: lvs. small, sessile, entire, coriaceous, oblong-lanceolate, obtuse: fls. small. S.W. Calif. to W. Mex. J. B. S. NORTON.

SINNÍNGIA (for Wilhelm Sinning, gardener at the University of Bonn). Including *Dolichodèra, Ligèria,* and *Rosanòvia. Gesneriàceæ.* Tropical herbs with handsome tubular flowers, of glasshouse culture; includes the florists' gloxinia.

Pubescent or villous, from a tuberous rhizome: lvs. opposite, usually large, petioled, the floral ones reduced to bracts: fls. usually large, solitary or fascicled in the axils, pedicelled; calyx-tube shortly and broadly turbinate, adnate, 5-angled or 5-winged, the limb foliaceous, broadly 5-cleft or -parted; corolla-tube nearly equal at the base or the posterior gibbous, long or broadly cylindrical, the upper part swollen or bell-shaped; lobes 5, spreading, or the 2 posterior smaller; stamens included, attached to the tube of the corolla; anthers broad, the cells confluent at the apex; glands of the disk 5, distinct, or the 2 posterior more crowded together or connate; ovary half inferior; style dilated at the tip; stigma concave, entire or slightly 2-lobed.—Species 20–25, Brazil. Allied to Gesnera, Isoloma, and Achimenes, and of similar cultural requirements. The genus includes the cult. gloxinia, which is properly *Sinningia speciosa,* Benth. & Hook., but which is treated in this book under *Gloxinia.* Other than this species, the sinningias are little known horticulturally, although some of the species have much merit.

speciòsa, Benth. & Hook. (*Gloxínia speciòsa,* Lodd. *Ligèria speciòsa,* Decne.). St. short or not evident: lvs. oblong, petiolate, obtuse or acutish, villous-hairy, convex on top, usually attenuate at base, crenate: peduncles, with fls., about the length of the lvs.: fls. large, tubular, showy, usually violet or purplish; calyx-lobes ovate-lanceolate and somewhat villous, longer than calyx-tube; corolla broadly campanulate. Brazil. Variable, giving rise to such forms as var. **cauléscens,** Hanst. (*Gloxínia cauléscens,* Lindl.), with thick elongated st. and larger lvs. B.R. 1127. L.B.C. 16:1566. Var. **macrophýlla,** Hanst. (*Gloxínia speciòsa* var. *macrophýlla,* Hook.), has large white-nerved lvs. B.M. 3934. Var. **albiflòra,** Hanst. (*Gloxínia speciòsa* var. *albiflòra,* Hook.). White-fld. B.M. 3206. Var. **rùbra,** Hanst. (*Gloxínia rùbra,* Paxt.). Fls. beautiful red. P.M. 7:271. From this species, and perhaps from hybrid offspring, have descended the florists' gloxinias. To the historical discussion on pp. 1350 and 1351, Vol. III, may be added the following quotation from T. A. Sprague, G.C. III. 36, p. 88: "The turning-point in the history of our cultivated 'gloxinias,' however, was in 1845, when an erect and regular-flowered plant was raised by Mr. John Fyfe, gardener at Rothesay, Bute; this had a white corolla with a violet center, and five perfect stamens, instead of the four usual in Gesneriaceæ. Unfortunately for the systematic botanist, no exact record of its parentage was made, though in Flore des Serres, t. 311, where it was figured three years later, *Sinningia speciosa* is stated to have been one of its parents."

Regìna, Sprague (*Gesnèria Regìna,* Hort.). Handsome plant about 9 in. high: lvs. broad-ovate with auriculate-cordate base and acutish apex, 4–8 in. long, somewhat velutinous above and glabrous beneath, white-veined, crenate: fls. pale violet, drooping, long-stalked, 4–6 together from the axils, and "as two suc-

cessive pairs of leaves are usually close together on the stem, the effect is that of two many-flowered whorls, and is very fine." Brazil. G.C. III. 36:201. B.M. 8182. Gt. 53, p. 525. G.W. 9, p. 277. A handsome plant, with long flowering period. Var. **hýbrida,** Hort., is a garden hybrid with much larger fls. Var. **grandiflòra,** Hort., is advertised, the fls. "several times larger than the type, and well displayed above the handsome dark green and purplish red foliage."

conspícua, Nichols. (*Rosanòwia conspícua,* Regel). Root tuberous: st. 1 ft. high: lvs. ovate-oblong, short-acuminate, somewhat heart-shaped at the base and dentate: fls. yellow, paler on the outside, marked on the lower part of the tube with purple dots and lines; calyx-tube entirely united with the ovary, equally 5-parted, the segms. lanceolate, spreading; corolla-tube obliquely and narrowly campanulate, swollen and recurved at the base; glands of the disk 2: caps. 1-celled; seeds many.

ornàta, Benth. & Hook. (*Rosanòwia ornàta,* Van Houtte). A hybrid of the above species with a garden variety of Gloxinia with fls. of a bright red; the result is a plant resembling *S. conspicua,* but differing in having the lvs. tinted on the veins and petioles with purple and in having a somewhat more elegantly shaped fl., pure white with purple lines on the outside of the corolla-tube and the inside of a yellowish green, lined with purple. F.S. 23:2423.—Probably not now in the market.

L. H. B.†

SINOFRANCHÈTIA (for Adrien Franchet, French botanist who wrote much on Chinese botany). *Lardizabalàceæ.* Deciduous climbing shrub allied to Holboellia, but easily distinguished by the deciduous lvs., by the rounded small sepals of the fls. borne in very long racemes and by the small berry-like frs. The only species is **S. chinénsis,** Hemsl. (*Holboèllia chinénsis,* Diels). Twining, to 30 ft., glabrous: lvs. long-petioled, 3-foliolate; lfts. stalked, short-acuminate, broadly cuneate at the base, entire, the terminal broadly obovate, 4–5 in. long, the lateral lfts. obliquely ovate: racemes axillary, 8–12 in. long; fls. unisexual, short-stalked, ¼in. across, white striped brownish; sepals obovate; stamens 6, free, short: carpels 3, developing into ovoid many-seeded, bluish purple berries about ¾in. across. Cent. China. H.I. 29:2842.—The long racemes of bluish purple berries are strikingly handsome: the plant has proved perfectly hardy in southern England, but is tender at the Arnold Arboretum. Prop. is by seeds and by layers, possibly also by cuttings like akebia.

ALFRED REHDER.

SINOMÈNIUM (*Sina,* China, and Greek, *men,* moon, meaning Chinese moon-seed). *Menispermàceæ.* A shrubby vine from E. Asia closely related to Menispermum and Cocculus; from the first it differs in the parts of the fl. being arranged in whorls and in the 9–12 stamens, and from the second chiefly in the structure of the flattened curved seed: lvs. deciduous, alternate, long-petioled: fls. dicœcious, small, in axillary and terminal panicles; sepals 6, pilose outside; petals 6, inflexed at the base and inclosing the filaments; the pistillate fls. with 9 staminodes and 3 carpels with recurved styles: fr. a drupe with a compressed crescent-shaped stone ribbed on the back. A handsome vigorous-growing twining vine with large lustrous often lobed lvs. remaining green until late in autumn, with inconspicuous fls. in long pendulous racemes and bluish black frs. It has proved only half-hardy at the Arnold Arboretum. Prop. like cocculus and menispermum.

acùtum, Rehd. & Wilson (*S. diversifòlium,* Diels. *Menispérmum acùtum,* Thunb. *Cócculus diversifòlius,* Miq., not DC. *C. heterophýllus,* Hemsl. & Wilson. *C. variifòlius,* Hort.). Twining, to 20 ft.: branchlets terete, striped, glabrous: lvs. long-stalked, ovate, acuminate, usually cordate at the base, palmately 5–7-nerved, entire or palmately lobed, rarely sagittate with 2 lobes at the base only, glabrous, 4–7 in. long: fls. ⅓in. across, greenish, in slender panicles 4–8 in. long: drupes compressed, bluish black, ⅓in. across, in pendulous panicles to 8 in. long. June; fr. in Sept. and Oct. Japan and China. G.C. III. 52:411. Var. **cinèreum,** Rehd. & Wilson. Lvs. densely grayish pubescent beneath.

ALFRED REHDER.

SINOWILSÒNIA (for Ernest Henry Wilson, who collected extensively in China during 1900–1910 and intro. numerous new plants into cult.). *Hamamelidàceæ.* A deciduous tree similar in foliage to Hamamelis, but in its fls. more closely related to Corylopsis, from which it is chiefly distinguished by the unisexual, apetalous fls., and the tubular-urceolate calyx-tube: fls. in pendulous racemes; tube of the calyx urceolate, inclosing the ovary, with obovate-spatulate lobes; petals wanting; the pistillate fls. with 5 staminodes opposite to the sepals; ovary with 2 long and slender styles: fr. a dehiscent 2-seeded woody caps. The only species is **S. Hénryi,** Hemsl. Shrub or tree, to 25 ft., more or less stellate-pubescent: lvs. short-petioled, membranous, broadly obovate to elliptic, acute or short-acuminate, denticulate, 4–6 in. long: calyx-tube yellowish, stellate-tomentose, nearly ¼in. long: caps. sessile, nearly ½in. long; seeds black. May. Cent. and W. China. H.I. 29:2817. —Botanically interesting, but without particular ornamental qualities; has proved hardy at the Arnold Arboretum. Prop. is by seeds and probably by layers and by grafting on hamamelis.

ALFRED REHDER.

SIPÀNEA (native name in Guiana). *Rubiàceæ.* Annual or perennial herbs, hispid-setose, pilose or glabrate, erect or prostrate, with terete branches: lvs. opposite, petiolate, ovate or lanceolate; stipules linear, elongate, persistent: fls. paniculate or cymose, the cymes in corymbs, axillary, terminal or dichotomously disposed, white or rose, the throat frequently golden villous; calyx-tube turbinate or ovoid, the limb with 5 elongate-subulate, persistent lobes; corolla funnelform or salver-shaped, tube elongated with the throat dilated, the limb with 5 equal, broad-ovate spreading lobes; stamens 5; disk annular; ovary 2-celled: caps. ovoid or subglobose, leathery.—About 5 species, Trop. Amer. *S. cárnea,* Neumann. Perennial herb, about 3 ft. or more high: lvs. oval, lanceolate, acute: fls. pale rose-violet, arranged in a corymb; corolla-tube cylindrical, 5-parted, oval, acute: fr. hemispherical. Cent. Amer. H.U. 4, p. 193. R.H. 1843:445.

SIPHOCÁMPYLUS (Greek, *siphon,* tube, and *kampylos,* curved, referring to corolla); sometimes misspelled *Syphocampylus. Campanulàceæ.* Herbs, subshrubs, or shrubs, sometimes climbing, glabrous, hirsute or stellate-tomentose, adapted to the warm- or coolhouse: lvs. alternate, rarely verticillate, entire or denticulate, rarely incise-dentate or pinnately lobed or divided: peduncles 1-fld., axillary or corymbosely grouped at the ends of the branches or laxly racemose: fls. often rather large, red, orange, or purplish, rarely green; calyx 5-lobed; corolla straight or incurved: caps. loculicidally 2-valved.—About 100 species, Trop. Amer.

betulæfòlius, Don. Height 2–3 ft.: st. woody at base: branches rounded: lvs. alternate, petiolate, 3–4 in. long, cordate, acuminate, doubly serrate, nearly glabrous: peduncles 1-fld., as long as the lvs., thickened upward: calyx-segms. long awl-shaped, with a few notches; corolla 2½–3 in. long, tube vermilion, limb yellow. Brazil. B.M. 3973. H.U. 5, p. 97.—Tender perennial, not cult. in Amer., but interesting as one supposed parent of *Centropogon Lucyanus,* itself of little value.

S. bícolor, Don=Lobelia laxiflora, HBK.—*S. gigantèus,* Don (Tupa salicifolia, Don) grows 14 ft. high: lvs. lanceolate, 6–9 in. long, scarcely petioled: fls. reddish yellow; corolla falcate, velvety. Ecuador.—*S. Líndleyi,* Lem., has ovate-oblong, glandulose-serrate

lvs. and approximate red fls. Colombia. J.F. 2:142.—*S. Orbignidnus*, A. DC., is herbaceous; has ternate, ovate-acuminate, short-petioled lvs. and numerous red-and-yellow fls. in the upper axils. Bolivia. J.F. 4:425.—*S. rugòsus*, A. DC., has pendulous branches, ovate-rotund coriaceous and rugose lvs., the corolla with lanceolate, acute lobes and the caps. 10-angled. Peru. H.U. 3, p. 368.

F. Tracy Hubbard.†

SIPHÒNIA: *Hevea.*

SISYRÍNCHIUM (an old Greek name first applied to some other plant). *Iridàceæ.* Satin Flower. Blue-eyed Grass. Rush Lily. Hardy or half-hardy perennials, usually with fibrous roots, sometimes used in the hardy border.

Stems simple or branched, 2-edged or winged: lvs. grass-like, lanceolate or terete: fls. small, fugacious, in umbellate clusters from a usually 2-lvd. spathe, blue or yellow, perianth nearly flat or bell-shaped, segms. 6, nearly alike: caps. globular, 3-angled.—About 150 species, all American, mostly in moist fields and sandy places and along shores. The species are of easy cult. in any good garden soil. They are very little known as horticultural subjects.

A. *Fls. yellow.*

B. *St. leafless.*

califórnicum, Dry. (*Marìca califórnica*, Ker-Gawl.). A half-hardy perennial: st. 1½ ft. high, 2 lines through, broadly winged: lvs. many, shorter than the st., about ½in. broad: spathe 3–6-fld.: segms. of perianth yellow, lined with brown, ½in. long: caps. oblong. Calif. to Ore. B.M. 983.—Swampy grounds.

BB. *St. lf.-bearing.*

C. *The st. slightly 2-edged.*

tenuifòlium, Humb. & Bonpl. A half-hardy perennial: roots fleshy, fibrous: st. ¼–1 ft. high, often branched low down: lvs. subterete or narrowly linear: spathes 3–4-fld.; segms. of perianth pale yellow, ½in. long. Mountains of Mex. B.M. 2117; 2313.

striàtum, Smith (*S. lutéscens*, Lodd. *Marìca striàta*, Ker-Gawl.). Perennial, 1–3 ft.: sts. compressed-ancipital, leafy: lvs. ensiform, glaucous, radical equitantly imbricate toward their base, cauline remote, clasping: fls. in sessile fascicles laxly and closely disposed along the flexuous rachis, yellow, darker striate at center, about ¾–1 in. across; perianth-segms. cuneate-ligulate, the outer ones twice as broad as the inner, blades rotately spreading, obtuse and mucronate. Chile and Argentina. B.M. 701. L.B.C. 19:1870. Gn. 70, p. 202. R.H. 1910, p. 457.

CC. *The st. broadly winged.*

convolùtum, Nocca. A tender perennial: root fibrous, slender: st. about 1 ft. high, usually forked: lvs. linear: spathes 3–4-fld.: segms. of perianth yellow, veined with brown, ½in. long. Trop. Amer.

AA. *Fls. purple, blue, or white.*

B. *St. terete.*

grandiflòrum, Douglas (*S. Doúglasii*, A. Dietr.). A hardy perennial: root-fibers slender, long: st. simple, about 1 ft.: lvs. short, sheathing the lower part of the st.: fls. 2–3, cernuous; perianth-segms. bright purple, rarely white, ¾in. long. May, June. N. W. U. S. B.M. 3509. B.R. 1364. G. 2:100; 5:559.—This is possibly the handsomest species in the trade. **Var. álbum,** Hort., is also offered and is equally desirable.

BB. *St. flat.*

C. *Spathes equal in length.*

graminoìdes, Bicknell (*S. ánceps*, Wats., not Cav.). A hardy perennial: st. winged, about 1 ft. high, usually terminating in 2 unequal branches, subtended by a lf.: lvs. nearly equaling the st., grass-like, 1–3 lines wide: spathes about 1 in. long, 2–4-fld.; pedicels longer than the spathes: fls. blue, ½–¾in. across. April–June. E. U. S. B.B. 1:453.

CC. *Spathes very unequal in length.*

angustifòlium, Mill. (*S. ánceps*, Cav. *S. bermudiànum*, Authors). A hardy perennial: root-fibers long: st. about 1 ft. high, 1½ lines through, with 2–3 clusters on long-winged peduncles: lvs. linear, shorter than the st., 1–1½ lines wide: spathes 1–4-fld., about 1 in. long: pedicels about 8 lines long. May–Aug. Maine to Va., west to Colo. Var. **béllum,** Hort. (*S. béllum*, Wats.). Sts. more narrowly winged, usually without any lf. below the fork: spathes shorter: pedicels longer. Calif., New Mex.

mucronàtum, Michx. Hardy perennial similar to the last: sts. narrowly winged: spathes usually purple-tinged, not gibbous; outer bract with the margins united a little above the base, ¾–2¾ in. long, the inner ¼–¾in. long: perianth violet (rarely white): caps. straw- or greenish yellow. W. Mass. to Va. and Mich. B.B. (ed. 2) 1:544.

F. W. Barclay.
F. Tracy Hubbard.†

SITOLÒBIUM (name refers to the grain-like fructification). *Polypodiàceæ.* Under this name one fern is still listed, but the group now forms a section of Dicksonia or Dennstædtia characterized by prostrate rhizome and a cup-shaped nearly spherical involucre placed at the base of the depression of the lobes. The fern in question is *Dennstædtia cicutària*, Moore (*Sitolòbium cicutàrium*, J. Smith. *Dicksònia cicutària*, Hook. & Baker), a W. Indian species with bipinnate lvs.: lower pinnæ 12–18 in. long and 6 in. broad, with deeply cut linear-acuminate pinnules, the segms oblong-deltoid and deeply cut.

SÌUM (from *Sion*, old Greek name used by Dioscorides). *Umbellíferæ.* Glabrous herbs, including one of economic value, *S. Sisarum* or skirret (which see), the roots of which are used as a vegetable: lvs. pinnate, the pinnæ dentate: umbels composite, terminal or lateral; involucres and involucral bracts numerous: fls. white; calyx-teeth acute; petals inflexed: fr. ovate or oblong, laterally compressed or constricted at the junction of carpels.—About 4 species, northern hemisphere, also one species in S. Afr., apt to be subaquatic.

Sisàrum, Linn. Skirret. Plant, 3–4 ft. high, tuberous-rooted: lvs. pinnatisect; segms. oblong-acute, serrate: involucre 5-lvd., reflexed. E. Asia.

latifòlium, Linn. Water Parsnip. Sts. 3–5 ft. high, angular, furrowed and erect: lvs. pinnate; lfts. oblong-lanceolate, evenly serrate, pointed: umbels terminal; involucral lvs. many, lanceolate. Ditches and rivers, England.—Like Ferula and certain other umbelliferous plants, it is valued more for its stately habit and handsome foliage than for its fls. F. Tracy Hubbard.

SKÍMMIA (Japanese, *Skimmi*, meaning a hurtful fruit). *Rutàceæ.* Ornamental woody plants grown chiefly for the bright red berries and the handsome foliage.

Evergreen glabrous shrubs: lvs. alternate, short-petioled, entire, dotted with translucid glands: fls. perfect or dicecious, the staminate fragrant and in large panicles; sepals and petals 4–5; stamens 4–5; style with 2–5-lobed stigma; ovary 2–5-loculed: fr. a drupe with 2–4 1-seeded stones.—Four species from the Himalayas to China and Japan.

The skimmias are densely branched, usually low shrubs with medium-sized generally oblong acute leaves, small white flowers in terminal panicles and showy bright red, rarely black, berry-like fruit. They are tender, not being reliably hardy as far north as Washington, D. C. *S. Fortunei* is somewhat hardier than *S. japonica.* Handsome shrubs for borders of evergreen shrubberies and especially valuable for planting in cities, as they belong to the best smoke-enduring evergreen shrubs; they are particularly beautiful when

covered with their bright red fruits, which are retained through the whole winter if not eaten by birds. In the greenhouse two crops of berries on a plant may be seen occasionally. The skimmias are of rather slow growth and thrive best in a sandy loamy soil, but also grow well in strong clay; they prefer a partly shaded situation. On account of their handsome fruits they are sometimes cultivated in pots in a sandy compost of peat and loam. As the skimmias are polygamous and mostly unisexual, it will be necessary to plant staminate plants among the pistillate ones to secure well-fruited specimens. Propagation is by seeds sown in fall or stratified and by cuttings under glass with gentle bottom heat. William Scott writes: "Seeds sown in the fall and grown along in a coolhouse during winter can be planted out in a good loam the following spring, when they will make a vigorous growth, and can be lifted the following October. Their red berries make them very desirable as a Christmas berry plant."

japónica, Thunb. (*S. oblàta,* Moore. *S. fràgrans,* Carr. *S. fragrantíssima,* Hort.). Shrub, 5 ft. high, except the minutely pubescent infl. quite glabrous: lvs. crowded at the ends of the branchlets, short-petioled, elliptic-oblong to oblong-obovate, narrowed at both ends, obtusely pointed, bright or yellowish green above, yellowish green beneath, 3½–5 in. long: panicles 2–3½ in. long; fls. polygamous, usually 4-merous, yellowish white: fr. coral-red or bright scarlet, globose or depressed-globose. ½in. across. Spring. Japan. S.Z. 1:68. B.M. 8038. G.C. II. 25, p. 244; III. 5, pp. 521, 524. Gn. 7, p. 183; 35, p. 480; 42, p. 135. J.H. III. 30, p. 525; 66:175; 70:343. R.H. 1869, p. 259; 1890, p. 56. F. 1865, p. 161. G.W. 5, p. 261.—*S. fragrans* and *S. fragrantissima* are names of the staminate plant; *S. oblata* of the pistillate. Var. **ovàta,** Rehd. (*S. oblàta ovàta,* Carr.), has larger and broader lvs. Var. **Veìtchii,** Rehd. (*S. oblàta Veìtchii,* Carr.), has obovate lvs. and often perfect fls. R.H. 1880, p. 57.

Fórtunei, Mast. (*S. japónica,* Lindl.). Similar to the preceding but of dwarfer habit: lvs. lanceolate or oblong-lanceolate, acuminate, dark green above, light green beneath, 3½–10 in. long: fls. white, in oblong-ovate panicles, perfect: fr. obovate, dull crimson-red. Spring. China. G.C. II. 25, p. 245 (as *S. oblata*); III. 5, p. 525. The following as *S. japonica:* B.M. 4719; F.S. 7, p. 39; Gn. 7, p. 183, and 8, p. 519; G. 1:40; R.H. 1869, p. 259, and 1880, p. 56. This species fruits more freely than the preceding. Var. **rubélla,** Rehd. Peduncles, pedicels, and buds reddish; staminate form. R.H. 1874:311; 1885, p. 189. Var. **argéntea,** Mast., has the lvs. bordered with white. A hybrid between this and the preceding species is probably *S. intermèdia,* Carr., with narrow oblong-elliptic lvs. dark green above. To this hybrid belong also *S. Fóremanii,* Hort., with lanceolate or oblanceolate yellowish green lvs. and subglobose and obovate fr. on the same panicle (G.C. III. 5:553. Gn. 61, p. 160; 67, p. 57) and *S. Rógersii,* Hort., with similar but deep green lvs. and globose squarish fr.

3620. Rootstock of Smilacina racemosa. The figures designate the position of the stalks in the different years. Between each of the figures or scars is a year's growth. (×½)

S. Laurèola, Sieb. & Zucc. Shrub, 5 ft. high, of a strong aromatic odor when bruised: lvs. narrow-oblong to obovate, acute or acuminate, bright green: fls. 5-merous. Himalayas. G. 32:255.—*S. melanocárpa,* Rehd. & Wilson. Shrub, or small tree, to 15 ft.: lvs. oblong-lanceolate or lanceolate, dark green and lustrous above, 1½–3½ in. long: fls. dicœcious, in panicles about 1½ in. long: fr. purplish black, globose, ½in. across. W. China, Himalayas.

ALFRED REHDER.

SKIRRET (*Sium Sisarum,* Linn.) is a vegetable of minor importance, the roots of which are used like salsify or oyster plant. It is a hardy perennial umbelliferous herb, native to eastern Asia. It grows 3 to 4 feet high, has pinnate foliage and small white flowers in compound umbels. The roots grow in large clusters, something like those of a sweet potato or dahlia, but they are much longer, more cylindrical, and somewhat jointed. The roots have a sweet and slightly floury taste and, if well grown, are tender. The chief objection to this vegetable is the woody core, which must be removed before cooking, as it is not easily separated from the fleshy part at the table and detracts from its quality. The thickness of the core varies greatly, no matter whether the plants are propagated by seed or otherwise.

Skirret needs a rich soil. The seeds may be sown in autumn or spring and the plants yield well the first season. For European practice Vilmorin recommends that the seedlings be grown in a seed-bed until they have made four or five leaves and then transplanted into permanent quarters. Sow the seed in drills ½ inch deep, and thin out the seedlings to 8 inches in the row. The roots may be left outdoors in the ground all winter, but others advise storing them in sand or earth.

WILHELM MILLER.

SKUNK CABBAGE: *Symplocarpus fœtidus.*

SLIPPER FLOWER: *Calceolaria.* **Lady's:** *Cypripedium.*

SLOE: *Prunus spinosa.*

SMALL-FRUIT: Blackberry, Blueberry, Currant, Dewberry, Gooseberry, Raspberry.

SMELÓWSKIA (named for Prof. T. Smelowski, botanist of St. Petersburg, died 1815). *Crucíferæ.* Somewhat cespitose gray-white-tomentose perennial herbs, rather rare in cult., suitable for the rock-garden: lvs. pinnately or bipinnately cut: fls. racemose, without bracts, white or yellow, frequently small; sepals short, lax, uniform at the base: silique rather short, narrowed at both ends, somewhat 4-sided or laterally compressed; seeds few, arranged in one series.—About 10 species, Asia and N. Amer.

calýcina, C. A. Mey. Low, tufted perennial, very variable in foliage: lvs. soft, usually deeply pinnatifid, with 2 or several pairs of linear to obovate, obtuse segms. and a terminal one: rarely a few lvs. entire: racemes at first dense and subcorymbose, but elongating in fr.: fls. white or nearly so; petals about 2 lines long. Arctic regions.—Recommended by some persons for rock-gardens, but it does not seem to be advertised in Amer. F. TRACY HUBBARD.†

SMILACÌNA (resembling smilax). *Liliàceæ.* FALSE SOLOMON'S SEAL. Perennial herbs, with simple stems from rootstocks (Fig. 3620), used for the hardy border or the wild-garden.

Leaves alternate, nerved, and usually sessile: panicles or racemes terminal; fls. white or greenish white, sometimes fragrant; perianth 6-parted, spreading, withering-persistent; stamens 6; ovary 3-celled: berry globular, 1–2-seeded.—About 25 species, N. and Cent. Amer. and Temp. Asia. Vagnera is an older name for this genus and is used by some American writers; but on the principle of fifty years of established usage, Smilacina is retained in the "nomina conservanda" list of the Vienna Congress.

Smilacinas are of easy culture in any good soil. They prefer a rich loam in a moist but not wet partly shaded place. They are handsome plants both in foliage and flower, particularly when growing with natural companions. *S. racemosa* is probably the most attractive. The plants may be forced slowly for bloom in the late winter and early spring.

3621. Smilacina racemosa. (× about ⅝)

davùrica, Turcz.; also spelled *dahurica.* St. many-lvd., rather pilose: lvs. alternate, semi-clasping, oblong, glabrous above, rather pilose beneath: racemes terminal; pedicels in pairs or ternate. Dahuria and Japan. — Related to *S. stellata,* which is distinguished by the solitary pedicel.

paniculàta, Mart. & Gal. Glabrous herb: sts. erect: lvs. ovate-lanceolate, long-acuminate, 5–6 in. long, much narrowed at the very base, main nerves 5–7: panicle terminal, racemosely branched, 2¼ in. long and as much across, all parts snowy white: fls. about 4 lines across; perianth-segms. elliptic; ovary ovoid. Mex. B.M. 8539.

racemòsa, Desf. (*Vagnèra racemòsa,* Morong). Figs. 3620, 3621. Rootstock rather stout: st. 1–3 ft. high: lvs. 3–6 in. long, oblong-lanceolate or oval, sessile or nearly so: fls. numerous, in a panicle: berry ¼in. through. In shaded or partly shaded places throughout the greater part of the U. S. B.B. (ed. 2) 1:515. A.G. 13:519.

sessilifòlia, Nutt. (*Vagnèra sessilifòlia,* Greene). Rootstock slender: st. 1–2 ft. high, slender: lvs. 2–6 in. long, lanceolate, acute, flat and spreading: raceme open, sessile, or short-peduncled: berry 3–5 lines through. Early summer. Pacific States.

stellàta, Desf. (*Vagnèra stellàta,* Morong). Very near to *S. sessilifolia:* lvs. usually folded and ascending: raceme shorter and more crowded. May, June. Moist soil, greater part of the U. S. B.B. (ed. 2) 1:516.

trifòlia, Desf. (*Vagnèra trifòlia,* Morong). Rootstock slender: st. 2–15 in. high: lvs. sessile, oval to oblong-lanceolate, 2–5 in. long: fls. in a simple raceme, few to several: berry ¼in. through. Bogs and moist soil in the N. U. S. and Asia. B.B. (ed. 2) 1:516.

S. bifòlia, Schult. f.=Maianthemum bifolium.

F. W. Barclay.
F. Tracy Hubbard.†

SMÌLAX (ancient Greek name). *Liliàceæ.* The greenbriers, useful for winter greens and outdoor planting.

Usually woody climbers with paired tendrils on the base of the petiole; sometimes shrubs or herbaceous perennials, young shoots little branched, old woody shoots becoming much branched above; shoots arising from a rootstock, slow-growing and woody or with large fleshy tubers; in some species with long creeping rhizomes: lower lvs. reduced to scales, the upper simple or slightly lobed, 3–7 (or more) -nerved, deciduous to completely evergreen, usually variable in outline on different types of branches: fls. rather small, dicœcious, usually numerous in axillary peduncled umbels; pedicels uniform in length: berries normally globose, 1–6-seeded, blackish or red.—Over 200 species generally distributed over the world.

The genus Smilax, of which there are twenty-five species native to the United States, has been used very little in this country for planting in ornamental grounds, its value as a decorative plant having been largely ignored. The vines of the wild plants have been gathered locally for decorations and *S. lanceolata,* the Florida smilax of the trade, is extensively shipped from the southern states to the northern centers for use in large decorations. Most of the common woody species of the North are unsuited for planting in restricted areas as they spread rapidly by underground stems. None of the native species listed below is ordinarily handled by nurserymen.

The smilax of florists is *Asparagus asparagoides.* See p. 3175; also p. 409, Vol. I.

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KEY TO THE SPECIES.

A. *Shoots herbaceous.*
B. *Fls. carrion-scented.* ..... 1. **herbacea**
BB. *Fls. not carrion-scented.* ..... 2. **lasioneuron**
AA. *Shoots woody.*
B. *Umbels in axils of normal lvs.*
C. *Foliage completely deciduous.*
D. *Plant not at all glaucous: berries green-black, usually 1-seeded: rootstock short, woody, slow-growing, without long rhizomes: spines long, slender, black, dense below.*
E. *Lvs. orbicular to ovate, not crenulate.* ..... 3. **hispida**
EE. *Lvs. triangular, ovate, crenulate.* ..... 4. **Sieboldii**
DD. *Plant, i.e., pedicels, fls., and fr. glaucous: berries 3-seeded: rootstocks long and creeping: spines stout, few, never at nodes.*
E. *Berries blue-black: lvs. broad, ovate: st. green.* ..... 5. **rotundifolia**
EE. *Berries coral-red.*
F. *Lvs. broad-ovate: st. stout, green.* ..... 6. **excelsa**
FF. *Lvs. oblong: st. slender, brown.* ..... 7. **Walteri**
CC. *Foliage at least partly evergreen.*
D. *Flowering in the spring: fr. ripe the same season: lvs. partly deciduous in the N.: plants with long-creeping rhizomes.*
E. *Lvs. glaucous, entire-margined: sts. glabrous below, slender, brownish: berries 3-seeded, blue-black.* ..... 8. **glauca**
EE. *Lvs. green, on vegetative sts. usually hastate and spiny-margined: sts. stout, green, stellate pubescent below: berries 1-seeded, greenish black.* 9. **Bona-nox**
DD. *Flowering in the summer: fr. ripe the next season: lvs. evergreen: underground sts. large, short, fleshy tubers, without long rhizomes.*
E. *Lvs. thin, lanceolate to ovate, slightly glaucous beneath: berries mostly 3-seeded: not a swamp plant.* ..... 10. **lanceolata**

EE. *Lvs. thick, narrow-oblong, green beneath: berries 1-seeded: growing in swamps.* 11. **laurifolia**
BB. *Umbels borne on special leafless flowering branches on the old wood: exotic species.*
C. *Flowering branch spike-like, with numerous umbels: plant and lvs. spiny*.....12. **aspera**
CC. *Flowering branch short, with 1 or 2 umbels: plant unarmed*.....13. **australis**

1. **herbàcea,** Linn. A hardy perennial vine 4–10 ft. high, unarmed: lvs. ovate to lanceolate, acute to cuspidate, obtuse or cordate at base, long-petioled, 7–9-nerved, glabrous and glaucous beneath: umbels 15–80-fld., long-peduncled: fls. carrion-scented: berry bluish black, about ¼in. diam., normally 3–6-seeded. April–June. N. E. U. S. B.M. 1920. B.B. (ed. 2.) 1:527.—This species is undesirable on account of the strong carrion odor of the fls. There are several herbaceous species in N. Amer. and E. Asia, but only this and the following have been intro. to the trade.

2. **lasioneûron,** Hook. (*S. herbàcea* var. *inodòra,* Hort. *Neméxia herbàcea* var. *mélica,* A. Nels). Similar to the above but with the lvs. pulverulent-pubescent beneath: peduncles shorter than the lvs.: fls. not carrion-scented. From Colo. to Man. in the Great Plains and E. Rocky Mts.—Distinguished from the other herbaceous forms by the lack of the carrion odor.

3. **hìspida,** Muhl. (*S. Pseùdo-china,* Auth., not Linn.). Bamboo Brier. Fig. 3623. Rootstock short, woody, slow-growing, never spreading far: sts. clustered, high-climbing, 20–50 ft., green, densely spiny below, unarmed or nearly so above: spines straight, black, slender, usually most numerous at lower nodes, never on upper nodes: lvs. ovate, larger ones heart-shaped, deciduous: peduncle longer than the petiole. Conn. to Minn., south to N. C. and Texas, absent from the coast. B.B. (ed. 2) 1:529. G.F. 5:53 (adapted in Fig. 3623).—This is the only one of the northern species that does not spread rapidly by rootstocks; by proper attention to pruning this species will make an upright hedge-plant of merit.

4. **Sièboldii,** Miq. Closely related to *S. hispida* from which it differs in its weaker habit, more pointed narrower lvs. which in the growing plant are distinctly crenulate: peduncles fewer-fld. and little longer than petioles. Japan and Korea.

3622. Smilax glauca. (× about ½)

5. **rotundifòlia,** Linn. Horse-Brier. Rootstock scarcely tuberous, long-creeping: sts. stout, green, often angled, never spined at nodes: spines stout, few, black-tipped, straight, often absent on flowering branches: lvs. ovate to orbicular: peduncle scarcely longer than the petiole: berries blue-black, glaucous, less than ¼in., 3-seeded. Nova Scotia to Ill., south to Ga. and Texas. The common horse-brier of the E. U. S. B.B. (ed. 2) 1:528.—A rank weedy vine with nothing to recommend it for general planting as it spreads rapidly by underground rhizomes.

6. **excélsa,** Linn. Similar to the above in habit: sts. large, angled, with few heavy spines: lvs. heavier and larger: fls. 3–10 in umbel: berries ⅓in. diam., coral-red. Persia, S. Eu. to Azores.

3623. Smilax hispida. (× about ½)

7. **Wálteri,** Pursh. Underground sts. slender, creeping: st. slender, terete, brownish: armed below with stiff short spines, naked above: lvs. ovate to oblong: umbels few-fld. on short peduncles: berries over ⅓in., densely packed in umbels, bright coral-red, white-berried sports are known. Swamps in sandy regions, N. J. to Fla. west to Mississippi River Valley. B.B. (ed. 2) 1:530.—The berries of this species are useful for winter decorations in the holiday season.

8. **glaùca,** Walt. Cat-Brier. Fig. 3622. Underground sts. spiny, tuberous but with long slender rhizomes: sts. slender, brown, spines below, disappearing above, when present always some at nodes: spines stout, recurved: the entire ovate lvs. and often whole plant glaucous: berries 3-seeded, small, peduncles and pedicels slender, longer than petioles. Dry ground, Mass. to Fla. and Texas. B.B. (ed. 2) 1:528. G.F. 5:425 (adapted in Fig. 3622).—Ordinarily counted a bad weed, but perhaps of use in large landscape plantings.

9. **Bòna-nóx,** Linn. Saw-Brier. Underground sts. spiny, often with large tubers, also long, creeping rhizomes: sts. stout, green, densely covered with stiff spines below, lower part of large sts. with a characteristic stiff stellate pubescence not found elsewhere in the genus: lvs. variable, on vegetative branches distinctly hastate or with basal lobes, spiny on margins and midnerve below, smooth and green on both sides; upper lvs. triangular, ovate, thick, fine net-veined: peduncles much longer than petioles, flat, many-fld.: berries 1-seeded, black, not glaucous. Va. and Fla. west to Kans. and N. Mex. B.B. (ed. 2) 1:529.—A rank-growing vine that becomes a bad weed along borders of woods and in half-wooded pastures.

10. **lanceolàta,** Linn. Florida Smilax. Underground sts. short, large, fleshy tubers, densely clustered, suggesting large potatoes: sts. stout, often ¾in. diam., lightly scabrous, glaucous when young, spiny below with stout recurved spines, unarmed above,

climbing to the tops of tall trees often 70–80 ft., much branched above: lvs. thin, evergreen, glaucous beneath, ovate to lanceolate, 2–4 in. long: peduncles shorter than petioles, flowering in summer: young berries remaining over winter and ripening the next summer; berries 3-seeded, ¼in. or more diam. Va. to Fla., Ark., and Texas. July, Aug. B.B. (ed. 2) 1:530.—The best American smilax for cult. as an ornamental vine.

11. **laurifòlia,** Linn. False China Brier. Similar to the above in habit: lvs. narrow, oblong, thick, green on both sides, turning dark brown on wilting: berries smaller, 1-seeded. N. J. south to Fla. and Texas. July, Aug. B.B. (ed. 2) 1:530.—This plant is always found near water, usually associated with *S. Walteri*.

12. **áspera,** Linn. A half-hardy shrub often somewhat scandent, unarmed or with spines: lvs. ovate-deltoid or lanceolate, 1½–6 in. long, usually blotched with white, 5–9-nerved: fls. white, sweet-scented, in many-fld. umbels: berries ¼in. thick, usually 3-seeded, shining red. S. Eu. to India. Gn. 28, p. 615; 62, p. 397. G. 6:315 (as *S. tamnoides*). Var. **mauritánica,** Gren. & Godr. A more robust form with larger lvs. and fewer spines. Canaries, S. Eu., N. Afr.

13. **australis,** Brown. Sts. terete, robust, rarely spined: lvs. ovate-elliptic, base obtuse, 2–5 in. long, 7-nerved: umbels 1–2 on a short flowering branch without lvs., 15–20-fld. from a globose bracted receptacle: berries about ½in. diam. Austral.—A tropical plant unsuited to our colder climate.

S. argyrèa, Lind. & Rod. Tender foliage plant: st. wiry, slender, armed with short, stout thorns: lvs. lanceolate, becoming 8–10 in. long, dark green, blotched with gray, 3-nerved, short-petioled: fls. and fr. unknown. Bolivia. I.H. 39:152. J.H. III. 46:77. According to G.F. 8:305 the above species is a robust healthy plant doing well in a moderate temperature and quickly forming ornamental specimens. It should be given a rich, fibrous soil and a light and sunny position. It may be prop. by half-ripe cuttings of the side shoots with 2–3 eyes inserted in a moderately warm bed. This may be any one of a number of S. American species. The variegated foliage is found in practically all of the woody plants of this genus, being strongly developed in S. glauca, S. Bona-nox and S. lanceolata.

J. B. Norton.

SMILAX, FLORISTS'. The smilax of florists is an Asparagus (*A. asparagoides*, page 409). It is one of the most popular of all greenhouse vines for use in decoration.

Commercially, smilax is grown in deep solid beds under glass, and the tall growth is tied to strings. These strings are cut for sale. Some growers do not renew their beds of smilax for three or four years. It is doubtless most profitable to replant every year with young stock, grown from seed. It is a heavy feeder. A strong loam with one-fifth half-rotted cow-manure is the best compost for the bed. A light house is not essential. The middle of an equal-span house running north and south is an ideal place for it, if there is height sufficient to run up the strings 7 or 8 feet. Plant as early as possible in July. Many florists who grow a few hundred strings of smilax make the mistake of putting them in a cool-house. It will grow in a temperature of 50°, but not profitably; 60° at night, and even 65°, is the better temperature. The plants should be 8 inches apart in the row and 10 inches between rows. Red-spider attacks the smilax, but daily syringing is a sure preventive. When cutting the strings, avoid picking out one here and there. Begin to cut at one end of the bed, and as much as possible clear off all the strings, because when denuded of so much growth the fleshy roots are liable to rot if over-watered; little water is needed till young growth starts. Care should also be taken in cutting, for many times there will be several young growths a foot or so high that can be saved for a future string, and they may be useless if cut. Good drainage should always be provided.

Smilax for planting in July should be raised from seed sown in February. When 2 or 3 inches high, and showing its character-leaves, it should be potted in 2-inch pots. In May, the plants should go into 3-inch pots. It is very important that the first growth, which is always weak, should be made in these 3-inch pots; then, when planted out, the first growth in the beds is strong enough to make salable strings. Never neglect tying up smilax as soon as the preceding crop is cut. For this purpose use silkaline or similar green twine. Contrary to what is the case with many plants, the hotter smilax is grown the hardier and more durable the leaves, providing it is not cut prematurely.

William Scott.

SMITHIÁNTHA (*Smith's flower*, named for Miss Matilda Smith, botanical artist, Kew). A name proposed for the species of Nægelia of Regel (which see), a name which had been given four years earlier to a genus of fungi; it is accepted by Fritsch in Engler & Prantl's "Pflanzenfamilien." The names under Smithiantha of the cult. kinds are: *S. cinnabarina*, Kuntze, *S. zebrina*, Kuntze, *S. multiflora*, Fritsch (*S. amabilis*, Kuntze), *S. achimenoides*, Fritsch.

SMODÍNGIUM (Greek, *indurated mark;* from the callous fr.). *Anacardiàceæ*. Glabrous shrub, allied to Rhus: lvs. alternate, long-petioled, trifoliate; the lfts. lanceolate, coarsely serrate: fls. minute, in terminal pubescent panicles, polygamous; calyx 5-toothed, persistent; petals 5, oblong, spreading, deciduous; disk small, annular; stamens 5; ovary free, sessile, 1-celled: fr. compressed, winged-margined, oblique-oblong, vittate on both sides; the shell leathery. One species, S. Afr. *S. argùtum*, Mey. Erect or climbing shrub with striate branches: lvs. palmately 3-foliate; lfts. 4–5 x 1 in., lanceolate acuminate, coarsely and sharply toothed: fls. in an ample panicle. S. Afr. R.H. 1908, p. 385. It has been mentioned in cult. in the warm part of the U. S.

SMOKE TREE: *Cotinus Coggygria.*

SMUT. Diseases of many cultivated cereal grasses and other plants caused by the attacks of fungi of the order Ustilaginales. The mycelium sometimes produces swellings on various parts of the host (or attacked plant), the swellings being eventually filled with brownish or blackish spores known as chlamydospores, which emerge, as a fine dust-like powder, when the outer membrane of the tissues bursts or cracks. The chlamydospores produce upon germination a structure known as a promycelium (basidium) which gives rise to lateral or terminal sporidia (basidiospores). The smut on Indian corn may be taken as typic. The disease usually appears first on the leaves, afterward at the junction of leaf-sheath and blade; finally the ear of corn is attacked, and the tassel. On the leaves blisters are found; on the ear, large whitish polished swellings appear. As the spores mature, the swellings become darker in color, and the inclosing membrane finally ruptures, exposing the dark olive-green mass of spores which are 8 to 12 μ (Greek micron) and are beset with fine spines. Unlike most other cereals, maize can be inoculated at any age. Several smuts have been described, viz., loose smut of oats (*Ustilago avenæ*), maize and teosinte smut (*Ustilago zeæ*), loose smut of wheat (*Ustilago tritici*), smut of blue-stem grass (*Sorosporium syntherismæ*), rye smut (*Urocystis occulta*), onion smut (*Urocystis cepulæ*), and colchicum smut (*Urocystis colchici*). For the loose smut of oats and wheat, the treatment of the seeds with hot water before planting is efficacious. The corn smut is best controlled by destroying the affected plants before the spores mature. The onion smut is due to infected soil which may be treated with sulfur, or formalin. John W. Harshberger.

SNAKE CUCUMBER: A form of *Cucumis Melo*. **S. Gourd:** *Trichosanthes*. **Snakehead:** *Chelone*.

SNAKEROOT: **Black S.:** *Cimicifuga racemosa* and *Sanicula marilandica*. **Button S.:** *Liatris*. **Canadian S.:** *Asarum*. **Seneca S.:** *Polygala Senega*. **White S.:** *Eupatorium ageratoides*.

SNAKE'S BEARD: *Ophiopogon.* **Snake's-Head Iris:** *Hermodactylus.* **Snake's-Head Lily:** *Fritillaria Meleagris.* **Snake's Mouth:** *Pogonia.* **S. Tongue:** *Ophioglossum.*

SNAPDRAGON: *Antirrhinum.*

SNEEZEWEED: *Helenium.* **Sneezewood:** *Ptæroxylon.* **Sneezewort:** *Achillea.*

SNOWBALL TREE: *Viburnum Opulus.* **S.-berry:** *Chiococca* and *Chiogenes;* also *Symphoricarpos.* **S.-drop:** *Galanthus.* **S.-flake:** *Leucojum.* **S.-flower:** *Chionanthus.* **S. Glory:** *Chionodoxa.* **S.-on-the-Mountain:** *Euphorbia marginata.* **S. Pear:** *Pyrus nivalis.* **S. Tree:** *Pyrus nivalis;* also *Halesia.* **S. Wreath:** *Neviusia alabamensis.*

SOAP BARK TREE: *Quillaja Saponaria.* **S.-berry:** *Sapindus.* **S.-Bulb:** *Chlorogalum.* **S.-Plant:** *Chlorogalum.* **Soapwort:** *Saponaria officinalis.*

SOBOLÈWSKIA (named for G. Sobolewski, Russian botanist). *Cruciferæ.* Erect paniculately branched glabrous annual or biennial herbs, adapted to outdoor use: lvs. long-petioled, rotundate, coarsely crenate: fls. in corymbose racemes, slender-pedicelled, without bracts, white; sepals spreading, uniform at base: silique clavate, compressed or nearly terete, curved, leathery, 1-celled, 1-seeded.—Five species, Asia Minor and the Caucasus region.

clavàta, Fenzl. Basal lvs. reniform-cordate, the upper nearly sessile: silique 2½ lines long by 1¼ lines wide. May. Asia Minor.

F. W. Barclay.

SOBRÀLIA (for Fr. Mart. Sobral, a Spanish botanist). *Orchidàceæ.* Extremely handsome terrestrial orchids with a very distinct habit, some of them comparing well with cattleyas and lælias in bloom.

3624. Sobralia macrantha. (×⅓)

Leaves with sheathing bases, plicate-venose: fls. membranaceous, few, in short, terminal racemes, or solitary; sepals and petals spreading; labellum convolute around the column, terminal portion large, undulate, often fimbriate, smooth or with longitudinal ridges; column slender; pollinia 8.—About 30 or more species, inhabiting the mountains of Mex. and Trop. Amer. The following account comprises the species that appear to be in the American trade, but others are to be found in the collections of fanciers. The plants have slender reed-like sts. clothed with lvs. throughout their entire length. The sts. are tufted, forming bushy plants varying in height according to the species. The fls. are among the largest of the orchids, those of *S. macrantha* attaining a diam. of 9 in. across the sepals. They are, however, very transient, fading a few days after opening.

Sobralias are charming orchids, and when room can be given to large plants they well repay the space and care they require. Many of them, to be sure, are very fugacious in their blooming, some lasting only a day, but nearly all of them make up for this by a succession of flowers which is more or less rapid. In size the individual blossoms vary from that of an ordinary *Cattleya labiata* to one scarcely 1½ inches across, and the plants themselves present as great variety, ranging from such as *S. fragrans,* which grows less than a foot high, to that giant of the tribe, *S. Cattleya,* which will reach a height of nearly 10 feet. They also give as much variety in their coloring, ranging from a shade of lavender which is almost a blue through different shades of purple to the rich claret-color of *S. Lowii,* and from yellow to the purest white. Where space for large and bushy plants can be afforded, some of the sobralias will prove most charming plants, having the double advantage of presenting in a well-grown plant not only beautiful blossoms but a subject which is thoroughly attractive as a foliage plant. They also have the added advantage of being, in most instances, of rather easy culture. Given a suitable soil and a liberal supply of water they are almost sure to grow and bloom, although they will do better if they are given their time for rest, when less water is allowed without permitting the material about the roots ever to become quite dry. (F. J. LeMoyne.)

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A. *Fls. white (see also Nos. 5 and 7).*

B. *Lip shorter than sepals, orange, center lined brown.*

1. **leucoxántha,** Reichb. f. Sts. tufted, 3 ft. high, spotted: lvs. 4–6 in. long, lanceolate, acuminate: fls. 6–7 in. across; sepals linear-lanceolate, spreading and recurved, white; petals shorter, oblong, undulate above, also pure white; labellum with a ventricose tube; limb large, circular, notched in front and the margin irregularly lobulate and wavy, throat golden yellow, with a few brownish stripes. Aug. Costa Rica. B.M. 7058. R.B. 23:205. J.H. III. 33:77; 46:331.

BB. *Lip nearly as long as sepals, yellow, center marked with orange.*

2. **virginàlis,** Cogn. Sts. up to 3 ft. tall: lvs. coriaceous, broadly lanceolate, 5–6 in. long, 1–1½ in. broad: fls. solitary, sessile, white except the yellow disk and throat; sepals revolute at apex, 3½ in. long; petals a little shorter than sepals, undulate; lip as long as petals, strongly undulate crisped. Colombia. C.O. 3. Var. **lilácina,** Cogn , has the lip tinted lilac. C.O. 3*a*.

AA. *Fls. yellow.*

B. *Lip crisped and undulate on margin; fls. 5 in. or more across.*

3. **xantholeùca,** Reichb. f. Sts. about 2 ft. high, tufted: lvs. spreading and drooping, lanceolate, 6–7 in. long, with speckled sheaths: fls. solitary, lemon-yellow, with a deeper shade on the lip; sepals linear-lanceolate, spreading and recurved; petals similar but shorter; blade of the labellum orbicular, crisp, and undulate,

margin crenate. Guatemala. B.M. 7332. R.H. 1890: 12. G.C. III. 5:9. Gn. 22: 508. C.O. 2.—A species with fls. about as large as *S. macrantha*, but plants of more compact habit. Var. **supérba**, Hort. Fls. deeply shaded with deep cream-yellow; throat marked with orange-brown.

BB. *Lip fimbriate on margin; fls. less than 3 in. across.*

4. **fràgrans,** Lindl. A small species with sts. about 1 ft. high: lvs. 1 or 2, oblong-lanceolate, 4–5 in. long: fls. 2–3 on a long peduncle, about 2 in. long, pale sulfur-yellow; sepals oblong, spreading; petals similar but erect; middle lobe of the labellum fimbriate on the margin and having many fimbriated crests. Colombia. B.M. 4882.—One of the smallest of the genus.

AAA. *Fls. chiefly purple or rose.*

5. **macrántha,** Lindl. Fig. 3624. Sts. tufted, reed-like, 4–7 ft. high, leafy all the way up: lvs. broadly lanceolate to oblong-lanceolate, long-pointed, 8–10 in. long: fls. several at the ends of the sts., rose-purple, with the front of the labellum deep purple; sepals linear-oblong, 4½ in. long, reflexed and twisted; petals broader, oblong, wavy above; labellum 5 in. long, with the expanded portion almost circular, 3 in. across and 2-lobed at the apex, very wavy; tube long, whitish within, with a yellow stain in the throat and several thin yellow ridges. May–July. Mex. and Guatemala. B.M. 4446. F.S. 7:669. P.M. 14:241 (var). G.M. 31:559. C.O. 1. O. 3:75. Var. **Kienastiàna,** Hort., (var. *álba*) has white fls. G.C. III. 48:182. Var. **álbida,** Hort. Fls. very large, creamy white. Var. **nàna,** Hort. Fls. smaller than type; lip dark violet-purple.

6. **Brándtiæ,** Kränzl. Sts. 3 ft. high: lvs. lanceolate, acuminate, 8 in. long: fls. purple-rose, paler outside, with the labellum darker and having a yellow disk; sepals linear; petals twice as wide; middle lobe of the labellum very broad, divided into 2 diverging, rather acute lobes; anther-bed with a long recurved horn on each side. Resembles a medium-sized *S. macrantha*, distinguished by the long horns of the column, and black spots (not hairs) on the lf.-sheaths. S. Amer.

7. **Fenzliàna,** Reichb. f. Sts. slender: sheaths blackish, asperulate: lvs. oblong, acutish: fls. rose-colored; sepals oblong, acute; petals obovate-cuneate, three-fourths as long as the sepals; labellum spreading, front portion ovate, notched, crenulate; horns of the column equaling the anther. Nicaragua. Var. **álba,** Hort., has pure white fls.

8. **Hólfordii,** Sander. Plants of dwarf habit: fls. rose-carmine, deeper in the lip, shading to whitish in the throat. Habitat not stated by Sander.

9. **Cáttleya,** Reichb. f. St. stout: lvs. oblong, acuminate, plaited, bearing several lateral clusters of strong, thick fls. of a firm fleshy texture, with purplish brown sepals and petals and a purplish lip, with a white column and 3 yellow lines over the center of the lip. Colombia.

10. **Lòwii,** Rolfe. An imperfectly known species intro. about 1892 from Colombia. It grows about 1½ ft. high and has fls. of a bright uniform purple.

S. Àmesiæ=S. Wilsonii × S. xantholeuca. G.C. III. 40:suppl. Aug. 25.—*S. Amesiàna*=S. Wilsonii × S. xantholeuca. G. 31:581.—*S. blánda*, Kränzl. Fls. 6 in. across, white, except throat and middle portion of disk of lip, which are golden yellow. Hab.(?).—*S. Chárlesworthii*, Hort. Fls. rich rose-purple, with broad purple band around lip and bright yellow crest. Colombia.—*S. Clíftoniæ*, a dwarf, white-fld. species, said to come from Ecuador. G.M. 53: 325. J.H. III. 53:75; 63:3 (both as S. Holfordii).—*S. Còlmanii*=S. xantholeuca × S. Veitchii.—*S. Elizabethæ*=S. Liliastrum.—*S. Lánthoinei*=S. Ruckeri.—*S. Liliástrum*, Lindl. Fls. large, white, yellow-veined. Guiana, Brazil.—*S. Lucasiàna*, Hort. Fls. large; sepals and petals white; lip soft rose-purple, throat yellow. Trop. Amer.—*S. luminòsa*=S. Holfordii × S. Wilsonii.—*S. Malmquistiàna*, Schlecht. Fls. pale rose, with orange-yellow blotch on lip. Colombia. O. 1911:59, desc.—*S. murábilis*=S. Veitchii × S. macrantha Kienastiana.—*S. Rùckeri*, Lind. & Reichb. f. Sepals and petals pale rose-purple; lip with a white base, marked with a yellow band, the front of lip dark rose-purple. Colombia. G.C. III. 30:67. J.H. III. 48:531.—*S. schoenbrunnénsis*=S. xantholeuca var. superba × S. macrantha.—*S. séssilis*, Lindl. Sheaths and under surface of lvs. black-pubescent: lvs. sessile, oblong-lanceolate: fls. sessile, rose, the lip darker. Guiana. B.R. 27:17. J.F. 1:104.—*S. Siebertiàna*=S. macrantha Kienastiana × S. Hodgkinsonii.–*S. válida*, Rolfe. Fls. about 2 in. long, fragrant, whitish yellow, with deeper yellow band on lip, becoming deep orange in front. Panama.—*S. Veitchii*, Hort.=S. macrantha × S. xantholeuca. Sepals oblong, somewhat undulate, white, lightly tinted rose-lilac; petals oval-oblong, undulate, white, tinted rose; lip ample, the limb strongly tinted with lilac-violet, the throat orange, the margin strongly undulate-crisped. J.H. III. 63:171. C.O. Hyb. 1.—*S. Wiganiæ*=S. macrantha × S. xantholeuca. G.M. 45:441.—*S. Wilsonii*, Rolfe. Fls. large, white, shaded with rose and spotted with purple.

GEORGE V. NASH.†

SOCRÀTEA (named after the philosopher Socrates). *Palmàceæ*. Treated by Drude, in Engler & Prantl's "Pflanzenfamilien," vol. 2, part 3, page 60, as a subgenus of Iriartea, the subgenus characterized by the numerous stamens, the branches of the raphe which rise from the base and are united, running up to the micropyle which is at the apex of the seed.

Forgetiàna, Hort. (*Ceratólobus Forgetiàna*, Hort.). Lvs. rich green, at first entire and broadly rounded, later pinnate with the terminal lft. much larger than the others. Peru. G.C. III. 51:suppl. May 25, p. xv.; 53:286. G.M. 55:636. Gt. 61, p. 391.

SOIL. The soil is a superficial covering of the earth's crust, more or less well adapted to the growth of plants. It is usually only a few inches thick. Below this is a subsoil often differing, especially in humid climates, from the soil proper in color, texture, or chemical composition. A very striking definition has been suggested by Sir John B. Lawes, who considered the soil to be rotten subsoil, and the subsoil rotting rock. The term soil is occasionally used in a more comprehensive way to include both the soil and the subsoil.

The soil adapted to the growth of the higher plants consists of fragments of rocks or minerals, organic matter, soil solution, and a soil atmosphere. The mineral fragments vary in size from the finest clay particles to gravel and even boulders. The organic matter is derived from low organisms, from previous vegetation, or from growing plants; as also from stable manure, and occasionally fish or animal matter added to the soil by man. The soil solution consists of water carrying dissolved substances derived from the soil grains and from the organic matter, as well as from fertilizing materials artificially applied, and constitutes a nutrient solution from which the plant derives its mineral constituents. The soil atmosphere differs from the ordinary atmosphere above the soil in being richer in carbon dioxid and nitrogen, and containing more water vapor and less oxygen.

In origin there are two main classes of soils: sedimentary soils, formed by the disintegration and decomposition of rocks in place; and transported soils, including those of alluvial, glacial, and æolian origin. The word alluvial is here used to include all water-transported material; the term is, however, frequently used in a more specific sense to indicate the recent flood deposit of rivers.

Soils are classified according to their origin and their mechanical and chemical composition and properties. Genetically, they are classified according to the rock from which they are derived, as granite soil, limestone; or according to the manner of their origin, as alluvial, lacustrian, or drift. Mechanically, they are classified broadly into stony, gravelly, sandy, sandy loam, loam, clay loam, clay, adobe, black-waxy, or according to some other physical property; chemically, into calcareous, humus, alkali, and according to other striking chemical features. In the soil survey of the United States Department of Agriculture a local name is adopted for each type under which the specific characters are given; examples of this are Hartford sandy loam, Norfolk sand, San Joaquin adobe.

The physical properties of soils concern the size and

arrangement of the particles, and the relation of these to each other and to the organic matter; also the soil atmosphere, the soil moisture, and the physical forces of heat and gravitation. In these there is an intimate relation with physiography or the form and exposure of the surface of the land, as well as to climatology.

There are, undoubtedly, constant physical changes going on in the soil, as well as chemical changes, which have much to do with the best development of vegetation. The soil-moisture may be looked upon as a nutrient solution, dissolving its material from the difficultly soluble compounds in the soil and from fertilizers artificially applied. The amount of substances in solution varies with the moisture content and with the way moisture is supplied to the soil. The dissolved substances, naturally present in the soil or derived from fertilizers, influence the solubility of the soil components, rendering them more or less soluble according to their nature and existing conditions. It is probable that there is a normal weathering of the soil material which produces a certain concentration in the soil solution which will be maintained on the gradual withdrawal of nutrient material by the plant. However, this natural weathering is often not sufficient in amount to produce the yield and quality of crops desired, and this may be increased by methods of cultivation and fertilization so that crops may annually remove larger quantities of nutrient substances without any particular exhaustion to the soil.

It is certain that these nutrient materials do not accumulate to any considerable extent in soils in humid countries, as they are liable to be leached away and also to recombine, forming difficultly soluble compounds with the material of the soil-grains. A soil is in good heart or good condition when the physical conditions, such as the water-supply, soil atmosphere, and temperature relations, are favorable, and when the weathering of the material is sufficient to furnish an abundant and constant nutrient solution in the soil moisture.

One of the most potent agents in the weathering of soils is the organic material contained. This is unquestionably due largely to the amount of carbon dioxid formed, which renders many of the nutrient matters

3625. How the gardener makes his soil, by letting it decay in piles. The larger pile is composed of sods.

much more soluble. Moreover, the organic matter forms a culture medium for bacteria, ferments, and the various organized and unorganized agents which assist in breaking down the organic material, and facilitate as well the weathering of the other soil components. Soils in general have remarkable power of absorbing on the surface of the soil-grains vast quantities of carbon dioxid, ammonia, and other gases, and of other nutrient materials, which, while soluble and actually dissolved, do not readily diffuse out into the solution between the soil-grains.

The influence of fertilizers is therefore twofold: the direct addition of plant-food for the immediate use of plants, and the action of the fertilizing components upon the solubility of the otherwise difficultly soluble compounds in the soil. There are other offices which are very strikingly shown in the case of lime. This substance, when in the form of either caustic or slaked lime, corrects the acidity which is very often present in soils. It changes the structure of soils. It renders some of the soil components much more soluble, especially when the lime is in the form of the sulfate or gypsum, and it has undoubtedly a physiological rôle which enables the plant to assimilate larger quantities of other nutrient matters even in amounts which would be detrimental if the lime-salt were not present in excess.

The principal objects of the cultivation of the soil are to secure proper aëration, to conserve the moisture supply, and to improve the drainage. The irrigation and artificial drainage of soils are treated elsewhere.

The physical properties of texture and structure, that is, the size and arrangement of the soil-grains, have a greater practical importance with field crops and the relation of crops to soil under extensive cultivation than upon horticultural crops either in the field or greenhouse, where intensive methods are used. Particularly in the eastern states, where the natural rainfall is relied upon for the water supply, these physical properties have great influence in determining the relation of crops to soils. This is due in large part to the influence of the physical properties upon the water supply, and the commercial values of many soils are dependent largely upon this one condition. This is notably the case with the early truck crops, with corn, wheat, and grass lands, and with special products such as celery, cranberries, and other horticultural crops. With intensive cultivation, however, the flavor, appearance, texture, and general quality of the crop assume greater commercial importance, and even with intensive methods these are largely influenced by the character of the soil. This is shown in a striking manner in the localization of certain interests, even under the most intensive system of agriculture, such as the production of the fine lettuce around Boston, of the carnations, violets, tomatoes, and roses in other districts. With the present specialization in these lines, it is not only necessary that one should have a knowledge of the methods of cultivation, but should have the proper soil conditions as well as suitable climatic conditions; and to such an extent has this specialization been carried that different varieties of roses, for example, are best grown in different localities where the soils are slightly different. These matters must be realized by the horticulturist in order to attain the highest degree of success in any particular undertaking.

MILTON WHITNEY.

Soils for potting.

Strictly speaking, there are but two distinct kinds of soils, though there are several modifications or physical differences in both. These are mineral soils and organic soils or peat. Peat is formed in temperate climates by the accumulation of vegetable matter in swamps, or in some parts of the world under peculiar atmospheric conditions (see *Peat*). Mineral soils, which cover the greater portion of the earth's surface, are formed by the disintegration of rocks and stones through the agency of water, frost, or the atmosphere. Peaty soils are composed almost entirely of vegetable matter, with but little mineral matter. Mineral soils are just the reverse. The physical differences in peat are practically reduced to two, viz., the absence or presence of fiber. The physical differences in mineral soils vary considerably from almost pure clay to almost pure sand; indeed, the mechanical (or physical) analysis of mineral soils is based largely upon the proportions of clay and sand.

The composition of soils can be still further known by chemical analysis, but to the average gardener this is not necessary. Moreover, it is an operation of great nicety and one that requires an experienced chemist to perform. The chemical constituents which plants derive from the soil are present in most soils, though in varying degree, but they are sure to be present in ample quantity in the potting soil selected by an experienced gardener. The air and water may furnish as much as 98 per cent of the material with which the plant body is built up in some cases, and only the remaining 2 per cent be strictly derived from the soil. Three important nutrient elements are nitrogen, phosphoric acid, and potash. Nitrogen composes four-fifths of the atmosphere and the soil absorbs it chemically through the action of bacteria when the soil is in good physical condition. Hence the importance of remembering always that air in the soil is as important as water. Sorauer, in his "Physiology of Plants," page 56, says: "The ideal condition of a soil is one in which it resembles a sponge, and in which it will retain the greatest amount of nutritive substances and water without losing its capacity for absorbing air."

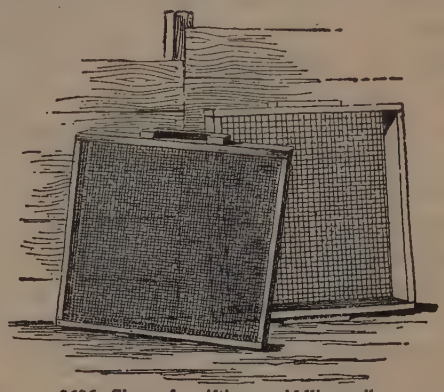
The capacity of soils to retain moisture varies considerably. A clay loam is more retentive of moisture than a sandy loam. The experienced gardener therefore selects a clay loam for his strong-rooting, large-leaved tropical plants, because transpiration is so much greater in these plants. For a general collection of greenhouse and small-growing tropical plants he selects a good loam. For cacti, agaves, and other succulent plants which will not take as much water at all seasons as other plants, he selects a sandy loam. For ferns, most of the Ericaceæ and Gesneraceæ, he selects peat; while for nepenthes, orchids, bromeliads, and the epiphytic aroids he selects fern or kalmia root. Other materials which a gardener should always have on hand when he has a large and varied collection of plants are: leaf-mold, which is made by collecting leaves and storing for at least two years, turning them over occasionally to facilitate decay; living or fresh sphagnum moss; sand; charcoal, and some convenient manures, such as pulverized sheep-manure and bone-meal.

Growing plants in pots is very different from growing them in borders or the open ground. The experienced gardener digs the turf only from good pasture or meadow land, so that it shall be full of the fibrous roots of the grass. But before using the turf for potting it should be placed in square piles, turf downward, for at least six months in order to kill the grass and all vegetable life. Fern root should also be collected and stored the same length of time in order to kill out the ferns. (Fig. 3625.) Raw and very coarse soils are usually sifted before being used for most greenhouse plants. Shallow sieves are used for this purpose. (Fig. 3626.)

Except for sowing seeds and for potting seedlings and freshly rooted cuttings, thoroughly decayed and homogeneous soils should not be sifted, but should be broken into small lumps, as the small lumps assist materially in aërating the soil. If the soil is sifted too much it becomes very fine, packs close and allows too little aëration. Leaf-mold is decayed vegetable matter, or humus. It may have little manurial value, but is used by gardeners to make soils "light" or spongy. For most young plants a good proportion added to the soil is excellent as it encourages root-growth.

Sand is the best medium for rooting cuttings of the larger number of plants. It is also added to soils to increase their porosity, especially when potting very young plants. Silver sand is best.

In potting plants, experienced gardeners make potting mixtures or add a variety of materials to the soil to suit the requirements of different plants. For young seedlings or for freshly rooted cuttings, the compost should be of a light and porous nature, but as plants increase in size and vigor a heavier and richer mixture is usually given, that is, if plants are to be grown on as specimens; but the proportion of nutrient substances used in a potting mixture should be determined by the vigor of the plants. It is always better to use too little plant-food than too much; if too much is used it often becomes available faster than the roots of plants can



3626. Sieves for sifting or riddling soils.

absorb it, often with fatal results. Many amateur plant-growers in their over-anxiety to grow fine plants make this fatal mistake.

In most gardens the greenhouse space is limited, and a gardener cannot always develop his plants to their fullest capacity or he has to reduce his variety and numbers. This, then, determines in the mind of an experienced gardener the composition of his potting mixtures. His aim should be to grow the finest possible specimens in the smallest possible pots and space.

EDWARD J. CANNING.

SOILS, STERILIZING. Greenhouse and plant-bed soils are specially liable to infection by disease organisms, as they are intensively cropped and not exposed to the action of frost and weather. Careful growers now resort to methods of artificial sterilization.

In practice, the sterilizing is accomplished either by heat applied by live steam, or by a chemical process employing a formalin drench. In either case, the work must be thoroughly performed if satisfactory results are to be expected; it will be required at least as often as every other year, and the situation is safer if sterilizing is practised annually.

Steam sterilizing is of two methods: by buried perforated pipes, and by a pan inverted over the soil and under which the steam may be conveyed. The latter is probably preferable in most cases. In either case, live steam should be applied for an hour or more.

"The perforated pipe method appears to consist, at its best," according to Selby and Humbert in Circular No. 151 of the Ohio Experiment Station, "in a system or set of perforated pipes, with crosshead and high-pressure boiler connection. These pipes are connected and buried in the soil of the bed, either with or without partial banking up of the soil; the surface of the bed is then covered with canvas or other covering and the steam passed into the system for such a period as is required to heat the soil to the necessary temperature. This temperature for best results is 180° to 212° F. maintained for a period of an hour or more. The time required to reach this temperature will vary with the boiler area, the pressure and other steam and soil factors. The length of pipes of the system will be adapted to the beds, being one-half or one-third the total length of large beds. Generally, 1½-inch pipe is used with ⅛-inch holes bored in a straight line about 1 foot apart. These pipes are buried in the beds 12 to 16 inches apart."

For the inverted pan method, "The apparatus consists," according to W. W. Gilbert, "of a galvanized iron pan, 6 inches deep and 6 by 10 feet in size, which is inverted over the soil to be sterilized and the steam admitted under pressure. The pan is supplied with steam hose connections, has sharp edges, which are forced into the soil on all sides to prevent the escape of steam, and is fitted with handles for moving it from place to place, the weight of the entire pan being not over 400 pounds."

Remarking on the formaldehyde or formalin drench method, Selby and Humbert say that "Soils to be treated by any method of sterilization should be prepared as for use by addition of manure so that the latter is incorporated with the soil before treatment. The soil after spading or plowing is ready for treatment, whether by steaming or drenching. For the work of drenching it is rather difficult to make exact estimates as to cost of appliances, as well as labor outlay, since the appliances are the usual watering devices of greenhouses or coldframes, and the labor will be somewhat variable according to the effectiveness of these devices. The appliances used may be extremely various, though usually some form of sprinkling-can, a force pump with hose and nozzles or application through the overhead Skinner watering system. For outside beds the hose and force pump offer a convenient method. The best strength appears to be three to three and one-half pints or pounds to each fifty gallons of drench applied at the rate of seven-eighths to one gallon to the square foot of surface."

SOLÁNDRA (named for Daniel C. Solander, a Swedish naturalist and traveler, 1736–1786). *Solanàceæ*. Very tall glabrous woody showy-flowered vines suitable for the warmhouse, and grown in the open in the warmest parts of the United States.

Leaves entire, leathery, shiny: fls. very large, white; the pedicels solitary and thick; calyx long-tubular, 2–5-cleft at the top; corolla funnelform, the tube cylindrical, the throat oblique and broad-campanulate, lobes broad; stamens 5; ovary 2-celled: berry globose, pulpy. —About 4 species, Trop. Amer.

Solandras are attractive plants and their needs are simple. A warm greenhouse—one in which the temperature is never allowed to fall below 50°—will suit them very well in the eastern states. The plants would probably do well outdoors in Florida and the far South. They like plenty of light and sunshine at all seasons of the year, and water should be given freely from early autumn till the latter part of spring, as they make their growth and bloom during that period. In summer, when the wood is ripening, a dry state is preferable for them. The soil that gives the most satisfactory results is a good, somewhat sandy loam. It is unwise to disturb the roots of established plants more frequently than is necessary. The chief point in growing solandras is to obtain short, sturdy branches, for those of rank growth seldom or never develop flowers; for this reason the use of rich soils and strong fertilizers should be avoided always. Propagated by cuttings of firm young shoots taken with a heel and placed in slight bottom heat. *S. grandiflora* is perhaps the best. The flowers do not last more than four or five days. They are of a pretty greenish white color when they first open and turn slowly to a rich brownish yellow. (Michael Barker.)

3627. Solandra grandiflora. (×⅛)

A. *Plant about 2 ft. high, with trailing branches.*

longiflòra, Tussac (*S. lævis*, Hook.). Lvs. oblong-ovate or obovate, acute; petioles purplish: fls. fragrant; corolla usually 1 ft. long, 3 times as long as the calyx, contracted at the throat, white or yellowish. B.M. 4345.

AA. *Plant becoming 12–20 ft. high.*

grandiflòra, Sw. Fig. 3627. Lvs. obovate-oblong, acute, glabrous, thick: fls. fragrant; corolla twice as long as the calyx, not contracted at the throat, white or somewhat yellowish. B.M. 1874. G.C. III. 21:273. Gn. 53:214. J.H. III. 34:123.

guttàta, Don. Shrub about 12 ft. high, erect, branched: lvs. alternate, petioled, elliptic-oblong, acute or very short-acuminate, entire, rather glabrous above, paler and copiously pubescent beneath, base broadened, rounded, 3–6 x 2–3 in.: fls. terminal, solitary, fragrant, ochre-yellow, large; calyx tubular, pubescent, 3 in. long; corolla funnelform, 9 in. long, 5-lobed, lobes crenate and undulate, 5 purple-brown ridges at the throat. Mex. B.R. 1551.

Hártwegii, N. E. Br. Branched shrub: lvs. alternate, glabrous, elliptical, acute, short-acuminate or obtuse, base acute: fls. solitary, terminal, yellow, 6–8 in. across; calyx 5-angled, unequally 3–4-lobed; corolla glabrous, tube 5-ribbed, ribs green outside, brownish purple inside, lobes 5, more or less crisped and turned back. Mex. G.C. III. 49:383.

F. Tracy Hubbard.†

SOLÀNUM (Latin, *solamen*, solace or quieting). *Solanàceæ*. Nightshade. A vast group of temperate and tropical herbs, shrubs and even trees, comparatively poorly represented in temperate North America, of various horticultural adaptabilities, comprising ornamental subjects and also the potato, tomato, eggplant, ground cherry or physalis, red pepper or capsicum; also medicinal plants.

Leaves alternate: infl. mostly sympodial and therefore superaxillary or opposite the lvs.: corolla gamopetalous and rotate or shallow-campanulate, plaited in the bud, the limb angled or shallow-lobed; stamens usually 5, inserted on the throat of the corolla, the anthers narrower or elongated and connivent and mostly opening by an apical pore or slit; ovary usually 2-loculed, ripening into a berry which is sometimes inclosed in the persistent calyx; fls. white, purple or yellow.—Dunal, the latest monographer (DC. Prodr. 13, pt. 1), in 1852, recognized 901 species, and many species have been discovered since that time, the number now being estimated at about 1,200. Many new species have recently been described by Bitter in various volumes of Fedde, Rep. Nov. Sp. Reg. Veget. The genus finds its greatest extension in Trop. Amer. Of the vast number of species, barely 25 are of much account horticulturally, and half that number will comprise all the species that are popularly well known. One of these is the potato, *Solanum tuberosum*, one of the leading food plants of the human race. The genus seems to abound in plants with toxic properties, although its bad reputation in this respect is probably exaggerated. The species are herbs in temperate climates, but in warm countries many of them are shrubby and some are small trees. Many of them are climbers. It is impracticable to distribute the few cult. species into the various botanical groups of a great genus, and the following species are therefore assembled mainly on a

horticultural plan. See Baker, Journ. Linn. Soc. 21, for account of the tuberiferous solanums. Other important papers on the tuberous species are Berthault, Recherches botaniques sur les varietés cultiveés du *Solanum tuberosum* et les espèces suavages de Solanum tuberiferes voisins, Ann. Sci. Agron. Ser. III. 6th année 1911; Sutton, in Journ. Linn. Soc. Bot. 38:1909; Wittmack, Berichti Deutsch. Bot. Gesellschaft 27:28, 1909, and Landwirtschaftliche Jahrbucher Zeitschrift 38: suppl. 5, 1909; Heckel, sur les Origines de la Pomme de Terre Cultiveé, etc. Ann. de la Faculté des Sci. de Marseille 16:1906; Ballivian & Tovar, Noticia Historica y Classificacion de la Papa de Bolivia. 1914.

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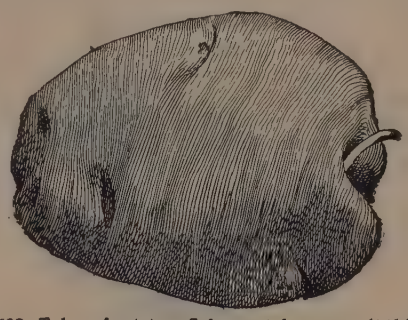
A. *Species bearing underground tubers (except No. 6): lvs. pinnate.*

B. *Corolla not deeply lobed.*

1. tuberòsum, Linn. POTATO. Figs. 3628, also 3152, 3153, Vol. V. Low, weak-stemmed, much-branched perennial with tender, herbaceous tops, and perpetuating itself asexually by means of thickened or tuberous underground sts., glabrous or pubescent-hirsute: lvs. unequally pinnate, the 5–9 oblong-ovate lfts. interposed with much smaller ones: fls. variable in color, white passing through various tints and shades of purple, violet, and blue, in long-stemmed dichotomous clusters: fr. a globular berry ½–1 in. or more in diam., usually through lack of viable pollen not produced in the highly developed modern varieties except in favored localities and in the case of certain varieties, but fruiting abundantly in S. Chile and in Peru. Temp. Andes of Peru and Bolivia. See *Potato*.

2. Máglia, Schiecht. DARWIN POTATO. Rough-hirsute branched perennial, with angled more or less winged sts. at least near the insertion of the lvs.: lvs. unequally pinnate, the terminal lft. 4 in. long, the lateral ones 2–3 pairs, elliptical, unequal at the base, acute at the apex, the interposed lfts. very small or sometimes wanting entirely: fls. in dichotomous clusters, the pedicels articulate about the middle; calyx hirsute, the lobes abruptly narrowed to a linear-acuminate point; corolla pure white, slightly lobed, the lobes acute. Infrequent along the Chilean coast from the vicinity of Valparaiso southward, and occasionally on the islands as far as the Chonos Archipelago. B.M. 6756.—Tubers gathered by the writer were about 4 in. long, dark purple, both in the skin and flesh. Apparently very difficult to hybridize with *S. tuberosum*. It was at one time considered by some to be the original of the potato. Darwin describes the plant in his "Naturalist's Voyage."

3. Féndleri, Gray (*S. tuberòsum* var. *boreàle*, Gray). Herbaceous perennial with st. about 18 in. high, angled, and foliage somewhat resembling the common potato: lvs. 4–5½ in. long, with 1–2 pairs of short-stalked lateral lfts., these 1¼–1¾ in. long, the terminal lft. somewhat larger, broadly ovate and abruptly rounded or subcordate at the base, acute at the apex, interposed lfts. very few, all pubescent on both surfaces with scattered hairs: fls. violet, the pedicels ½–¾in. long; calyx-lobes about 1 line long, ovate, short-acuminate; corolla about ¾–1 in. diam., the lobes pubescent without. New Mex.



3628. Tuber of potato.—*Solanum tuberosum*. (×½)

and probably also W. Texas, but apparently very infrequent.—The species has nothing to do with the potato and is much less frequent than the following.

4. demíssum, Lindl. St., both surfaces of the lvs., pedicels, and calyx pubescent with flattened hairs: lvs. 4–6 in. long with 2–3 pairs of mostly oval lateral lfts., the upper pair sometimes decurrent with the rachis, terminal lfts. much larger than the lateral ones, obovate or oval, interspersed lfts. few: fls. appearing when the plant is quite small and continuing to bloom for some time; calyx-lobes shorter than or only equaling the tube, ovate, slightly acuminate; corolla violet, ½–¾in. diam.: fr. ovoid or globose-ovoid: tubers an inch or more in diam. New Mex., Ariz. and N. Mex.—Apparently not infrequent.

5. edinénse, Berthault. Sts. angled, rather strongly villous: lvs. unequally pinnate, the segms. unequal at the base, pubescent on both surfaces: calyx rather densely hairy with flattened hairs; corolla purple: fr. globose or slightly ovoid.—The tubers are white in the skin and flesh and after 20 years of garden cult. are reported to average 1½ in. diam. For several years this species was confused with *S. etuberosum* which apparently does not produce tubers, and from which it may easily be distinguished by the hairy calyx and larger lf.-segms. Original locality probably Chile.

6. etuberòsum, Lindl. Sts. 1–2 ft. high, angled: lvs. rather densely short-pubescent: pedicels about ½in. long, glabrous but peduncle pubescent: calyx-lobes nearly or quite glabrous, short-ovate, and abruptly contracted to a short acute point; corolla large, deep purple with a yellowish center. Not known to produce tubers, but may be multiplied by dividing its stout underground sts. and also grown from seed. Chile. B.R. 1712.

BB. *Corolla deeply lobed.*

7. Jàmesii, Torr. Low and slender, 12–18 in. tall under cult., the small angular branches glabrous or soon becoming so: lvs. oblong in general outline, the rachis narrow-winged, the lfts. 5–9, with no interposed small ones, small and lanceolate-oblong in shape: fls. small, white, the corolla deeply cleft and the anthers large and prominent: tubers few, globular, hard, 1 in. or less in diam., withstanding frost. Mountains of Colo., New Mex., Ariz., and Mex. B.M. 6766.—Sometimes cult. as a curiosity. The tubers do not appear to be eaten.

8. Cómmersonii, Dun. Sts. angled, sparingly pubescent or glabrate: lvs. pubescent, strongly so on the lower surface, or sometimes nearly glabrous, mostly 4–8 in. long with 2–4 pairs of lfts., the lfts. oval or slightly

ovate, usually confluent with the rachis, obtuse at the apex, ½–1½ in. long, the terminal one somewhat larger, the upper lateral pair sometimes more or less adnate with the terminal, interspersed lfts. very few or none: calyx slightly pubescent, the lobes ovate-acute, about a line long; corolla white or pale violet, rather deeply lobed, pubescent on the outer surface, rather strongly so toward the apex of the lobes. E. Argentina and Uruguay, usually in moist situations. Trans. Hort. Soc., vol. 5: t. 10.—Of no value in the improvement of the common potato. See suppl. list, p. 3186.

aa. *Species grown for the edible frs.: lvs. simple.*

9. **nìgrum,** Linn. Black Nightshade. Morella of the French. Low unarmed herbaceous annual or suffrutescent in warm climates, glabrous or the young parts sometimes sparingly pubescent: lvs. simple, ovate,

3629. Two solanums.—Pepino, or melon shrub, Solanum muricatum; and garden huckleberry, S. nigrum var. guineense, at *a*. (Both ×½)

narrowed at both ends, entire or more frequently sinuate-toothed, petioled: fls. small, white, in pedunculate lateral cymes; calyx much shorter than the corolla with small obtuse lobes; corolla about ½in. diam.: berry globular, black, about ¼in. diam. A widely distributed weed in all temperate and tropical regions.—In the Dakotas, according to Hansen, the plant is often called "stubbleberry," as it volunteers freely in wheat-stubble, and the fr. is used there for pies and preserves. Hansen finds that the plants withstand considerable frost. In warm countries, according to Vilmorin, the lvs. are sometimes eaten as spinach is, "and apparently without any injurious result, although the plant belongs to the dangerous family of the Solanaceæ." The species is extremely variable, and much difference of opinion exists in regard to the poisonous qualities of the berries. Possibly differences exist in this respect in different forms but not correlated with characters recognizable by the systematist. Var. **guineénse,** Linn., with scarcely angled to angular smooth st., broadly ovate lvs. glabrous above and glabrous or sparingly pilose below, deeply lobed calyx and relatively large fr., is the "garden huckleberry" (Fig. 3629). This form is cult. to some extent in some sections and the fr. used for pies and preserves. Another form, *S. Búrbaṅkii*, bitter, with foliage rather dark green above, and erect or ascending peduncles, is stated by the originator to be a hybrid between the "garden huckleberry" and *S. villosum* of the Pacific coast. In some characters it appears to be intermediate between its supposed parents, and it is used as is the former.

10. **muricàtum,** Ait. (*S. guatemalénse*, Hort.). Pepino. Melon Pear. Melon Shrub. Fig. 3629. An erect spineless bushy herb or subshrub 2–3 ft. high, the branches often with rough warty excrescences, and usually glabrous or nearly so: lvs. entire or with slightly undulate margins, rarely ternate, oblong-lanceolate, or ovate, tapering to the more or less margined petiole and also toward the more or less obtuse or sometimes acute apex, the surface sparingly soft-pubescent: fls. in a long-stalked cluster, rather small, the corolla bright blue, deeply 5-lobed, puberulent on the outer surface, inclined or nodding: fr. ovoid or egg-shaped, long-stalked, drooping, yellow overlaid with splashes of violet-purple, 4–6 in. long when cult., flesh yellow and seedless under cult. Said to be a native of Peru and cult. in other parts of Trop. Amer. at temperate elevations. G.F. 5:173. G.C. III. 3:309.—This plant attracted some attention in this country about 25 years ago. It appears to have been intro. into the U. S. from Guatemala in 1882 by Gustav Eisen. A full review of the history and botany was made in Cornell Exp. Bull. No. 37 (1891). The fr. is aromatic, tender, and juicy, and in taste suggests an acid eggplant. In a drawer or box, the fr. may be kept till midwinter. In the N. the seasons are too short to allow the fr. to mature in the open, unless the plants are started very early. The pepino is properly a cool-season plant, and when grown in pots in a cool or intermediate house will set its frs. freely. It is readily prop. by means of cuttings of the growing shoots. The plant will withstand a little frost.

11. **Melóngena,** Linn. (*S. insànum*, Linn.). Erect and much-branched herb or subshrub, 2–3 ft. tall, woolly or scurfy, spiny: lvs. large and heavy, ovate or oblong-ovate, becoming nearly glabrous above but remaining densely tomentose beneath, shallowly sinuate-lobed: fls. large, mostly in clusters, the calyx woolly and often spiny, the spreading, deeply lobed, purplish corolla 1 in. or more across: fr. a large berry. Afr. and S. Asia. Original habitat probably S. W. Asia.

Var. **esculéntum,** Nees (*S. esculéntum* and *S. ovígerum*, Dun.). Common Eggplant. Guinea Squash. Aubergine. Figs. 1379–1381, 1383, Vol. II. Cult. for its large frs., which are usually oblong, obovoid, or egg-shape in form, and purple, white, yellowish or striped: differs from the wild plant in having fewer spines, mostly solitary fls., and much larger and more variable frs. There are 2 well-marked subvarieties: var. **serpentìnum,** Bailey. Snake Eggplant. Fr. greatly elongated and curled at the end. Var. **depréssum,** Bailey. Dwarf Purple Eggplant. Fig. 1382. Low and diffuse, many of the branches finally resting on the ground, usually dark-colored, nearly glabrous and always spiny: lvs. small and relatively thin, less lobed: fls. small and longer-stalked: fr. purple, pyriform. See *Eggplant.*

AAA. *Species grown wholly for ornament or curiosity.*

B. *Habit erect, the plant either herbaceous or woody.*

C. *Plant without spines, the lvs. entire or merely undulate (except sometimes in No. 13).*

D. *Foliage entirely glabrous.*

12. **aviculàre,** Forst. (*S. laciniàtum,* Ait.). A leafy unarmed soft-wooded glabrous shrub 4–8 ft. high, with spreading branches, smooth or marked with raised lines decurrent from the petioles: lvs. variable in size and shape, 4–12 in. long or sometimes even longer, lanceolate or linear-lanceolate, entire or irregularly pinnatifid and the lobes linear or lanceolate and acute: fls. in cymose clusters in the axils of the upper lvs. or lateral; calyx-lobes broad and obtuse, with an abrupt point; corolla violet, ¾–1 in. diam., the lobes short and broad: fr. a broad ovoid edible berry ¾–1 in. long, yellowish. New Zeal.; also common in many parts of Austral., Tasmania, and in Norfolk Isl. B. M. 349.

3630. Solanum Pseudo-capsicum. (×½)

13. **glaûcum,** Dun. (*S. glaucophýllum,* Desf.). A perennial plant 6 ft. or more high, with round erect sts., suckering abundantly: lvs. 5–6 in. long, ¾–1½ in. broad, ovate-lanceolate to oblong-lanceolate, entire, narrowed toward the base and decurrent with the petiole, acuminate at the apex, the surface glabrous and somewhat glaucous: fls. in terminal and lateral branched racemes or corymbs; corolla blue, star-shaped, about 1 in. diam., the lobes ovate: berry small, ovoid-globose, yellow. Province of Buenos Aires in Argentina, and in S. Brazil. B.M. 7945.

DD. *Foliage more or less pubescent, at least on the lower surface (except in No. 14).*

E. *Fls. small, less than ½in. diam., white.*

14. **Pseudo-cápsicum,** Linn. JERUSALEM CHERRY. Fig. 3630. A small branching leafy shrub, reaching 3–4 ft., erect and glabrous throughout: lvs. narrowly lanceolate, oblanceolate, or oblong, entire or the margins slightly wavy, narrowed at the base to a short petiole, mostly obtuse at the apex, the surface bright green and shining, the veins prominent: fls. solitary or few in lateral clusters, small, white: fr. globose, scarlet or rarely yellow, ½–¾in. diam. Widely distributed in tropical and semi-tropical regions, naturalized in Fla. Probably a native of the Old World, perhaps Madeira. —An old-fashioned plant usually grown as small specimens in pots for its showy scarlet frs., which persist for a long time. Var. **nànum,** Hort., is a dwarf compact form. Var. **Wéatherillii,** Hort., Weatherill's hybrid, is a form with strongly veined undulate lvs. and pointed orange-colored frs.

15. **Héndersonii,** Hort. Very like *S. Pseudo-capsicum,* but the white fls. very numerous, and the fr. ovoid or olive-form, orange-red. A horticultural form, perhaps a hybrid. Also known as *S. hýbridum Héndersonii,* but not related to the plant known in Old-World gardens as *S. hybridum.*

16. **Capsicástrum,** Link. Fig. 3631. A small shrub resembling the last but only 1–2 ft. high: st. more or less pubescent, with stellate hairs or glabrate: lvs. simple, oval, oblong, or sometimes slightly ovate, narrowed toward the petiole, obtuse at the apex, the margins entire or slightly undulate, the upper surface green and somewhat pubescent, the lower more strongly so: fls. small, white: fr. ½in. diam., orange-red or scarlet. Brazil and Uruguay. F.S. 12:1242. G.W. 3:529.—Frequent greenhouse and window-plant. Var. **Mélvinii,** Hort., a compact form 12–15 in. high with ovoid berries. Var. **variegàtum,** Hort., has variegated lvs.

EE. *Fls. usually ¾in. or more diam., violet or rarely white in No. 22.*

17. **Rantonnétii,** Carr. (incorrectly spelled *S. Rantònnei, Rantònni,* etc.) (*S. mùticum,* N. E. Br. *S. japónicum,* Hort.). An erect bushy grayish green half-shrub, growing 3–5 ft. high, the st. marked with raised lines decurrent from the petioles: lvs. entire, lanceolate or ovate-lanceolate, narrowed to the petiole, mostly acute at the apex, glabrous or inconspicuously pubescent on the upper surface, pubescent with short hairs below: fls. 2–5, together in the axils, 1 in. or more diam.; calyx-lobes with an abrupt linear point, corolla violet with a light yellow center: the red fr. nearly or quite 1 in. diam., heart-shaped, drooping, and very ornamental. Margins of woods in Paraguay and Argentina. Cult. in warm temperate regions of Amer. and Eu. R.H. 1859, p. 135. Gt. 43:1401.—An excellent plant for blooming in the open in summer. Easily prop. by means of cuttings.

18. **críspum,** Ruiz & Pav. An unarmed shrub, or sometimes attaining the size of a small tree, with rather long green flexuous branches puberulous when young, later becoming glabrous: lvs. 3–4 in. long, entire, thin, ovate to ovate-lanceolate, subcordate at the base, acute at the apex, smooth above, the margins somewhat undulate and the nerves prominent on lower surface: corymbs many-fld., corolla pale violet, about ¾in. broad and twice as long as the calyx, the lobes ovate or ovate-lanceolate: fr. globose, pale yellow, about the size of a pea. In Chile from the central provinces to the Island of Chiloe, also in Peru. B.M. 3795. G.C. III. 30:424.

19. **Xánti,** Gray. A low shrub or at high elevations herbaceous from a woody base, the sts. slender, 1–2 or even 3 ft. high, the younger ones angled, somewhat villous with many-celled usually gland-tipped simple hairs: lvs. membranous, ovate, ovate-oblong to oblong-lanceolate, ½–1¾in. long, wedge-shaped, rounded or subcordate at the base, entire or lobed: fls. in umbel-like cymes, corolla ½–1 in. diam., rotate, angular or short-lobed, violet: fr. erect, berry-like, globose, light green or purplish in color. Throughout Calif., except in the desert region, ascending to 6,500 ft. altitude. B.M. 7821.

3631. Solanum Capsicastrum. (×½)

20. **Wállacei,** Parish. A shrubby plant often forming round masses and reaching a height of about 3 ft., the sts. densely villous with long many-celled tawny viscid hairs: lvs. rather thick, usually less densely hairy than the sts., the lower rather large, cordate, the upper ovate, rounded or subcordate at the base: fls. in rather large forked cymes, corolla 1–1½ in. diam., pale violet: ripe fr. dark purple. Islands off the coast of Calif.,

Low. Calif., and near the seacoast in Cent. Calif. The *S. Xanti* var. *Wallacei* of Gray.

21. **umbellíferum,** Esch. (*S. califórnicum,* Dun.). A densely villous rarely glabrate shrub: lvs. entire, usually obovate or oblong, rarely oval or ovate, ½–1 or 2 in. long: fls. in umbel-like terminal clusters; corolla pale violet or sometimes white, pubescent on the outer surface, ¾in. diam., showy and fragrant: berry large, purple. Calif.—The plant offered as *S. umbellatum* is very likely this species.

CC. *Plant more or less spiny, the lvs. sinuate or lobed.*

D. *Lvs. pinnately lobed.*

E. *Species perennial.*

22. **aculeatíssimum,** Jacq. (*S. ciliàtum,* Lam. *S. myriacánthum,* Dun.). An undershrub 1–2 ft. high, st. branched, furnished with many long straight spines, interspersed in the younger parts with stiff bristles: lvs. solitary or geminate, broadly ovate or ovate-cordate, pinnately 5–7-lobed, 4 in. long, 3 in. wide, with rigid adpressed hairs on both surfaces, and spines on the upper surface of the principal nerves; petiole 1 in. long: cymes extra-axillary, few-fld.; calyx-lobes triangular, closely beset with spines; corolla rotate, 1 in. diam., snow-white, the lobes lanceolate: fr. globose, 1–2 in. diam., glabrous, orange or orange-yellow, flattened on the ends, corrugated. Widely distributed in tropical regions. F.S. 19:1988. F.M. 1871:521. R.B. 20, p. 249. R.H. 1888, p. 78.

EE. *Species annual.*

23. **citrullifòlium,** A. Br. (*S. heterodóxum,* Brit., not Dun.). An annual plant armed with straight prickles, glandular pubescent with mostly simple hairs: lvs. 1–2-pinnatifid, the lobes obtuse and repand: infl. racemose, corolla violet, nearly 1½ in. diam., somewhat irregularly 5-cleft, the lobes ovate-acuminate, anthers unequal, 4 of them yellow, the larger one tinged with violet: fr. inclosed in the prickly calyx. W. Texas and New Mex.

3632. Solanum integrifolium.—A species grown for its ornamental fruit. (×⅙)

24. **sisymbriifòlium,** Lam. (*S. Balbísii,* Dun.). An annual plant with many yellow- or orange-colored spines covering the st., both surfaces of the lvs., petioles, and sepals, and the upper part usually somewhat villous with gland-tipped hairs: lvs. oblong or ovate, sinuately lobed or even deeply pinnatifid and the lobes sinuate or deeply cut: infl. terminal or soon lateral, racemose, the fls. rather numerous, light blue or white and 1 in. or more diam.: fr. globose, red, 1 in. or more diam., surrounded by the at length ovate-lanceolate calyx-lobes. Trop. Amer. and naturalized in waste grounds in the Gulf states. B.M. 2828; 3954. G.C. III. 45:61.

25. **cornùtum,** Lam. (*S. Fontanesiànum,* Hort.). An annual herbaceous simple-stemmed spiny plant 1–4 ft. high: lvs. oval or ovate, pinnately lobed and the lobes again sometimes divided nearly to the center, the divisions oblong, acute, or rounded at the apex and tipped with an abrupt point, pubescent on both surfaces, that on the lower stellate: fls. terminal, in clusters of 3 or 4, corolla yellow, about 1–1¼ in. diam., villous on the outside, anthers uneven, the fifth ½–¾in. long and twice the length of the other 4, enlarged at the base and shaped somewhat like a horn, hence the name: fr. small, spiny. Mex.

DD. *Lvs. sinuately lobed.*

E. *The lvs. rusty-tomentose at least on the lower surface.*

26. **Warscewíczii,** Hort. (*S. warscewiczoìdes,* Hort.). Strong erect suffrutescent plant, reaching a height of about 6 ft., usually with a central st., densely rusty-tomentose and armed with many short stout hooked or straight greenish yellow spines: lvs. large, sometimes the blade a foot or more long, rather soft green and slightly pubescent at least along the veins above, grayish or rusty below and with dense stellate pubescence or tomentum, oval, somewhat cordate at the base and rather deeply lobed with unequal lobes: infl. at first terminal, later lateral in 1-sided corymbiform racemes with numerous fls.; calyx deeply lobed, the segms. oval and long-acuminate, spiny or unarmed, covered with numerous whitish hairs; corolla white, about 1½ in. diam., the lobes lanceolate and acute: fr. pale yellow, glabrous and shining. Probably S. American. R.H. 1865, p. 430; 1896, p. 237.—A very striking plant for subtropical gardening and can easily be raised from seed in a single season; half-hardy perennial.

27. **alàtum,** Seem. & Schmidt (*S. robústum,* Wendl.). Vigorous more or less spiny densely tomentose herb or subshrub, the sts. winged, 3–5 ft. high: lvs. decurrent with the spiny petiole, sometimes 1 ft. long, broadly ovate or ovate-elliptic in outline, sinuately lobed, the lobes acute, upper surface green and tomentose-velvety, woolly with more or less rusty tomentum beneath: fls. in axillary racemes, calyx unarmed, corolla about 1 in. across, white, with ovate-lanceolate acute lobes: fr. globular, small, hairy, orange-colored. Brazil. R.H. 1863, p. 250; 1896, p. 236.—Bold species, useful for subtropical gardening.

EE. *The lvs. with gray or whitish pubescence.*

F. *Fls. white.*

28. **integrifòlium,** Poir. (*S. coccíneum,* Hort. *S. Lobèlii,* Tenore). CHINESE SCARLET EGGPLANT. ORNAMENTAL EGGPLANT. ETHIOPIAN EGGPLANT. Fig.

3632. Coarse, bushy herb, 3 ft. tall, scurfy-tomentose, armed with strong hooked spines: lvs. much like those of the eggplant but the lobes sharper, spiny on the midrib and petiole: fls. small, white, in clusters of 2–6: fr. 1–2 in. across, mostly flattened on the ends but sometimes nearly globular in outline, prominently lobed, bright scarlet or yellow. Probably African.—An old-time garden plant, but little grown. Annual.

29. **marginàtum,** Linn. f. A shrub 3–4 ft. high: st. terete, covered with white stellate tomentum: spines subulate, those on the upper part ⅜–¾in. long, on older parts 1 in. long: lvs. ovate, pinnately lobed less than half-way to the midrib or the upper ones undulately lobed, subcordate at the base, coriaceous, 3–7 in. long, 2–5 in. wide, covered with fine white stellate pubescence which in age disappears from the upper surface except near the margin, remaining silvery white beneath; spines on the principal veins often 1 in. long: cymes extra-axillary, subumbellate; pedicels covered with white stellate tomentum; calyx spiny, the lobes narrow and acute, corolla broadly campanulate, 1¼ in. diam., white with the center and midrib bluish: fr. globose, 1½ in. diam., spiny, shining yellow and drooping. Nile Land, Abyssinia. Naturalized to a slight extent at Montecito near Santa Barbara, Calif. B.M. 1928.

FF. *Fls. blue or violet.*

G. *Size of lvs. large, 10–15 in. long.*

30. **macrânthum,** Dun. (*S. maroniénse,* Poit). A shrub 6 ft. or more high, with yellowish brown straight prickles: lvs. 10–15 in. long, narrowed at the base to short winged petioles or sometimes subcordate, ovate, lanceolate or lanceolate-elliptic, sinuate-angled or lobed, pale on the lower surface with stellate pubescence, dense on the younger lvs.: fls. in simple or branched racemes 3–5 in. long and 7–12-fld.; corolla bluish violet, 1½–2½ in. diam., the lobes acute. Brazil. B.M. 4138.

31. **macrophýllum,** Hort. An erect more or less stellate pubescent plant with curved spines: lvs. large, a foot or more long, unequal at the subcordate base, sinuate-lobed, the lobes oblong-lanceolate, acute, repand-undulate, petioles about 1 in. long, decurrent with the st.: infl. racemose; calyx-lobes with a long attenuate point; corolla large, blue, marked with yellow in the center: berry globose, yellowish, about ⅜in. diam. Mex. G. 2:283.

GG. *Size of lvs. smaller, 5–7 in. long.*

32. **Tórreyi,** Gray. Strong perennial herb, with close grayish stellate pubescence, prickles small and few along the st. and midribs of the lvs. or sometimes nearly wanting: lvs. 4–6 in. long, ovate with truncate or slightly cordate base, sinuately 5–7-lobed, the lobes entire or undulate, obtuse, unarmed: infl. at first terminal, cymose, 2–3-fld.; lobes of the calyx short-ovate with an acuminate point; corolla 1½–2 in. diam., pale blue, the lobes broadly ovate: fr. globose, smooth, 1 in. diam., pale yellow at maturity. Kans. to S. Texas. B.M. 6461.—It survives the winters at Cambridge, Mass., and spreads by running underground shoots.

33. **pyracánthum,** Jacq. An erect spiny plant with woody st. 3 ft. tall: lvs. 5–6 in. long, short-petioled, oblong, acute, deeply lobed and the lobes oblong, entire, obtuse, tomentose, spiny along the midvein: fls. numerous, in lateral racemes sometimes 6 in. long; corolla blue: fr. globose, glabrous, nearly ½in. diam. Probably Afr. Hort. Schoenb. 4:36. t. 470.

34. **índicum,** Linn. A much-branched prickly undershrub sometimes reaching a height of 8 ft., densely clothed when young with stellate tomentum, the prickles compressed, stout, and sometimes recurved: lvs. ovate, sinuate or lobed, 3–6 in. long and 1–4 in. broad, stellate woolly, beneath and prickly along the nerves: racemes lateral, many-fld.; fls. blue, calyx-lobes in fl. triangular, acute, very woolly, unarmed, or with slender straight spines, these becoming stronger in fr., corolla ¾–1 in. diam., lobes broadly triangular, tomentose without, less so within: berry yellow or scarlet, glabrous, about ½in. diam. Very common in Trop.

3633. Solanum Wendlandii. (Much reduced.)

India and China, Malaya, and the Philippines. Doubtfully in the American trade.

BB. *Habit of plant climbing, more or less woody, spineless (except No. 38).*

C. *Foliage entirely glabrous.*

35. **jasminoìdes,** Paxt. POTATO VINE (from the fls.). Fine greenhouse twining shrub, reaching several feet in height, glabrous: lvs. rather small, the upper ones lanceolate to lance-ovate and entire, the lower ones of about 3 narrow, ovate entire lfts.: racemes short and united into a cluster 3 in. or less long and about 8–12-fld.; fls. about 1 in. across, star-shaped, white with tinge of blue; pretty. S. Amer. P.M. 8:5. B.R. 33:33. Gn. 43, p. 433; 45, p. 162; 50, p. 19; 51, p. 358; 53, p. 28. —A most useful deciduous climber for the coolhouse, and much grown. Half-hardy, and useful for the open in the S. Will grow 10–20 ft. if given a chance. Var. **grandiflòrum,** Hort., has very large trusses of fls. and is a robust grower; excellent. Gng. 1:259. Var. **variegàtum,** Hort., has variegated foliage.

36. **Seaforthiànum,** Andr. (*S. azùreum,* Hort., not Fern. *S. venústum,* Kunth). Beautiful slender unarmed herbaceous or slightly woody climber or trailer, with st. 3–4 ft. long, glabrous throughout: lvs. with 3 lfts., these 1½–2 in. long, or the upper ones simple, lanceolate, or ovate-lanceolate with entire or undulate margins: fls. numerous, in long drooping axillary panicles, on pedicels swollen at the apex, the corolla light purple or blue, star-shaped and usually 1 in. or less diam.: fr. ovoid or nearly globose, glabrous, scarlet. Brazil. B.M. 1982; 5823. B.R. 969. R.H. 1893, p. 177; 1897:424.—A very beautiful plant for the coolhouse. Begins to bloom when very young. Var. **álbum,** Hort., a variety with white fls. recently intro.

37. **Wéndlandii,** Hook. f. (*S. Wéndlandii magnìficum,* Hort.). Fig. 3633. Tall-climbing, glabrous, with a few scattered prickles: lvs. various, sometimes 10 in. long, the uppermost simple and oblong-acuminate, the others lobed or trifoliolate and with the terminal lft. much the largest, all with entire margins: fls. in large cymes, pale lilac-blue, the corolla 2½ in. across and shallow-lobed: fr. globose. Costa Rica. B.M. 6914. G.C. III. 14:339.

G.M. 36:610. A.F. 12:1147. F.E. 8:828.—A splendid greenhouse climber, perhaps the most showy of the cult. solanums. Blooms in summer and fall. Ernest Braunton writes: "*S. Wendlandii* is a magnificent climber in this climate (Los Angeles), reaching 50 ft. or more and having umbels 12 in. across. It is perhaps the showiest vine in Calif. when in bloom. It is generally hardy here, although some winters nip and even kill the vine in the colder and lower parts of this city. Cut up an old vine, any kind of wood, stick the pieces in sand or light soil, and wait. Every cutting will grow. When in a robust condition it is a gross feeder. It should be in full sun, though it does well anywhere."

3634. Solanum Dulcamara. (×¼)

cc. *Foliage usually more or less pubescent, sometimes glabrous or glabrate.*

38. **Dulcamàra,** Linn. Bitter-sweet. Fig. 3634. A more or less pubescent or sometimes glabrous shrubby climber with st. 4–6 ft. long: lvs. entire or sometimes 3–5-parted, 1–3 in. long, the entire ones cordate, ovate-cordate, or the upper ones hastate: fls. many, drooping, in panicled corymbs opposite the lvs.: corolla white or violet, ½in. diam., the lobes reflexed, each segm. furnished with 2 greenish spots near the base: fr. ovoid, ½in. diam., red or rarely yellowish green. Naturalized from Eu.—Berries poisonous.

39. **jasminifòlium,** Sendt. St. round, unarmed, sparingly pubescent or glabrate: lvs. ovate to ovate-lanceolate, entire or very slightly undulate, usually subcordate at the otherwise truncate base, acute or obtuse at the apex, petiole ½–1 in. long, the blade 1–2 in. long: fls. several in a paniculate cluster; calyx campanulate, the lobes about equaling the tube, oblong and obtuse; corolla about ¾in. across, deeply lobed, the lobes ovate or oval. Brazil.

40. **pénsile,** Sendt. A woody climber, more tender than *S. Wendlandii:* lvs. simple and entire, 2–4 in. long, somewhat glossy green and glabrous above, paler below, ovate or slightly cordate at the base, rarely narrowed toward the petiole: fls. in long panicles or racemes, the corolla purplish red changing to pale blue with white star-shaped center, rather deeply lobed and about 1 in. diam.: fr. globose, pale violet, about the size of a small cherry. British Guiana, the Amazon region and Surinam.

41. **Wórsleyi,** Hort. An unarmed woody climbing plant reaching a height of about 9 ft.: lvs. soft-pubescent, oblong-lanceolate, drooping, 6–12 in. long. frs. the size of a hen's egg, clear light red in color; is a native of the highlands near Rio de Janeiro, Brazil, where it is used for the decoration of dwellings. In the unripe stage the frs. are said to be prepared and used as a vegetable. G.C. III. 27:19.

S. auriculàtum, Ait., is allied to S. verbascifolium, and is sometimes mistaken for it. Lvs. 6–7 in. long, ovate-oblong, acuminate, entire, velvety-tomentose above with branched hairs, more densely so and paler below, axils furnished with small lvs.: corymbs subterminal, many-fld.; corolla violet, about ½in. across: berry globose. Afr.—*S. betàceum,* Cav., is Cyphomandra, for which see Vol. II.—*S. cérnuum,* Velloz. Shrub or small tree, with cyphomandra-like lvs. and the young parts clothed with chaffy hairs: fls. white: fr. globose, hairy, inclosed in the calyx. S. Brazil. B.M. 7491.—*S. Cómmersonii,* "Violet," which attracted much attention a few years ago, is S. tuberosum, being similar to, if not identical with the variety known as "Blue Giant."—*S. corymbòsum,* Jacq. A fetid rather weak, unarmed, branched half-shrub: lvs. 2–5 in. long, glabrous except for the ciliate margins, ovate or lanceolate, entire or slightly lobed: fls. about ½in. diam., blue or violet: fr. reddish orange, ¼–⅜in. diam. Native of Peru.—*S. erèctum* is Cyphomandra betaceum.—*S. Pierreànum,* Paill. & Bois, has fr. the size of a walnut and shaped like a tomato, scarlet.—*S. stoloníferum,* Schlecht. & Bouché. Tuber-bearing: lvs. with 3–4 pairs of pinnæ, the interposed ones very numerous; lfts. mostly subcordate at the base and acuminate at the apex, sparingly pubescent with scattered flattened hairs on the upper surface, usually only along the veins on the lower surface, but puberulent on both surfaces: calyx glabrous, the lobes about the length of the tube; corolla white.—*S. tubingénse* and *S. Darwiniànum* said to be graft hybrids of Lycopersicum esculentum and S. nigrum produced by Prof. Winkler of Tubingen. G.C. III. 50:161.—*S. verbascifòlium,* Linn. Lvs. lanceolate-ovate, or ovate-oblong, entire, tomentose, without smaller lvs. in the axils: fls. rather small, white: fr. the size of a small cherry. Widely distributed in the tropics. W. F. Wight.

SOLDANÉLLA (Latin, *a small coin,* referring to the shape of the leaves). *Primulàceæ.* Small glabrous perennial herbs with short rhizomes, hardy and useful in the border or rock-garden.

Leaves long-petioled, thick, cordate-orbicular or reniform, entire: scapes slender, solitary or few, 1-fld. or many-fld., umbellate: fls. blue, violet, or rose, rarely white, nodding, about ½–¾in. across; calyx 5-parted, segms. lanceolate, persistent; corolla hypogynous, funnelform-campanulate, 5-lobed to the middle, the lobes laciniate-lacerate; ovary superior, ovoid: caps. conic-oblong, many-seeded.—Species, 6, mountains of Eu. For account of species and cult., see Gn. 61, pp. 126, 127; for monograph, Paxt. & Knuth in Das Pflanzenreich, hft. 22 (IV. 237).

Soldanellas are amongst the most famous flowers of the Alps, though not the commonest. *S. alpina* ascends the mountains to the line of perpetual snow. Grant Allen, in "Flashlights on Nature," declares that the flower of soldanella actually thaws its way up through a solid block of ice. Soldanellas are cultivated in this country only in a few rock-gardens. Those who have limited resources and dwell in the region of changeable winters might attempt to grow these plants in pots under a frame in lieu of nature's winter covering. They are said to prefer a half-shady or shady position and are propagated by seed or division.

A. *Fls. 2–4 on a scape; corolla split half-way to the base; filaments half as long as anthers.*

B. *Pedicels pubescent.*

montàna, Mikan. Sts. 6–14 in. high: lvs. roundish; margin slightly and remotely crenate: fls. violet. May–July. Gn. 61, p. 127. G.W. 15, p. 714.

BB. *Pedicels roughish.*

alpìna, Linn. (*S. Clùsii,* F. W. Schmidt. *S. occidentàlis,* Vierh.). Fig. 3635. Sts. 3–6 in. high: lvs. roundish; base more or less kidney-shaped; margin entire or somewhat wavy: fls. violet, with darker streaks. May. B. M. 49: 2163. G.C. II. 24:457. G. 34:469. Gn. 61, p. 127. Var. **álba,** Hort., is a white-fld. form. Natural hybrids are known of which this species is one of the parents. Pyrenees, Alps, etc. Handsome species.

3635. Soldanella alpina. (×½)

CV. Solidago ulmifolia, one of the common goldenrods.

AA. *Fls. solitary; corolla split a third of the way to the base; filaments about as long as anthers.*

B. *Pedicels roughish.*

pusílla, Baumg. Sts. 3–6 in. high: base of lvs. heart-shaped or kidney-shaped; margin somewhat wavy: fls. copper-colored, verging on blue, the fringes straight, not spreading. May. Gn. 61, p. 126. Var. **álba,** Hort., is a white-fld. form. G.C. III. 55:224. Gn. 78, p. 172.

BB. *Pedicels pubescent.*

mínima, Hoppe. Sts. 3–4 in. high: lvs. roundish: fls. pale lilac, streaked purple inside; the fringes spreading at the tips. June, July. Gn. 61, p. 126. Var. **álba,** Hort., is white-fld. form. *S. Gánderi,* Huter, is a hybrid of *S. alpina* and *S. minima.*

WILHELM MILLER.
F. TRACY HUBBARD.†

SÒLEA: *Hybanthus.*

SOLENÁNTHUS (Greek, *tube* and *flower,* referring to the form of the corolla). *Boraginàceæ.* Gray-villous hirsute or rarely glabrous perennial herbs, hardy and suitable for border planting: lvs. alternate: racemes sometimes elongated and simple, sometimes short, scorpioid, densely-fld., and numerous in terminal panicles: fls. blue or rose; calyx 5-parted, segms. narrow; corolla tubular or funnelform, 5-lobed, the lobes small, obtuse; ovary 4-lobed, distinct: nutlets 4, depressed.—About 20 species, S. Eu., W. Asia, and Russia.

apenninus, Hohen. (*Cynoglóssum apennìnum,* Linn.). Plant hardy, 2½–3 ft. high: lvs. rather coarse, the radical ovate-oblong, those of the st. long-lanceolate: fls. blue, forget-me-not-like, in dense, axillary, panicled racemes. May, June. S. Eu.—A useful plant amongst shrubbery or in the back part of borders. Prop. by division or seed.

SOLENÍDIUM (Greek, *tube,* and *appearance,* in allusion to the shape of the fl.). *Orchidàceæ.* Epiphytic herbs with abbreviated sts. terminated by 1–2-lvd. pseudobulbs, occasionally grown in the warmhouse: lvs. rather long, thin-leathery: scape simple, axillary from below the pseudobulb: fls. in a lax raceme, medium-sized and long-pedicelled; bracts small; sepals subequal, free, spreading; petals similar to the sepals; labellum spreading at the base of the column, contracted to a long claw, dilated at the tip, undivided; column erect, broadly 2-winged, the wings spreading above into auricles and united with the membranaceous variously toothed or lobed clinandrium; pollinia 2: caps. not known.—One species in the Colombian Andes, *S. racemòsum,* Lindl. About 6 in. high: st. shortened: lvs. rather long, ensiform, thinly coriaceous, narrowed at the base: fls. yellow, spotted with red; sepals and petals free. Nov. J.F. 4:349. Cult. like oncidium.

F. TRACY HUBBARD.

3636. Solidago cæsia.

3637. Solidago speciosa.

SOLENOSTÈMON (Greek, *tube* and *thread,* referring to the fact that the filaments are grown together, at their base, into a tube). *Labiàtæ.* Erect herbs allied to Coleus, probably similarly used: lvs. ovate, crenate, long-petioled: whorls of fls. laxly 6- to many-fld., arranged in long racemes or panicles: fls. small; calyx ovoid-campanulate, upper tooth ovate with decurrent edges, lateral small, lower oblong, as long as the upper; corolla-tube exserted, slender, dilated and oblique at the throat, the limb 2-lipped, upper shorter, lower long, oblong, slightly concave; stamens 4, the filaments united at their base into a tube; disk glandular: nutlets ovoid, smooth.—Eight species, W. Trop. Afr.; one also occurs in Brazil.

Godefròyæ, N. E. Br. (*Còleus Godefròyæ,* Godef.-Leb.). Herb, up to 2 ft. high, branches 4-angled: lvs. opposite, green, paler beneath, ¾–1¼ in. long, very wide-ovate or deltoid-ovate, base truncate or cuneate-truncate, slightly crenulate: racemes terminal, spike-like; fls. blue; calyx subequally 2-lipped; corolla, basal portion of tube, abruptly upcurved, upper portion abruptly deflexed, flattened-dilated, upper lip very short, crenately 4-toothed, lower lip compressed sideways. Trop. Afr. B.M. 8511. F. TRACY HUBBARD.

SOLIDÀGO (according to Gray, from "*solidus* and *ago,* to make solid or draw together, in allusion to reputed vulnerary properties"). *Compósitæ.* GOLDENROD. Perennial herbs very useful for borders and for colonizing, but little known in the trade.

Erect, of various habit, with simple alternate lvs. and many small yellow (rarely whitish) heads in spikes, thyrses, compound panicles, or racemes: heads oblong or narrow-campanulate, with small mostly appressed scales, containing few florets, the disk-florets all perfect and the ray-florets in one series and pistillate: pappus of 1 or 2 rows of roughish capillary bristles.—The genus is characteristic of E. N. Amer., where about 60 species occur. There are several species on the Pacific coast, a few in Mex. and S. Amer., and 2 or 3

in Eu. and N. Asia, making, altogether, perhaps 130 species. A very few of the important species may be described here; for others, the current botanical manuals should be consulted.

Amongst the glories of the American autumn are the asters and goldenrods. They complement each other. The asters run in cyanic colors, goldenrods in xanthic, —the blue and blush on the one hand and the yellow and golden on the other. Because the goldenrods are so common, they have not been appreciated for planting. They improve in the garden, however, the plants becoming larger and the bloom fuller and richer. They present few difficulties in cultivation. They may be transplanted from the wild with the greatest ease, and the stools may be lifted and divided as soon as they become root-bound and show signs of failing. Some of them become weedy if the soil is very rich. The solidagos are variable, even within the same species. Therefore it is well to mark fine individual clumps when in bloom, for removal in late autumn or early spring. The observation of a single season should result in a fine collection of individual plants. A very attractive grouping of asters and goldenrods can be made entirely of native species:

3638. Solidago canadensis.

3639. Solidago nemoralis.

3640. Solidago rugosa.

with a background of sumac, the autumnal colors of which are beautifully harmonized by the blues and purples of the asters and the yellows and cream-yellows of the goldenrods.

A. *Heads in small axillary clusters, not usually in large terminal infl.*

cæsia, Linn. Wreath Goldenrod. Fig. 3636. A smooth slender perennial, often glaucous, simple or sometimes branched: lvs. stalkless, acuminate, the base narrowed, sharply toothed, 2½–3½ in. long: fls. in axillary racemes or head-like clusters, yellow or sometimes whitish: involucral bracts obtuse. E. N. Amer. Aug.–Oct.—Useful as a partial shade plant or in the open border.

AA. *Heads in a large terminal infl. which is not composed of 1-sided clusters of fls.* (*secund*).

B. *Lvs. serrate.*

speciòsa, Nutt. Fig. 3637. Stout, smooth, usually simple-stemmed perennial, smooth below, often rough above: lvs. glabrous, firm, the basal 3–6 in. long and ¾–1½ in. wide, diminishing in size above, crenate, pinnately veined: heads in a large showy terminal thyrsus, the branches of which are ascending and often leafy: bracts of the involucre oblong, very blunt. Rich soil, E. N. Amer. A.G. 13:583. G.F. 3:561 (adapted in Fig. 3637).—Excellent for half-shady border.

BB. *Lvs. entire or essentially so.*

Virgaùrea, Linn. European Goldenrod. A rough simple-stemmed but stout perennial 1–3 ft. high: basal lvs. 4–7 in. long, 2–2½ in. wide, obtuse or acute; upper lvs. sessile or narrowed into margined petioles: fls. in a dense terminal, rather narrow and often interrupted thyrsus which is often 8–10 in. long: bracts of the involucre acute or acutish. Eu. G. 27:7.—One of the best garden plants of the group. A prostrate form is offered. *S. cámbrica,* Huds., is a compact and dwarf form, 6 in. or less high, with larger heads. *S. Virgaurea* is represented in the U. S. by *S. Cútleri,* Fern. (*S. Virgaùrea* var. *alpìna,* Bigel.), in the highest alpine districts of N. New England and N. Y.; this American species appears not to be in the trade.

AAA. *Heads in a terminal infl., usually a panicle, which is composed of 1-sided branches or clusters* (*secund*).

B. *Foliage fragrant; lvs. pinnately veined.*

odòra, Ait. Sweet Goldenrod. A slender, simple-stemmed, anise-scented perennial about 18–24 in. high: lvs. dotted, quite entire, acute or acuminate, 2½–4 in. long, lanceolate: fls. in a small, not very showy cluster, but persisting many weeks; tips of the involucral bracts acute. E. U. S.—Good for dry sandy open places. July–Sept.

BB. *Foliage not fragrant; lvs. triple-nerved, with a pair of lateral veins beside the midrib.*

C. *Lower lvs. lanceolate, sharply serrate.*

canadénsis, Linn. Fig. 3638. St. 3–5 ft., stout, hairy and usually much branched: lvs. acute at each end, the lower sharply serrate, lanceolate, 3–7 in. long, ¾–1½ in. wide, the upper smaller and often entire: fls. in a very large terminal secund panicle, involucral bracts linear, obtuse or acutish. In dry soil, E. N. Amer.—There are many wild forms but none seems to be in the trade. Aug.–Nov. This is a coarse and somewhat weedy species; very common.

cc. *Lower lvs. oblanceolate, merely crenate or entire.*

nemorâlis, Ait. Fig. 3639. St. slender, hairy, 18–24 in. tall: lvs. thick, roughish, the lower petioled, oblanceolate, crenate; upper lvs. becoming smaller, linear-oblong, acutish and entire: fls. in a 1-sided panicle, not very large or showy; bracts of the involucre linear-oblong, obtuse. In dry open places, E. N. Amer.—Aug.–Oct. Good for the sunny border and the fls. usually very persistent.

BBB. *Foliage not fragrant; lvs. pinnate-veined, rough.*

rugòsa, Mill. Fig. 3640. Stout erect mostly stiff plant, to 7 ft., hairy: lvs. crowded above, lanceolate to ovate-lanceolate, sharply serrate, more or less rugose: heads in a broad pyramidal panicle, closely arranged on one side of the curving branches. Canada and U. S.

Any number of Solidagos may be offered in lists, but they are scarcely trade commodities. *S. Buckleyi*, Torr. & Gray, N. C. to Ala., is a plant described as 2 or 3 ft. high, with ovate-oblong to oblong-lanceolate lvs., and heads in a loose and elongated thyrse; the name is listed abroad, the plant said to be "suitable for rock-garden, later summer-flowering, yellow, 1 ft."—*S. flexuòsa, S. gigantèa, S. lævigàta*, are also listed, but the writers do not know what plants pass under these names in cult.—*S. sempérvirens*, Linn. A maritime fleshy-lvd. smooth plant, tall and stout, 2–4 ft. and more: lvs. entire, lanceolate to lance-oblong: heads in short racemes which are disposed in a panicle. Atlantic seaboard of the U. S.—*S. spectábilis*, Gray. Plant 1–2½ ft. tall: lvs. lanceolate to linear, the lower oblong or more or less spatulate and sparingly serrate: heads golden yellow, numerous and crowded in a thyrse. Nev. to Calif.

L. H. B.
N. Taylor.

SÓLLYA (in honor of Richard Horsman Solly, 1778–1858, an English botanist). *Pittosporàceæ*. Evergreen climbing subshrubs, ornamental greenhouse plants and hardy outdoors in the South.

Leaves narrow, entire or rarely sinuate: fls. nodding, at the ends of the branches, in lax, few-fld. cymes or rarely 1-fld., blue; sepals small, distinct, petals obovate, spreading from the base; anthers connivent in a cone around the ovary; ovary subsessile, perfectly 2-celled: berry oblong, indehiscent.—About 3 species, Austral. Prop. by cuttings in sand under glass, or by seeds, which germinate readily.

heterophýlla, Lindl. Australian Bluebell Creeper. Fig. 3641. Small shrub, 2–6 ft. high, with slender, twining sts.: lvs. variable, from lanceolate or oblong-linear to ovate-lanceolate, or ovate-oblong, obtuse or slightly acuminate, entire, 1–2 in. long, usually narrowed into short petioles: cymes 4–8–12-fld., terminal or lf.-opposed: fls. bright blue, ⅓–½in. long. July. B.M. 3523. R.B. 21:253. B.R. 1466.—Hardy and much cult. in Cent. Calif. and a great favorite on account of the brilliant blue of its fls. Especially valuable for covering banks, rockwork, and low fences, preferring to scramble over other plants. Also grown as an herbaceous border plant, being kept within bounds by the shears. The roots are very attractive to the California pocket-gopher, who plays sad havoc with it if not watched. Sometimes seen in greenhouses.

parviflòra, Turcz. Much more slender and twining than *S. heterophylla*, usually loosely soft-hairy: lvs. lanceolate or oblong-linear, the larger about 1 in. long, very short-petioled and thinner than the preceding: fls. small, solitary, or 2–3 in a cyme; pedicels filiform: berry ½–¾in. long, tapering at both ends. W. Austral.

Drúmmondii, Morr. St. weak, flexuous-twining to the left, prostrate, pubescent: lvs. alternate, linear-lanceolate, both ends acute, scarcely petioled, nerves pilose: cymes 2-fld. or the fls. solitary, terminal; peduncles rather glabrous: fl. nodding; sepals linear, villous. Austral. B.H. 4:33.

F. Tracy Hubbard.†

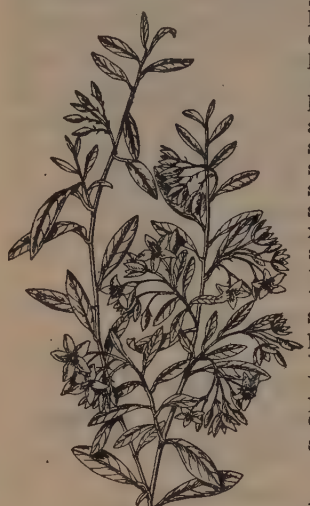
SOLOMON'S SEAL: *Polygonatum.* False S. S.: *Smilacina.*

SÓNCHUS (the Greek name). *Compósitæ*. Mostly weedy plants, but some of the Canary Island species are good foliage subjects.

Annual or perennial, usually more or less succulent, sometimes frutescent, leafy-stemmed, mostly smooth and glaucous, summer-flowering: lvs. usually clasping entire, toothed or runcinate-lobed or even pinnatifid and laciniate, more or less prickly-margined: heads homogamous and ligulate, yellow-fld., with more or less imbricated involucral bracts, becoming thickened or tumid at base, corymbose or paniculate: achenes ribbed or costate, not beaked, with fine white pappus. —Species 40 or more, in the Old World, some of them intro. in N. Amer. as weeds.

Certain bold foliage plants of this genus are more or less listed and mentioned abroad, the botanical identity of which is to be determined. *S. arbòreus laciniàtus* described as a "magnificent foliage plant with laciniated lvs.," is probably a form of *S. pinnàtus*, Ait., which grows 3 ft. or so high, bearing glabrous pinnately parted lvs. with narrow entire or toothed lobes, native of Madeira. What is mentioned abroad and also in S. Calif. as *S. Jácquinii*, is probably *S. congéstus*, Willd., described as a beautiful foliage plant with long and broad crowded recurved oblanceolate more or less pinnatifid lvs. (1 ft. or less long and 2–3 in. broad) and showy panicles of yellow heads 2–3 in. across; Canary Isls., where it is known as pastor's lettuce (lachuza de pastor), perhaps in allusion to availability of the lvs. for salad. The lvs. of other species of Sonchus are said sometimes to be similarly used. The names *S. elegantíssimus* and *S. laciniàtus* sometimes appear in horticultural literature, representing ornamental plants with much-divided lvs., the segms., very narrow; they are probably forms of Canary or Madeira species.

L. H. B.



3641. Sollya heterophylla. (×⅓)

SONERÌLA (adapted from a native name). Syn., *Cassebeèria. Melastomàceæ*. Herbs or small shrubs of various habit, with ornamental foliage, suitable for the greenhouse.

Leaves similar or dimorphous, often membranaceous, entire or serrulate, 3–5-nerved: fls. in scorpioid racemes or spikes, frequently rose, rather large or some small; calyx glabrous or setose, tube turbinate, oblong or campanulate, 3-lobed, the lobes short; petals 3, ovate, obovate, or oblong; stamens 3 (rarely 6, the alternate ones smaller); ovary adherent or almost so to the tube of the calyx, 3-celled: caps. included in the turbinate, cylindrical, ribbed or 3-angled tube of the calyx, 3-valved.—About 75 species, India and the Malay Archipelago. This includes a number of dwarf tender foliage plants which must be grown in the greenhouse all the year round. The plants belong to the same cultural group with Bertolonia, Gravesia, and Monolena, and are distinguished by having their floral parts in 3's. The fls. are usually rose-colored, ½in. across or less, and generally disposed in scorpioid racemes or spikes. The species described here are all caulescent plants with lvs. distinctly petioled, those of each pair being of equal size (except in *S. maculata*): fls. 3-merous; stamens 3, long-acuminate.

It was long thought impossible to grow sonerila and its allies outside of a bell-jar or Wardian case. Gardeners now dispense with the "double glass" and

grow these plants in tropical or even temperate greenhouses. For potting material they use a compost of fibrous peat and chopped sphagnum, sprinkled with sand and interspersed with bits of charcoal. The plants should have a partially shaded position, and should never be syringed. Never allow water to remain on the leaves. The species seed freely. The varieties are propagated by division.

Sonerilas thrive best in a close and moisture-laden atmosphere with just enough ventilation to keep them from melting or decaying. A temperature of not less than 75° suits them best. Cuttings of well-ripened growth are placed under a glass case or bell-glass in a bottom heat of 70° to 80°. Care must be taken every morning to allow the drops of condensation which gather on the glass to dissipate. For potting material use fine-screened leaf-mold, with plenty of silver sand intermixed and a little finely chopped fresh sphagnum on the top of the pots or pans. These plants have shallow roots, and require plenty of drainage, consisting of fine broken potsherds mixed with either charcoal or finely ground soft-coal clinkers. When the plants have made their full growth (which they do if started at the proper time in early spring) they start into flower. At this time the plants should be hardened off by gradually withholding water, and they should also be kept a little cooler. When fully ripened they may be cut back in order to furnish material for cuttings. Keep the old stools a little warmer and they will gradually start into new growth again. These plants make choice decorative plants in pans or even in wire baskets and can be used for choice table or mantel decorations. (H. A. Siebrecht.)

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KEY TO THE SPECIES.

A. *Foliage not variegated*..... 1. **speciosa**
AA. *Foliage variegated.*
B. *Calyx with rather long and sparse glandular hairs.*
C. *Margins of lvs. ciliate*..... 2. **maculata**
CC. *Margins of lvs. not ciliate*..... 3. **læta**
BB. *Calyx glabrous or rarely dotted-scurfy.*
C. *Number of nerves 7: margin of lvs. minutely serrate*..... 4. **picta**
CC. *Number of nerves 9 or 7: margin of lvs. sharply and prominently serrate.*
D. *Color of nerves dark purple: lvs. covered with short, dark purple hairs*..... 5. **orientalis**
DD. *Color of nerves green: lvs. glandular-pubescent, the pubescence not purplish.*
E. *Lvs. with a dark green ground, and pearl-like spots of regular size and arrangement*... 6. **margaritacea**
EE. *Lvs. with a dark green ground, and irregular light-colored blotches between the veins*..... 7. **Hendersonii**
EEE. *Lvs. silvery, only the nerves dark green*..... 8. **argentea**

1. speciòsa, Zenker. This is practically the only species cult. for its fls.: height 1 ft.: lvs. opposite, cordate-ovate, green above, sometimes crimson beneath, mostly 7–9-nerved: fls. purple or rose, 4–14 in a cluster, 1 in. across. India. B.M. 4978 (as *S. elegans*); 5026. F.S. 23:2442.

2. maculàta, Roxbg. This differs from the other species here described in having lvs. of unequal sizes. The larger one of each pair may be 3–5 in. long; the smaller a half or third as long: lvs. ovate or oblong, unequal at the base, minutely denticulate, 9–11-nerved: fls. violet. India. R.H. 1865, p. 91, is too poor to determine.—Probably not in cult.

3. læta, Stapf. Erect herb, 6 in. high: st. terete, glandular-puberulent: lvs. petioled, ovate or elliptic-ovate, symmetrical or a little asymmetrical, not ciliate-margined, the larger lvs. up to 4 x 2 in., green but white-spotted above, purple and green-spotted beneath: cyme terminal, contracted, 7-fld.; calyx oblong-cylindrical, purple; petals oblong, subacuminate. China.—Closely related to *S. maculata.*

4. pícta, Korth. Erect or ascending, with scurfy or puberulous branches: lvs. short-petioled, broadly lanceolate, wedge-shaped at the base, minutely serrate, 7-nerved, lined with white along the primary nerves: fls. rosy. Sumatra.—*S. picta* of the trade is probably *S. orientalis* var. *picta.*

5. orientàlis, Lind. The botanical status of this name is doubtful. In horticulture it applies to a group of varieties sent out by Wm. Bull in 1891, and remarkable for two novel features: some of the varieties have dark purple or bronzy colors; others are peppered all over with an infinite number of small, light-colored dots. All have dark purple nerves. G.W. 6, p. 327. In I.H. 37:113 the lvs. are shown as ovate, acuminate, more or less cordate and unequal at the base, with 9 or 10 nerves, entire: color of fls. not recorded. Habitat not stated. The typical form is said to have bronzy lvs. with an amaranth reverse. Var. **guttulàta,** Hort., has green lvs. peppered with small white dots and is pale green below. Var. **punctàta,** Hort., is much like the preceding variety but has paler lvs. Var. **pícta,** Hort., has purplish lvs. of the type, with an irregular lanceolate strip of silvery gray down the middle. Var. Robert Sallier, R.B. 20:61, has dark green lvs. peppered white and with a lanceolate figure of silver down the middle. Said to be a hybrid of vars. *picta* and *punctata.* It has the stripe of one and the dots of the other.

6. margaritàcea, Lindl. This is the most important species. The name "margaritacea" means "pearly," referring to the regular rows of pearly spots between the nerves and parallel with them, which are characteristic of the typical form. Lvs. ovate-lanceolate, acutely serrate, 7–9-nerved, glabrous, purplish below, acute at the base: fls. rosy. B.M. 5104. F.S. 11:1126 (nerves too parallel). I.H. 2:40. G.W. 6, p. 326. H.F. II. 4:72. Lowe 16.—Supposed to be native of Java. In Vol. II, edition 1, page 684, *Gravesia guttata* var. *margaritacea* is erroneously referred to Sonerila instead of Salpinga. *Salpinga margaritacea* is readily told from *Sonerila margaritacea* by its 5-nerved lvs. and floral parts in 5's.

7. Héndersonii, Hort. (*S. margaritàcea* var. *Héndersonii*, Hort.). This is referred by Cogniaux to *S. margaritacea*, of which it is perhaps merely a horticultural variety. For trade purposes it is convenient to treat it like a distinct species. It seems to be the chief parent in the development of the numerous hybrids with blotched foliage. It differs from the type in having a broader lf. with a shorter acumen and rounded base, and especially in being covered with irregular blotches, which, however, do not cross the nerves. F.M. 1875: 159. I.H. 23:230. G.W. 2, p. 285. G.Z. 19:161.—The blotches are all about the same size. **S. Màmei,** Lind., has more regular and roundish blotches, which are nearer white and on a darker ground, the under side netted with rosy purple. I.H. 23:254.

8. argéntea, Hort. (*S. Héndersonii* var. *argéntea*, Fournier). For horticultural purposes this may be treated as a distinct species, characterized by its silvery foliage, resembling that of certain begonias, with no dark green except on the nerves. This is the parent of most of the forms that have a silvery cast of foliage, just as *S. Hendersonii* is responsible for the irregular blotches. G.W. 6, p. 325.

A very handsome hybrid between the orientalis and margaritacea groups is called Mme. Paul du Toict. It has the serrate lf. and some of the silveriness of S. argentea, with the numberless minute dots of the S. orientalis group. It is much like Robert Sallier, but the central coloring is bronzy as well as silvery and more broken up by the green.

S. marmorâta and *S. picturâta* of the trade are not accounted for botanically.

WILHELM MILLER.
F. TRACY HUBBARD.†

SÓPHORA (*Sophera*, Arabian name of a tree with pea-shaped flowers). Including *Styphnolòbium* and *Edwárdsia*. *Leguminòsæ*. Ornamental woody or rarely herbaceous plants grown chiefly for their attractive flowers and handsome foliage.

Deciduous or evergreen useful ornamental plants: lvs. alternate, odd-pinnate with opposite usually small entire lfts.: fls. pea-like, in racemes or terminal leafy panicles; calyx with 5 short teeth; standard orbicular or broadly obovate; stamens 10, free or connate only at the base: pod stalked, almost terete or 4-winged, rarely compressed, few- to many-seeded, moniliform, indehiscent or tardily dehiscent.—About 25 species in the temperate and subtropical regions of both hemispheres. The fls. and frs. of *S. japonica* yield a yellow dye, *S. tomentosa* has medicinal properties, and the seeds of *S. secundiflora* contain sophorine, a poisonous alkaloid. *S. tetraptera* is a valuable timber tree in its native country.

The sophoras are handsome trees, rarely shrubs or herbs with graceful foliage, evergreen in some species, and with papilionaceous whitish, violet or pink, or yellow flowers in terminal panicles or in racemes, followed by long and narrow moniliform pods. *Sophora japonica* and the shrubby *S. viciifolia* are hardy as far north as Massachusetts, while *S. affinis* is less hardy. The evergreen species are tender and can be grown only in the southern states and California; they are very showy in spring when they are in bloom; in England they are often planted against a wall, where they can be easily protected against light frost. *S. japonica* is especially valuable for its late-appearing flowers, which are white and disposed in ample panicles; the foliage is dark green and graceful and the tree is conspicuous in winter on account of its dark green branches. It is sometimes planted as a street tree, as it stands heat and drought well. The sophoras thrive best in well-drained sandy loam but grow fairly well in rather dry soil. Propagation is by seeds and the varieties by grafting on the typical form; some species are also increased by greenwood cuttings and by layers.

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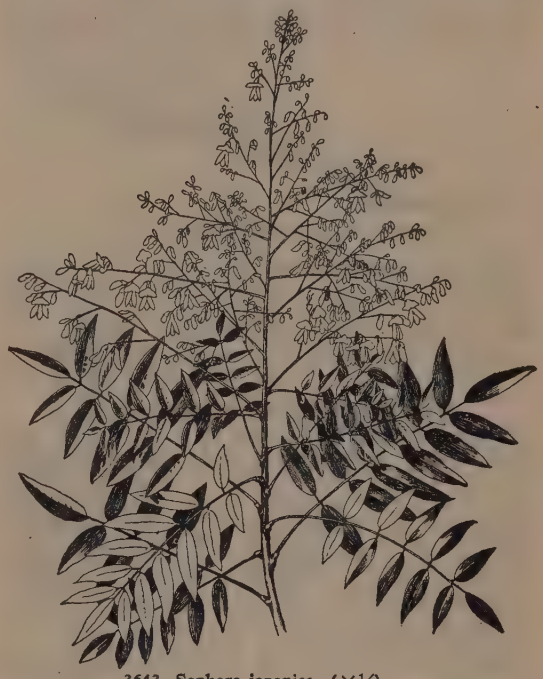
3642. Sophora viciifolia. (×⅜)

A. *Fls. white, violet, or pink.*

B. *Lfts. ½in. long, or less: spinescent shrub.*

1. viciifòlia, Hance (*S. Davidii*, Komarov. *S. Moorcroftiàna* var. *Dàvidii*, Franch.). Fig. 3642. Spinescent shrub, to 6 ft., with slender spreading pubescent branchlets: lvs. 1–1½ in. long, short-petioled; lfts. 11–15, sessile, elliptic, obtuse, and mucronulate, pubescent beneath, ¼–½in. long: fls. bluish violet or nearly white, about ½in. long, in short, 6–12-fld. racemes terminal on short branchlets; calyx shortly 5-toothed,



3643. Sophora japonica. (×¼)

violet; petals of nearly equal length; standard spatulate-obovate, reflexed: pod about 2 in. long, slender, long-beaked, glabrous. June, July. Cent. and W. China. B.M. 7883. A.F. 29:155. G.C. III. 36:3. Gn. 68, p. 87; 78, p. 469. Gng. 16:3. G.W. 11, p. 139.—Graceful shrub; has proved quite hardy at the Arnold Arboretum.

BB. *Lfts. larger: unarmed trees.*

C. *Fls. in large terminal panicles.*

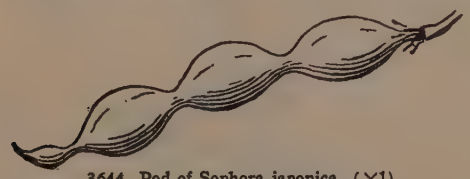
2. japónica, Linn. (*Styphnolòbium japónicum*, Schott). JAPAN PAGODA TREE. Figs. 3643, 3644. Tree, attaining 60 ft., with spreading branches, forming a dense round head: lvs. 7–9 in. long; lfts. 7–17, distinctly stalked, ovate to ovate-lanceolate, acute, rounded at base, dark green and glossy above, more or less pubescent beneath, 1–2 in. long: fls. yellowish white, ½in. long, in loose panicles 15 in. long: pod distinctly stalked, glabrous, terete, 2–3 in. long, ⅓in. broad. July–Sept. China; cult. in Japan. Gn. 24, pp. 210, 211, 214; 29, p. 222; 73, p. 43. G.M. 38:665. Gng. 6, p. 247. M.D.G. 1898:183. F.E. 12:1174. G.W. 8, p. 615; 12, p. 200; 13, p. 243. Var. **péndula,** Loud. Figs. 3645, 3646. With long and slender pendulous branches. R.H. 1876:194, 195 (adapted in Figs. 3645, 3646). Gn. 9. pp. 600, 601; 24, pp. 202, 203, 211; 28, p. 27. M.D.G. 1898:182 G. 6:257. Gn.M. 2:106. G.C. III. 28:479. F.E. 14: 1430, pl. 43. Var. **columnàris,** Schwerin. Of narrow pyramidal habit. Var. **violàcea,** Carr. (*S. violàcea*, Dipp., not Thwaites). Lfts. 15–17, sparingly pubescent above, densely so beneath, acute: fls. with pinkish lilac wings and keel, standard white.—The plants cult. as *S. tomentòsa*, *S. sinénsis*, and *S. Korolkòwii* also belong to this species. The first, which is not to be confused with *S. tomentosa*, Linn. (see suppl. list), has 15–19, smaller and broader, elliptic lfts. densely pubescent beneath, less so above; the second has pale pink fls. and 11–17

ovate to ovate-oblong lfts. soft-pubescent beneath; the third has larger oblong-lanceolate lfts. broadly cuneate at the base and slightly pubescent beneath. There is also a form with variegated lvs.

CC. *Fls. in racemes.*

D. *Foliage deciduous: racemes axillary.*

3. affinis, Torr. & Gray. Small round-headed tree, with slender branches, to 20 ft.: lfts. 13–19, elliptic,



3644. Pod of Sophora japonica. (×1)

obtusish or emarginate, broadly cuneate at the base, glabrous or with scattered hairs below, conspicuously veined, 1–1½ in. long: fls. ½in. long, white tinged with rose, with the lvs. in axillary nodding racemes 3–5 in. long: pod terete, moniliform, more or less pubescent, ½–3 in. long, black. Spring. Ark., Texas. S.S. 3:122.

DD. *Foliage evergreen: racemes terminal.*

4. secundiflòra, Lag. Small tree, 35 ft. high, with short, slender trunk and upright branches forming a narrow head or shrubby: lvs. 4–6 in. long; lfts. 7–9, elliptic or obovate-oblong to oblong, rounded or emarginate at the apex, cuneate at the base, silky-pubescent while young, dark yellowish green above, 1–2½ in. long: fls. violet-blue, the standard marked near the base with a few dark spots, very fragrant, about 1 in. long, in 1-sided racemes 2–3 in. long: pod white-tomentose, terete, 1–7 in. long, ½–¾in. thick; seed bright scarlet. Spring. Texas to New Mex. S.S. 3:121. R.H. 1854:201.—On account of its handsome fragrant fls., to be recommended for planting South.

AA. *Fls. yellow, in axillary racemes: lvs. evergreen. (Edwardsia.)*

B. *Pod 4-winged: fls. about 1½ in. long.*

5. tetráptera, Ait. (*Edwárdsia tetráptera,* Poir.). Shrub or small tree, 30, rarely 40 ft. high, with slender spreading branches: lfts. very numerous, almost sessile,

3645. Sophora japonica var. pendula, in winter.

obovate to linear-oblong, silky-pubescent: fls. in 2–8-fld. racemes, pendulous, about 1½ in. long: pod 4-winged, 7 in. long. Spring. New Zeal., Lord Howe Isl., Juan Fernandez, Chile. G. 29:185.—The following varieties are in cult.: Var. **grandiflòra,** Hook. f. (*Edwárdsia grandiflòra,* Salisb.). Lfts. linear-oblong, obtuse, appressed silky-pubescent on both sides, about 1 in. long, in 10–25 pairs: fls. 1⅔ in. long; standard shorter than wings. B.M. 167. G.C. II. 9:729. Gn. 24, p. 211; 76, p. 292. L.B.C. 12:1162. G. 5:593; 10:445. Var. **microphýlla,** Hook. f. (*S. microphýlla,* Ait. *Edwárdsia Macnabiàna,* Curt.). Lfts. orbicular-obovate to broadly oblong, usually emarginate, glabrous or nearly so above, sparingly pubescent beneath, sometimes only on the midrib, ¼–½in. long: fls. about 1½ in. long; standard about as long as wings. B.M. 1442; 3735. G. 34:503, 505. Gn. 24, p. 211. Gn. 12:87 also seems to belong here.

6. chrysophýlla, Seem. (*Edwárdsia chrysophýlla,* Salisb.). Tree, to 30 ft.: lfts. 13–21, obovate-oblong or oblong, obtuse, tawny or grayish pubescent beneath, less so above, rarely glabrescent, ½–1 in. long: fls. pale yellow, about 1 in. long; standard slightly shorter than wings: pod 4-winged, 4–6 in. long. Hawaiian Isls. B.R. 738.

3646. Sophora japonica var. pendula, in summer.

BB. *Pod not winged: fls. ¾–1 in. long.*

7. macrocárpa, Smith (*Edwárdsia chilénsis,* Miers). Shrub or small tree, with the young branchlets densely tomentose: lfts. in 10–20 pairs, elliptic or obovate obtuse, silky-pubescent beneath, ¾–1 in. long: fls. ¾–1 in. long, in short racemes; standard as long as wings: pod terete, not winged, 1–4-seeded. Chile. L.B.C. 12:1125. B.R. 2798.

S. alopecuroìdes, Linn. Grayish-pubescent undershrub, with upright, virgate branches: lvs. 6 in. long, with 15–25 oblong lfts.: fls. yellow: racemes dense, terminal, about 6 in. long: pod terete, 6–12-seeded. W. Asia to Himalayas. Half-hardy.—*S. austràlis,* Linn.=Baptisia australis.—*S. platycárpa,* Maxim.=Cladrastis platycarpa.—*S. tomentòsa,* Linn. Pubescent shrub: lvs. 6–10 in. long; lfts. 15–19, oval to oblong, obtuse, 1–1¾ in. long: fls. yellow, in terminal 6–12-in. long racemes: pod 4–6 in. long. Southern states, W. India. B.M. 3390. Not hardy North.

ALFRED REHDER.

SOPHROCATLÆLIA (compounded from *Sophronitis, Cattleya,* and *Lælia*). *Orchidàceæ.* A name to designate the hybrids between the genera Sophronitis, Cattleya, and Lælia.

SOPHROCÁTTLEYA (compounded from *Sophronitis* and *Cattleya*). *Orchidàceæ.* A group established to contain hybrids between Sophronitis and Cattleya.

Sophrocáttleya Batemaniàna=S. grandiflora × C. intermedia. Gn.W. 4:809.—*S. Blàckii*=S. grandiflora × C. Hardyana.—*S. Chámberlainii triúmphans*=S. grandiflora × C. Harrisoniana.—*S. eximia*=S. grandiflora × C. Bowringiana. Gn. 72, p. 5.—*S. Heàthii*=S. grandiflora × C. Schroederæ.—*S. Impératrix*=S. grandiflora × C. Mossiæ.—*S. Marriottiàna*=S. grandiflora × C.

aurea.—*S. Nýdia*=S. grandiflora × C. columnata.—*S. Sáxa*=S. grandiflora × C. Trianæ.—*S. schoenbrunnénsis*=S. cernua × C. Bowringiana.—*S. Thwàitesii*=S. grandiflora × C. Mendelii. J.H. III. 58:295.—*S. warnhaménsis*=S. grandiflora × C. amethystoglossa. G.M. 49:547.—*S. Wéllesleyæ*=S. grandiflora × C. labiata. G.M. 57:207.—*S. westfieldénsis*=Sc. eximia × C. labiata.

GEORGE V. NASH.

SOPHROLÆLIA (compounded from *Sophronitis* and *Lælia*). *Orchidàceæ*. A group-name to comprise hybrids between Sophronitis and Lælia. *S. Gratrixiæ*=L. tenebrosa × S. grandiflora. G.M. 50:683.—*S. heatonénsis*=L. purpurata × S. grandiflora. G.M. 45:698.—*S. Marriottiàna*=following.—*S. Marrióttii*=L. flava × S. grandiflora. G.C. III. 27:66.—*S. Órpetii*=L. pumila × S. grandiflora.—*S. Ortoniàna*=L. Diana × S. grandiflora.

GEORGE V. NASH.

SOPHRONÌTIS (Greek, *modest*). *Orchidàceæ*. Dwarf epiphytic orchids, cultivated on account of their neat habit and brilliantly colored flowers.

Pseudobulbs small, with 1 or rarely 2 small flat lvs.: fls. from the top of the pseudobulbs, brightly colored; sepals and petals nearly equal, spreading; labellum with a broad middle lobe and small erect side lobes, the base leading into a cavity in the wall of the ovary; column short, the stigmatic surface covering 2 wing-like projections at its summit; pollinia 8.—About 6 species, closely related to Lælia, Cattleya, and the like; Brazil.

These plants, and also sophrocattleyas and sophrolælias, thrive in the temperature of the cattleya house. In growing season, give a moderate supply of water and plenty of fresh air. Rest them at 50° to 55°, and water sufficiently to keep them from shriveling. Grow them in shallow pots with plenty of drainage, and a thin layer of fine turfy fern-root, using no sphagnum. (Wm. Mathews.)

grandiflòra, Lindl. (*S. coccínea*, Reichb. f.). Pseudobulbs clustered: lvs. about 2 in. long, elliptic: fls. solitary, on short peduncles, 1½–4 in. across, brilliant scarlet, often with a shade of orange, with an orange labellum; sepals oblong-lanceolate; petals broadly elliptic; labellum narrow, with folded sides. Flowers during the whole winter. Organ Mts. B.M. 3709. F.S. 1:22; 17:1716. P.M. 9:193. Gn. 25:474 (var. *rosea*); 31, p. 358; 48:82. I.H. 34:32. J.H. III. 34:319; 62:13. G.C. II. 22:561; III. 9:669; 17:492; 21:266; 43: 281. G.M. 56:99. R.H. 1886:492 (var. *aurantiaca*). A.F. 6:609.

cérnua, Lindl. Very small plants with a creeping rhizome bearing 1-lvd. pseudobulbs: lvs. ovate, thick and leathery, a little over an inch long: fls. 4–8, on a st. from the axils of the lvs., bright scarlet or reddish orange, with an orange lip; sepals and petals ovate; labellum ovate-acuminate, shorter, concave. Winter. Rio Janeiro. B.M. 3677. B.R. 1129.

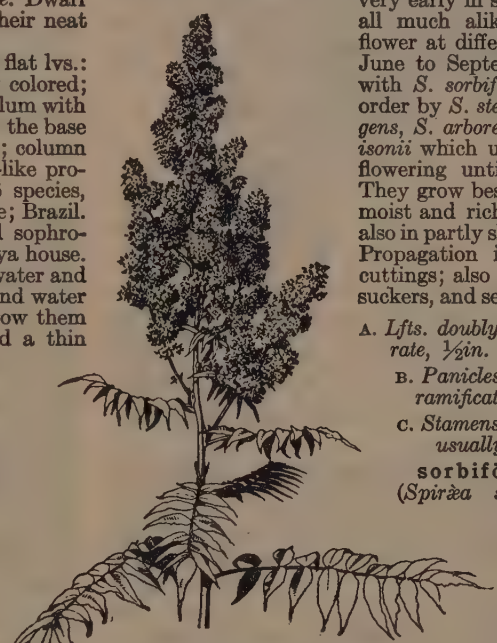
violàcea, Lindl. One of the smallest of cult. orchids: pseudobulbs ovoid, 1 in. long: lvs. linear, 2–3 in. long: fls. bright rose, about 1 in. diam.; sepals and petals oblong-lanceolate, acute; labellum rhombic-obovate, flat. Winter. Organ Mts., Brazil. B.M. 6880.

HEINRICH HASSELBRING.

SORBÀRIA (derived from Sorbus: the leaves resemble those of the mountain-ash). Syn., *Basilìma*. *Rosàceæ*. Ornamental woody plants chiefly grown for their large panicles of white flowers and the handsome pinnate foliage.

Deciduous shrubs: lvs. alternate, odd-pinnate, with serrate lfts., stipulate: fls. in terminal panicles; sepals and petals 5; stamens 20–50: carpels 5, opposite to the calyx-lobes, partly connate, dehiscent at the ventral suture, with several seeds.—Eight species in E. Asia. Formerly usually united with Spiræa but easily distinguished by the stipulate, pinnate lvs. and the 5 carpels being opposite to the sepals.

The sorbarias are very handsome upright shrubs with rather large bright green pinnate leaves and small white flowers in large and showy panicles appearing in summer and followed by small capsular fruits; the panicles, however, after the flowers have faded and dried up, become rather unsightly and should be removed. *S. sorbifolia* is hardy North and *S. stellipila, S. assurgens*, and *S. arborea* have proved hardy at least as far north as Massachusetts, while *S. Aitchisonii* is somewhat tenderer and *S. Lindleyana* still more so. They are well adapted for borders of shrubberies and woods or for planting on banks of brooks or rivers, but should not be brought together with slow-growing and delicate shrubs, as they spread in suitable soil rather rapidly by means of suckers and are likely to overcrowd other plants. The handsome bright green foliage appears very early in spring. They are all much alike in habit, but flower at different times from June to September, beginning with *S. sorbifolia*, followed in order by *S. stellipila, S. assurgens, S. arborea*, and *S. Aitchisonii* which usually continues flowering until September. They grow best in a somewhat moist and rich soil and thrive also in partly shaded situations. Propagation is by hardwood cuttings; also by root-cuttings, suckers, and seeds, like spirea.



3647. Sorbaria sorbifolia.—Often known as Spiræa sorbifolia. (×⅛)

A. *Lfts. doubly and sharply serrate, ½in. or more wide.*

B. *Panicles with upright ramifications, dense.*

C. *Stamens 40–50: lfts. with usually 20 pairs of veins.*

sorbifòlia, A. Braun (*Spiræa sorbifòlia*, Linn. *Basilìma sorbifòlia*, Raf.). Fig. 3647. Upright shrub, 3–5 ft. high, much spreading by suckers: lfts. 13–23, lanceolate or ovate-lanceolate, long-acuminate, doubly serrate, stellate-pubescent beneath when young or glabrous, 3–4 in. long: panicles 5–10 in. long; fls. ⅓in. across: carpels and frs. glabrous. June, July. N. Asia, from Ural to Japan. A.G. 11:125. Gn. 16, p. 217. F.E. 30:777.—Sometimes escaped from cult.

stellípila, Schneid. (*S. sorbifòlia* var. *stellípila*, Maxim.) Shrub, to 5 ft.: branchlets pubescent: lfts. 11–19, oblong-lanceolate to lanceolate, long-acuminate, stellate-pubescent beneath, 2–3½ in. long: infl. puberulous, 8–10 in. long; calyx pubescent: carpels and frs. pubescent. July. N. E. Asia, Japan. G.W. 15, p. 651.

CC. *Stamens about 20: lfts. with 25 or more pairs of veins.*

assúrgens, Rehd. Shrub, to 8 ft., with upright or ascending sts.: lfts. 13–17, oblong-lanceolate to narrow-lanceolate, long-acuminate, cuneate at the base, often falcate, pubescent on the veins beneath, 2–3½ in. long: panicle 6–12 in. long, puberulous; stamens longer than petals: carpels and frs. glabrous. July. China. V.F. 75.

BB. *Panicles with spreading ramifications, open.*

Lindleyàna, Maxim. (*Spiræa Lindleyàna*, Wall. *Basilìma Lindleyàna*, Kuntze). Four to 8 ft. high: lfts.

15–21, lanceolate, long-acuminate, rounded or nearly so at the base, doubly serrate, with simple hairs beneath when young, 3–4 in. long: panicles 8–12 in. long and about 8 in. broad; fls. ¼in. across; stamens as long as petals or shorter. July, Aug. Himalayas, China. F.S. 2:108. B.R. 31:33. Gn. 47, p. 222; 49, p. 229; 55, p. 116; 77, p. 487; 78, p. 126. G.C. III. 43:415. G. 33:507.

arbòrea, Schneid. (*Spirǽa arbòrea,* Bean). Shrub, to 20 ft.: lfts. 13–15, ovate-oblong to lanceolate, long-acuminate, usually broadly cuneate at the base, stellate-pubescent or nearly glabrous beneath, 1½–3½ in. long: panicles 8–12 in. long, 6–8 in. wide: fls. ¼–⅓in. across; stamens much longer than petals. July, Aug. Cent. China. Gn. 77, p. 424. G.M. 61:603. G. 35:697. Var. **glabràta,** Rehd. Lfts. usually lanceolate or narrow-lanceolate, quite glabrous beneath: branchlets and petioles often purple, glabrous: stamens 2–3 times as long as petals. Cent. and W. China. This is the handsomest variety and resembles somewhat *S. Aitchisonii.* Var. **subtomentòsa,** Rehd. Lfts. usually elliptic to oblong-lanceolate, densely stellate-pubescent or tomentose beneath, with close-set veins: branchlets and petioles pubescent.

AA. *Lfts. simply or indistinctly doubly serrate, ½in. or less wide.*

Àitchisonii, Hemsl. (*Spirǽa angustifòlia,* Zabel. *S. Àitchisonii,* Hemsl. *S. sorbifòlia* var. *angustifòlia,* Wenzig). Shrub, 6–8 ft. high, with upright or ascending, little-branched, glabrous sts. usually bright red when young: lfts. 15–21, lanceolate to linear-lanceolate, acuminate, narrowed at the base, simply or obscurely doubly serrate, glabrous, 2–4 in. long: panicles to 12 in. long and to 6 in. broad, with spreading ramifications, leafy at the base; fls. ⅓in. or more across. July–Sept. Afghanistan, Kashmir. G.C. III. 28:255; 38:114; 43:397. G. 27:441; 31:455; 34:639. G.M. 49:42. Gn.M. 9:75. Gn. 68, p. 143; 77, p. 560. M.D.G. 1901:18.—A very desirable shrub with handsome graceful foliage.

S. grandiflòra, Maxim. (Spirǽa grandiflora, Sweet. Spirǽa sorbifolia alpina, Pallas). Allied to S. sorbifolia. One to 3 ft. high: lvs. glabrous: panicles 3–5 in. long; fls. ½in. across. S. Siberia. Gt. 9:295. —*S. Kirilòwii,* Maxim. (Spirǽa Kirilowii, Regel). Allied to S. sorbifolia. Shrub, 5–10 ft.: lfts. 12–19, glabrous: panicle broadly pyramidal; stamens as long as corolla: fr. with the style much below the apex. N. China.—*S. Millefòlium,* Focke=Chamæbatiaria Millefolium.

ALFRED REHDER.

SÓRBUS (ancient Latin name of *S. domestica*). Including *Aria, Córmus, Micromèles,* and *Torminària. Rosàceæ.* Ornamental woody plants grown for their handsome foliage, attractive white flowers and ornamental usually red fruit.

Deciduous trees or shrubs: lvs. alternate, stipulate, simple and serrate or odd-pinnate, folded or rarely convolute in the bud: fls. in compound corymbs; sepals and petals 5; stamens 15–20, with red or yellow anthers; carpels 2–5, either partly free above and half superior or wholly connate and quite inferior; styles free or connate at the base: fr. a 2–5-loculed pome, usually rather small; the cells with cartilaginous or leathery walls, each with 1 or 2 seeds. Closely allied and often referred to Pyrus, from which it is chiefly distinguished by its compound infl. and by the fls. being in most species more or less perigynous; the frs. are usually smaller and berry-like.—About 80 species distributed throughout the northern hemisphere, in N. Amer., south to N. C. and New Mex., in Asia south to the Himalayas. The frs. of some species, as *S. domestica, S. torminalis, S. Aucuparia* var. *dulcis* and var. *rossica* are edible and are made into preserves in Europe; the strong and close-grained wood of *S. torminalis* and *S. domestica* is used for handles of tools and for similar small articles.

The sorbuses are handsome trees or shrubs with graceful pinnate or with simple foliage sometimes silvery white beneath, and with showy clusters of small white rarely pinkish flowers in spring, followed by red or rarely whitish or brown fruits usually berry-like, rarely larger and apple- or pear-shaped. Most of the pinnate-leaved kinds are hardy North except some Asiatic species and *S. domestica,* which seem tender north of Massachusetts; they are chiefly inhabitants of mountainous regions, and the northern species, as *S. americana* and *S. decora,* do not thrive well in warmer and drier climates, while the simple-leaved species, as *S. alnifolia, S. intermedia, S. Aria,* and *S. torminalis,* endure drought and heat well and have proved hardy at least as far north as Massachusetts. The trees are often attacked by borers. Propagation is by seeds sown in fall or stratified, also by layers. Varieties and rarer kinds are usually budded or grafted on allied species, but most kinds will grow on *S. Aucuparia* or *S. americana* and on hawthorn. They all have handsome foliage, which usually turns orange-red in fall; their fruits are showy and often remain on the branches the whole winter if not eaten by birds. They are not particular as to the soil and are well suited for planting on rocky hillsides. Those of the Aucuparia group are more adapted for cool and moist mountain regions; those of the Aria and Torminaria group, which grow especially well on limestone soil, are suited to warmer and drier climates. *S. hybrida* is sometimes used as a small-sized avenue tree on account of its regular pyramidal habit.

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KEY TO THE SPECIES.

A. *Foliage pinnate.*
B. *Lvs. regularly pinnate, with the lfts. of almost equal size.*
C. *Frs. small, ¼–½in. across, or slightly larger, berry-like.*
D. *Lfts. 9–17, ¾–4 in. long.*
E. *Winter buds glutinous, glabrous or sparingly appressed, rusty-pubescent.*
F. *Fls. ½–¼ in.: lfts. long-acuminate: fr. ⅛–¼ in. across* ..... **1. americana**
FF. *Fls. ¼–⅓in. across: lfts. acute or obtusish: fr. about ⅓in. across* ..... **2. decora**
EE. *Winter buds covered with white villous tomentum.*
F. *Young branchlets and lvs. pubescent* ..... **3. Aucuparia**
FF. *Young branchlets and lvs. glabrous* ..... **4. tianschanica**
DD. *Lfts. 19–29, ½–¾in. long* ..... **5. Vilmorinii**
CC. *Frs. ½in. or more across, apple- or pear-shaped, with grit-cells: styles 5* ..... **6. domestica**
BB. *Lvs. only pinnate toward the base, lobed or only serrate in the upper part, varying much on the same plant and occasionally only lobed. Hybrids.*

cc. *Habit tree-like* ..... 7. **hybrida**
cc. *Habit shrub-like* ..... 8. **spuria**
aa. *Foliage simple.*
b. *Fr. with persistent calyx.*
c. *Under side of lvs. glabrous at length, green: lvs. lobed: ovary inferior: fr. brown, with grit-cells* ..... 9. **torminalis**
cc. *Under side of lvs. grayish or whitish tomentose: ovary half-superior.*
d. *Lvs. lobed or sharply serrate.*
e. *Shape of lvs. ovate to oblong, usually acute.*
f. *Margin of lvs. lobed.*
g. *Base of the usually broadly ovate lvs. mostly rounded* ..... 10. **latifolia**
gg. *Base of the ovate to oblong-ovate lvs. broadly cuneate* ..... 11. **intermedia**
ff. *Margin of lvs. sharply and doubly serrate* ..... 12. **Aria**
ee. *Shape of lvs. suborbicular to broadly obovate* ..... 13. **umbellata**
dd. *Lvs. serrulate, grayish-tomentose or sometimes glabrescent beneath* ..... 14. **alpina**
bb. *Fr. with deciduous calyx leaving a circular scar: ovary quite inferior.*
c. *Under side of lvs. glabrous or slightly pubescent.*
d. *Styles usually 2: lvs. ovate to elliptic-ovate* ..... 15. **alnifolia**
dd. *Styles usually 5: lvs. elliptic-oblong to obovate-oblong* ..... 16. **caloneura**
cc. *Under side of lvs. white-tomentose* 17. **Folgneri**

Group 1. AUCUPARIA.

1. americàna, Marsh. (*Pyrus americàna*, DC. *S. micrántha*, Dum.-Cours.). AMERICAN MOUNTAIN-ASH. DOGBERRY. Fig. 3648. Small tree, attaining 30 ft., with spreading branches, or sometimes shrubby: lfts. 11–17, lanceolate, long-acuminate, sharply serrate, glabrous or slightly pubescent when young, light green above, paler beneath, 1½–4 in. long: fls. ⅓–¼in. across, in dense, 3–6-in.-broad, usually glabrous corymbs: fr. globose, bright red, ⅛–¼in. across, with the calyx-lobes very small and connivent. May, June. Newfoundland to Man., south to Mich. and N. C. S.S. 4:171, 172. F.E. 23:209; 32:721. Var. **microcárpa,** Torr. & Gray (*S. microcárpa*, Pursh), has narrower foliage and very small frs. about ⅛in. across.

3648. Sorbus americana. (×½)

2. decòra, Schneid. (*S. americàna* var. *decòra*, Sarg. *Pyrus sambucifòlia*, Gray, not Cham. & Schlecht. *Pyrus sitchénsis*, Rob. & Fern., not Piper. *S. scopùlina*, Brit., not Greene). Small tree or shrub, closely allied to the preceding: lfts. 7–15, oval to ovate-lanceolate, or oblong, obtuse to short-acuminate, serrate, glabrous and

3649. Sorbus Aucuparia. (×½)

dark green above, rather pale and usually pubescent beneath when young, or glabrous, 1½–3 in. long: fls. ¼–⅓in. across, in 2–4-in.-broad and rather loose corymbs, sometimes few-fld.: fr. globose, ovoid when young, red, about ⅓in. across, with more or less upright calyx-lobes. May. Labrador to Minn., south to N. Y. and Vt. S.S. 4:173, 174.—Often confounded with the preceding species; intermediate forms are not uncommon in regions where the two meet. Both are very handsome in autumn with their large clusters of bright red fr. and particularly *S. decora* is often planted for its showy fr.

3. Aucupària, Linn. (*Pyrus Aucupària*, Gaertn.). EUROPEAN MOUNTAIN-ASH. ROWAN TREE. Fig. 3649. Round-headed tree, 20–40, occasionally 60 ft. high: young branchlets pubescent, grayish brown when older: petioles more or less tomentose; lfts. 9–15, oblong to oblong-lanceolate, serrate, entire toward the base, dull green above, pubescent beneath or rarely glabrous, ¾–2 in. long: fls. white, ⅓in. across, in flat, 4–6-in.-broad, tomentose or sometimes almost glabrous corymbs; stamens about as long as petals: fr. globose, about ⅓in. across, bright red. May, June. Eu. to W. Asia and Siberia. H.W. 3:54, pp. 78, 79. Var. **dúlcis,** Kraetzl (var. *moràvica*, Zengerling). Almost glabrous: petioles purplish; lfts. oblong-lanceolate, 2–3 in. long, glaucescent beneath, usually serrate only above the middle. The frs. are of an agreeable acid flavor and recommended for preserves. The tree thrives well in cold northern climates where hardly any other fr.-tree will grow. G.M. 52:887. Var. **róssica,** Spaeth, is similar and also bears edible fr., but the lfts. are larger and broader and more serrate. Var. **Beissneri,** Rehd. (var. *dúlcis laciniàta*, Beissn., not var. *laciniàta*, Hartm.), is a handsome and graceful form of var. *dulcis* with the lfts. pinnately lobed and the lf.-stalks and young branchlets bright red. G.W. 3:267. Var. **fastigiàta,** Loud., forms a narrow pyramidal tree, with upright branches. Var. **péndula,** Hort., has long and slender pendulous branches. M.D. 1911, p. 246. Var. **integérrima,** Lange. Lfts. entire or nearly so. Var. **Fifeàna,** Dipp. (var. *fructulùteo*, Hort.). Fr. yellow. There are also varieties with

variegated foliage.—This species is often planted as a street tree in mountain regions of Eu.

4. **tianschánica,** Rupr. (*Pỳrus thianschánica,* Regel). Small tree or shrub, similar to the preceding: young branchlets glabrous, red-brown and glossy when older: petioles and lvs. glabrous; lfts. 11–15, lanceolate, acuminate, serrate, entire toward the base, dark green and glossy above, light green beneath, about 2 in. long: corymbs glabrous; stamens half as long as petals; styles 2–5: fr. globose, bright red. May, June. Cent. Asia. Gt. 40, p. 8. B. M. 7755.—Very handsome on account of the contrast of its dark green foliage and red-brown branches.

3650. Sorbus domestica. (×⅓)

5. **Vilmorínii,** Schneid. (*Córmus foliolòsa,* Franch.). Shrub or small tree, to 20 ft.: lvs. slender; rachis slightly winged; lfts. 19–29, opposite or nearly so, oblong-elliptic, serrate above the middle, glabrous, ½–¾in. long: infl. loose, 1–3 in. wide, rusty-pubescent; fls. ¼in. across; stamens about 20; styles 3, nearly glabrous: fr. globose, red, ⅓in. across. June; fr. in Sept. W. China. B.M. 8241.—A very graceful shrub.

Group 2. Cormus.

6. **doméstica,** Linn. (*Pỳrus Sórbus,* Gaertn. *P. doméstica,* Smith. *Córmus doméstica,* Spach). Service Tree. Fig. 3650. Round-headed tree, 30–60 ft. high: winter buds glutinous: petioles tomentose; lfts. 11–17, obovate-oblong to oblong, sharply and rather coarsely serrate, with acuminate teeth, usually entire near the base, green and glabrous above, floccose-tomentose beneath, at least when young, 1–2½ in. long: fls. white, ½in. across, in broadly pyramidal rather loose, tomentose corymbs: fr. ½–1¼ in. across, usually yellowish, with red or orange cheek, apple-shaped in var. **malifórmis,** Lodd., pear-shaped in var. **pyrifórmis,** Lodd. May. S. Eu., N. Afr., and W. Asia. G.C. II. 1:283; 6:649. M.D.G. 1897:376–8. H.W. 3, pp. 80, 81. G.W. 1, p. 158. —This species is often confounded with the European mountain-ash, from which it is almost indistinguishable without frs. or fls., except by the glutinous winter buds.

Hybrids of Group 1 with Group 4 or with Aronia.

7. **hýbrida,** Linn. (*Pỳrus pinnatífida,* Ehrh. *P. fénnica,* Babington. *S. intermèdia* × *S. Aucupària*). Tree, attaining 40 ft., of regular, pyramidal habit, with upright branches: young branchlets and petioles whitish tomentose: lvs. ovate to oblong-ovate, with 1–4 pairs of decurrent lfts. at the base, or but pinnately lobed, upper part lobed with the lobes becoming gradually shorter and more indistinct toward the apex, dark green above, whitish or grayish tomentose beneath, 2½–5 in. long; petioles about 1 in. long: fls. ⅓–½in. across, in tomentose corymbs about 3 in. broad: fr. globose-ovoid, ½in. high. May, June. H.W. 3, p. 86. S.I.F. 3:485.—A form of narrow pyramidal habit is var. **fastigiàta,** Hort. G.C. III. 42:185.—Natural hybrid, occasionally found with the parents in Eu. Two different hybrids are usually included under *S. hybrida;* the typical one is *S. Aucuparia* × *S. intermedia,* which has the lvs. oblong-ovate to oblong, 3–5 in. long, with 10–12 pairs of veins, the lfts. and lobes narrower and pointed and the veins often slightly recurved. It is mostly cult. under the name of *S. quercifòlia,* or *S. quercoìdes,* Hort. The second hybrid is var. **thuringìaca,** Rehd. (*Pỳrus thuringìaca,* Ilse. *S. thuringìaca,* Schneid.), and is a hybrid of *S. Aucuparia* × *S. Aria;* it has ovate to ovate-oblong lvs., somewhat less deeply lobed, 2½–4 in. long, with 8–10 pairs of veins, lfts. and lobes broader and obtusish, with the veins usually curving upward. This is known in gardens as *S. quercifòlia hýbrida nàna.* Var. **decúrrens,** Koehne (*S. decúrrens,* Hedl. *S. lanuginòsa,* Hort., not Kit.), is a transition to *S. Aucuparia;* only the 3 or 5 upper lfts. are connate into a terminal lft., which, like the upper separate lfts., is decurrent at the base, under side less densely tomentose. In some nurseries under the name of *S. sambucifolia.*

8. **spùria,** Pers. (*Pỳrus heterophýlla,* Dur. *S. Aucupària* × *Aròmia arbutifòlia*). Shrub or small tree, attaining 15 ft., with slender, sometimes pendulous branches: lvs. ovate to oblong-ovate, obtuse, with 2–6 lobes or lfts. near the base, simply crenate-serrate toward the apex, 1½–3½ in. long, pubescent beneath: fls. white or pinkish white, in pubescent or glabrous corymbs 1–1½ in. broad: fr. subglobose or pear-shaped, dark purple. May, June. Of garden origin. B.R. 1196. —Sometimes cult. under the name *S. quercifolia floribunda nana.* Hybrids of different origin are usually united under *S. spuria;* the more pubescent forms with dark purple fr. are probably the offspring of *S. Aucuparia* and *Aronia arbutifolia* and represent typical *S. spuria,* while the more glabrous forms with usually blackish fr. have *S. Aucuparia* and *Aronia melanocarpa* as their parents and may be called *S. fàllax,* Schneid. (*S. heterophýlla,* Dipp.). A similar form with quite glabrous and more pointed lvs., is probably a hybrid of *S. americana* and *Aronia melanocarpa,* and is named *S. sorbifòlia,* Hedl. (*S. Sárgentii,* Dipp.).

Group 3. Torminaria.

9. **torminàlis,** Crantz (*Pỳrus torminàlis,* Ehrh. *Torminària torminàlis,* Dipp. *T. Clùsii,* Roem.). Wild Service Tree. Round-headed tree, with spreading branches, 40–80 ft. high: lvs. broadly ovate, slightly cordate to broadly cuneate at the base, with several triangular-ovate, serrate lobes on each side, the lower sinuses reaching about half-way to the middle, floccose-tomentose when young, finally glabrous, rarely with persistent tomentum, 2–4 in. long; petioles 1–1¾ in. long: fls. white, ½in. across, in broad, rather loose tomentose corymbs: fr. oval, ½–¾in. high, brown, dotted. May, June. S. and Cent. Eu. H.W. 3:53, pp. 82, 83.—The foliage turns bright red in autumn.

3651. Sorbus Aria. (×⅓)

Group 4. Aria.

10. **latifòlia,** Pers. (*Pỳrus rotundifòlia,* Bechst. *P. intermèdia* var. *latifòlia,* Ser. *P. Ària* var. *latifòlia,* Hort. *Torminària latifòlia,* Dipp. *S. Ària* × *S. torminàlis*). Tree, attaining 50 ft., similar to the preceding: lvs. broadly ovate to ovate, usu-

ally rounded at the base, pinnately lobed with short, broadly triangular, sharply serrate lobes, and with 6–9 pairs of veins, grayish or whitish tomentose beneath, 2½–4 in. long; petioles ½–1 in. long: fls. about ½in. across, in broad, tomentose corymbs: fr. globose or globose-ovoid, about ½in. high, orange to brownish red. May, June. Occasionally occurring in Cent. Eu. H. W. 3, p. 85.

11. **intermèdia,** Pers. (*Pỳrus intermèdia,* Ehrh. *Sórbus scándica,* Fries. *Ària suècica,* Koehne. *Háhnia suècica,* Dipp.). Tree, 20–40 ft. high, with oval head: lvs. ovate to oblong-ovate, broadly cuneate at the base, pinnately lobed with broad and short, irregularly serrate lobes and 5–8 pairs of veins, whitish tomentose beneath, 2½–4 in. long; petioles ½–¾in. long: fls. about ½in. across, in broad, tomentose corymbs: fr. orange-red, globose or subglobose, about ½in. high. May. N. and Cent. Eu. S.I.F. 3:485.—This is sometimes confounded with *S. hybrida* and considered to be a hybrid of similar origin, but it is certainly a good species. It never bears distinct lfts. at the base and the sinuses do not reach farther than one-third toward the middle.

12. **Ària,** Crantz (*Pỳrus Ària,* Ehrh. *Ària nívea,* Host. *Háhnia Ària,* Medikus). White Beam-Tree. Fig. 3651. Tree, with broadly pyramidal or oval head, 25–50 ft. high: lvs. elliptic to oblong-oval, usually cuneate at the base, acute or obtuse at the apex, sharply and doubly serrate, of firm texture, bright or dark green and glabrous above, white-tomentose beneath, 2–5 in. long; petioles ½–¾in. long: fls. ½–¾in. across, in tomentose, 2–3-in.-broad corymbs: fr. subglobose, orange-red, about ½in. high. May. Cent. and S. Eu. to Himalayas and Siberia. G.M. 44:291. H.W. 3:52.—Desirable tree for dry and exposed situations, and very ornamental in foliage on account of the contrasting colors of the upper and under sides of the lvs. Var. **Decaisneàna,** Rehd. (*Ària Decaisneàna,* Lav. *Pỳrus Decaisneàna,* Nichols. *Pỳrus Ària* var. *majéstica,* Prain. *S. Ària* var. *majéstica,* Zabel). Lvs. elliptic or ovate, irregularly doubly serrate, 3–7 in. long: infl. 3–4 in. across: fls. ¾in. across; stamens longer than styles: fr. oval, ½in. across. B.M. 8184. Origin unknown, probably from the Himalayas. Var. **edùlis,** Wenzig (*Pỳrus edùlis,* Willd. *S. longifòlia,* Hedl.). Lvs. elliptic-oblong to oblong, rounded or acute at the apex, 2–5 in. long: fr. oval, ½–¾in. high. There are some garden forms, as vars. **aùrea, chrysophýlla,** and **lutéscens,** Hort., with more or less yellow foliage.

13. **umbellàta,** Fritsch (*S. meridionàlis,* Guss. *S. flabellifòlia,* S. Schau. *S. Ària* var. *flabellifòlia,* Wenzig. *S. flabellàta,* Hort.). Small tree, attaining 20 ft.: lvs. orbicular to broadly oval, obtuse, usually broadly cuneate at the base, incisely lobed above the middle, with the short lobes truncate or rounded and coarsely toothed, with 5–7 pairs of veins, snowy white beneath, 1½–2½ in. long: fls. scarcely ½in. across, in dense, white-tomentose corymbs: fr. depressed-globose, orange-red. S. E. Eu., W. Asia.—Cult. in some nurseries as *Pyrus aurea striata.* Var. **crètica,** Schneid. (*S. Ària* var. *crètica,* Rehd. *Ària grèca,* Roem. *S. Ària* var. *grèca,* Koch). Lvs. orbicular-obovate, doubly serrate, scarcely lobed, with 6–11 pairs of veins, 1½–3 in. long. S. E. Eu., W. Asia.

14. **alpìna,** Heynh. (*Aròmia densiflòra,* Spach. *A. Willdenòwii,* Zabel. *S. Ària* × *Aròmia arbutifòlia*). Shrub, similar to *S. Aria,* but lvs. smaller, densely serrulate, with fewer and less straight veins: infl. and fls. smaller; styles 3–4: fr. red or brownish red, ¼in. across. Of garden origin.—From *Aronia arbutifolia* it may be distinguished by usually larger lvs. with more numerous veins and with a less close and less glandular serration and by larger fls. with only 3–4 styles. A similar hybrid is *S. Dippelii,* Zabel (*S. Ària* × *Aròmia melanocárpa*) with the lvs. often finally glabrescent and black frs. over ⅓in. across.

Group 5. Micromeles.

15. **alnifòlia,** Koch (*Micromèles alnifòlia,* Koehne. *Pỳrus Miyàbei,* Sarg.). Fig. 3652. Tree, to 60 ft., with upright branches: branchlets glabrous or slightly pubescent: lvs. ovate to elliptic-ovate, rounded at the base, short-acuminate, unequally serrate, glabrous above, glabrous or slightly pubescent beneath, on vigorous shoots sometimes densely pubescent, 2–4 in. long, with 6–10 pairs of veins: infl. loose, nearly glabrous, 6–12-fld.: fls. ⅛–½in. across; ovary usually 2-celled: fr. subglobose, ¼in. across, red with yellow. May; fr. in Sept., Oct. Cent. China, Manchuria, Korea, Japan. B.M. 7773. G.F. 7:84 (adapted in Fig. 3652). Gt. 41, pp. 283, 284; 52, p. 3. S.I.F. 1:49.

16. **caloneùra,** Rehd. (*Micromèles caloneùra,* Stapf. *Pỳrus caloneùra,* Veitch). Shrub or small tree, to 20 ft.: branchlets glabrous: lvs. elliptic-oblong to obovate-oblong, acute or sometimes short-acuminate, broadly

3652. Sorbus alnifolia. (×½)

cuneate at the base, doubly crenate-serrate, quite glabrous and dark green above, pale beneath and sparingly hairy on the veins, 2½–3½ in. long, with 10–12 pairs of veins impressed above: infl. dense, many-fld.: fls. ¼in. across, with violet-purple stamens; styles 5; ovary 5-celled: fr. pyriform, ⅛–½in. long, brown. May; fr. in Oct. Cent. China. B.M. 8335.

17. **Fólgneri,** Rehd. (*Micromèles Fólgneri,* Schneid. *Pỳrus Fólgneri,* Bean). Tree with spreading and arching branches: young branchlets tomentose: lvs. ovate to elliptic-ovate, acute or short-acuminate, rounded or broadly cuneate at the base, finely serrate or on shoots doubly serrate and often slightly lobed, dark green and glabrous above, white-tomentose beneath, 2–3 in. long, with 8–9 pairs of veins: infl. about 4 in. across, tomentose, many-fld.; fls. ¼–½in. across; styles 3: fr. ovoid, red, about ½in. long. May: fr. in Oct. Cent. China. M.D.G. 1912:136. Var. **péndula,** Rehd. (*Pỳrus Fólgneri* var. *péndula,* Veitch). Branches pendulous.—This is a very handsome and graceful species.

S. apérta, Koehne. Allied to S. Aucuparia. Tree, to 40 ft.: lfts. 9–17, elliptic to elliptic-oblong, acute, serrate, glabrous, 1–2 in. long: styles 5: fr. small, whitish. W. China.—*S. arbutifólia*, Heynh.=Aronia arbutifolia.—*S. Chamæmèspilus*, Crantz (Pyrus Chamæmespilus, Poll. P. alpina, Dur. Aria Chamæmespilus, Host.). Upright shrub, 6 ft. high, allied to S. Aria. Lvs. elliptic to oblong, serrate, almost glabrous, 1½–2½ in. long: fls. pinkish, with upright petals, in dense corymbs about 1½ in. broad: fr. oval, orange to brownish red. Cent. and S. Eu. H.W. 3, p. 84. Var. *sudética*, Wenzig. Lvs. whitish or grayish tomentose beneath. Mountains of Cent. Eu.—*S. commixta*, Hedl. (S. Aucuparia var. japonica, Maxim. S. japonica, Koehne, not Hedl.). Allied to S. americana. Small tree: lfts. 11–15, oblong-lanceolate to lanceolate, long-acuminate, glabrous, 2–3 in. long: infl. glabrous: fr. red, small. Japan. S.I.F. 2:31.—*S. Conradìnæ*, Koehne. Allied to S. Aucuparia. Tree, to 25 ft.: stipules large, persistent; lfts. 11–13, oblong to oblong-lanceolate, short-acuminate, serrate, tomentose beneath, 2–3 in. long: styles usually 4: fr. globose, red, about ½in. across. W. China.—*S. cuspidàta*, Hedl. (S. vestita, Schau. Pyrus vestita, Wall. Pyrus crenata, Lindl., not Don. Cormus lanata, Koehne. S. nepalensis, Hort.). Tree, allied to S. Aria: lvs. elliptic to elliptic-oblong, acuminate, doubly serrate, densely tomentose beneath, 3–7 in. long: styles usually 5, woolly at the base: fr. about ½in. across. Himalayas. G.C. II. 1:17. B.M. 8259.—*S. Decaisneàna*, Rehd. (Micromeles Decaisneana, Schneid.). Tree, to 40 ft.: lvs. elliptic-obovate, crenate-serrulate, with 8–10 pairs of veins, nearly glabrous beneath, 2–3½ in. long: infl. tomentose, 1½ in. across; styles usually 3, connate below: fr. ovoid, red, ½in. across with deciduous calyx. Cent. and W. China.—*S. discolor*, Hedl. (Pyrus discolor, Maxim.). Doubtful species allied to S. Aucuparia; possibly the same as S. pekinensis. The plants in cult. as S. discolor probably do not belong here.—*S. Esserteauiàna*, Koehne. Allied to S. Aucuparia. Tree, to 25 ft.: stipules large, persistent; lfts. 11–13, oblong-lanceolate, subacuminate, serrate, whitish tomentose beneath, 1½–3½ in. long: infl. tomentose, 4–6 in. across: fr. globose, scarlet, ½in. across. W. China.—*S. grácilis*, Koch (Pyrus gracilis, Sieb. & Zucc.). Shrub, with pinnate lvs., those at the base of the loose, few-fld. corymbs with large, incised-dentate stipules: lfts. 7–9, ovate to ovate-oblong, 1–1½in. long: styles 2. Cent. and S. Japan.—*S. Hóstii*, Koch (Pyrus Hostii, Hemsl. Aria Hostii, Jacq. f.). Supposed to be a hybrid between S. Mougeotii and S. Chamæmespilus: shrub or small tree, 12 ft. high: lvs. oval to elliptic-obovate, sharply serrate: fls. pinkish, in dense corymbs about 2½ in. broad: fr. globose, ovoid, red. Mountains of Cent. Eu. Gn. 20:376. R.H. 1877:210.—*S. japónica*, Hedl. (Micromeles japonica, Koehne. S. Koehnei, Zabel). Allied to S. alnifolia. Lvs. pubescent above, grayish tomentose beneath: infl. denser with smaller fls.: fr. deeper scarlet, punctate. Japan. S.I.F. 1:48.—*S. japónica*, Koehne=S. commixta.—*S. japónica*, Zabel=Eriobotrya japonica.—*S. Koèhnei*, Zabel (not to be confused with S. Koehneana, Schneid., a species of the Aucuparia group, not in cult.)=S. japonica.—*S. lanàta*, Wenzig (Pyrus lanata, Don). Tree, allied to S. Aria: lvs. oval, sharply and doubly serrate and slightly lobed, 4–7 in. long: styles 2–3, connate below, woolly: fr. globose, ½–1½ in. across. Himalayas.—*S. Matsumuràna*, Koehne (Pyrus Matsumurana, Makino). Allied to S. decora. Shrub, glabrous: lfts. 9–13, oblong-ovate to oblong, acute, serrate above the middle, 1½–2½ in. long: stamens half as long as petals; styles 5: fr. red, ½in., bloomy. Japan.—*S. megalocárpa*, Rehd. Shrubby tree, to 25 ft.: lvs. elliptic-obovate to obovate-oblong, acuminate, crenate-serrate, glabrous, 5–10 in. long: infl. 4–6 in. across; styles usually 3: fr. ½–1 in. long, russet-brown. W. China.—*S. meliosmifólia*, Rehd. Allied to S. alnifolia. Tree, to 30 ft.: lvs. short-petioled, ovate to elliptic-oblong, doubly serrate, with 18–24 pairs of veins, slightly pubescent beneath, 5–8 in. long: infl. 2–4 in. across: fr. subglobose, brownish red, ½in. long. W. China.—*S. Mougeótii*, Soyer-Willemet (Pyrus Mougeotii, Aschers. & Graebn.). Allied to S. intermedia; often shrubby: lvs. ovate to ovate-oblong, lobed, short-acuminate, with 8–12 pairs of veins: fr. red, globose, ½in. across, edible. Mountains of Cent. Eu. H.W. 3, p. 83.—*S. nepalénsis*, Hort.=S. cuspidata.—S. *occidentàlis*, Greene=S. pumila.—*S. ochrocárpa*, Rehd. Allied to S. Aria. Lvs. generally elliptic, doubly denticulate-serrate, grayish tomentose beneath, 2–4 in. long: infl. small, sessile, styles 2, connate at base: fr. pale, subglobose, ¼in. across. W. China.—*S. pekinénsis*, Koehne. Allied to S. americana. Tree, nearly glabrous: lfts. 13–17, oblong, acute, serrate, 1½–2½ in. long: infl. 4–8 in. across; styles 3: fr. subglobose, small, pinkish white or yellowish. N. China. Gt. 55:1551, fig. 7.—*S. pohuashanénsis*, Hedl. Allied to S. Aucuparia. Tree: stipules large, persistent; lfts. 13–15, ovate-oblong to ovate-lanceolate, whitish beneath, 1½–2 in. long: infl. 4–5 in. across, tomentose: fr. red, subglobose, ½in. across. N. China.—*S. pùmila*, Raf. (S. sitchensis, Roem. S. occidentalis, Greene. S. sambucifolia var. Grayi, Wenzig). Allied to S. decora. Shrub: lfts. 7–11, oval to oval-oblong, obtuse, serrate toward the apex, bluish green, 1–2 in. long: infl. 1–3 in. across; styles 3–5: fr. subglobose, red. Alaska to N. Calif. G.F. 10:85.—*S. sambucifòlia*, Roem. Allied to S. americana. Shrub: lfts. 9–11, ovate-oblong, acuminate, serrate, glabrous, green on both sides, 2–3 in. long: infl. slightly villous: fr. subglobose, ½in. across, yellowish red. N. E. Asia. Very rare in cult., usually S. decora is cult. under this name.—*S. Sargentiàna*, Koehne. Allied to S. Aucuparia. Tree, to 30 ft.: stipules large, persistent: lfts. 9–11, oblong-lanceolate, acuminate, serrate, villous beneath while young: infl. 6 in. across; styles 3–5: fr. globose, ¼in. across, scarlet. W. China. Not to be confused with S. Sargentii which see under No. 8.—*S. scalàris*, Koehne. Allied to S. Vilmorinii. Shrub, to 20 ft.: stipules large, persistent; rachis slightly winged: lfts. 25–27, linear-oblong, dentate only at the apex, villous beneath, ¾–1½ in. long: infl. tomentose; styles 3–4: fr. globose, red, ½in. across. W. China.—*S. setschwanénsis*, Koehne. Allied to S. Vilmorinii. Shrub, to 15 ft.: rachis slightly winged: lfts. 25–35, narrow-oblong, serrulate, glabrous, ½–½in. long: infl. glabrous, 1–2½ in. across; styles 2–4: fr. globose, ¼in. across, whitish or pale purple. W. China.—*S. sitchénsis*, Roem.=S. pumila.—*S. sudética*, Heynh.=S. Chamæmespilus var. sudetica.—*S. unguiculàta*, Koehne. Allied to S. Vilmorinii. Shrub, to 15 ft.: rachis narrowly winged: lfts. 23–33, oval to narrow-oblong, serrulate, villous on midrib beneath, ½–¾in. long: infl. 1–2 in. broad, slightly villous; claw or petals one-half as long as blade: fr. globose, ½in. across, whitish or pale purple. W. China.—*S. vestìta*, Wall.= S. cuspidata.

ALFRED REHDER.

SORGHÁSTRUM (named for its resemblance to sorghum, a name which has been applied to Holcus). *Gramíneæ*. Grasses having the infl. as in Holcus but the pedicellate spikelet wanting, the pedicel only present.—Species about 12, mostly American.

nùtans, Nash (*Chrysopògon nùtans*, Benth. *Andropògon avenàceus*, Michx.). INDIAN GRASS. In large clumps, perennial, 3–5 ft. tall, bearing beautiful narrow panicles, 6–12 in. long, the copious golden hairs and brilliant yellow anthers producing a charming effect when in bloom, turning to a bronzy brown; culms simple, lvs. pale. A native species occurring on dry soils from the Atlantic to the Rocky Mts. Dept. Agric., Div. Agrost. 7:21. f. 15. 1897.—Useful for the wild border. One of the handsomest natives; very hardy and worthy of greater use.

A. S. HITCHCOCK.

SÓRGHUM: *Holcus*.

SORINDEÌA (said to be the native name in Madagascar). *Anacardiàceæ*. Glabrous trees or shrubs, suitable for the warmhouse and also grown outdoors in the far South.

Leaves alternate, odd-pinnate; the lfts. entire: fls. small, polygamous or dicœcious, in many-fld. panicles which are terminal, axillary, or from the old wood, often lax and divaricate; calyx 4–5 (3) -toothed, cup-shaped; petals as many as the calyx-teeth, valvate; stamens in the male fl. 10–20, occupying a central disk or as many or twice as many as the petals, inserted around the disk; ovary in the female fl. sessile: fr. drupaceous.—About 15 species, Trop. Afr. and Madagascar.

madagascariénsis, DC. GRAPE MANGO. Tree, often of large size, glabrous: lvs. odd-pinnate, more or less leathery; lfts. 7–9–11, oblong or oblong-elliptical, the terminal often obovate: panicles fascicled, lateral, or from the old wood, often 1–2 ft. long, dependent in fr., calyx broadly 5-toothed: fr. the size of a "sparrow's egg," yellow, "sweet, with the taste of turpentine." Madagascar, Trop. E. Afr., and Zanzibar.—Cult. in Trop. Asia and intro. into the southern U. S.

F. TRACY HUBBARD.

SORREL. Various species of Rumex (which see) produce large thick acid leaves which are prized for salads or for "greens." Leaves of some of the native or naturalized species are gathered as pot-herbs in many parts of the country. In the Old World, however, several species are regularly cultivated in kitchen-gardens; in this country these cultivated species are relatively little known. They are perennials of the very easiest culture. Usually they persist for a number of years after well established, giving an abundance of soft edible leaves early in the spring when herbage is scarce. They are usually grown from seeds, and plants fit for cutting may be had when the plants are one or two years old. Plants should be placed at one side of the garden where they will not interfere with the regular tillage. No special treatment is demanded. When they begin to show signs of failing, new plants should be started or the old ones may be taken up and divided. The rows should stand about 18 inches apart. Do not let the plants exhaust themselves by seed-bearing. The spinach dock (*Rumex Patientia*) is one of the best and earliest. The belleville (*Rumex Acetosa*) is also an excellent plant for the home-garden and has the advantage of following the other as a succession. Various other species may be had of European seed-dealers. See *Dock* and *Rumex*.

L. H. B.

SORREL-TREE: *Oxydendrum.* **S., Wood:** *Oxalis Acetosella.*

SOUR GUM: *Nyssa sylvatica.* **S. Sop:** *Annona muricata.* **S. Wood:** *Oxydendrum.*

SOUTHERNWOOD (*Artemisia Abrotanum*, which see for botanical account) is a European herb, aromatic, much branched, woody-stemmed, rather tender, perennial, 3 to 5 feet tall, with pale green or grayish often variegated leaves, small yellowish flowers and minute seeds. (Fig. 3653.) It is occasionally found in family gardens, where it is grown from seed (or more often from its easily rooted cuttings, which are most readily obtained in early summer) for its pleasant taste and tonic properties, which resemble those of wormwood. It is seldom offered by seedsmen in this country because of its slight importance.

M. G. KAINS.

SOWBUGS. There are two common species, *Armadillidium vulgare* and *Porcellio lævis*, known respectively as the greenhouse pillbug and the dooryard sowbug. These are small oval grayish terrestrial crustaceans (not insects) that live in damp situations. They feed, mostly at night, on decaying vegetable matter and sometimes attack germinating seeds and the roots, crown, and occasionally the leaves and blossoms of greenhouse plants, such as primulas, petunias, saxifrage, violets, geraniums, roses, and wisteria. Orchids, especially cattleyas, are liable to injury. Head lettuce is often infested, and sowbugs sometimes become a veritable pest in mushroom cellars.

Sowbugs reproduce by means of eggs which are carried by the female in a pouch on the under side of the body. The young are similar in form to the adults and are carried by the female until they attain a considerable size. There is probably but one brood annually.

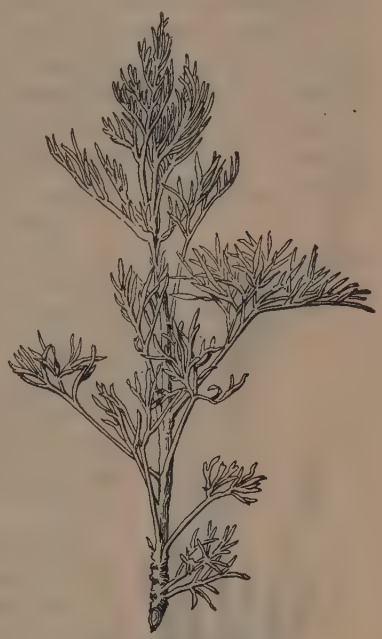
Sowbugs are destroyed in greenhouses and similar situations by the use of freshly sliced potatoes or beets dusted lightly with paris green or some other arsenical. These baits should be placed on the soil near the plants to be protected in the evening, since sowbugs are nocturnal in their habits. Another excellent bait is made as follows: To a quart of corn-meal add enough brown sugar to sweeten it, then add two tablespoonfuls of paris green and stir until it is thoroughly mixed. Moisten the mixture with just enough water so that it will hold together. This bait is to be distributed around the plants as recommended above.

Water-cress sowbugs (*Mancasellus brachyurus*).—In the eastern United States water-cress is often seriously injured by an aquatic species of sowbug that attacks the submerged portions of the plant, cuts off the roots and stems, and causes large masses of the cress to float on top of the water. This form differs from the species found in greenhouses by having longer legs and antennæ and being shrimp-like in form when viewed from the side. It is about ½ inch in length and gray in color. It often occurs in immense numbers so as practically to destroy the whole crop. Where cress is grown in natural streams or ponds no practical method of controlling the sowbugs has been devised. Some growers, however, have been able to overcome the difficulty by growing the plants in broad shallow beds sloping toward the center, where a trough 10 inches square, lined with boards, extends the whole length of the bed. When the sowbugs become abundant, the water is shut off for twelve to twenty-four hours, allowing the beds to drain. Water is retained in the trough in which the sowbugs soon accumulate in great numbers. They may be destroyed by the addition of a liberal quantity of copper sulfate solution. Less injury will result to the plants if the water is drained off soon after the cress has been gathered.

C. R. CROSBY.
M. D. LEONARD.

SOW THISTLE: A name for the prickly weedy species of Sonchus.

SOYBEAN (*Glycine Soja*, formerly called *G. hispida*) is a legume, long a staple crop in Japan, but somewhat recently cultivated more or less extensively in the United States. (Figs. 479, 483.) In its native country, Japan, the seed is an important human food product, but in the United States its principal use at present is as a forage plant for farm live-stock and as a soil-renovator. It is an upright leafy branching plant, growing 3 to 4 feet high. Two distinct plants have been called soybean: the smaller one (*Phaseolus aureus*) is grown principally in southern Asia; the larger species, the true soybean, is *Glycine Soja*. This latter species has become popular in some sections of the United States because of its power of resisting drought and for the further reason that is may supply a large amount of forage rich in protein. In the northern states it is probable that the soybean will be acclimated and that it will serve as an adjunct to the maize crop as a food for stock, although it is coarse in leaf and stalk.



3653. Southernwood. (×½)

It thrives best upon a warm well-drained loamy soil, and seed should not be planted until all danger from frost is over. The land should be prepared by plowing and harrowing in the early spring, and the harrow should be used two or three times before the seeds are planted. Best success is attained by planting in drills, rows to be from 2½ to 3 feet apart and the hills in the row 18 to 20 inches apart. During the early periods of growth, cultivation should be frequent, preferably with a fine-toothed implement. After the plants have grown so that the ground is well shaded, the tillage may be discontinued. It is doubtful whether the curing of the plants for hay will ever come into general practice, but the crop may be largely grown for green soiling and for ensilage purposes. It may be cut into the silo with corn and serves to improve the quality of the food.

To the horticulturist the soybean is valuable chiefly as a soil-renovator. The soil of the orchard can be given clean culture during the early summer and the soybeans may be sown broadcast about July 1 and harrowed in. One bushel of seed to the acre will be required. One bushel of rye to the acre should be sown at the same time, for when the beans are killed down by the frost in the fall the rye will then serve as a cover-crop for the winter. When the soil is so hard and forbidding that clover will not thrive, the soybean may be made to serve as a nitrogen-gatherer. See *Glycine*.

L. A. CLINTON.

SPÆNDÓNCEA: *Cadia.* *S. tamarindifòlia*, Desf.=*Cadia purpurea.* H.F. II. 4:11.

SPANISH BAYONET: *Yucca.* **S. Broom:** *Spartium junceum.* **S. Lime:** *Melicocca bijuga.* **S. Oyster Plant:** *Scolymus.*

SPARÁXIS (Greek word referring to the torn or lacerated spathes, a character which distinguishes this genus from Tritonia). *Iridàceæ.* WAND-FLOWER. Bulbs or corms with fibrous coating, the plants suitable for outdoor planting but grown mostly under glass.

Stems simple or slightly branched: lvs. few, flat, sword-like or broadly linear, erect or falcate: spathes few, remote or sometimes solitary, broad-striate or frequently marked with short brown lines: fls. 1 to a spathe, sessile, rather large, yellow; perianth-tube short and slender, 6-lobed; ovary 3-celled: caps. membranaceous, ovoid or oblong, included in the spathe.—About 3 species, Cape Colony, S. Afr. Sparaxis is a group of spring-blooming Cape bulbs of the Ixia tribe, with spikes of 6-petaled, more or less funnel-shaped fls. 1–2 in. across and exhibiting an extraordinary range of color and throat-markings. These plants are less popular than ixias, which they much resemble. The plants are dwarfer and more compact than ixias, usually 6–12 in. high, the spikes are shorter and fewer-fld., and the blossoms are sometimes larger. Sparaxis is essentially distinguished from Ixia and other allied genera by the subregular perianth, unilateral and arcuate stamens, and scarious lacerated spathe-valves.

3654. Sparaxis tricolor. (×⅓)

Although a few plants of sparaxis are occasionally cultivated in America by bulb-fanciers, one may search through many American catalogues without finding them listed. The Dutch bulb-growers offer twenty-five distinct kinds, which is perhaps a quarter of the number of varieties of ixias in cultivation. According to J. G. Baker, there is "only one species in a broad sense, varying indefinitely in the size and coloring of the flowers." For practical purposes Baker recognizes the three species given below; of these the most important and variable is *S. tricolor.*

Sparaxis pulcherrima of the Dutch trade is properly *Dierama pulcherrima,* Baker. This grows as much as 6 feet high and has pendulous bright blood-purple flowers but apparently with pale rose and perhaps other varieties (also a white variety). It is distinguished by its pendulous flowers with regular perianth, simple style-branches, equilateral stamens, and large bracts which are not laciniate. B.M. 5555. F.S. 17:1810. Gn. 20:588; 44, p. 281. G. 16:386; 29:197. G.L. 27:152. This plant is said by F. W. Burbidge to be "perhaps the most graceful of all the Cape irids." (See Vol. II, page 1007.)

A. *Throat of fl. same color as segms.*

B. *Fls. small; segms. ½–¾in. long.*

bulbífera, Ker. Corm globose, ½–¾in. thick: basal lvs. about 4, linear or lanceolate, ½–1 ft. long: sts. ½–1 ft. long, simple or branched, bearing low down 2–3 small lvs., often with bulbils in the axils: fls. solitary or few in a spike, yellow; perianth-tube ½in. long. B.M. 545 (as *Ixia bulbifera*).—To this species Baker refers *S. albiflòra,* Eckl., with fls. whitish inside, and *S. violàcea,* Eckl., with dark purple fls.

BB. *Fls. larger; segms. 1 in. or more long.*

grandiflòra, Ker. Habit, corm, lvs., and spathe just as in *S. bulbifera* but the fls. larger, the limb 1 in. or more long, usually yellow or purple, and larger anthers. B.R. 258 (fls. white inside, midvein on the back purple). B.M. 541 (as *Ixia grandiflora;* fls. rich purple, margined lighter); 779 (fls. primrose inside, flamed purple outside).—The principal named forms are: Var. **atropurpûrea,** Hort., dark purple; var. **anemonæflòra,** Hort., pale yellow; var. **Liliàgo,** Baker, white, flushed with claret-purple outside; and var. **stellàris,** Baker, dark purple, the segms. narrower than the type, oblanceolate and acute rather than oblong.

AA. *Throat of fl. bright yellow, often with a dark blotch on the lower part of each segm.*

tricolor, Ker. Fig. 3654. Differs from *S. grandiflora* only in the color of the fls., which are very variable but always have a bright yellow throat and often a dark blotch at the base of each segm. B.M. 381 (as *Ixia tricolor*); 1482. F.S. 2:124. F. 1843:213 (as *S. picta, S. purpurea, S. pulchella*).—According to Baker, this is the favorite species among cultivators. It certainly has the greatest variety of colors and markings. In the works cited the floral segms. range from nearly white through rose, brick-red, carmine, crimson, and light purple to dark purple, excluding blue and yellow, which latter color usually appears in the throat.

WILHELM MILLER.

SPARGÀNIUM (Greek, *fillet,* referring to the ribbon-like leaves). *Sparganiàceæ.* BUR-REED. Marsh or aquatic herbs which may be used in the bog-garden or along the pond-edge. Pflanzenreich, IV, 8. 1900.

Leaves alternate, sessile, linear-elongate, erect or floating, entire: fls. monœcious, in globular, sessile, or pedunculate heads, the upper bearing 3-androus, naked fls. and minute scales, the lower consisting of numerous sessile or shortly pedicelled pistillate fls.; ovary 1–2-celled: fr. obovoid or spindle-shaped, 1–2-seeded.—About 15 species, temperate and subfrigid regions of the northern hemisphere and in Austral. Bur-reeds are marsh herbs closely allied to cat-tails but with fls. in globular heads instead of oblong spikes. A few hardy perennial kinds are advertised by collectors of native plants and one or two are procurable from specialists in aquatics. Bur-reeds are desirable only in bog-gardens or in wild-gardening operations. The beauty of these plants often lies in each species being massed alone, as well as in the mixing with other plants.

A. *Infl. unbranched.*

símplex, Huds. Sts. weak and slender, 1½–2 ft. high, unbranched: lvs. more or less triquetrous: staminate heads 4–6; pistillate 2–6, 5–8 lines in diam.: fr. stalked. June–Aug. N. Amer.

AA. *Infl. branched.*

B. *Height 3–8 ft.*

eurycárpum, Engelm. Sts. stout, 3–8 ft. high, branching: lvs. linear, flat, slightly keeled beneath: staminate heads numerous, pistillate 2–4 on a st. or branch, 10–16 lines in diam.: fr. sessile, angled, depressed at the summit. May–Aug. N. Amer.

BB. *Height 2–4 ft.*

ramòsum, Huds. Lvs. 3-angled at the base, long and linear: heads 5–9, disposed in axillary and terminal, interrupted spikes, the lowest one larger and pistillate, the others wholly staminate; pistillate heads 8–10 lines in diam. July. Old World. WILHELM MILLER.

SPARMÁNNIA (named for Andreas Sparmann, 1747–1787). *Tiliàceæ.* Shrubs or trees, with soft stellate pubescence, grown in the greenhouse and also out-of-doors in the southern United States.

Leaves cordate, dentate, or lobed: fls. white, in terminal, umbelliform little cymes; sepals 4, petals 4, naked at the base; stamens numerous, free; ovary nearly 4-celled: caps. globose, spiny.—About 5 species, Afr.

Sparmannia africana is of easy treatment under glass in a moderate temperature with plenty of air and light. The plants are benefited by being plunged in the garden in the summer and syringed during dry weather. Plants should be potted early in spring. The tips of young shoots root readily with 60° of heat.

A. *Lvs. deeply 5–7-lobed.*

palmàta, E. Mey. A slender shrub much smaller in all its parts than *S. africana:* branches half-herbaceous: lvs. on long petioles, the lobes long-acuminate, incisely sinuate and unequally toothed, prominently 5–7-nerved below: fls. white or purplish, densely arranged on the subterminal peduncles: caps. 4-celled. S. Afr.—Sparingly cult. in S. Calif.

AA. *Lvs. not lobed.*

africàna, Linn. A large shrub or tree, 10–20 ft. high: lvs. cordate-acuminate, 5–7-angled, unequally toothed, 5–6 in. long, 7–9-ribbed below: fls. white, on many-fld. peduncles: caps. 5-celled. S. Afr. B.M. 516. G.M. 37: 233. R.H. 1858, p. 105. Gn. 45:528; 76, p. 192. G. 22: 689; 27:195. Gn.W. 22: suppl. March 25. G.W. 5, p. 566.—A useful greenhouse plant. Var. **flòre-plèno,** Hort., is also grown. G.C. II. 19:477.—*S. africana* is not common in S. Calif., but is highly esteemed. One specimen, 40 years old, is 12 ft. high and 16 ft. through, and consists of about 50 trunks ½–4 in. diam. It is literally covered with snowballs of 4 in. diam., the blooms being so heavy that the ends of the branches touch the ground, necessitating severe pruning as soon as blooms were past beauty. No viburnum, hydrangea, or other shrub can compare with it at its blooming season. During the remainder of the year it has the appearance of a clump of basswood suckers, the lvs. being nearly identical in appearance with those of the basswood. It is therefore a dense mass of broad lvs. and looks well anywhere and at any time. This is one of the finest white-fld. shrubs or trees in cult. The double variety is not so desirable as the single. (Ernest Braunton.)

F. W. Barclay.

SPARTÌNA (Greek, *spartine,* a cord, referring to the tough leaves). *Gramíneæ.* Perennial marsh-plants of various parts of the world, most or all of which are found in the U. S.: culms rigid and reed-like: lvs. coarse and rough, usually becoming rolled inward: spikelets 1-fld., strongly flattened, sessile, closely imbricated in 2 rows on one side of a narrow rachis; spikes 2 to several in a raceme.—Species about 10, most of them found in saline marshes of the seacoast.

Michauxiàna, Hitchc. (*S. cynosuroìdes,* Amer. Auth., not Roth). Fresh-water Cord-Grass. Fig. 3655. Culms 3–6 ft.: blades narrow, 2–4 ft., tapering to a long slender point, flat but soon involute in drying, the margins very scabrous: spikes 5–20, scattered, spreading, 2–4 in. long.—In the West known as "slough-grass." A common coarse fresh-water marsh grass, occurring across the continent in the northern states. Recommended for cult. along the margins of ponds and artificial lakes. Procurable from collectors.

S. cynosuroides, Roth (S. polystachya, Willd.), on the Atlantic and *S. foliòsa,* Trin., on the Pacific coast act as mud-binders and are important factors in the natural reclamation of salt-marshes. In England, *S. stricta,* Roth, and *S. Tòwnsendii,* Groves, perform the same service. G.C. III. 43:33. *S. alterniflòra,* Loisel., is common to the British Isles and the St. Lawrence and New England coasts.—A yellow-margined form (S. cynosuroides var. aureo-marginata) is shown in G. 31:171.

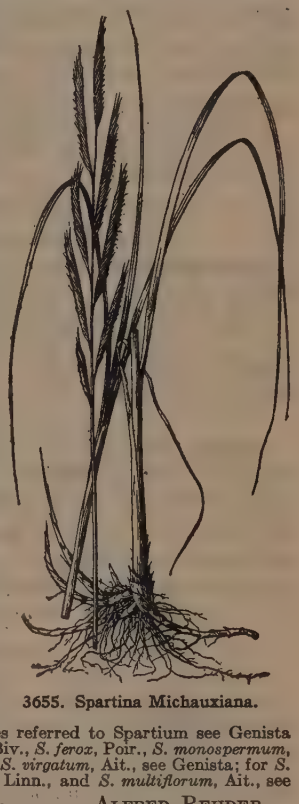
A. S. Hitchcock.

SPÁRTIUM (Greek, *spartos,* the ancient name of the plant). Syn., *Spartiánthus. Leguminòsæ.* Ornamental hardy shrub grown chiefly for its bright yellow flowers.

Leaves alternate, simple, small: fls. in terminal, loose racemes; calyx split above, hence 1-lipped, with 5 minute teeth; keel incurved, acuminate: pod linear, compressed, many-seeded; seeds with callose appendage at the base, like in Genista.—One species in the Medit. region and the Canary Isls. Allied to Genista and Cytisus, but chiefly distinguished by the 1-lipped calyx. The slender branches yield fiber, which is used in S. France and Spain for making ropes, cords, and cloths.

This is a handsome shrub with long and slender rush-like green branches, small and sparse foliage and showy papilionaceous flowers in terminal racemes. It is especially adapted for warmer and drier regions; in the East it is probably hardy as far north as Philadelphia. It becomes naturalized easily, as happened in several localities in South America, whence it was afterward described as *S. americanum,* Meyen. It grows in almost any kind of well-drained soil and is well suited for planting on exposed sandy and rocky situations. Propagation is by seeds and by greenwood cuttings under glass.

júnceum, Linn. (*Genísta júncea,* Lam. *Spartiánthus júnceus,* Link). Spanish Broom. Upright shrub, 10 ft. high, with slender, terete, green, rush-like branches sparingly leafy or almost leafless: lvs. oblanceolate to linear, entire, bluish green and sparingly appressed pubescent, ½–1½ in. long: fls. fragrant, yellow, about 1 in. long, with ample standard: pod linear, pubescent, 2–3 in. long. June–Sept., in Calif. blooming almost the whole year. B.M. 85. B.R. 1974 (as *S. acutifolius*). Gn. 22, p. 404; 34, p. 284; 44, p. 57.—There is a double-fld. form. Var. **ochroleûcum,** Sprenger, has whitish fls.



3655. Spartina Michauxiana.

For other species sometimes referred to Spartium see Genista and Cytisus. For *S. ætnense,* Biv., *S. ferox,* Poir., *S. monospermum,* Linn., *S. radiatum,* Linn., and *S. virgatum,* Ait., see Genista; for *S. purgans,* Linn., *S. scoparium,* Linn., and *S. multiflorum,* Ait., see Cytisus.

Alfred Rehder.

SPARTOCÝTISUS FÍLIPES, Webb.: *Cytisus filipes.*

SPATHÈLIA (from the Greek for a *staff*). *Rutàceæ.* Odd evergreen trees without branches, grown in the warmhouse and the American tropics.

Trunk simple, the lvs. aggregated at its extremity, so that the plant has the look of a tree-fern or palm: lvs. alternate, odd-pinnate; lfts. many-paired, alternate, linear-oblong or sickle-shaped, subentire or serrate, the margin glandular: fls. polygamous, rather large, short-pedicelled, in large panicles, which are terminal, elongated and branched, the ultimate branches somewhat cymose; calyx 5-parted, the segms. spreading, valvate or subvalvate; petals 5, imbricate; disk none; stamens 5; ovary 3-angled, 3-celled: drupe without juice, elliptic-oblong, 3-edged, 3-winged, the shell stony.—About 5 species, W. Indies.

símplex, Linn. St. slender, usually leaning, resembling a palm, 20–50 ft. high: the lvs. and panicles are frequently several feet long; lfts. 20–40 pairs, very variable, opposite or alternate, sessile or petiolulate, cordate or obliquely rounded at base, oblong- or linear-lanceolate, crenate or entire: panicle powdery. Sometimes planted in the W. Indies. B.R. 670.

F. Tracy Hubbard.

SPATHIPHÝLLUM (Greek word, referring to the leaf-like spathes). *Aràceæ*. Stemless or short-stemmed herbs, used as warmhouse foliage plants.

Leaves large, oblong or lanceolate, acuminate or cuspidate, midrib strong: spathe lf.-like, membranaceous, oblong or lanceolate; spadix shorter than the spathe, sessile or stipitate, cylindrical, densely fld.: fls. hermaphrodite, all fertile; perianth-segms. 4, 6, or 8, connate or coherent in a truncate or lobed cup; stamens 4, 6, or 8; ovary oblong, 3–4-celled: berry globose or oblong-conical, 3-celled, cells 1–2-seeded.—About 27 species, mostly from Trop. Amer., one or two Malayan. Monographed by Engler and Krause in Engler's Pflanzenreich, hft. 37 (IV. 23B), 1908. Gardeners recommend as soil for their cult. a mixture of leaf-mold, peat, and fibrous loam, together with some sand and charcoal.

A. *Petals free, 6–8, in 2 rows, sometimes stuck together, never connate; stamens 6–8, rarely 4 or 5; ovary 3–4-celled, oblong, style pyramidal, more or less exserted, coronate.*

Section EUSPATHIPHYLLUM.

B. *Ovary-cells 8-, 6-, or 4-ovuled.*

cochlearispàthum, Engler (*S. heliconiifòlium*, Schott). Caudex short: lvs. thin, membranaceous, broadly oblong, margin usually slightly undulate, base rotundate or subcordate, 20–30 x 8–10 in.: spathe oblong, 6–12 in. long, base more or less acute, apex gradually narrowed to a cusp, somewhat decurrent on the peduncle. Mex. I.H. 21:189.

BB. *Ovary-cells 2-ovuled.*

blándum, Schott. Lvs. elliptic-oblong or oblong, acute, base rather suddenly narrowed and concaved, 10 x 4 or more in.: spathe pale on both surfaces, elliptic-oblong, about 3 in. long, base suddenly narrowed, apex cuspidate-acuminate, narrowly decurrent on the peduncle. Dutch Guiana.

AA. *Petals free; ovary shortly obpyramidal, hexagonal, top truncate, style not at all distinct.*

Section AMOMOPHYLLUM.

B. *Petiole about equaling or slightly shorter than blade.*

floribúndum, N. E. Br. Lvs. oblong-elliptic or oblong-lanceolate, base obtuse finally abruptly contracted to a knee or acute, apex acute, about 6 x 3 in., upper surface rich green, lower paler: spathe white, oblong-lanceolate, about 3 in. long, long-cuspidate; spadix yellow-green or whitish. Colombia. I.H. 21:159 (as *Anthurium floribundum*). F. 1880, p. 76.

BB. *Petiole almost twice as long as blade.*

Patínii, N. E. Br. (*S. cándidum*, N. E. Br.). Lvs. elongate-lanceolate, both ends long-narrowed, apex very acute, 8–9 x 1½–2½ in.: spathe whitish, oblong-lanceolate, about 2¾ x ¾in. Colombia. I.H. 27:397. F.M. 1875:160. F. 1879, p. 19.

AAA. *Petals connate in a 6-angled cup which is truncate or 6-lobed; stamens 6; ovary obovoid or ovoid and 3-celled, top rather flat; cells 2-, 4-, 6-, or 8-ovuled.*

Section MASSOWIA.

cannæfòlium, Schott; also spelled *cannifolium* (*Pòthos cannæfòlia*, Dry. *S. cándicans*, Poepp.). Lvs. membranaceous, ovate-oblong or elliptic-oblong, base rather gradually running down to a knee, apex short-acuminate, slightly unequally so, 12–32 x 4–6 in., upper surface dark green, shining, lower paler and dull: spathe stiffly membranaceous, outside green, inside white, lanceolate, or elliptic-oblong, 4½–8 in. long, base suddenly narrowed, scarcely decurrent, apex short-cuspidate; spadix greenish or yellowish. W. Indies. Colombia. B.M. 603.

Hybrid, unclassed.

hýbridum, N. E. Br. A hybrid between *S. cannæfolium* and *S. Patinii*. Petioles 6–8 in. long; lf.-blades broadly lanceolate to oblong-lanceolate, acuminate, 8–9 in. long: spathe white on both sides, lanceolate, acuminate, 4–5 in. long; spadix 2 in. long. I.H. 29:450. G.C. II. 19:500.

S. Ghiesbrèghtii, Hort., is offered in the trade, but is unknown botanically.—*S. pictum*, Hort. Lind.=Rhodospatha picta.

F. TRACY HUBBARD.†

SPATHÒDEA (Greek, *spathe-like*, referring to the shape of the calyx). *Bignoniàceæ*. Two or 3 evergreen trees native of Trop. Afr. with large odd-pinnate opposite or sometimes ternate lvs., the lfts. entire, and with large fls. in terminal panicles or racemes: calyx large, split on one side and recurved, exposing the corolla to the base; corolla large, broadly campanulate and ventricose; stamens 4, exserted but shorter than the corolla, with spreading and pendulous anther-cells; disk large, cup-shaped; ovary oblong, with the ovules in several rows: caps. oblong-lanceolate, acuminate at the ends, loculicidal with woody valves; seeds elliptic, broadly winged.—The spathodeas are handsome evergreen trees with large pinnate foliage and large and very showy orange-red or scarlet fls. They can be grown only in subtropical or tropical countries and demand rich and well-drained soil with sufficient moisture during the growing period; they are rarely grown in greenhouses, as they need much space and do not bloom until they have attained a large size. Prop. is by seeds or by cuttings. See also *Radermachia* for cult.

campanulàta, Beauv. Tree, to 70 ft., glabrescent: lvs. 1–1½ ft. long; lfts. 9–19, short-stalked, ovate-lanceolate, abruptly short-acuminate, entire at the base with 2 or 3 fleshy glands, glabrous or somewhat pubescent beneath while young, 2–4 in. long: fls. scarlet, in many-fld. racemes or panicles; calyx coriaceous, boat-shaped, recurved, 2½ in. long; corolla about 4 in. long, with ovate, plicate, and somewhat undulate lobes; ovary papillose: caps. 8 in. long, glabrous. Trop. Afr. B.M. 5091. F.S. 8:830. J.F. 4:388. G.C. III. 50:458.

nilótica, Seem. Shrubby tree, to 20 ft.: branchlets pubescent: lvs. ½–1⅓ ft. long; rachis pubescent; lfts. 9–15, ovate-oblong, short-acuminate, entire, glabrous above, densely pubescent or tomentose beneath, 1½–4 in. long: fls. almost like those of the preceding species, in short dense racemes; calyx densely tomentose, 1½–2 in. long. Cent. Trop. Afr. H. Johnston, Uganda protectorate, 1:68.—In its smaller size this tree has an advantage over the preceding species the fls. of which are usually borne so high on the tree as to be almost out of sight.

S. lævis, Beauv., is now referred to Newbouldia which differs from Spathodea chiefly in the shape of the calyx which incloses the base of the corolla and is split on one side and 2-lobed at the apex, and in its funnelform-campanulate corolla, the inclosed stamens with parallel anther-cells: caps. elongated-linear with leathery valves; seeds with the wing emarginate on one side. *N. lævis*, Seem. (Spathodea speciosa, Brongn.). Shrub or tree, to 40 ft., nearly glabrous: lvs. opposite or ternate, 1–2 ft. long; lfts. 7–13, ovate-oblong, obtusely acuminate, serrate, glabrous or nearly so, 3–8 in. long: fls. white with purple spots or pink or purple, in dense terminal panicles; calyx oblong, 2-lobed at the apex, ¾–1 in. long; corolla 2–2¼ in. long, limb slightly 2-lipped with spatulate-obovate lobes. Trop. W. Afr. B.M. 4537. J.F. 1:51. F.S. 6:634, H.U. 5:357. The bark has medicinal properties.—*S. pentándra*. Hook. (B.M. 3681), is apparently a form of N. lævis with 6-lobed pale purple corolla and 5 stamens.—*S. speciòsa*, Brongn.=Newbouldia lævis.

ALFRED REHDER.

SPATHOGLÓTTIS (Greek, *spathe* and *tongue;* said to refer to the shape of the lip). *Orchidàceæ*. Plants agreeing with Bletia in habit and form of inflorescence; terrestrial orchids of the Old-World tropics, mostly with numerous flowers.

Pseudobulbs broadly conic, 1–3-lvd.: lvs. elongate, long-petioled, narrow, plicate, articulated: scape lateral, bearing large fls. in a terminal raceme: sepals free, subequal; petals similar or broader and longer;

labellum not spurred, lateral lobes somewhat convolute, middle lobe clawed; column slender; pollinia 8.—About 40 species in Asia, Austral., and the Malay Isls.

Spathoglottises grow best at the warm end of the cattleya or Brazilian house in a moist shady location. Pot culture suits them best, and the compost should consist principally of equal parts peat fiber and sphagnum moss with a little chopped sod added; about half of the pot should be devoted to drainage. They all require a liberal amount of water when growing, but only enough to keep them in sound condition when at rest. They are rather hard to increase by division and the supply depends upon new importations. (Robt. M. Grey.)

3656. Spathoglottis Vieillardii. (×½)

plicàta, Blume. Lvs. 2–4 ft. long, finely acuminate: scape 2–3 ft. high, with a raceme 6–12 in. long: fls. 1 in. across, lilac; sepals and petals broad, acute; middle lobe of the labellum long and narrow, cuneately dilated at the tip; calli yellow, villous. Malay Penins. O. 1911:48.

aùrea, Lindl. (*S. plicàta,* Griff.). Lvs. 12–18 in. high, narrowly lanceolate: scape tall and stout, 2 ft. high: raceme 6–8 in. long; fls. 1½ in. across, golden yellow; sepals broad, obtuse; middle lobe of the labellum equaling the falcate lateral lobes, narrowly lanceolate. Malay Penins. G.C. III. 4:93.—The lip varies, being sometimes broad and retuse at the apex.

Vieillàrdii, Reichb. f. (*S. Augustòrum,* Reichb. f.). Fig. 3656. Lvs. long-lanceolate, acuminate, 1–2 ft. long: scape 12–18 in. high, robust: raceme 6 in. long, broad, corymb-like at first; fls. 2 in. across, very pale lilac, nearly white; sepals and petals ovate-oblong, subacute; labellum as long as the sepals, lateral lobes orange-brown, with orange calli speckled with red, middle lobe narrow, with a broadened tip variable in form. New Caledonia. B.M. 7013. A.G. 12:93. A.F. 6:631. J.H. III. 51:425.

S. aùreo-Vieillàrdii, Hort., is a hybrid between this and S. aurea. Fls. pale chrome-yellow, with the sepals slightly and the petals profusely dotted with crimson, the tips of the lobes of the lip rich crimson. G.C. III. 23:309. G.M. 41:308.—*S. Còlmanii*=S. aurea var. ×S. aureo-Vieillardii.—*S. edinénsis*=S. Fortunei×S. pulchra.—*S. Hardingiàna,* Par. & Reichb. f. Scapes basal, up to 15 in. tall: fls. numerous, rose-purple or pale lilac, about 1 in. diam.; sepals lanceolate; petals linear-lanceolate; lip linear, auricled at base, with 2 yellow brown-spotted tubercles. N. Burma. B.M. 7964.—*S. kewénsis*=S. plicata var. Micholitzii×S. Vieillardii.—*S. Kimballiàna,* Hook., is often regarded as a variety of S. aurea, from which it differs in having the backs of the sepals mottled with red-brown, the crest glabrous, and narrower lvs. B.M. 7443.—*S. plicàta* var. *Micholitzii* is advertised by Sander. Fls. amethyst-color, with the segms. broader than in the type. Habit more dwarf.—*S. Southeriàna,* F. M. Bailey. Fls. in upright spikes, more than 1 in. across; sepals and petals light rose-color. Queensland.—*S. zebrina*=S. Fortunei×S. plicata.

HEINRICH HASSELBRING.

SPATHYÊMA: *Symplocarpus.*

SPATTER-DOCK: *Nuphar advena.*

SPEARMINT: *Mentha.* **Spear-wood:** *Eucalyptus doratoxylon.* **Spearwort:** Species of *Ranunculus.*

SPECULÀRIA (from *Speculum Veneris,* meaning Venus' looking-glass). *Campanulàceæ.* VENUS' LOOKING-GLASS. Erect or decumbent, hispid or glabrous annual herbs, suitable for outdoor garden planting.

Leaves alternate, entire or dentate: fls. blue, violet, or white, sessile or short-pedicelled, axillary; calyx-tube adnate, oblong or linear, limb 5-parted; corolla subrotate, or broad-campanulate, 5-lobed; stamens free; ovary inferior, 3-celled: caps. oblong or linear.—About 10 species, northern hemisphere, 1 also occurs in S. Austral. Closely allied to Campanula but differing by the very long calyx-tube, ovary, and caps. The long calyx-tube is one of the most conspicuous features of the plant and has perhaps served to suggest the handle of the mirror. There is one North American species, *S. perfoliata,* which differs from all the rest in having perfoliate lvs. and the caps. dehiscing laterally near the middle instead of near the calyx-lobes. It is a weed.

S. Speculum is a pretty little hardy annual herb with five-lobed blue flowers not quite an inch across. The plants grow about 9 inches high, bloom in spring and summer and are desirable for edging flower-beds. They are of easy culture. See *Annuals.*

A. *Peduncles about 3-fld.*

Spéculum, DC. (*Campánula Spéculum,* Linn.). VENUS' LOOKING-GLASS. Fig. 3657. Erect, 9 in. high: calyx glabrous or pubescent, the tube constricted at the apex; lobes finally reflexed, according to DeCandolle. Eu. B.M. 102. Var. **àlba,** Hort., is a white-fld. form. Gn. 72, p. 253. Var. **procúmbens,** Hort., is offered abroad in addition to lilac and double forms. R.H. 1897, p. 254.

AA. *Peduncles 1-fld.*

pentagònia, DC. Calyx pilose, lobes spreading. Asia Minor. B.R. 56.—This species is not now advertised in Amer. Some specimens have narrow lvs. and longer calyx-tube than *S. Speculum.* An interesting feature of this species (and perhaps others) is the 5-angled fl.-buds.

F. TRACY HUBBARD.†

SPEEDWELL: *Veronica.*

SPELT: *Triticum.*

SPÉRGULA (Latin, *spargere,* to scatter; the seeds are said to be expelled). *Caryophyllàceæ.* Annual herbs including SPURRY (which see), a forage plant adapted to poor dry sandy soils: lvs. subulate, appearing whorled from the cluster of secondary lvs. at the axil; stipules small and scarious: fls. pedicelled, in cymose racemes; sepals 5; petals 5, entire; stamens 10, rarely 5; styles 5, alternate with the sepals; ovary 1-celled, many-seeded: caps. 5-valved, the valves opposite the sepals.—About 5, possibly more species, temperate regions of the world. Some of the species are dichotomously branched, but the following has clusters of branches originating at or near the base.

3657. Venus' looking-glass.—Specularia Speculum. (×½)

arvénsis, Linn. Annual, 6–18 in. high, branched at or near the base, bright green, little if at all viscid: lvs. linear, clustered at the nodes in 2 opposite sets of 6–8 together, appearing as if verticillate: fls. numerous, small, white, about ¼in. across and borne in terminal panicles: seeds papillate. Eu. **S. satìva,** Boern., the cult. SPURRY is a dull green viscid plant, with margined not papillate seeds. Eu. F. TRACY HUBBARD.†

SPHÁCELE (old Greek name). *Labiàtæ.* A score or more of shrubs or subshrubs, in Calif., Hawaii, and S. Amer., one or more of which has been listed for ornament, but apparently little known in cult. Fls. whitish to red or blue, in the axils of small bracts and forming verticillate racemes or spikes which may be simple or branched; calyx campanulate, about 10-nerved, enlarging in fr.; corolla-limb 4-parted, scarcely labiate; stamens 4, didynamous or nearly equal; style 2-lobed: nutlets ovoid, smooth. *S. chamædryoìdes,* Briquet (*S. campanulàta,* Benth.), from Chile, is mentioned abroad: 2–3 ft., shrubby: lvs. oblong-lanceolate, short-stalked, wrinkled: fls. pale blue, ½–⅔in. long about 2 in a whorl. B.R. 1382. Coolhouse plant.

SPHÆRÁLCEA (Greek for *globe,* and *Alcea,* the generic name of the marsh mallow). *Malvàceæ.* GLOBE MALLOW. Shrubs, subshrubs, or herbs, adapted to the warmhouse or outdoors in the far South.

Leaves frequently angled or lobed: fls. short-pedicelled, solitary, or arranged in axillary fascicles or in terminal racemes or spikes, violet or flesh-colored, rarely long-peduncled or red; bracteoles 3, free or united at base; calyx 5-cleft; staminal column divided at the top into many filaments; ovary many-celled: fr. subglobose, of many compressed, 2-valved, dehiscing, 2-3-seeded carpels, united in a ring around a central torus, from which they slowly separate.—About 65 species, 4 or 5 of which are S. African, the remainder from the warmer regions of N. and S. Amer. Several species have been mentioned in horticultural literature and occur occasionally in cult. One species has been intro. into Calif. Closely allied to Abutilon but with 3 bractlets instead of none.

3658. Sphæralcea acerifolia. (×⅙)

A. *Lvs. 5–7-lobed.*

B. *Fls. in spikes.*

acerifòlia, Torr. & Gray. Fig. 3658. Perennial herb, 2–6 ft. high: lvs. 3–4 in. long, cordate, palmately 5-lobed (sometimes with 2 or more basal lobes), coarsely serrate: fls. rose-color, varying to white, 2 in. across, 15 or more in spicate clusters terminating the branches. Rocky Mts. B.M. 5404.

BB. *Fls. in umbels.*

umbellàta, Don (*S. vitifòlia,* Benth. & Hook. *Málva umbellàta,* Cav.). Erect branched shrub, 3 ft. or more high, flocculose-tomentose: lvs. long-petiolate, cordate, somewhat 7-lobed, peltate, nerved, flat, glabrate and green above, hoary and ribbed beneath; the lobes short, acute, margin crenate: peduncles axillary, usually 3-fld., rarely 2- or 5-fld.: calyx broad-campanulate, leathery, 5-lobed, the lobes semi-ovate; petals scarlet, white at base, obcordate; filaments forming a white column. Mex. B.R. 1608. L.B.C. 3:222. Var. **tricolor,** Hort., is said to have reddish purple fls. striped with white and rose.

AA. *Lvs. 3-lobed.*

B. *Fls. scarlet or rose.*

Munroàna, Spach. Perennial herb, 1–2 ft. high: lvs. broad at base, obscurely 3-lobed, crenate, sometimes incised: fls. scarlet or rose, 1 in. across: panicles axillary and terminal, numerous. Dry plains, Brit. Col. to Idaho and south. B.M. 3537 and B.R. 1306 (both as *Malva Munroana*). A.G. 11:539. G. 35:451.—Advertised in 1890 as the "sunset plant." The same plant is said to be offered in some catalogues as *Malva miniata.*

BB. *Fls. brick-red.*

cisplátina, St. Hil. (*S. miniàta,* Spach. *Málva miniàta,* Cav. *M. miniàta,* Jacq.?). Tender branching subshrub, 2–4 ft. high, formerly considered desirable for conservatory decoration in Oct. and Nov., when it produces its brick-red fls.: lvs. 1–2 in. long, 3-lobed, coarsely and unequally crenate, midlobe longest: fls. 1–1¼ in. across, in axillary, few-fld. cymose racemes. La Plata. The above description is from B.M. 5938.—Miniata means cinnabar-red, the color of red lead. There seems to be no reason why *S. cisplatina* and *S. Munroana* should be confused. The lvs. of *S. Munroana* are obscurely 3-lobed, the lobes broad, blunt and short; the lvs. of *S. cisplatina* are deeply and sharply cut, acuminate and narrowed toward the base, the lobes narrow and acute, the midlobe over twice as long as the side lobes. The color of the fls. is very distinct and the clusters are branched in *S. Munroana* but not in *S. cisplatina.* F. TRACY HUBBARD.†

SPHÆROCÒDON (Greek, *globe* and *bell,* probably referring to the shape of the corolla). *Asclepiadàceæ.* Perennial herbs with a woody or tuberous rootstock, suitable only for the warmhouse: sts. erect, not twining: lvs. opposite, short-petioled, elliptic or oblong: fls. moderate-sized, in pedunculate sublateral umbel-like cymes; calyx 5-parted; corolla campanulate or somewhat so, 5-lobed, the lobes overlapping and slightly twisted to the left in bud; crown of 5 small fleshy compressed tubercles or teeth; column arising from the base of the corolla; anthers without appendages: fr. unknown.—Five species from Trop. and S. Afr. *S. obtusifòlium,* Benth. Rootstock woody: sts. several to a root, erect, 1–3 ft. high, branching only at the base: lvs. elliptic, usually very obtuse and apiculate, sometimes subacute: fls. in sublateral, 6–13-fld. umbel-like cymes, dark purple; sepals linear-lanceolate, acute; corolla broadly campanulate, 5-lobed to one-third of the way down or more. Trop. and S. Afr. B.M. 7925.

SPHÆRÓGYNE: *Tococa.*

SPHÆROSTÉMA: *Schizandra.*

SPHAGNUM. Sphagnum moss, bog-moss, or peat-moss is found in swamps or bogs and is one of the plants from which peat is formed; it is much used by gardeners. Its geographical distribution extends to all countries in the North Temperate zone. According to Warnstorf, 1911 (Engler's "Das Pflanzenreich"), there are 342 recognized species of Sphagnum, of which many occur in North America. Sphagnum mosses differ from the true mosses so much that they are usually classified in a distinct family, Sphagnaceæ. Besides differences in structure of the reproductive organs, the marked differences lie in the

CVI. Spinach.—Above, a plant of Long Season variety. Below, spinach field near Norfolk, Virginia.

larger growth of sphagnum (which is often a foot or more in height), its soft appearance, pale green color, and the absence of root-hairs. The stems and leaves are inclosed or encircled by one, two, and often four strata of transparent cells connected with each other by small holes, which have the capacity of sucking up and retaining a large amount of water. These cells therefore perform the function of root-hairs, and it is this abundant water-storage tissue that makes sphagnum moss of so much use to gardeners in the cultivation of orchids, anthuriums, and the like, and in fact most plants of an epiphytal or swamp-loving character, such as sarracenia and darlingtonia. Sphagnum often forms at least one-third of the compost in which pitcher-plants and epiphytes are grown. The fresh green tips of sphagnum are also most useful for surfacing pots of orchids and other plants. Besides giving them a better appearance, the moss acts as an index to the moisture condition of the plant. Sphagnum is also useful in the propagation of many stove plants, such as cordyline, nepenthes, and the like; for starting tropical tuberous-rooted plants, such as fancy caladiums; for sowing seeds of orchids, anthuriums, nepenthes, and sarracenias when fresh and chopped fine; as a mulch; as a non-conducting material for plants in pots in exposed positions in summer; and in packing plants for transportation, for which purpose it is an ideal material. Owing to its sponge-like character it may be used wet or dry, according to the character of the plants intended for packing.

Unless one has an ideal position in which to keep sphagnum moss after gathering it from its native place, or unless one has conditions very similar to its native habitat, it is difficult to keep it living for any length of time. This does not greatly matter, except that sphagnum used for surfacing pots should always be living for the sake of appearance. That which is used in potting and propagating need not necessarily be living as long as it is fresh and not decayed, while partially decayed moss may be used for mulching and packing.

EDWARD J. CANNING.

SPHEDAMNOCÁRPUS (derivation unknown). *Malpighiàceæ*. Scandent or erect shrubs or subshrubs: lvs. opposite, entire, petiolate, without stipules, the petiole glandular: fls. rather large, in 3–4-fld. umbels, collected in terminal panicles; calyx 5-parted, not glandular; petals unequal, short-clawed, the lobes dentate or nearly entire; stamens 10; ovary 3-celled: samaras 3, with a vertical dorsal wing.—About 5 species, Trop. and S. Afr. *S. prùriens*, Szyszylowicz (*Acridocárpus prùriens*, Juss.). A tall climbing shrub, silky-tomentose on most of its parts: lvs. opposite, ovate-oblong, 1–4 in. long: fls. subcorymbosely clustered at the ends of the branches, 1–1½ in. diam., golden yellow; petals short-clawed, orbicular, margins crisped: samaras silky-pubescent. S. Afr. B.M. 7894.

SPHENÓPHOLIS (Greek, *sphen*, a wedge, and *pholis*, a scale, referring to the broadly obovate second glume). Syn., *Eatònia*, Endl., not Raf. *Gramíneæ*. Slender perennials with rather delicate panicles: spikelets 2–3-fld., articulated below the glumes; glumes dissimilar in shape, the first narrow, the second obovate.—Species about 5, N. Amer. Three kinds have been catalogued among native plants offered for sale.

A. *Panicle dense, spike-like, strict.*

obtusàta, Scribn. Spikelets crowded on the short, erect panicle-branches; upper glume rounded-obovate, very obtuse. Dry soil throughout U. S. Dept. Agric., Div. Agrost. 7:258.

AA. *Panicle more loose and slender.*

pállens, Scribn. (*Eatònia pennsylvánica*, Gray). Lvs. 3–6 in. long: panicle-branches lax, nodding, glumes unequal, the first shorter. Moist woods and meadows. Maine to Texas. Ibid. 257.

nftida, Scribn. (*Eatònia Dúdleyi*, Vasey). Lvs. 1–2 in. long: panicle-branches spreading in flowering, afterward erect; glumes equal in length. E. U. S. Ibid. 259.

A. S. HITCHCOCK.

SPICE BUSH: *Benzoin.*

SPIDER FLOWER: *Cleome.* **S. Lilies:** *Hymenocallis* and *Pancratium.* **S. Plant:** *Cleome.* **Spiderwort:** *Tradescantia.*

SPIGÈLIA (named for Adrian von der Spigel, physician, 1558–1625). *Loganiàceæ*. Annual or perennial herbs, some hardy, the others either warmhouse or greenhouse plants, rarely somewhat woody, with opposite membranous feather-veined rarely 3–5-nerved lvs., and long or small, red, yellow, or purplish fls. usually borne in terminal one-sided somewhat curved spikes: calyx 5-lobed; segms. narrow; corolla tubular; lobes 5, valvate; stamens 5, attached to the corolla-tube; ovary 2-loculed; style articulated, simple, obtuse or somewhat capitate and stigmatose at the summit: caps. flattened, circumscissile above the persistent base.—About 50 species, Amer.

marilándica, Linn. PINK-ROOT. A handsome hardy perennial herb, with slender, tufted sts. 1–2 ft. high, opposite, ovate, sessile, thin lvs. 2–4 in. long, and red, tubular fls. with yellow throats in terminal, 1-sided spikes. June, July. Woods, N. J. to Wis. and south. B.B. 2:605. B.M. 80.—An elegant plant for the hardy border. Shade is not necessary for its welfare if planted in good loose deep loam.

S. splèndens, Hort., grows 1½ ft. high: lvs. 4–5 in. long, contracted to a short petiole, obovate-oblong: fls. bright scarlet, 1 in. or more long, in recurved spikes. July. Mex. and Guatemala. B.M. 5268. G.W. 2, p. 417; 7, p. 362.

F. W. BARCLAY.

SPILÁNTHES (Greek, meaning *spot-flower*, in reference to the markings on the disk in some of the species). *Compósitæ*. Herbs, mainly weeds, some of them desirable for outdoor planting, with opposite lvs.: rays yellow or whitish, or none: achenes nearly always flattened, biaristate or without bristles, glabrous or strongly ciliate, in the latter case quite distinct in appearance. There are about 40 species of Spilanthes, widely distributed in both hemispheres, mostly confined to warmer countries, or, in the New World, also occurring in the South Temperate zone; one variety native to Amer. Good technical characters for distinguishing the different forms are found in but few cases. The latest monograph is in the Proceedings of the American Academy of Arts and Sciences, vol. 42, pp. 521–69. **S. oleràcea,** Linn. (Tropics), is cult. for the pungent flavor of its lvs., used in salads; also, to a slight extent, as an ornamental, on account of its odd cylinder-like heads, in which the ratio of length to breadth is the greatest in the genus. Two types of it are named in the trade, Parà cress and Brazil cress, the latter said more commonly to have a brownish cast to sts. and lvs. Gn. 22, p. 295. Gt. 2, p. 36. While most of the species are of inferior appearance, several are distinctly worth cultivating or possibly hybridizing for ornament. The principal ones are enumerated below; all but *S. callimorpha* belonging in the radiate section, Acmella, DC.

S. americàna, Hieron., var. *rèpens*, A. H. Moore. One of the best of the showy members of the genus. Erect or weak, ascending, decumbent, or rarely prostrate: lvs. large for the genus: rays bright yellow. By selection the erect type could probably be made to predominate. A hybrid combining with this the handsome lvs. and red st. of S. phaneractis would be most pleasing, were it produceable. Sept. Mo., Ark., La. to Fla. and Texas.—*S. callimórpha*, A. H. Moore. Decumbent or prostrate: lvs. long-acuminate; internodes long: rayless species, but of pleasing appearance. Yunnan Province, China.—*S. charitópsis*, A. H. Moore. One of the dainty species; a fair companion-piece to S. iodiscæa, but with pale disks. Brazil.—*S. flìpes*, Greenm. Erect plant with long internodes: small attractive heads. Yucatan, Mex.—*S. grísea*, A. H. Moore. Lvs. densely hispidulous: rays large, very bright yellow. Paraguay.—*S. iodiscæa*, A. H. Moore. A dainty little plant, with delicate green foliage: disk violet, the tiny rays creamy. Porto Rico. Though not quite so charming, S. charitopsis would be a pretty good companion.—*S. phaneráctis*, A. H. Moore. Decumbent or

prostrate: sts. red: lvs. linear to linear-lanceolate: rays large, bright yellow. Known from states of Jalisco and Michoacan, Mex. One of the few very conspicuous-fld. species.—*S. poliolepidica*, A. H. Moore. Erect: rays golden yellow: plants hairy. Costa Rica.

ALBERT HANFORD MOORE.

SPINACH (*Spinacia oleracea*, which see) is an annual crop grown as a pot-herb, or for "greens." Fig. 3659. It is a cool-season plant, and therefore it is grown in fall to spring. It is a plant of easy culture, thriving in any good garden or field soil, although for quick results and for tender succulent foliage, land that has an abundance of available plant-food, and particularly of nitrogen, is most desirable. The plant is hardy, and when the land is well drained, it will ordinarily stand the winter climate as far north as the city of New York, and still farther in somewhat protected places.

Spinach is grown both as a fall and spring crop. The fall crop is raised from seed that is sown in August; in eight weeks the leaves may be large enough for eating.

3659. Spinach.

The spring crop is grown from seeds sown in autumn, or from those sown in winter in hotbeds or cold-frames, or from those sown directly in the open ground as soon as it is fit in the spring. If the plants for spring use are to be started in the fall, the seeds should be sown about six to eight weeks before hard freezing weather is expected. Then the plants will have attained sufficient size and roothold to enable them to pass the winter. It is advisable to cover the plants, just before winter sets in, with straw or loose litter or dry manure. Even though the plants will withstand the winter, they nevertheless thrive better if given this protection, particularly in soils that are likely to heave. It is customary to grow this fall-sown spinach on wide ridges or beds that are made by plowing several furrows together, leaving a dead-furrow between them. This allows of surface drainage. These beds may be from 5 to 10 feet wide. On these beds, the seeds are sown in rows running lengthwise, the distance between the rows being from 10 to 20 inches, depending on the methods that are employed for tillage. If hand tillage alone is to be given, the plants may be placed closer. In the spring the cover is removed from the plants at the earliest opportunity, for spinach is most desired very early in the season. Unless the land is in extra good "heart," it is well to make a surface application of a soluble fertilizer early in the spring in order to start the plants into growth. A fertilizer that is very rich in nitrogen gives best results; in fact, it is customary in some places to use a solution of nitrate of soda or sulfate of ammonia, applying the material with a sprinkling-cart. From fifty to seventy-five pounds of the fertilizer may be used to the acre with very good results at each of two or more applications.

For home use, spinach is sometimes carried over the winter in frames, the plants having been transplanted to the frames or raised in them during the late fall. These frames are protected from severe freezing weather by mats or shutters. Whenever it is desired to bring the plants into growth, sash is placed over the frame, and extra protection is given in very cold weather. The plants will soon become green and begin to make new leaves. Different frames may be covered at different times as the season advances, thereby providing a supply for home use. Sometimes the seed is sown in hotbeds that are made late in winter or very early in spring, and the plants are secured in advance of the ordinary season. The growing of spinach in frames is less frequent than formerly, owing to the fact that the market is now supplied with the product grown in the middle South.

Spring spinach may be grown from seeds that are sown as soon as the land can be worked in spring. If the land has been plowed and manured in the fall, quicker results may be secured. Two or three sowings may be made in the home-garden for spring use, but after the middle of June spinach is likely to become tough and is in little demand. If spinach is wanted during the summer, it is better to use the New Zealand spinach, which is a warm-weather plant. This plant has no relationship with the ordinary spinach (see *Tetragonia*). It is usually best to sow spinach seed where the plants are to stand, although it is sometimes transplanted into frames for home use. Care must be taken that the plants do not become checked or stunted, else they will tend to run to seed. If the seed is sown too late in spring, when hot weather is approaching, the root-leaves will be very few and the plant will quickly throw up flower-stalks. Spinach is always grown as a succession or companion crop, as it occupies the land for a small part of the year. There are very few insects and diseases that are generally troublesome.

Spinach is usually transported to market in barrels or crates. Plants are usually cut so that an inch or so of the root is left with them. All dirt is removed, as also all broken and dead leaves. The plants are packed tight. It is essential that the plants be dry before they are shipped.

There are several important varieties of spinach. The large broad-leaved varieties are most popular in the markets, such as the Viroflay and the Round-leaved. The prickly spinach is considered to be the most hardy and is chiefly recommended for fall sowing. L. H. B.

SPINÀCIA (from *spina;* alluding to the spiny fruit). *Chenopodiàceæ.* SPINACH. SPINAGE. According to Volkens (in Engler & Prantl's "Pflanzenfamilien"), there are only two species of Spinacia, *S. oleracea*, Linn., the common spinach, and *S. tetrandra*, Stev., although Bentham & Hooker had made the genus to include four species. *S. tetrandra* is an anual herb of the Asia Minor-Persian region, and is not in cultivation. *S. oleracea*, the spinach, is probably native to southwestern Asia, and it is now widely cultivated. It is an annual herb, developing rather large arrow-shaped root-leaves, and these leaves are eaten for "greens." Later in the season it sends up a branching flower-stem 2 to 3 feet high, bearing axillary clusters of seed-like fruits. In one type these fruits are spiny: this is the form once described as *S. spinosa*, Moench, but which is not now considered to be specifically distinct. Whether the round-seeded or the prickly-seeded type is the original form of the spinach is not known, but as a matter of nomenclature, Linnæus' *S. oleracea*, which is the oldest name, is held to include all.

Spinacia belongs to the Atriplex tribe. The genus is distinguished from Atriplex in the fact that the pistillate flowers are bractless, whereas those of Atriplex are inclosed in a pair of enlarging calyx-like bracts. Spinacia is dicœcious, bearing the flowers in small axillary clusters; stamens 4 or 5, in a 4- to 5-lobed calyx; ovary 1, with 4 to 5 styles or stigmas, in a 2- to 4-toothed calyx, this calyx hardening and inclosing the achene and often becoming horned on the sides and giving rise to "prickly-seeded" spinach. The cultivated forms have developed much thicker and broader radical leaves, which are used for greens, often showing little of the halberd or sagittate shape. See *Spinach*. L. H. B.

SPIRÆA (ancient Greek name of a plant used for garlands, derived from *speira*, band, wreath; probably first used for the present genus by Clusius). *Rosàceæ*, subfam. *Spiræeæ*. SPIREA. Ornamental woody plants grown for their profuse handsome white, pink, or carmine flowers.

Deciduous shrubs: lvs. simple, short-petioled, dentate or serrate, sometimes lobed, rarely entire, without stipules: fls. in umbel-like racemes, corymbs or panicles, perfect, rarely polygamous; calyx cup-shaped or campanulate, 5-lobed; petals 5, rounded; stamens 15–60, inserted between calyx and disk; pistils usually 5, distinct, developing into follicles dehiscent along the inner suture, with several minute oblong seeds.—About 70 species in the temperate regions of the northern hemisphere, in Amer. south to Mex., in Asia south to the Himalayas. Many species formerly included under Spiræa are now referred to other genera; see *Physocarpus*, *Holodiscus*, *Sorbaria*, also *Chamæbatiaria*, *Luetkea*, *Petrophytum*, and *Sibiræa* for shrubby species, and *Aruncus*, *Filipendula*, and also *Astilbe* for the herbaceous ones. There is a monograph of Spiræa and the allied genera by Maximowicz in Acta Horti Petropolitani, vol. 6, pp. 105–261 (1879) and a monograph of the cult. species, with their numerous hybrids fully described by H. Zabel, Die strauchigen Spiräen der deutschen Gärten (1893). There is much horticultural literature on spireas, for the plants are popular and about two-thirds of the known species and numerous hybrids mostly originated in gardens are in cult.

The spireas are very ornamental, usually low or medium-sized shrubs with rather small deciduous foliage and with small white or pink or sometimes nearly crimson flowers in showy corymbs or panicles followed by small inconspicuous capsule-like fruits. Many are hardy North; some of the best of them are *S. arguta*, *S. Thunbergii*, *S. Vanhouttei*, *S. pubescens*, *S. trilobata*, *S. nipponica*, *S. media*, *S. ulmifolia*, *S. alba*, *S. Douglasii*, *S. Menziesii*, *S. tomentosa*. The recently introduced *S. Henryi*, *S. Veitchii*, *S. Wilsonii*, *S. Rosthornii* and *S. Sargentiana* have proved hardy at the Arnold Arboretum, while *S. blanda*, *S. japonica*, and *S. albiflora* require a sheltered position or protection during the winter, though *S. japonica* and its allies, even if killed almost to the ground, will produce flowers on shoots of the same season. *S. cantoniensis*, *S. Blumei*, *S. chinensis*, *S. canescens*, and *S. bella* are more tender and not to be recommended for the North, but are hardy or nearly hardy in the middle states. *S. prunifolia* is hardy as far north as Boston.

In regard to the flowering season, the spireas can be divided into two groups. The first one contains the species of the section Chamædryon, with white flowers in umbels and blooming in spring, from April to June. The second group is composed of the sections Calospira and Spiraria, with white or pink flowers in corymbs or panicles appearing from June to autumn. Some of the most important species, arranged according to their relative flowering-time, are the following: Early-flowering spireas—*S. Thunbergii*, *S. arguta*, *S. hypericifolia*, *S. prunifolia*, *S. media*, *S. pikowiensis*, *S. pubescens*, *S. chamædryfolia*, *S. trilobata*, *S. Vanhouttei*, *S. cantoniensis*, *S. nipponica*. Late-flowering spireas—*S. bella*, *S. Rosthornii*, *S. Wilsonii*, *S. Henryi*, *S. Sargentiana*, *S. Veitchii*, *S. corymbosa*, *S. densiflora*, *S. canescens*, *S. japonica*, *S. albiflora*, *S. salicifolia*, *S. alba*, *S. Menziesii*, *S. Douglasii*, *S. tomentosa*. Many species of the second group do not produce their flowers all at once like those of the first group, but continue blooming for a longer time.

The spireas are all medium-sized or low shrubs and well adapted for borders of shrubberies, as single specimens on the lawn, or for rockeries. Especially the species of the early-flowering group possess a graceful habit and make effective single specimens, except perhaps *S. chamædryfolia* and *S. media*, which are somewhat stiffer and less handsome and produce suckers. *S. canescens*, *S. Henryi*, and its allies have the graceful habit of the first group. *S. japonica* and its numerous hybrids form mostly low, round bushes and are pretty as single specimens or in the border. *S. alba*, *S. Douglasii*, *S. Menziesii*, and their hybrids should be planted in shrubberies only and especially in situations where their spreading by suckers does no harm; they are sometimes used for low ornamental hedges. For rockeries *S. decumbens*, *S. betulifolia*, *S. corymbosa*, *S. densiflora*, *S. bullata*, and some dwarf hybrids of *S. japonica* are to be recommended.

The species of the section Chamædryon, and also *S. canescens* and *S. bella*, should be pruned as little as possible—only thinned out and the weak wood removed—while those of the sections Spiraria and Calospira can be pruned more severely if necessary, since they produce their flowers at the ends of the young shoots. Some of the early-flowering spireas, especially *S. arguta*, *S. prunifolia*, *S. Vanhouttei*, and *S. Bumalda*, are sometimes forced.

3660. Spiræa Thunbergii. (×½)

The spireas grow in almost any moderately moist soil and do not stand drought well, the spiraria species being generally more moisture-loving; *S. tomentosa* thrives well only in a peaty or sandy soil, while those recommended above for rockeries require a well-drained soil and sunny situation. Propagation is by seeds sown in spring and covered only slightly with soil, or by hardwood or greenwood cuttings. The species of Chamædryon grow very well from greenwood cuttings under glass, while the spirarias are usually raised from hardwood cuttings. The calospiras seem to grow equally well in both ways. The spirarias are also often propagated by division and by suckers.

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KEY TO THE SECTIONS.

A. *Infl. a simple umbel-like raceme: fls. white.*
Section I. CHAMÆDRYON. Species Nos. 1–20.
AA. *Infl. compound: fls. white or pink.*
B. *Fls. in corymbs.*
Section II. CALOSPIRA. Species Nos. 21–42.
BB. *Fls. in panicles.*
Section III. SPIRARIA. Species Nos. 43–55.

Section I. CHAMÆDRYON. Species Nos. 1–20.

A. *Fls. in sessile umbels with none or very small lvs. at the base or only the lower umbels on leafy stalks.*
B. *Foliage entire or crenately dentate only near the apex, often 3-nerved, grayish green* ..... 1. **hypericifolia**
BB. *Foliage dentate or serrate, usually penninerved, bright green.*
C. *Shape of lvs. linear-lanceolate: glabrous* ..... 2. **Thunbergii**
CC. *Shape of lvs. ovate to oblong-lanceolate: finely pubescent when young.*
D. *Umbels on the lower part of the branches stalked.*
E. *Lvs. oblong* ..... 3. **arguta**
EE. *Lvs. obovate* ..... 4. **multiflora**
DD. *Umbels all sessile, 3–6-fld.* ..... 5. **prunifolia**
AA. *Fls. in umbel-like racemes on leafy stalks.*
B. *Margin of lvs. entire or crenate or dentate only toward the apex.*
C. *Foliage grayish pubescent on both sides* ..... 6. **cana**
CC. *Foliage almost glabrous.*
D. *Shape of lvs. elliptic to oblong-lanceolate.*
E. *Lvs. penninerved: shoots angular* ..... 7. **alpina**
EE. *Lvs. all or partly 3-nerved.*
F. *Shoots striped: lvs. all 3-nerved* ..... 8. **crenata**
FF. *Shoots terete: lvs. partly penninerved, partly 3-nerved* ..... 9. **pikowiensis**
DD. *Shape of lvs. almost orbicular, ½–1 in. broad* ..... 10. **nipponica**
BB. *Margin of lvs. incisely serrate and often slightly lobed (only in No. 18 sometimes entire).*
C. *Stamens shorter than or as long as petals; sepals erect or spreading in fr.*
D. *Foliage glabrous.*
E. *Form of lvs. orbicular to ovate.*
F. *Apex of lvs. obtuse.*
G. *Lvs. penninerved, ovate* ... 11. **Blumei**
GG. *Lvs. palmately 3–5-nerved, orbicular* ..... 12. **trilobata**
FF. *Apex of lvs. acute* ..... 13. **Vanhouttei**
EE. *Form of lvs. rhombic-lanceolate* ..... 14. **cantoniensis**
DD. *Foliage pubescent, at least beneath.*
E. *Umbels and follicles pubescent.*
F. *Tomentum grayish* ..... 15. **blanda**
FF. *Tomentum yellowish* ..... 16. **chinensis**
EE. *Umbels and follicles glabrous.* 17. **pubescens**
CC. *Stamens longer than petals; sepals reflexed.*
D. *Shoots terete, often pubescent* ... 18. **media**
DD. *Shoots angular, glabrous.*
E. *Lvs. doubly and irregularly serrate from below the middle* ..... 19. **chamædryfolia**
EE. *Lvs. simply serrate, usually only above the middle* ..... 20. **flexuosa**

1. **hypericifòlia,** Linn. Vigorous shrub, 5 ft. high, with slender arching or upright branches: lvs. almost sessile, cuneate-obovate to obovate-lanceolate, 3-nerved or with few lateral veins, almost glabrous, ¾–1½ in. long: fls. small, white, in sessile umbels; pedicels usually pubescent; petals almost orbicular, usually longer than stamens. April, May. S. E. Eu. to Siberia. —Variable species. Var. **acùta,** Ser. (*S. acutifòlia,* Willd.). Lvs. narrower, oblanceolate: fls. smaller, yellowish white; pedicels glabrous; petals obovate, shorter than stamens: fls. somewhat earlier, but less showy. G.O.H. 9. Var. **flabellàta,** Zabel (*S. flabellàta,* Bertol. *S. hypericifòlia* var. *crenàta,* Boiss. & Buhse). Lvs. obovate to obovate-lanceolate, acute, incisely serrate at the apex or entire on the flowering branches. Var. **obovàta,** Maxim. (*S. obovàta,* Waldst. & Kit.). Lvs. obovate, rounded at the apex, crenate above the middle. S. E. Eu. G.O.H. 11. Var. **truncàta,** Zabel (*S. thalictroìdes,* Hort., not Pall.). Lvs. broadly obovate to oblong-obovate, truncate and crenately dentate at the apex. Siberia.

2. **Thúnbergii,** Sieb. Fig. 3660. Shrub, 5 ft. high, with spreading or arching branches: lvs. linear-lanceolate, sharply serrulate, 1–1¾ in. long: fls. pure white, about ½in. across, in 3–5-fld. naked umbels; petals

3661. Spiræa prunifolia var. plena. (×½)

obovate, much longer than stamens: follicles with the spreading styles below the apex. April, May. China, Japan. S.Z. 1:69. G.F. 8:84, 85. J.H. III. 47:337.—A very graceful early-flowering shrub, the slender arching branches clothed with feathery bright green foliage, turning late in fall to orange or scarlet. Almost hardy, but tips of branches sometimes killed by severe frost; valuable for seaside planting.

3. **argùta,** Zabel (*S. Thúnbergii* × *S. multiflòra*). Similar in habit to the former but higher and more vigorous: lvs. oblong-obovate to oblong-oblanceolate, sharply and sometimes doubly serrate, glabrous at length, 1–1¾ in. long: fls. pure white, ½in. across, in many-fld. umbels, mostly with small lvs. at the base; pedicels glabrous; petals broadly obovate, almost twice as long as stamens. May. Of garden origin. G.C. III. 22:3; 43:398. Gn. 73, p. 578; 78, p. 82. A.G. 22:633. G.M. 44:385.

A.F. 17:192. Gn.W. 24:470. G.L. 27:33. Gng. 7:291. F.E. 11:160. G.F. 10:443. M.D.G. 1900:16.—The most free-flowering and showy of the earlier spireas; quite hardy.

4. **multiflòra,** Zabel (*S. crenàta* × *S. hypericifòlia*). Shrub, 5 ft. high, with slender, arching branches: lvs. obovate, cuneate, serrate above the middle, usually 3-nerved, glabrous at length, about 1 in. long: fls. pure white, in many-fld. umbels, sessile on the upper, borne on leafy stalks on the lower part of the branches. May. Of garden origin.—Handsome shrub similar to the former, but blooming a little later.

5. **prunifòlia,** Sieb. & Zucc. Graceful shrub, 6 ft. high, with upright slender pubescent branches: lvs. ovate to oblong, denticulate, pubescent beneath, 1–2 in. long: fls. pure white, about ½in. across, on slender pedicels, in 3–6-fld. umbels; petals obovate, longer than stamens. May. China, Japan. J.C.T. 22:12. Var. **plèna,** Schneid. (var. *flòre-plèno*, Hort.). Fig. 3661. Fls. double, rather large. S.Z. 1:70. F.S. 2:153. Gn. 53, p. 185. A.G. 18:425. F.E. 9:593. Mn. 3, p. 42. G. 21:314; 27:132. G.M. 50:187. Gn.M. 3:208. F.E. 31:602.—Very handsome, early-flowering shrub, with dark green, shining foliage, turning orange in fall. The single-fld. form is less showy and rare in cult.; its foliage is lighter and not shining.

6. **càna,** Waldst. & Kit. Dense, bushy shrub, 3 ft. high: lvs. elliptic to oblong, acute at both ends, usually entire, grayish pubescent on both sides, more densely beneath, ⅓–1 in. long: fls. ¼in. across, in dense head-like umbels; petals about as long as stamens; sepals reflexed in fr. May. S. E. Eu., W. Asia. R.F.G. 24:148.—Hardy, but not very showy.

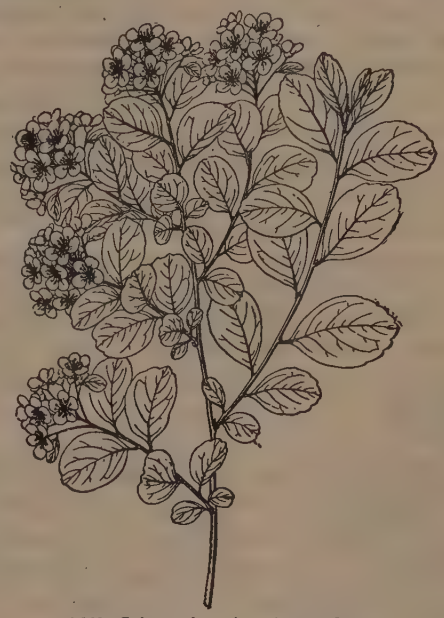
7. **alpìna,** Pall. Shrub, 4 ft. high, with upright or arching, angular, reddish brown branches: lvs. oblong-obovate to oblanceolate, acute, usually entire, glabrous, penninerved, ¼–1 in. long: fls. white, rather small, in short-stalked, small, glabrous umbels; petals roundish, little shorter than stamens; sepals upright in fr.: follicles curving outward. May, June. N. E. Asia. G.O.H. 8.—Hardy shrub, with graceful foliage.

8. **crenàta,** Linn. (*S. crenifòlia*, C. A. Mey.). Shrub, 3 ft. high, with slender striped branches: lvs. oblong-obovate to oblanceolate, acute at both ends, crenately serrate toward the apex, grayish green, puberulous beneath when young, 3-nerved, ½–1¼ in. long: fls. white, rather small, in dense almost semi-globose umbels; petals roundish obovate, shorter than stamens; sepals upright in fr.: follicles with erect styles. May. S. E. Eu. to Caucasus and Altai. L.B.C. 13:1252. G.O.H. 10. R.F.G. 24:147.—Hardy.

9. **pikowiénsis,** Bess. (*S. crenàta* × *S. mèdia*. *S. Nicoudiértii*, Hort.). Shrub, 4 ft. high, with terete upright branches: lvs. oblong, cuneate at base, with few sharp teeth at the apex or sometimes entire, penninerved to 3-nerved, almost glabrous, 1–2 in. long: fls. white or greenish white, in many-fld. almost glabrous umbels; petals orbicular, shorter than stamens; sepals upright in fr.: follicles with the upright style somewhat below the apex. May.—Supposed natural hybrid, found wild in Podolia, Poland.

10. **nippónica,** Maxim. (*S. bracteàta*, Zabel, not Raf.). Fig. 3662. Shrub, 8 ft. high, with upright or spreading branches, quite glabrous: lvs. obovate, usually crenate at the apex, dark green above, bluish green beneath, of firm texture, ½–¾in. long: fls. ⅓in. across, in umbel-like racemes, sometimes compound at the base; petals orbicular, longer than stamens; sepals spreading in fr. June. Japan. Var. **rotundifòlia,** Makino (*S. mèdia* var. *rotundifòlia*, Nichols.). Lvs. broadly obovate or roundish obovate, ¾–1½ in. long: fls. somewhat larger. G.C. II. 23:283; III. 37:149; 43:399. J.H.S. 33, p. 349. G. 29:663. G.M. 43:95. B.M. 7429. G.F. 7:305 (adapted in Fig. 3662).—Desirable hardy shrub of vigorous growth with showy umbels of pure white fls. and dark green handsome foliage remaining green until late in fall.

11. **Blùmei,** Don (*S. rupéstris*, Sieb.). Shrub, 4 ft. high, with spreading and arching branches: lvs. ovate to rhombic-ovate, incisely crenate-serrate, pale bluish green beneath and rather prominently veined, ¾–1¾ in. long: fls. polygamous, white, in many-fld. umbels; petals roundish-obovate, about as long as stamens: follicles with spreading or reflexed styles. June. Japan. B.H. 8:36.—Not hardy N., rare in cult.; often the following or other species are met with under its names.



3662. Spiræa nipponica. (× nearly 1)

12. **trilobàta,** Linn. (*S. triloba*, Linn.). Fig. 3663. Shrub, 4 ft. high, with slender spreading branches: lvs. almost orbicular, incised-dentate and often 3-lobed, obtuse, pale bluish green beneath, ½–1 in. long: fls. pure white, in many-fld. umbels; sepals upright in fr.: follicles with ascending styles. May, June. N. China to Siberia and Turkestan. L.B.C. 13:1271. G.F. 1:452. F.E. 30:45 (as *S. cratægifolia*).—Handsome bushy shrub, quite hardy; cult. under many different names as *S. aquilegifòlia*, *S. adiantifòlia*, *S. cratægifòlia*, *S. Blùmei*.

13. **Vanhoùttei,** Zabel (*S. cantoniénsis* × *S. trilobàta*. *S. aquilegifòlia* var. *Vanhoùttei*, Briot). Fig. 3664. Shrub, 6 ft. high, with arching branches: lvs. rhombic-ovate or rhombic-obovate, rounded or somewhat narrowed at the base, acute, incised-serrate, dark green above, pale bluish green beneath, ¾–1¾ in. long: fls. white, ⅓in. across, in many-fld. umbels; petals twice as long as stamens; sepals upright or spreading in fr. May, June. Of garden origin. Gn. 53, p. 251; 71, p. 334. Gn.M. 1:116; 3:131. G. 27:94. F.R. 10:133. F.E. 14:389; 17:673; 31:600. C.L.A. 4:210. G.F. 2:317. Gng. 5:210. A.G. 15:297. P.G. 3:173. M.D.G. 1900:17.—This is one of the most beautiful, or perhaps the most beautiful, of the early-blooming spireas and quite hardy. Sometimes confounded with the foregoing, which is similar but smaller in every part and less showy.

14. **cantoniénsis,** Lour. (*S. Reevesiàna*, Lindl. *S. lanceolàta*, Poir. *S. corymbòsa*, Roxbg.). Shrub, 4 ft. high, with slender, arching branches: lvs. rhombic-lanceolate, incisely doubly serrate, dark green above,

pale bluish green beneath, 1–2½ in. long: fls. over ⅓in. across, in rather dense umbels; sepals upright in fr.: follicles with spreading styles. May, June. China, Japan. B.R. 30:10. A.G. 18:356. G. 34:441.—Very handsome shrub, with large pure white fls., but only half-hardy N. Var. **lanceàta,** Zabel (*S. Reevesiàna flòre-plèno,* Hort.), with double fls. and narrower lvs. is still more tender. H.F. 1855:11. This species and the three foregoing are valuable also for their handsome foliage, which remains fresh and green until late in fall.

15. **blânda,** Zabel (*S. chinénsis* × *S. cantoniénsis. S. Reevesiàna robústa* or *nòva,* Hort.). Upright shrub, 6 ft. high, with arching branches: lvs. oblong to ovate, acute at both ends, incised-serrate, dark green and almost glabrous above, grayish-tomentose beneath, 1–1⅓ in. long: fls. rather large, pure white, in pubescent umbels; sepals ovate-lanceolate, upright in fr.: follicles pubescent, with spreading styles. May, June. Of garden origin.—Only half-hardy North.

16. **chinénsis,** Maxim. (*S. pubéscens,* Lindl.). Upright shrub, 5 ft. high, with arching branches, tomentose when young: lvs. long-petioled, ovate, incisely serrate and sometimes 3-lobed, finely pubescent above, yellowish tomentose beneath, 1–2 in. long: fls. pure white, about ⅓in. across, in pubescent umbels; sepals upright in fr., ovate-lanceolate, tomentose like the follicles; styles terminal, spreading. May. China. B.R. 33:38.—Handsome, but not hardy North.

17. **pubéscens,** Turcz. Upright shrub, 6 ft. high, with slender, arching branches: lvs. similar to those of the foregoing species, but more grayish tomentose beneath and somewhat smaller, petioles shorter: fls. ¼–⅓in. across, in glabrous umbels; sepals triangular-ovate, upright in fr.: follicles glabrous, with the spreading styles below the apex. May. N. China. G.F. 1:331.—Hardy N., and the large-fld. form as handsome as the foregoing species.

18. **mèdia,** Schmidt (*S. confùsa,* Regel & Koern.). Upright shrub, 5 ft. high, with terete branches, glabrous or pubescent when young: lvs. ovate to oblong,

3663. Spiræa trilobata. (×½)

cuneate at the base, incisely serrate above the middle, almost glabrous or pubescent, 1–2¼ in. long: fls. in many-fld. rather long-stalked, umbel-like racemes: follicles with the spreading or reflexed styles somewhat below the apex. May. S. E. Eu. to Japan. J.H. III. 46:533. G. 30:45. G.M. 49:504. R.F.G. 24:149. Var. **glabréscens,** Simonkai. Almost glabrous. Var **subintegérrima,** Zabel (*S. oblongifòlia,* Waldst. & Kit.). Lvs. elliptic-oblong to oblong-lanceolate, narrowed at both ends, entire or with 1–3 teeth at the apex, nearly glabrous. Var. **serícea,** Regel (*S. sericea,* Turcz.). Lvs. pubescent on both sides.

19. **chamædryfòlia,** Linn. Shrub, to 6 ft., with angular glabrous branchlets: lvs. slender-petioled, ovate, incisely or doubly serrate from below the middle, almost glabrous, bluish green beneath, 1½–3 in. long: umbels many-fld., the lower ones on branchlets about 2 in. long, the upper ones often almost sessile; fls. about ⅓in. across: follicles with the style upright and terminal. May, June. S. E. Eu. to Japan. G. W. H. 83. Var. **ulmifòlia,** Maxim. (*S. ulmifòlia,* Scop.). Lvs. more rounded at the base: umbels more elongated-hemispherical. S. E. Eu. R.F.G. 24:150. Var. **trânsiens,** Zabel. Lvs. narrower, oblong-ovate.—This and the preceding species spread by suckers.

3664. Spiræa Vanhouttei.

20. **flexuòsa,** Fisch. (*S. chamædryfòlia* var. *flexuòsa,* Maxim.). Similar to the preceding species, but lower and more spreading: branchlets slender, strongly angled, distinctly zigzag: lvs. oblong-ovate to lance-oblong, cuneate at the base, usually serrate above the middle only, 1–2 in. long: umbels few-fld., short-stalked. May, June. N. E. Asia. Var. **stenophýlla,** Schneid. (*S. chamædryfòlia* var. *stenophýlla,* Zabel). Lvs. smaller and narrower, usually less than 1 in. long.

Section II. Calospira. Species Nos. 21–42.

A. *Corymbs on usually short lateral branchlets along the mostly arching branches of the previous year.*
- B. *Lvs. ½–1 in. long, crenate-serrate, or serrate only at the apex: corymbs on very short branchlets.*
  - C. *Branchlets angular: lvs. generally oval, obtuse: winter buds with 2 outer scales* ..... 21. **canescens**
  - CC. *Branchlets terete: lvs. generally oblong: winter buds with several scales* ..... 22. **Sargentiana**
- BB. *Lvs. ¾–3 in. long.*
  - C. *Fls. perfect, white.*
    - D. *Winter buds short, ovate, with several outer scales: lvs. entire or dentate only above the middle.*
      - E. *Upper surface of lvs. glabrous; margin entire: flowering branchlets 2–3 in. long.* . 23. **Veitchii**
      - EE. *Upper surface of lvs. more or less pubescent, margin usually dentate toward the apex.*
        - F. *Infl. glabrous* ..... 24. **Wilsonii**
        - FF. *Infl. pilose* ..... 25. **Henryi**
    - DD. *Winter buds elongated, pointed, with 2 outer scales: lvs. doubly or incisely serrate.*
      - E. *Foliage pubescent on the veins below, incisely serrate.* 26. **Rosthornii**
      - EE. *Foliage glabrous, lvs. deeply serrate* ..... 27. **longigemmis**
  - CC. *Fls. diœcious, pink or white: lvs. sharply serrate: winter buds ovate, with several scales.*
    - D. *Shoot angular: lvs. usually ovate-oblong: fls. pink* ..... 28. **bella**
    - DD. *Shoot terete: lvs. usually ovate to elliptic: fls. white* ..... 29. **expansa**

AA. *Corymbs terminal on upright shoots of the year.*

BB. *Infl. pubescent, rarely glabrous, very compound, besides the terminal corymb lateral ones blooming somewhat later appear beneath it, only weak branches with a single corymb.*
C. *Shrub 1 ft. or less high, with bullate lvs. less than 1 in. long*.....30. **bullata**
CC. *Shrubs 1–5 ft. high, with larger lvs.*
D. *Branches terete.*
E. *Ripe follicles diverging*.....31. **japonica**
EE. *Ripe follicles upright, straight.*
F. *Fls. pink*.....32. **Margaritæ**
FF. *Fls. whitish or blushed*.....33. **Foxii**
DD. *Branches more or less angular, rather stiff, almost glabrous.*
E. *Color of fls. pink, rarely whitish*.....34. **Bumalda**
EE. *Color of fls. white*.....35. **albiflora**
BB. *Infl. consisting of only one terminal corymb, usually glabrous: follicles not diverging.*
C. *Corymbs usually pubescent.*
D. *Sepals reflexed in fr.: lvs. generally oblong, acute, or acuminate: fls. pink or whitish*.....36. **superba**
DD. *Sepals upright in fr.: lvs. generally ovate or oval: fls. white*..37. **corymbosa**
CC. *Corymbs glabrous (often puberulous in No. 41).*
D. *Stamens longer than the petals.*
E. *Fls. pink; annular disk wanting*.....38. **densiflora**
EE. *Fls. white; disk present.*
F. *Lvs. oblong, entire, or with few teeth above the middle, acute*.....39. **virginiana**
FF. *Lvs. oval or elliptic, toothed.*
G. *Margin of lvs. sharply, often doubly serrate, apex acutish*.....40. **lucida**
GG. *Margin of lvs. crenate-dentate, apex rounded*.....41. **betulifolia**
DD. *Stamens as long as petals: decumbent shrub: lvs. ½–1 in. long, sharply serrate*.....42. **decumbens**

21. canéscens, D. Don. Shrub, 6 or sometimes 12 ft. high, with spreading and arching branches; branchlets angled: lvs. broadly oval to obovate, very short-petioled, crenately dentate above the middle, grayish green, pubescent beneath or sometimes almost glabrous at length, ⅛–¾in. long: fls. white, rather small, in dense, semi-globose corymbs to 2 in. across, appearing very profusely along the branches; stamens about as long as petals; sepals upright or spreading in fr.: follicles villous, with the ascending styles a little below the apex. July. Himalayas. Gn. 45, p. 49; 49, p. 421; 52, p. 28; 54, p. 48; 61, p. 380; 62, p. 414. G.C. III. 43:90.—Very graceful and handsome shrub, but not hardy N. It occurs under very many different names in the gardens, as *S. cuneàta, S. cuneifòlia, S. flagellàta, S. flagelliformis, S. rotundifòlia, S. vaccinifòlia,* and others. Var. **myrtifòlia,** Zabel (*S. argéntea,* Hort.). Lvs. dark green above, glaucescent and less pubescent below, narrower. M.D.G. 1906:385.

22. Sargentiàna, Rehd. Shrub, to 6 ft., with slender spreading branches; branchlets terete, puberulous at first, soon glabrous: lvs. elliptic-oblong to obovate-oblong, narrowed into the petiole, with a few acute teeth at the apex, rarely entire, puberulous above, villous beneath chiefly on the veins, ½–1 in. long: corymbs dense, 1–1¾ in. across, villous: fls. white, ¼in. across; calyx villous; stamens about as long as petals: carpels nearly glabrous. June. W. China.—A very graceful shrub, similar to *S. canescens;* has proved not quite hardy at the Arnold Arboretum.

23. Veitchii, Hemsl. Shrub, to 12 ft., with spreading and arching branches; branchlets puberulous while young, reddish, striped: lvs. oval to oblong, rarely obovate, obtuse, cuneate at the base, entire, finely puberulous beneath and glaucescent, glabrous above, ¾–1½ in. long: corymbs 1½–2½ in. across, puberulous: fls. ⅛in. across, white; calyx puberulous; stamens longer than petals: carpels glabrous, upright. June, July. B.M. 8383. J.H.S. 35, p. 152, fig. 98. G.M. 52:598.—Like the two following closely allied species very handsome and hardy as far north as Mass.

24. Wilsonii, Duthie. Shrub, to 8 ft., with arching branches; branchlets dull purplish, pubescent while young: lvs. very short-petioled, oval to oblong or obovate, obtuse or acutish, cuneate at the base, entire or with a few coarse teeth at the apex, dull green and pubescent above, grayish green and villous beneath, particularly on the veins, ¾–2¼ in. long: corymbs dense, 1½–2 in. across, glabrous or nearly so: fls. ¼in. across, pure white; calyx glabrous: follicles sparingly pilose, slightly spreading. June. Cent. and W. China. B.M. 8390. G. 35:851.

25. Hénryi, Hemsl. Fig. 3665. Shrub, to 8 ft., with spreading branches; branchlets sparingly pilose or nearly glabrous: lvs. obovate or oblong to oblanceolate, cuneate at the base, acute or rounded at the apex, usually coarsely dentate toward the apex, slightly hairy above, villous beneath particularly on the veins, ¾–3 in. long; petiole ⅛–¼in. long: corymb 2 in. across, rather loose, pilose: fls. ¼in. across; stamens shorter than petals: follicles hairy, slightly spreading. June. Cent. and W. China. B.M. 8270. Gn. 65, p. 44. J.H.S. 28:62, fig. 20. G. 37:35. Var. **notábilis,** Farquhar. Corymbs larger.

3665. Spiræa Henryi. (×½)

26. Rósthornii, Pritz. (*S. Prátti,* Schneid.). Shrub, to 6 ft., with spreading branches; branchlets yellowish brown, sparingly hairy while young: winter buds elongated, long-pointed, often as long as petiole: lvs. ovate to ovate-oblong, acuminate, cuneate at the base, rarely nearly rounded, incisely serrate, bright green, hairy on the veins beneath, 1½–3 in. long; petioles ¼–⅓in. long: corymbs rather loose, 2–3 in. across, pilose, on elongated branchlets: fls. ¼in. across, white, stamens longer than petals. June. W. China.—A graceful shrub with handsome bright green foliage.

27. longigémmis, Maxim. Fig. 3666. Shrub, 4 ft. high, with slender terete branches, glabrous: axillary buds acuminate, longer than the petioles: lvs. ovate-lanceolate to oblong-lanceolate, incisely and doubly serrate, with glandular-tipped teeth, bright green, glabrous, 1½–2½ in. long: fls. white in rather loose 2–3-in. broad pubescent corymbs; sepals spreading in fr.: follicles almost glabrous, with terminal spreading styles June. N. W. China. G.F. 7:345 (adapted in Fig. 3666) I.T. 5:92. G. 34:443.—Hardy.

28. bélla, Sims (*S. expánsa,* Wall. *S. ovàta,* and *S. cóccinea,* Hort.). Shrub, 3 ft. high, with slender, spreading branches, angular and sparingly pubescent: lvs. ovate-elliptic to ovate-lanceolate, acute at both ends, sharply serrate from below the middle, almost glabrous, whitish or bluish green beneath, 1–2 in. long: fls. dicœcious, ⅕in. across, pink, in small corymbs, ½–2 in.

across; stamens little longer than petals; sepals reflexed in fr.: follicles pubescent only at the inner suture, with spreading styles. June, July. Himalayas. B.M. 2426. L.B.C. 13:1268.—Only half-hardy North.

29. **expánsa,** Koch (*S. bélla* var. *expánsa,* Regel. *S. fastigiàta,* Wall.). Closely allied to the foregoing; more vigorous and upright, 6 ft. high, with terete branches tomentose when young: lvs. ovate to ovate-oblong,

3666. Spiræa longigemmis. (×⅜)

acute at both ends, sharply serrate from the middle, usually pubescent on the veins beneath, 1½–3 in. long: fls. white, ¼ in. across, in 1–4-in.-broad corymbs terminal on upright, often very long branches: follicles pubescent, diverging. July. Himalayas.—**S. pulchélla,** Kunze (*S. kumaonénsis,* Hort.), is supposed to be a hybrid of this and the foregoing species; it combines the broader corymbs of the latter with the brighter color of the first species, therefore handsomer than either parent; sometimes cult. as *S. expánsa rùbra,* but there is also another hybrid of the same name. See *S. rubra* in suppl. list.

30. **bullàta,** Maxim. (*S. crispifòlia,* Hort.). Dwarf shrub, with strictly upright, brown, villous branches: lvs. roundish-ovate to ovate, very short-petioled, incisely serrate, thickish and bullate, almost glabrous, grayish green beneath, ½–¾ in. long: fls. deep pink, in small and dense corymbs 1½–3 in. across. July, Aug. Japan. Gt. 35:1216.

31. **japónica,** Linn. (*S. callòsa,* Thunb.). Shrub, 4 ft. high, with upright branches glabrous or puberulous when young: lvs. ovate to oblong-lanceolate, acute at both ends or acuminate, doubly and incisely serrate, pale bluish green and usually glabrous beneath, 1–4 in. long: fls. small, pale to deep pink, in usually much-compound and rather loose corymbs; sepals reflexed in fr.: follicles glabrous, diverging with ascending styles. June, July. Japan, China.—A very variable species. The variety most common in cult. usually under the name *S. callosa* is var. **Fórtunei,** Rehd. (*S. Fórtunei,* Planch. *S. callòsa,* Lindl., not Thunb.). Higher, with quite terete branches: lvs. 2–4 in. long, oblong-lanceolate, acuminate, sharply and doubly serrate, with incurved, callous-tipped teeth, rugose above, bluish white beneath: corymbs very compound, rather loose; disk less developed, sometimes wanting. E. and Cent. China. F.S. 9:871. B.M. 5164. B.H. 8:129.—Handsome shrub with the young unfolding lvs. of a pretty purplish color and very large much-compound corymbs. The Japanese forms grow less high, have smaller and broader, coarsely doubly dentate-serrate lvs., not rugose and less whitish beneath; the sts. are slightly striped by the decurrent petioles and the infl. is less compound. Other varieties of Chinese origin are the two following recently intro. varieties. Var. **acuminàta,** Franch. Lvs. ovate-oblong to lanceolate, acuminate, green and pubescent beneath, at least on the veins, 2–3½ in. long: fls. pink, in terminal corymbs 4–6 in. across. Cent. and W. China. Var. **ovalifòlia,** Franch. Lvs. oval to elliptic, acute, glabrous and glaucescent beneath, 1½–3 in. long: fls. white, in corymbs 3–5 in. across. W. China.—Japanese forms little known in cult. are var. **pubéscens,** Regel, with the lvs. pubescent beneath and the corymbs pubescent, and var. **glabràta,** Nichols. (*S. glabràta,* Lange), with ovate glabrous lvs. and bright pink fls. in glabrous corymbs. The following are garden forms: Var. **atrosanguínea,** Zabel. Fls. deep pink, in tomentose corymbs. Var. **rubérrima,** Zabel. Fls. deep pink, in puberulous corymbs. Var. **macrophýlla,** Simon-Louis. Lvs. becoming 6 in. long, bullate: corymbs small. Var. **variegàta,** Hort. Lvs. variegated with yellowish white. Most of the other forms enumerated as varieties under this species are hybrids.

32. **Margarìtæ,** Zabel (*S. japónica* × *S. supérba*). Shrub, 5 ft. high, puberulous: lvs. ovate-elliptic to elliptic, coarsely and often doubly serrate, pubescent on the midrib beneath and pale green, 2–3 in. long: fls. rather large, bright pink, in broad corymbs; sepals spreading in fr.: follicles upright, glabrous, with upright styles. July, Aug. Of garden origin.—Handsome, very free-flowering form.

33. **Fóxii,** Zabel (*S. corymbòsa* × *S. japónica*). Similar to the preceding: branches more or less striped, almost glabrous: lvs. elliptic, doubly serrate, glabrous: fls. whitish or pinkish, in large, puberulous corymbs; styles spreading in fr. June, July. R. H. 1900, p. 117. Of garden origin.—Less desirable than the preceding hybrid.

34. **Bumálda,** Burvenich (*S. japónica* × *S. albiflòra. S. pùmila,* Zabel). Shrub, 2 ft. high, rarely higher: lvs. ovate-lanceolate, sharply and doubly serrate, glabrous, 2–3 in. long: fls. whitish to deep pink: follicles diverging. July, Aug. B.H. 17: 12. Gn. 46, p. 416. Mn. 2, p. 24. G. C. III. 43:416.—Cult. in many different forms, probably all of garden origin. Two of the best are var. **Anthony Waterer,** a very free-flowering, compact shrub with bright crimson fls. in rather

3667. Spiræa albiflora. (×⅓)

dense corymbs and rather narrow, incisely serrate lvs. Gn. 45:49. G.C. III. 14:365; and var. **Froèbeli,** Hort. (*S. callòsa* var. *Froèbeli*, Hort.), a taller plant with broader, ovate-oblong lvs. and also with bright crimson fls. F.E. 31:604. A similar form is **S. Lemòinei,** Zabel (*S. Bumálda* var. *rubérrima*, Hort.), hybrid of *S. Bumalda* and *S. bullata*, a low, compact shrub, with somewhat bullate lvs. and pink fls.

3668. Spiræa latifolia. (×½)

35. albiflòra, Miq. (*S. japónica álba*, Regel. *S. leucántha*, Lange). Fig. 3667. Low shrub, 1½ ft. high, with stiff, upright branches: lvs. lanceolate, coarsely or sometimes doubly serrate, glabrous, 1–2 in. long: fls. white, in dense corymbs, one large terminal and many smaller ones below along the branch; disk prominent; sepals reflexed in fr.: follicles upright, not or little diverging. July, Aug. Japan.

36. supérba, Zabel (*S. albiflòra* × *S. corymbòsa*). Low shrub, with striped dark brown branches: lvs. elliptic-oblong to oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1–3 in. long: fls. rather large, pink or almost whitish; disk prominent; petals orbicular or broadly obovate. June, July. Of garden origin.

37. corymbòsa, Raf. (*S. cratægifòlia*, Link). Low shrub, with usually little-branched sts., rarely to 3 ft. high: branches purplish brown: lvs. broadly oval to ovate, acutish, coarsely and often doubly serrate, especially above the middle, pale bluish green beneath and glabrous, 1½–3 in. long: fls. white, rather small, in somewhat convex usually pubescent corymbs, 1½–3 in. across; petals oval: follicles and styles upright. May, June. N. J. to Ga. and Ky. L.B.C. 7:671. G.O.H. 82. B.B. (ed. 2) 2:246.

38. densifòlra, Nutt. (*S. betulifòlia* var. *ròsea*, Gray. *S. spléndens*, Baumann. *S. ròsea*, Koehne. *S. arbúscula*, Greene). Low, much-branched shrub: lvs. very short-petioled, oval to ovate, obtuse, crenately serrate, glabrous, rarely sparingly puberulous beneath, ¾–1½ in. long: fls. bright pink, in dense corymbs 1–2 in. across. June–Aug. Brit. Col. to Ore., Wyo., and Mont. G.F. 10:413.

39. virginiàna, Brit. Much-branched shrub, to 4 ft., glabrous: lvs. lance-oblong, acute, cuneate or rounded at the base, entire or with a few teeth above the middle, pale or glaucescent beneath, 1½–2 in. long: fls. white, in dense glabrous corymbs, about 2 in. across. June. Va. to N. C. and Tenn. B.B. (ed. 2) 2:246.

40. lùcida, Douglas (*S. corymbòsa* var. *lùcida*, Zabel). Closely allied to *S. corymbosa:* branches yellowish brown or brown: lvs. more incisely serrate, oval or obovate: corymb glabrous, usually looser and more flat, broader. June, July. Brit. Col. to Sask., Wyo. and Ore.

41. betulifòlia, Pall. Low, much-branched shrub: lvs. oval to obovate-oblong, usually cuneate at base and very short-petioled, serrate or crenately serrate, obtuse, glabrous or slightly pubescent on the veins beneath, ¾–1½ in. long: corymb usually glabrous, 1–2 in. across. June, July. Siberia to Manchuria, Kamchatka and Japan.—The three preceding species except *S. virginiana* are all closely allied and considered by some botanists varieties of *S. betulifolia.*

42. decúmbens, W. Koch (*S. procúmbens*, Hort.). Dwarf, procumbent shrub, about ½ft. high, with ascending branches, glabrous: lvs. elliptic to oblong, acute at both ends, crenately serrate above the middle, glabrous, ½–1 in. long: fls. white, in small corymbs, about 2 in. across: follicles glabrous, with upright terminal styles. June. Tyrol. G.C. II. 11:752. M.D.G. 1912:186. R.F.G. 24:151. G.M. 57:746.—Pretty shrub for rockeries.

SECTION III. SPIRARIA. Species Nos. 43–55.

A. *Infl. a broad panicle, about as broad as high. (Hybrids of species of this and the preceding section.)*
  B. *Panicles rather small, on lateral branchlets at the end of last year's branches* ..... 43. **Fontenaysii**
  BB. *Panicles large, terminal on long, upright branches.*
    C. *Lvs. glabrous or nearly so.*
      D. *Apex of lvs. acute* ..... 44. **conspicua**
      DD. *Apex of lvs. obtuse or acutish.*
        E. *Shape of lvs. broadly ovate or obovate* ..... 45. **notha**
        EE. *Shape of lvs. oblong or oval-oblong* ..... 46. **pyramidata**
    CC. *Lvs. pubescent or tomentose beneath.*
      D. *Base of lvs. acute* ..... 47. **sanssouciana**
      DD. *Base of lvs. rounded* ..... 48. **Watsoniana**
AA. *Infl. an elongated panicle, longer than broad. (Spiraria proper.)*
  B. *Foliage glabrous or nearly so.*
    C. *Lvs. sharply serrate, except at the very base.*
      D. *Panicles tomentulose.*
        E. *Fls. light pink* ..... 49. **salicifolia**
        EE. *Fls. white* ..... 50, **alba**
      DD. *Panicles glabrous* ..... 51. **latifolia**
    CC. *Lvs. coarsely serrate above the middle: fls. pink* ..... 52. **Menziesii**
  BB. *Foliage pubescent or tomentose beneath.*
    C. *Follicles glabrous: lvs. grayish or whitish tomentose beneath.*

DD. *Lvs. acute at both ends*.....53. **Billiardii**
DD. *Lvs. rounded or nearly so at both ends*.....54. **Douglasii**
CC. *Follicles pubescent: lvs. usually light tawny beneath*.....55. **tomentosa**

43. **Fontenàysii,** Billiard (*S. fontenaysiénsis,* Dipp. *S. canéscens* × *S. salicifòlia*). Shrub, 6 ft. high, with slender, upright branches: lvs. oval or oblong-oval, rounded at both ends, crenately serrate above the middle, pale bluish green beneath, almost glabrous, 1–2 in. long: fls. white or pink, in 1½–3-in.-long panicles; petals orbicular, about as long as stamens; sepals spreading in fr. June, July. Of garden origin.—Not quite hardy N. Var. **álba,** Zabel, is the white-fld., var. **ròsea,** Zabel, the pink-fld. form. **S. pruinòsa,** Zabel (*S. brachybòtrys,* Lange. *S. luxuriòsa,* Hort. *S. canéscens* × *S. Doúglasii*), is a similar form, but the lvs. are tomentose beneath and the fls. pink.

44. **conspícua,** Zabel (*S. albiflòra* × *S. álba*). Upright shrub, 3 ft. high, with dark brown puberulous branches: lvs. elliptic-oblong, acute at both ends, simply or doubly serrate, almost glabrous, 1½–2½ in. long: fls. pinkish white, in broad finely pubescent panicles; petals shorter than stamens. July–Sept.—Handsome form. A similar hybrid is **S. syringæflòra,** Lem. (*L. albiflòra* × *S. salicifòlia*), with oblong-lanceolate or lanceolate lvs., serrate above the middle, and pink fls. Closely allied is also **S. semperflòrens,** Zabel (*S. japónica* × *S. salicifòlia, S. japónica* or *S. Fórtunei* var. *paniculàta,* Hort.). Higher than the former: lvs. oblong-lanceolate, usually doubly serrate: fls. pink. R.H. 1860, pp. 496, 497. Gn. 45, p. 48. G. 3:191.

45. **nòtha,** Zabel (*S. corymbòsa* × *S. latifòlia*). Shrub, 3 ft. high, with brown, glabrous branches: lvs. broadly ovate to obovate, short-petioled, coarsely and doubly serrate, almost glabrous, 1–2 in. long: fls. white to pinkish white, in broad, glabrous panicles; stamens almost twice as long as the orbicular petals. July, Aug. —Of garden origin.

46. **pyramidàta,** Greene. Possibly hybrid between *S. lucida* and *S. Menziesii.* Upright shrub, 3 ft. high: lvs. oval-oblong to oblong, acutish or obtuse, usually doubly serrate above the middle, glabrous or nearly so, 1½–3 in. long: panicles 1½–3½ in. long, rather dense, puberulous: fls. pinkish or almost white. July. Found wild in Ore. and Wash.

47. **sanssouciàna,** Koch (*S. Doúglasii* × *S. japónica. S. Regeliàna,* Hort. *S. Nobleàna,* Hook.). Shrub, 4 ft. high, with striped, finely tomentose branches: lvs. oblong-lanceolate, sharply and usually doubly serrate, grayish tomentose beneath, 2–3½ in. long: fls. pink, in broad corymb-like panicles: follicles glabrous, with spreading styles. July, Aug. Of garden origin. B.M. 5169. I.H. 8:286.—An allied form is **S. intermèdia,** Lemoine (*S. albiflòra* × *S. Doúglasii*), similar in habit to *S. syringæflora* but with the lvs. tomentose beneath.

48. **Watsoniàna,** Zabel (*S. Doúglasii* var. *Nobleàna,* Wats. *S. Nobleàna,* Zabel. *S. Doúglasii* × *S. densiflòra*). Shrub, 4 ft. high, similar to the former: lvs. oblong or narrowly oblong, usually rounded at the base, acute, sharply serrate above the middle, grayish-tomentose beneath, 1–3 in. long: fls. light pink, in dense broadly pyramidal, tomentulose panicles 3–6 in. high; petals half as long as stamens; sepals reflexed in fr.; styles erect. June, July. Natural hybrid, found in Calif. *S. subvillòsa,* Rydb., apparently belongs here.—A similar form is **S. pachýstachys,** Zabel (*S. corymbòsa* × *S. Doúglasii*), with broader lvs. and fls. of paler pink. G.C. III. 38:322.

49. **salicifòlia,** Linn. (*S. sibírica,* Raf. *S. salicifòlia* var. *cárnea,* Ait.). Upright shrub, 5 ft. high, with terete yellowish brown branches puberulous when young: lvs. oblong-lanceolate to lanceolate, sharply and sometimes doubly serrate with often incurved teeth, 1½–3 in. long: fls. light pink or whitish, in oblong, dense, tomentulose panicles leafy below, the lvs. exceeding the ascending ramifications; stamens twice as long as petals; sepals upright in fr.: follicles ciliate at the inner suture. June, July. S. E. Eu. to Japan and probably Alaska. R.F.G. 24:152. G.W.H. 82. Var. **grandiflòra,** Dipp. (*S. grandiflòra,* Lodd.). Lower, with larger, lighter pink fls. L.B.C. 20:1988.

50. **álba,** Dur. (*S. salicifòlia* var. *paniculàta,* Ait. *S. lanceolàta,* Borkh.). QUEEN OF THE MEADOW. MEADOW-SWEET. Attractive upright shrub, attaining 6 ft., with reddish brown branches puberulous when young: lvs. narrow, oblong to oblanceolate, acute, usually regularly simply serrate, 1½–2½ in. long: fls. white, in leafy pyramidal tomentulose panicles, the lower spreading ramifications much longer than their supporting lvs.; stamens white, usually as long as petals: follicles quite glabrous. June–Aug. From N. Y. west to Mo., south to Ga. and Miss. B.B. (ed. 2) 2:245. —Also known as *S. salicifolia.*

3669. Spiræa Douglasii. (×⅓)

51. **latifòlia,** Borkh. (*S. salicifòlia* var. *latifòlia,* Ait. *S. carpinifòlia,* Willd. *S. canadénsis,* Hort. *S. bethlehemènsis,* Hort.). QUEEN OF THE MEADOW. MEADOW-SWEET. Fig. 3668. Branching shrub, 2–5 ft. high, with bright or dark red-brown glabrous twigs: lvs. broadly oval to obovate or oblong, usually coarsely and often doubly serrate, 1½–3 in. long: fls. white, larger than those of *S. alba,* sometimes slightly blushed and with the stamens and disk more or less pinkish; panicles quite glabrous, broadly pyramidal, with spreading and elongated ramifications; stamens longer than petals. June–Aug. Newfoundland and Canada to N. C. Em. 2:485. G.C. III. 43:417.—This and the preceding species have been referred by most American botanists to *S. salicifolia. S. alba* is chiefly found west, *S. latifolia* east of and on the Alleghanies, while the true *S. salicifolia* is an Old-World species.

52. **Ménziesii,** Hook. (*S. Doúglasii* var. *Ménziesii,* Presl). Upright shrub, 4 ft. high, with brown, at first puberulous, branches: lvs. oblong-obovate to oblong, coarsely and unequally serrate above the middle, pale green beneath, 1½–3 in. long: fls. small, pink, in rather narrow, 5–8-in.-long panicles; stamens more than twice as long as the roundish petals; sepals reflexed in fr. June–Aug. Alaska to Ore.

53. Billiárdii, Herincq (*S. Douglasii* × *S. salicifòlia*). Shrub, 6 ft. high, with brown pubescent branches: lvs. oblong to oblong-lanceolate, acute, sharply and often doubly serrate, except in the lower third, usually grayish-tomentose beneath, at least when young, sometimes almost glabrous at length, 2–3 in. long: fls. bright pink, in 5–8-in. long, tomentose or tomentulose panicles usually rather narrow and dense. July, Aug. Of garden origin. H.F. 5:24. F.E. 18:613.—*S. Lenneàna, S. bethleheménsis rùbra, S. triúmphans, S. exímia, S. Constántiæ, S. califórnica,* Hort., are very similar and probably of the same parentage.

54. Doúglasii, Hook. Fig. 3669. Shrub, 8 ft. high, with reddish brown, tomentose branches: lvs. oblong to narrow-oblong, rounded or acutish at both ends, unequally serrate above the middle, densely white-tomentose beneath, 1½–4 in. long: fls. deep pink, in dense, rather narrow or sometimes broad panicles, 4–8 in. long; stamens twice as long as the obovate petals; sepals reflexed in fr.: follicles glabrous. July, Aug. Brit. Col. to Calif. F.S. 2:66. R.H. 1846:101. P.M. 12:195. B.M. 5151. Gn. 23:246.

55. tomentòsa, Linn. HARDHACK. STEEPLEBUSH. Shrub, 4 ft. high, with upright, brown, tomentose branches: lvs. ovate to oblong-ovate, acute, unequally and often doubly serrate, densely yellowish or grayish-tomentose beneath, 1–2½ in. long: fls. deep pink or purple, in narrow dense panicles, brownish tomentose and 3–8 in. long; stamens somewhat longer than the obovate petals; sepals reflexed: follicles pubescent, usually diverging. July–Sept. Nova Scotia to Ga., west to Man. and Kans. B.B.(ed. 2) 2:245. Em. 2:485. Gn.M. 5:344. Var. **álba,** Rehd. (f. *albiflòra,* Macbride). With white fls. F.E. 8:833. Gng. 5:149.—This species does not spread by suckers like most others of the section Spiraria. All the last-named species are valuable as late-blooming shrubs and decorative with their showy panicles of bright or deep pink fls. They appear at their best when planted in masses in the wilder parts of the park in low ground.

S. Àitchisonii, Hemsl.=Sorbaria Aitchisonii.—*S. amurénsis,* Maxim.=Physocarpus amurensis.—*S. ariæfòlia,* Smith=Holodiscus discolor var. ariæfolius.—*S. Aráncus,* Linn.=Aruncus sylvester.—*S. assímilis,* Zabel (S. densiflora × S. japonica). Low shrub, with pink fls. in broad corymb-like panicles. Garden hybrid.—*S. astilboides,* Moore=Astilbe astilboides.—*S. Boursièri,* Carr.=Holodiscus Boursieri.—*S. brumàlis,* Lange (probably S. expansa × S. alba). Medium-sized shrub, with oblong, incisely serrate, almost glabrous lvs. and pinkish white fls. in broad and loose corymb-like panicles. Aug.–Oct. Garden hybrid.—*S. cæspitòsa,* Nutt.=Petrophytum cæspitosum.—*S. calcícola,* W. W. Smith. Shrub to 5 ft., with slender arching branches: lvs. small, obovate or elliptic, entire, glabrous: fls. white, pink outside, in 6–8-fid. umbels. S. W. China.—*S. camtschática,* Pall.=Filipendula camtschatica.—*S. capitàta,* Pursh=Physocarpus capitatus.—*S. cinèrea,* Zabel (S. cana × S. hypericifolia). Medium-sized shrub, with small, oblong, usually entire, pubescent lvs. and white fls. in short-stalked umbels. Garden hybrid.—*S. concínna,* Zabel (S. albiflora × S. expansa). Medium-sized shrub, with lanceolate, sharply serrate, almost glabrous lvs. and pinkish white fls. in broad corymbs. Garden hybrid.—*S. compácta multiflòra,* Hort.=Astilbe japonica var.—*S. conférta,* Zabel (S. cana × S. crenata). Medium-sized shrub, with small, ovate to oblong-lanceolate, 3-nerved, entire or crenate lvs. and white fls. in dense, small, peduncled umbels. Garden hybrid.—*S. dahùrica,* Maxim., is closely allied to S. alpina, but not yet intro. S. canescens and Sorbaria sorbifolia are sometimes cult. under this name.—*S. dasyántha,* Bunge. Allied to S. chinensis. Lvs. ovate, cuneate at the base, incisely serrate or lobed, with grayish white tomentum beneath: infl. grayish tomentose; stamens half as long as petals. N. China.—*S. Dàvidii,* Hort.=Astilbe Davidii.—*S. diffórmis,* Zabel (S. alba × S. corymbosa). Medium-sized shrub, with oval to oblong-lanceolate, serrate, almost glabrous lvs. and white fls. in large corymb-like panicles. Garden hybrid.—*S. digitàta,* Willd.=Filipendula palmata.—*S. discolor,* Pursh=Holodiscus discolor.—*S. dumòsa,* Nutt.=Holodiscus dumosus.—*S. Filipéndula,* Linn.=Filipendula hexapetala.—*S. fissa,* Lindl.=Holodiscus fissus.—*S. floribúnda.* A trade name of indiscriminate meaning. S. semperflorens and Sorbaria sorbifolia are sometimes met with under this name.—*S. gemmàta,* Zabel (S. mongolica, Hort., not Maxim.). Allied to S. alpina: axillary buds much longer than petioles: lvs. small, penninerved, oblong-lanceolate, usually entire: fls. white, in short-stalked, rather few-fid. umbels. Mongolia.—*S. Gieselerièna,* Zabel (S. cana × S. chamædryfolia). Medium-sized shrub, with ovate, sharply serrate lvs. and rather large white fls. in long-stalked umbels. Garden hybrid.—*S. gigantèa,* Hort.=Filipendula camtschatica.—*S. grácilis,* Maxim. (S. vacciniifolia, Lodd., not Don). Low shrub, allied to S. canescens, with slender, arching branches: lvs. small, ovate, obtuse, entire or crenate above the middle, quite glabrous: fls. white, in hemispherical loose corymbs. Himalayas. L.B.C. 15:1403.—*S. grandiflòra,* Sweet=Sorbaria grandiflora.—*S. grandiflòra,* Hook.=Exochorda racemosa.—*S. Hacquétii,* Fenzl & Koch. Closely allied to S. decumbens, but grayish-pubescent and with the sepals upright or spreading in fr. N. Italy, Tyrol.—*S. Hoòkeri,* garden name, applied to S. nudiflora, S. bella, S. expansa, S. tristis, and others, and also to Exochorda racemosa.—*S. Húmboldtii,* Hort.=Aruncus sylvester.—*S. infléxa,* Koch (S. crenata × S. mollis). Medium-sized shrub, with slender arching branches: lvs. elliptic-oblong, entire, sparingly pubescent beneath: fls. white, rather large, in many-fid. stalked umbels. Garden hybrid.—*S. japónica,* Hort., not Linn. f.=Astilbe japonica.—*S. kamaonénsis spicàta,* Hort., is a form of S. semperflorens.—*S. kamschática,* Auth.=Filipendula camtschatica.—*S. lævigàta,* Linn.=Sibiræa lævigata.—*S. laxiflòra,* Lindl.=S. vacciniifolia.—*S. Lindleyàna,* Wall.=Sorbaria Lindleyana.—*S. lobàta,* Gronov.=Filipendula rubra.—*S. micropétala,* Zabel (S. hypericifolia × S. media). Medium-sized shrub, with grayish green, oblong-obovate lvs., entire or serrate at the apex, 3- or penninerved: fls. white or greenish white, in umbels on leafy or naked stalks. Garden hybrid.—*S. Millefòlium,* Torr.=Chamæbatiaria Millefolium.—*S. Miyàbei,* Koidzumi. Allied to S. bella and S. japonica. Lvs. ovate, incisely serrate, glabrous, 1½–2½ in. long: infl. 1½–2 in. long, puberulous: fls. white, perfect; stamens much longer than petals: follicles upright, style spreading. Japan. Var. *glabràta,* Rehd. Lvs. broadly cuneate at base: infl. glabrous. Cent. China. Var. *pilòsula,* Rehd. Lvs. pubescent on the veins beneath: infl. sparingly pilose. Cent. China. This species is very similar to S. chamædryfolia in habit and foliage and also in the individual fls. but is easily distinguished by the compound corymb. Hardy at the Arnold Arboretum.—*S. mollifòlia,* Rehd. Allied to S. alpina and S. cana. Spreading shrub, to 6 ft.: winter buds acuminate, 2-valved, longer than petioles: lvs. elliptic-oblong or oblong, entire or with few teeth at the apex, villous on both sides, ½–¾in. long: infl. villous: fls. ⅛in. across, white: follicles upright, pubescent. W. China.—*S. móllis,* Koch (S. cana × S. media). Similar to S. media: lvs. smaller, usually entire, pubescent: fls. smaller, umbels pubescent. Garden origin.—*S. mongólica,* Maxim., is closely allied to S. crenata, but not yet intro.; the S. mongolica of gardens is S. gemmata.—*S. monógyna,* Torr. & Gray=Physocarpus monogynus.—*S. myrtilloìdes,* Rehd. Allied to S. alpina. Shrub, to 8 ft.: lvs. oval to obovate-oblong, entire, obtuse, rarely acutish, cuneate at the base, slightly pubescent beneath, ⅛–½in. long: infl. dense, hemispherical, on short leafy branchlets: fls. white, ¼in. across: follicles upright, glabrous. W. China. Very graceful shrub.—*S. nepalénsis,* a garden name applied to several species, as S. micropetala, S. canescens, S. salicifolia.—*S. nívea,* Zabel (S. canescens × S. expansa). Similar to S. canescens in habit, corymbs larger and looser: lvs. coarsely doubly serrate, pubescent, 1–2 in. long: fls. white or pinkish white. Garden hybrid.—*S. nudiflòra,* Zabel (S. bella × S. ulmifolia). Medium-sized shrub, with ovate, doubly serrate, almost glabrous lvs. and pinkish white fls. in hemispherical corymbs. Handsome, almost hardy shrub. Garden hybrid.—*S. opulifòlia,* Linn.=Physocarpus opulifolius.—*S. oxyòdon,* Zabel (S. chamædryfolia × S. media). Similar to S. media, but branches angular: lvs. narrower, follicles with the styles terminal and spreading. Garden hybrid.—*S. Pállasii,* Don=Sorbaria grandiflora.—*S. palmàta,* Pall.=Filipendula palmata.—*S. palmàta,* Thunb.=Filipendula purpurea.—*S. palmàta,* Linn.=Filipendula rubra.—*S. parvifòlia,* Bertol.=S. gracilis.—*S. pectinàta,* Torr. & Gray=Luetkea pectinata.—*S. revirèscens,* Zabel (S. expansa × S. japonica). Medium-sized shrub, with oblong, coarsely serrate lvs., pubescent on the veins beneath: fls. light to deep pink, in large corymbs; blooming in summer and usually again in fall. Garden hybrid.—*S. ritifòlia,* Nutt.=Physocarpus capitatus.—*S. rùbra,* Zabel (S. ruberrima, Dipp. S. Douglasii × S. expansa). Upright medium-sized shrub, with oblong-lanceolate, coarsely serrate lvs. tomentose beneath, and deep pink fls. in ovate panicles. Garden hybrid.—*S. Schinabéckii,* Zabel (S. chamædryfolia × S. trilobata). Medium-sized shrub, with arching branches: lvs. ovate to oblong-ovate, doubly serrate, glabrous: fls. white, rather large, in peduncled umbels; petals longer than stamens. Handsome shrub, similar to S. Vanhouttei. Garden hybrid.—*S. sorbifòlia,* Linn.=Sorbaria sorbifolia.—*S. Tobólskia,* Lodd.=Sorbaria sorbifolia.—*S. trifoliàta,* Linn.=Gillenia trifoliata.—*S. tristis,* Zabel. Hybrid of unknown origin, similar to S. expansa, but corymbs and the whitish pink fls. smaller; sepals upright in fr.—*S. Ulmària,* Linn.=Filipendula Ulmaria.—*S. vacciniifòlia,* D. Don (S. laxiflora, Lindl.). Shrub, to 2 ft., with arching branches: lvs. long-petioled, ovate, crenately dentate, almost glabrous, ¾–1½ in. long: fls. whitish, in tomentose corymbs, 1–3 in. across. June, July. Himalayas. F.S. 7, pl. 190.—*S. vacciniifòlia,* Lodd.=S. gracilis.—*S. vacciniifòlia,* Hort.=S. canescens, S. brumalis.—*S. venústa,* Hort.=Filipendula rubra var. venusta.—*S. venústula,* Kunth & Bouché=S. vacciniifolia.

ALFRED REHDER.

SPIRÁNTHES (name Greek, referring to the twisted spikes). *Orchidàceæ.* LADIES' TRESSES. Terrestrial herbs, few of which have any horticultural value; some of the hardy species are advertised by dealers in native plants and by collectors.

Erect herbs with fleshy or tuberous roots: lvs. mostly at the base or on the lower part of the st.: raceme terminal, twisted; fls. spurless, small or medium-sized; sepals free or more or less united at the top, or united with the petals into a helmet; labellum sessile or clawed, concave, embracing the column and spreading into a

crisped, sometimes lobed or toothed blade; pollinia 2, powdery.—Some 200 species, distributed in all parts of the world except the cold regions, but particularly abundant in the tropics of S. Amer.

A. *Fls. in 3 rows: lvs. persistent at the flowering-time.*

cérnua, Rich. Nodding Ladies' Tresses. Lvs. mostly basal, linear or linear-oblanceolate: st. 6–25 in. high, usually pubescent above, with 2–6 acuminate bracts: fls. white or yellowish, fragrant, nodding or spreading, in a spike 4–5 in. long; lateral sepals free, the upper arching and connivent with the petals; labellum oblong, rounded at the apex, crisp. Aug.–Oct. Nova Scotia to Minn. and south to Fla. B.M. 1568 (as *Neottia cernua*); 5277. B.R. 823. A.G. 13:467. V. 11:13.

3670. Spondias cytherea. (×⅜)

Romanzoffiàna, Cham. & Schlecht. Lvs. linear to linear-oblanceolate, 3–8 in. long: st. 6–15 in. high, leafy below: spike 2–4 in. long: fls. white or greenish, fragrant, sepals and petals broad at base, connivent into a hood; labellum oblong, broad at the base, contracted below and dilated at the apex, crisp. July, Aug. N. Amer. G.C. II. 16:465; 26:400.

lûcida, Ames. St. 4–10 in. high, glabrous or pubescent, bearing 4–5 lanceolate or oblanceolate lvs. near the base: fls. small; sepals and petals white, lateral sepals free, narrowly lanceolate, the upper one somewhat united with the petals; labellum quadrate-oblong, yellowish above, not contracted in the middle, wavy-crisp, obtuse or truncate. June–Aug. Maine to Minn. and Va.

AA. *Fls. alternate, appearing in a single spiral row.*

B. *Lvs. present at the flowering-time.*

præcox, Wats. (*S. graminea* var. *Wálteri,* Gray). Lvs. linear, 4–12 in. long, grass-like: st. 10–30 in. high, glandular pubescent above, leafy: spike 2–8 in. long: fls. white or yellowish, spreading; lateral sepals free, the upper one connivent with the petal; labellum oblong, contracted above and dilated toward the apex. July, Aug. N. Y. to Fla. and La.

BB. *Lvs. mostly withered at the flowering-time.*

símplex, Gray. Root a solitary oblong tuber: lvs. basal, ovate to oblong, short, absent at the flowering-time: st. very slender, 5–9 in. high: spike about 1 in. long: fls. white; labellum obovate-oblong, eroded and crisp. Aug., Sept. Mass. to Md. A.G. 13:466.

grâcilis, Beck. Roots clustered: lvs. basal, obovate to ovate-lanceolate, petioled, mostly dying before the flowering-time: st. 8–18 in. high, bearing a slender, many-fld., 1-sided or twisted spike: fls. white, fragrant; sepals longer than the labellum, the lateral ones free; labellum oblong, dilated in front, crenulate or wavy-crisp, thick and green in the middle. Aug.–Oct. E. N. Amer. A.G. 13:466.

S. colorâta, N.E. Br. (Neottia speciosa, Jacq.)= Stenorrhynchus. Heinrich Hasselbring.

SPIRODÈLA: treated under *Lemna.*

SPIRONÈMA (name means *spiral thread,* alluding to structure of the filaments). *Commelinàceæ.* One species, *S. fràgrans,* Lindl., is sometimes listed abroad for hothouse culture, an odd herb from Mex. Sometimes raised under glass for the delicious fragrance and for the transparency of its parts: st. fleshy, 2 ft. and more high: lvs. oblong-lanceolate, sheathing, parallel-veined: fls. white, clustered and nearly sessile in a terminal branched panicle, small, the petals paleaceous and diaphanous, the 3 sepals greenish; stamens 6. B.R. 26:47, where it is written that the plant will be cherished "because its thin and delicate tissue allows the hidden motion of its fluids and the subtile texture of its fructifying organs to be watched with ease and pleasure." It is very little known as a horticultural subject.

SPÓNDIAS (from a Greek word used by Theophrastus). *Anacardiàceæ.* A small genus of tropical trees, allied to the mango (*Mangifera indica*) and the cashew (*Anacardium occidentale*), cultivated for their fruits and often used for hedges because of the readiness with which large branches, when cut and used as posts, take root and grow.

Leaves usually clustered toward the ends of the branchlets, alternate, imparipinnate, with opposite lfts.: fls. polygamous, small, shortly pedicellate, disposed in racemes or panicles; calyx small, deciduous, with 4 or 5 valvate segms.; petals 4 or 5, valvate; stamens 8–10, inserted at the base of the disk; styles 3–5, free at the apex; ovary sessile, 3–5-loculed, with 1 ovule in each locule: fr. a fleshy drupe, with a 1–5-loculed woody endocarp.—Species about 12, several of which are common in the W. Indies, Mex., and elsewhere in Trop. Amer.; one species comes from the Society Isls., another from India.

cythèrea, Sonn. (*S. dúlcis,* Forst.). Otaheite-Apple. Pomme Cythere. Cajá Manga. Vi or Evi in Tahiti. Fig. 3670. Erect, stately tree, with rather stiff branches, up to 60 ft. in height: lvs. 8–12 in. long; lfts. 11–13, oval-oblong, 2½–3 in. long, 1–1¼ in. broad, acuminate, serrate: panicle 8–12 in. long; fls. whitish: fr. oval or obo-

void, golden yellow, up to 3 in. long, the seed about 1½ in. long, oval, echinate. Society Isls., but widely spread in the tropics.

Mŏmbin, Linn. (*S. purpùrea,* Linn.). Spanish Plum. Prunier d'Espagne. Ciruela. Small tree, sometimes spreading, stiff, up to about 25 ft. in height: lvs. 5–8 in. long; lfts. 16–21, oblong-elliptic, 1–1½ in. long, ⅝in. broad, usually somewhat asymmetrical, acute or bluntish, subserrate: racemes unbranched, about ½in. long, few-fld.; the fls. purplish maroon: fr. oblong-obovoid, commonly purplish, about 1 in. long, the seed oblong-elliptical, ½–¾in. long, roughened on the surface. Trop. Amer.

lûtea, Linn. (*S. Mómbin,* Jacq., not Linn.). Hog-Plum. Mombin. Jobo. Caja. Tall, handsome tree, up to about 60 ft. in height: lvs. 8–12 in. long; lfts. 7–17, ovate-lanceolate or lanceolate, 2½–4 in. long, 1–1½ in. broad, subentire or serrulate: panicle ½–1 ft. long, the fls. yellowish white: fr. ovoid, yellow, 1–1½ in. long, the seed oblong, ¾–1 in. long, smoothish. Cosmopolitan in the tropics.

pinnàta, Kurz (*S. mangífera,* Willd.). Hog-Plum. Amra. Small tree: lvs. 12–16 in. long; lfts. 5–11, ovate-oblong or elliptic-oblong, 4–6 in. long, 1½–3 in. broad, acuminate, entire: panicle 10–14 in. long; fls. whitish: fr. ovoid, yellow-green, 1½–2½ in. long, the seed oblong-elliptical, 1½–2 in. long, smoothish. Trop. Asia; according to Hooker, ascending to 5,000 ft. in the Himalayas.

tuberòsa, Arruda. Imbú. Umbú. Low, spreading tree, up to 25 ft. in height, with swollen roots: lvs. 4–6 in. long; lfts. 5–9, oblong-ovate, 1–1¾ in. long, ⅝–1 in. broad, sharply acute to acuminate, cordate at base, entire: panicle 4–6 in. long; fls. whitish: fr. ovoid, light yellow, 1½ in. long, the seed oblong-ovate, slightly flattened, ½–¾in. long, smooth. Brazil.

Cultivation and uses.

The Otaheite-apple, *S. cytherea,* is said to have been introduced to Jamaica in 1782, and again in 1792 by the famous Captain Bligh, who brought the bread-fruit from Tahiti to the West Indies. It has not become popular in Cuba, nor is it very extensively grown on the mainland of tropical America. In south Florida it succeeds well, and fine specimens can be seen at Miami and other points. In California it has not yet fruited, so far as known, and seems to be too tender for successful culture in any but the most favored locations. Some of the early travelers who visited Polynesia spoke of it in very high terms, and more recently it has been recommended as worthy of culture by numerous writers. Firminger, however, likens it to a "very bad mango." Probably a great deal depends on the variety. At its best the fruit is the size of a lemon; it is of deep golden yellow color when ripe, aromatic, with a thin but tough skin surrounding the soft, juicy, yellow pulp. The seed is large and oval, furnished with long woody spines over its entire surface. The flavor is sprightly, subacid, aromatic, suggesting the pineapple, but sometimes resinous and disagreeable. It is eaten out of hand, and also used to prepare jams and preserves.

The Spanish plum, *S. Mombin,* is much more common in tropical America, and occurs in a large number of varieties, some of which are of excellent flavor and quality, others rather inferior. In Cuba, where this fruit is called ciruela, the different varieties are distinguished by the addition of such words as roja (red), amarilla (yellow), and the like. In Brazil the species seems to be little known, but in Mexico and Central America it is widely grown. It is successfully cultivated in south Florida, but so far as known has never fruited in California, though it may be possible to grow it successfully in favored locations. The tree, which is much smaller than the Otaheite-apple, is deciduous during a portion of the year, as are the other species. The fruit is oval, about an inch long, usually purplish red in color, with a bright yellow, very juicy pulp of aromatic, subacid flavor. It is used like the Otaheite-apple.

The hog-plum, *S. lutea,* is one of the least esteemed of the genus. Its fruits are slightly larger than those of *S. Mombin,* but of a rank, pungent flavor which is not especially agreeable. Jumelle says that it makes an excellent refreshing drink. The tree is large and handsome, and is a conspicuous feature of many Cuban landscapes. *S. pinnata,* the hog-plum or amra of India, is scarcely known in America. Indian writers, who do not usually speak highly of it, state that it is used for pickles, preserves, and tarts. Firminger advises using it as a stock for *S. cytherea.*

The imbu of Brazil, *S. tuberosa,* is a little-known species introduced to the United States in 1914 by the Bureau of Plant Industry. Previous to this time it seems to have been unknown outside of its native home, but on the dry lands of interior northeastern Brazil (states of Bahia, Pernambuco, and so on) it is exceedingly abundant and the fruits are highly esteemed by the natives. Its tuberous roots are an adaptation to arid regions. The fruits are the size of large plums, with a pale yellow skin, soft, juicy pulp and a large, nearly smooth seed. The flavor slightly resembles that of a sweet orange, and is very agreeable. An excellent jelly is made from this species, and also a sweet custard called imbuzada, prepared by mixing the strained and sweetened pulp with boiled milk. For eating out of hand it is probably superior to the other species, with the exception of the best varieties of the Spanish plum.

This genus is of very simple culture. All the species are easily propagated by cuttings of large wood, which may be set in permanent locations immediately upon removal from the parent tree. Seeds can easily be grown in flats of light soil, covering them to the depth of an inch. They usually germinate within four to six weeks. Most of the species seem adapted to a variety of soils. They can readily be inarched, but this is not often practised in this country because of the ease with which cuttings can be grown. Improvement of all the species should be carried on by means of selection. F. W. Popenoe.

SPORE, a reproductive detached cell of a cryptogamous or so-called flowerless plant, not containing an embryo as does a seed. Spores are the reproductive bodies of ferns, mosses, club-mosses, liverworts, fungi, and similar plants. They are of interest to the plant-grower mostly as the means of propagating ferns. For description, see *Ferns* and *Fungi;* also the articles on *Mildew, Rust,* and *Smut,* in Vols. III, V, VI. For propagation by spores, see the discussion under *Ferns,* page 1211, Vol. III.

SPORÓBOLUS (Greek, *spora,* seed, and *ballein,* to cast forth, referring to the grain readily falling from the spikelet). *Gramíneæ.* Dropseed. Spikelets 1-fld., awnless, usually small, in narrow or open panicles.—About 80 species, chiefly of Temp. and Trop. Amer., of little value. *S. cryptándrus,* Gray, a widely distributed annual, is considered a good forage grass; *S. Wrightiànus,* Munro, Sacaton, of the alkali lands of the S. W. and of Mex., and *S. airoìdes,* Torr., an allied species, furnish pasture in alkali flats. *S. minutiflòrus,* Link, a slender annual with minute spikelets in a delicate panicle, is offered as an ornamental by some seedsmen under the name of *Agrostis minutiflora.* The species are little known horticulturally. A. S. Hitchcock.

SPRÀGUEA (named for Isaac Sprague, of Cambridge, Mass., botanical artist, collaborator of Asa Gray). *Portulacàceæ.* Dwarf half-hardy perennial herbs, well adapted to the rockery: lvs. radical, spatulate, somewhat fleshy; the cauline minute, alternate

stipules small and scarious: fls. ephemeral, in dense, scorpioid spikes, umbellately clustered on scape-like peduncles; sepals 2, orbiculate-cordate, membranaceous-hyaline, persistent; petals 4; stamens 3; ovary free: caps. membranaceous, rounded-compressed, 2-valved; seeds 8–10, black and shiny.—One, possibly 2 species, W. N. Amer.

umbellàta, Torr. Sts. several, simple, erect, 2–12 in. high: radical lvs. spatulate or oblanceolate; the cauline similar but smaller: fls. white, tinged rose, in a dense capitate umbel of nearly sessile spikes; sepals conspicuous; petals oblong-ovate. Late summer. Sierra Nevada, at 3,000–10,000 ft. altitude, from the Yosemite valley to the British boundary, usually in sandy dry soils. B.M. 5143. May be treated as an annual. Var. **caudicífera,** Gray, is a subalpine form in which the caudex-like branches extend for a year or more (the lvs. below dying away) and are at length terminated by scapes an inch or so in length. Desirable for rockwork and edgings. F. Tracy Hubbard.†

SPRAYING: *Diseases and Insects,* page 1057, Vol. II.

SPREKÈLIA (J. H. von Sprekelsen, of Hamburg, who sent the plants to Linnæus). *Amaryllidàceæ.* Jacobæan Lily. Half-hardy bulbous plants, generally grown in the greenhouse, often known as amaryllis: lvs. appearing late, strap-shaped-linear: scape hollow, cylindrical, 1-fld.: fl. large, showy; perianth gaping, tube none, upper segm. broadest, 2 lateral lanceolate, 3 lowest deflexed, rolled together inclosing the stamens and style; ovary turbinate, 6-angled, 3-celled: caps. globose-trigonous, 3-valved.—One species, Mex. For cult., see *Amaryllis;* also consult Hippeastrum, with which these plants are sometimes confused.

formosíssima, Herb. (*Amarýllis formosíssima,* Linn.). Bulb globose, 2 in. diam.; tunics brown: lvs. 3–6, contemporary with the fls., linear, green, finally 1–1½ ft. long: peduncle reddish, 6–12 in. long; spathe red-brown, 2 in. long, bifid at the tip; pedicel erect: perianth bright crimson, 3½–4 in. long. April. B.M. 47. G.L. 27:140. G.W. 15, p. 358. Var. **glaùca,** Baker (*S. glaùca,* Lindl.), has glaucous lvs.: fls. smaller and paler than the type. B.R. 27:16. F. Tracy Hubbard.†

SPRING BEAUTY: *Claytonia.*

SPRING-GARDENING. The gardening instinct is at its height in spring. The turn of the season invites it, and the wealth of quick-growing plant-material is great. On the plant-growing side, nothing need be said here that is not already written in other articles in this work, but names of a few plants for spring effects may be suggested.

The spring-gardener will think first of bulbs—crocuses, hyacinths, tulips, squills, snowdrops, fritillies, and others. These are described under their regular alphabetic generic entries, and also under the article *Bulbs* in Vol. I.

If one does not have a greenhouse, many of the annual flowers may be used for early spring bloom if the seeds are started in the window, or, as with pansies, if plants are established in autumn and carried over winter under a protection of leaves or other mulch. Some of the early-blooming hardy annuals are alyssum, candytuft, collinsia, daisy (*Bellis perennis,* perennial but may be treated as an annual after the manner of pansies), pansy, schizopetalon, stocks, violet, Virginian stock, wallflower (annual), pinks as annuals.

The spring-garden will derive its chief satisfaction, however, from the early-blooming perennial herbs, of which there are great numbers of attractive species. A few of the best kinds are here named: *Adonis vernalis,* anemonis, arabis, aubrietia, auricula, clintonia, cowslip (Primula), dicentra, forget-me-not, helleborous or Christmas rose (earliest, except perhaps some of the bulbs), iris, oxalis, *Papaver nudicaule,* pinks, polyanthus and other kinds of primula, pyrethrum, wallflower (perennial), and very many native perennials as epigæa, trillium, erythronium, hepatica, isopyrum, anemone, claytonia, phlox, sanguinaria, caltha.

The wealth of early-blooming trees and shrubs must not be overlooked, nor the beauty of sturdy herbaceous growths pushing from the ground.

A good part of one's success in spring-gardening results from careful preparation the previous autumn, particularly in providing good winter protection for young or partially tender plants that are to be carried over. All should be made ready before winter closes in, so that the first advantage may be taken of the opening of spring. L. H. B.

SPRUCE: *Picea.* **Douglas S.:** *Pseudotsuga taxifolia.* **Norway S:** *P. excelsa.* **Sitka S.:** *P. sitchensis.* **Tideland S.:** *P. sitchensis.*

SPURGE: *Euphorbia.* **S., Mountain:** *Pachysandra procumbens.* **S. Nettle:** *Jatropha.*

SPURRY (*Spergula sativa,* which see) has long been grown in Germany, France, Holland, and Belgium, where its value as a soil-renovator and as a forage crop was early recognized. It is an annual, and when sown in the spring matures seed in ten to twelve weeks from time of sowing. This plant possesses special value as a renovator for sandy soils. It has long been used by the farmers of Holland to hold in place the shifting sands along the seashore. So well adapted is it to sand that it has been termed "the clover of sandy lands." It is not recommended for the American farmer except where the soil is so poor that other plants fail. In such circumstances it may be used as a cover-crop to plow under. The seed may be sown any time from April to August, but in orchards it would better be sown in July. Sow at the rate of six quarts to the acre. The seed being small, it should be lightly harrowed in upon a well-fitted soil. It is very persistent in the production of seed, and upon fertile soils it will maintain itself for several years unless thorough cultivation is given. Where soils are in fair condition and other crops will grow, it is doubtful whether spurry has any place. Sometimes written spurrey. L. A. Clinton.

SQUASH: See the article *Pumpkin and Squash,* page 2859, Vol. V.

SQUAW-BERRY: *Mitchella repens.*

SQUILL: For the garden squill, see *Scilla;* for the medicinal squill, see *Urginea.*

SQUIRREL-CORN: *Dicentra canadensis.*

STÀCHYS (from an old Greek name applied by Dioscorides to another group of plants, coming from the word for *spike*). *Labiàtæ.* Woundwort. Tall perennial herbs or diffuse annuals, rarely subshrubs or small shrubs, both greenhouse and hardy plants, little known to gardeners.

Leaves very entire or dentate, the floral lvs. similar or reduced to bracts: floral whorls 2- to many-fld., axillary or arranged in terminal spikes: fls. sessile or very short-pedicelled, purplish, scarlet, pale yellow, or white, small or sometimes showy; calyx tubular-campanulate, 5–10-nerved, 5-toothed; corolla-tube cylindrical included or exserted, limb 2-lipped, the posterior often villous outside; stamens 4: nutlets ovoid or oblong.—About 270 species, mainly in the temperate regions but a few in the tropical and colder regions, scattered all over the world. The arrangement followed in the sections and sequence of species is that of Briquet in Engler & Prantl, Pflanzenfamilien, IV. 3*a*:260. Very few of the species are cult., although there are several with showy spikes. They are usually found in moist or even wet places when growing wild. A tuber-bearing species (*S. Sieboldii*) has come into notice as a kitchen-garden plant.

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cretica, 7.
densiflora, 1.
discolor, 5.
floridana, 14.
germanica, 7.
grandiflora, 2, 3.
incana, 1.
lanata, 8.
leucoglossa, 15.
longifolia, 4.
macrostachys, 4.
nivea, 5.
officinalis, 2.
orientalis, 4.
recta, 15.
robusta, 3.
rosea, 3.
sericea, 10.
Sieboldii, 12.
spicata, 3.
superba, 3.
sylvestris, 15.
tmolea, 6.
tuberifera, 12.

KEY TO SECTIONS.

A. *Outer bracts developed, reaching at least half-way up the calyx, often equaling or even exceeding it.*
B. *Annulus or ring at base of corolla absent; corolla-tube mostly exserted; anther-cells parallel.* Section I. BETONICA. Species 1–5.
BB. *Annulus or ring at base of corolla oblique and hairy; corolla-tube usually inclosed; anther-cells divergent or divaricate.* Section II. ERIOSTOMUM. Species 6–10.
AA. *Outer bracts minute, very much shorter than the calyx.* Section III. EUSTACHYS. Species 11–17.

Section I. BETONICA.

A. *Lowest floral-lvs. cordate-ovate.*
B. *Corolla more than 1 in. long*..... 3. **grandiflora**
BB. *Corolla scarcely ½in. long*..... 1. **densiflora**
AA. *Lowest floral lvs. lanceolate.*
B. *Lvs. white beneath*..... 5. **discolor**
BB. *Lvs. green or pale beneath.*
C. *Calyx ½in. or more long*..... 4. **longifolia**
CC. *Calyx scarcely ¼in. long*..... 2. **officinalis**

1. **densiflòra,** Benth. (*Betónica incàna*, Ait.). Perennial, 1½ ft. high: sts. erect, hirsute: lvs. 2–3 in. long, petioled, ovate-oblong, obtuse, crenate, base cordate, soft-pilose or more or less villous; floral lvs., lowest cordate-ovate, short-petioled: floral whorls approximate in a dense spike, lower whorls remote: calyx campanulate; corolla villous outside, flesh-colored. S. Eu. B.M. 2125.—There are older names referred to this species, but it is not certain that they are truly synonyms; even *Betonica incana* may not belong here.

2. **officinàlis,** Franch. (*S. Betónica*, Benth. *Betónica officinàlis*, Linn.). BETONY. Fig. 3671. A hardy perennial herb 1–3 ft. high: lower lvs. long-petioled, ovate-oblong, crenate, obtuse, cordate at the base, 3–6 in. long; upper lvs. distant, sessile, oblong-lanceolate, acute: fls. purple, in a dense, terminal spike. July. Eu., Asia Minor.—Rarely found as an escape in this country, and once cult. for use in domestic medicine. Useful for ornament, and now advertised for that purpose. There are white-fld. forms of the species offered in the trade under the names of *S. Betónica álba* and *S. Betónica albiflòra* and there is also a large-fld. form with soft rose-colored fls. known as *S. Betónica grandiflòra*.

3. **grandiflòra,** Benth. (*Betónica ròsea*, Hort. *B. spicàta*, Hort. *B. grandiflòra*, Willd.). A hardy perennial about 1 ft. high: lower lvs. broadly ovate, obtuse-crenate, long-petioled, base broadly heart-shaped; the upper gradually smaller, nearly similar and sessile, the uppermost bract-like: fls. violet, large and showy, the curving tube about 1 in. long and 3 or 4 times surpassing the calyx, in 2–3 distinct whorls of 10–20 fls. each. Asia Minor, etc. B.M. 700. G.M. 53:628. Var. **robústa,** Hort. (*Betónica grandiflòra robústa*, Hort. *B. spicàta robústa*, Hort.), is said to have tufts of corrugated lvs., to grow 18 in. high and spikes 3 in. long of rosy pink fls. Gn.W. 25: 299. Var. **supérba,** Hort. (*Betónica grandiflòra supérba*, Hort. *B. supérba*, Hort.), is said to have showy spikes of intense mauve or a rich shade of purple-violet fls. There is a white variant of this known in the trade as *Betónica supérba álba*.

4. **longifòlia,** Benth. (*Betónica orientàlis*, Linn.). A hardy perennial herb about 1 ft. high, densely villous: lower lvs. petioled, oblong-lanceolate, obtuse, crenate, deeply cordate at the base, 4–6 in. long; the upper lvs. similar in shape but sessile, those of the infl. bract-like: fls. reddish purple to pink, in a cylindrical, somewhat interrupted spike about ½ft. long. July. Caucasus.—Briquet in Engler & Prantl's Pflanzenfamilien has adopted *macrostachys* as the specific name, basing his name on *Betónica macróstachys*, Wender, but authorities differ as to the identity of Wender's material, hence the Bentham name has been retained.

5. **díscolor,** Benth. (*S. nívea*, Benth., not Labill. *Betónica nívea*, Stev.). Perennial, about 1 ft. high, villous: lvs. petiolate, oblong-lanceolate, obtuse, deeply crenate, rugose above, white-lanate beneath; floral lvs., upper lanceolate: floral whorls many-fld., somewhat distinct, few: calyx lanuginose-villous; corolla large, villous, rose, rarely yellowish white. Caucasus.

Section II. ERIOSTOMUM.

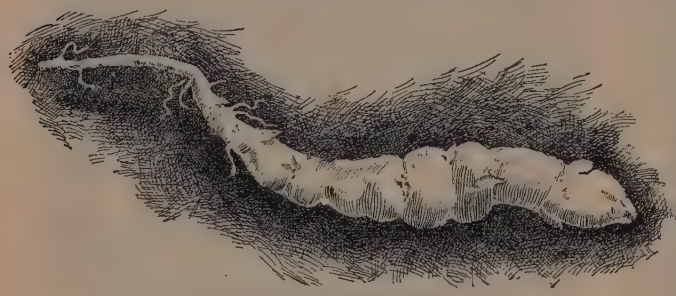
A. *Corolla yellow*..... 6. **tmolea**
AA. *Corolla purple or pink.*
B. *Sts. and lvs. densely white-lanate.*
C. *Base of lf. cordate*..... 7. **germanica**
CC. *Base of lf. narrowed or sometimes rounded-cordate*..... 8. **lanata**
BB. *Sts. laxly soft-pilose-villous: lvs. green above or on both surfaces.*
C. *Lvs. green on both surfaces*..... 9. **alpina**
CC. *Lvs. green above, canescent-lanate beneath*. 10. **sericea**

6. **tmòlea,** Boiss. Perennial, about 1 ft. high: sts. ascending, densely sericeous-pannose: lvs. lanceolate or oblong-lanceolate, obtuse, obscurely dentate, petioled, the radical about 3 in. long; floral lvs. oblong, acuminate: floral whorls densely many-fld., far remote: calyx pedicellate, hirsute, long-campanulate; corolla yellow, tube included. Mt. Tmolus region, Asia Minor.

7. **germánica,** Linn. Perennial, 1–4 ft. high: sts. herbaceous, tall, loosely white-lanate: radical lvs. 2–5 in. long, rather long-petioled; cauline lvs. short-petioled, ovate or ovate-lanceolate, obtuse, base usually cordate, crenate; lower floral lvs. subsessile, somewhat clasping, crenate, white-lanate: floral whorls many-fld., distinct, racemose, upper approximate: calyx lanate inside; corolla pale pink, variegated with white, lanate outside, tube included. Eu., Cent. Asia and N. Afr. B.R. 1289. Var. **Boissièri,** Briq. (*S. crètica*, Sibth. & Smith, not Linn.), has oblong or linear-lanceolate lower lvs., oblong-triangular or short-lanceolate floral lvs. and a rose-colored corolla, the upper lip of which is lanate. S.E. Eu., Asia Minor, and Syria.

3671. Stachys officinalis. (×¼)

8. **lanàta,** Jacq. Woolly Woundwort. A hardy perennial 1–1½ ft. high, white-woolly throughout: lvs. oblong-elliptical, the upper smaller, the uppermost much shorter and whorled: fls. small, purple, in dense 30- or more-fld. whorls in interrupted spikes. Caucasus to Persia. Gn. 78, p. 543.—Often grown as a bedding plant. Valuable for its very white herbage.



3672. Tuber of Stachys Sieboldii. (×¾)

9. **alpìna,** Linn. Herbaceous, tall: sts. erect, pilosely somewhat lanate: lvs. petioled, ovate, serrate-crenate, base cordate, both surfaces green or slightly canescent beneath; floral lvs. narrower, gradually smaller: floral whorls all remote, 15–20-fld.: calyx rather pilose, teeth lanceolate-ovate, strongly spined; corolla obscurely purplish or red-brownish, about twice as long as the calyx. Eu.

10. **serícea,** Wall. Herbaceous, tall: st. erect, very pilose: lvs. petioled, ovate or ovate-oblong, rather obtuse, crenate, base cordate, both surfaces villous, green above, pale or hoary beneath, the younger lvs. sericeous-lanate: floral whorls all distant, 10–15-fld.: calyx lanate, teeth ovate-lanceolate, very acute, spined; corolla pink, spotted with purple, hairy, scarcely longer than the calyx. Himalaya region and N. Asia.—There is an older *S. sericea* (of Cavanilles), but its botanical status is unknown. It is a native of Chile.

Section III. Eustachys.

A. *Species annual*.....17. **corsica**
AA. *Species perennial.*
B. *Corolla-tube long-exserted*.....11. **coccinea**
BB. *Corolla-tube included in the calyx or slightly exserted.*
C. *Plant with a basal rosette, below which the flowering shoots arise*...16. **citrina**
CC. *Plant without a basal rosette.*
D. *Angles of sts. not retrorse-hairy or prickly: annulus inside corolla, oblique, incomplete or even none*.....15. **recta**
DD. *Angles of sts. retrorse-hairy or prickly, rarely glabrous: annulus inside corolla, pilose, complete.*
E. *Tubers lacking*.....13. **aspera**
EE. *Tubers present.*
F. *Lvs. ovate, deltoid-ovate or ovate-lanceolate: tubers slender, clavate, nodose*...12. **Sieboldii**
FF. *Lvs. cordate-oblong-lanceolate, very obtuse: tubers cylindrical, uniformly nodose*.....14. **floridana**

Subsection Calostachydes.

11. **coccínea,** Jacq. One to 2 ft., slender, soft-pubescent: lvs. ovate-lanceolate, cordate at base or somewhat deltoid, obtuse, crenate: fls. scarlet-red, the narrow tube much exceeding the calyx, pedicelled, in an interrupted spike, blooming in succession. W. Texas to Ariz. B.M. 666. P.M. 8:101.—Showy.

Subsection Genuinæ.

12. **Sièboldii,** Miq. (*S. affinis*, Bunge, not Fresenius. *S. tuberífera*, Naudin). Chorogi. Chinese or Japanese Artichoke. Knotroot. Crosnes du Japan. Fig. 3672. Erect hairy mint-like plant, growing 10–18 in. tall: lvs. ovate to deltoid-ovate to ovate-lanceolate, cordate at base, obtuse-dentate, stalked: fls. small, whitish or light red, in a small spike: tubers (Fig. 3672) 2–3 in. long, slender, nodose, white, produced in great numbers just under the surface of the ground. China, Japan. G.C. III. 3:13.—Sent to France in 1882 from Pekin by Dr. Bretschneider, and about ten years ago intro. into this country. It is cult. for the crisp tubers, which may be eaten either raw or cooked. These tubers soon shrivel and lose their value if exposed to the air. The tubers withstand the winter in Cent. N. Y. without protection, so that a well-established plant takes care of itself and spreads. For history, chemical analyses, etc., see Cornell Bull. No. 37.

13. **áspera,** Michx. Erect, usually strict, 3–4 ft. high, the st. retrorsely hairy on the angles: lvs. oblong-ovate to oblong-lanceolate, mostly acuminate, serrate, petiolate: corolla small, glabrous, pale red or purple, in an interrupted spike. Wet places, Ont. and Minn. to the Gulf. L.B.C. 15:1412.—Has been offered by dealers in native plants.

14. **floridàna,** Shuttlew. Slender, erect, 1–2 ft., branching, glabrous: lvs. cordate-oblong-lanceolate, blunt-toothed, stalked: fls. small, light red, in an open interrupted spike: tubers cylindrical, uniformly nodose, 4–6 in. long. Fla.—Has been tested abroad as a food plant, and also at the Cornell Exp. Sta. (see Bull. No. 61), but practically unknown horticulturally. The tubers are as good for eating as those of *S. Sieboldii*.

Subsection Rectæ.

15. **récta,** Linn. (*S. sylvéstris*, Forsk.). Perennial: st. erect or ascending, about 2 ft. high, pilose: lvs. short-petioled, oblong-ovate or lanceolate, obtuse, crenate, 1–1½ in. long, base rounded or narrowed, rugose, hairy; floral lvs. sessile: floral whorls about 10-fld., distant: calyx ovate-campanulate, hairy, teeth ovate, subspinose; corolla yellowish white, throat purplish, glabrous, twice as long as the calyx. S. Eu., Caucasus. Var. **leucoglóssa,** Boiss. (*S. leucoglóssa*, Griseb.). Lvs. narrowly lanceolate, lower serrate, upper entire and linear: calyx somewhat scabrous, teeth as long as the tube. Caucasus.

Subsection Infrarosulares.

16. **citrìna,** Boiss. & Heldr. Subshrub, gray-canescent pannose: lvs. 1–1½ in. long, all basal, long-petioled, elliptical, obtuse, base attenuate, entire or minute, crenulate; floral lvs. narrower: fls. in small terminal heads which are short-ovate, dense, the lower floral whorls often subdistant and interrupted; calyx hirsute, campanulate; corolla sulfur-yellow, hirsute outside, included in the calyx. Greece, E.

3673. Stachys corsica. (×⅔)

Subsection Olisiæ.

17. **córsica,** Pers. Fig. 3673. Slender procumbent pilose herb: lvs. about ½in. long, petioled, ovate, very obtuse, broadly crenate, base rounded or subcordate; floral lvs. smaller: floral whorls 2–4-fld., remote: calyx campanulate, hispid, teeth lanceolate, acute, subspiny; corolla pinkish white, twice as long as the calyx, the tube short-exserted. Medit. region.

Betónica cárnea, Hort., is offered in the trade, probably a flesh-colored form of S. grandiflora.—*Betónica rùbra*, Hort., is also in the trade, probably a red-fld. form of S. grandiflora.

F. Tracy Hubbard.†

STACHYTARPHÈTA (Greek, *dense spike*). *Verbenàceæ*. Simple pilose, villous or glabrous herbs or shrubs, suitable for the warmhouse but hardy outside in the extreme southern United States.

Leaves opposite or alternate, dentate, often rugose: spikes terminal, sometimes long and dense, sometimes short or lax: fls. white, blue, purple, or scarlet, solitary in the axils of the bracts, sessile or half sunk in the rachis of the spike; calyx narrow-tubular, 4–5-ribbed, 4–5-toothed; corolla-tube cylindrical, limb spreading, 5-cleft, lobes broad, obtuse or retuse; perfect stamens 2; ovary 2-celled: fr. included in the calyx, oblong-linear. —About 50 species, mostly natives of Trop. and Subtrop. Amer. but one (*S. indica*) is dispersed very broadly in the tropics of Afr. and Asia.

mutábilis, Vahl. A low shrub, scabrous-pubescent: lvs. ovate, dentate, scabrous above, whitish-pubescent beneath: spike long, erect: bracts lanceolate, subulate: calyx 4-dentate, hispid, 4–6 lines long; corolla crimson, fading to rose, ½–¾in. across. W. Indies, Mex. to Guiana. B.M. 976. Gt. 3, p. 178.—Cult. in S. Calif.

índica, Vahl (*S. jamaicénsis*, Vahl. *S. urticifòlia*, Dalz. & Gibs.). Herb, 1–2 ft. high: branches quadrangular: lvs. 1–4 in. long, elliptic, serrate: spikes 3–12 in. long: fls. finally sunk in the thickened rachis, deep blue; calyx 4-toothed, 4-nerved. Trop. Amer.; Asia, probably naturalized. B.M. 1860.

F. Tracy Hubbard.†

STACHYÙRUS (Greek, *spike* and *tail;* in allusion to the form of the inflorescence). *Stachyuràceæ*, formerly usually included in *Ternstrœmiàceæ*. Ornamental woody plants grown for their very early flowers and the handsome foliage.

Deciduous or evergreen shrubs or trees: lvs. alternate, slender-petioled, serrate, with small deciduous stipules: fls. perfect or polygamous, nearly sessile, in pendulous axillary racemes; sepals 4, strongly imbricate; petals 4, imbricate; stamens 8 with slender filaments; ovary superior, incompletely 4-celled; style simple, with 4-lobed stigma: fr. a 4-celled, many-seeded small berry.—Five or possibly 6 species in Japan, China, and the Himalayas.

3674. Stachyurus præcox. (×½)

The species in cultivation are handsome shrubs with spreading branches, with medium-sized bright green, generally ovate to ovate-oblong leaves and pale greenish yellow flowers in long pendulous spikes appearing early in spring before the leaves from the axils along last year's branches. They have proved hardy in sheltered positions as far north as Massachusetts, but the flower-buds which are formed in autumn and remain naked during the winter are killed by the frost, if not protected. They grow well in moderately moist well-drained soil. Propagation is by seeds or usually by softwood cuttings under glass and by layers.

præcox, Sieb. & Zucc. Fig. 3674. Shrub, to 12 ft.: young branchlets reddish brown or chestnut-brown and lustrous: lvs. elliptic-ovate to ovate-lanceolate, acuminate, rounded at the base, serrate with somewhat spreading teeth, glabrous and lustrous beneath or slightly pubescent on the veins, 3–6 in. long: racemes 2–3 in. long: fls. campanulate, ⅓in. long; style shorter than petals: fr. globose, ⅓in. across, greenish yellow with reddish cheek. March; fr. in Sept., Oct. Japan. B.M. 6631. G.C. III. 21:285 (adapted in Fig. 3674). Gn. 75, p. 204. R.H. 1908, p. 87. S.I.F. 1:74.

chinénsis, Franch. Shrub, to 15 ft., very similar to the preceding species: young branchlets greenish or dull brown: lvs. ovate to oblong-ovate, long-acuminate, rounded or subcordate at the base, crenately serrate, glabrous, 2½–5 in. long: racemes 2–3½ in. long: fls. spreading, about ⅓in. long; style as long as petals or slightly exserted: fr. globose, ¼in. across. March. Cent. China. Gn. 79, p. 182.

Alfred Rehder.

STACKHOÙSIA (named for John Stackhouse, an English botanist). *Stackhousiàceæ*. Small herbs from a perennial herbaceous or woody rhizome, used for ornamental planting in warm climates: lvs. alternate, linear or spatulate, entire, leathery or somewhat fleshy; stipules none or very minute: fls. spicate at the ends of the branches or fascicled along the rachis, rarely racemose, white or yellow, hermaphrodite; calyx small, tube hemispherical, 5-lobed or rarely 5-parted; petals 5, linear or spatulate, claw elongated; stamens 5, inserted on the disk-margin, erect; ovary sessile, free, subglobose, 2–5-lobed or -parted, 2–5-celled: fr. splitting up into 2–5 globose, angular or winged indehiscent berries.—About 20 species, Austral.

monógyna, Labill. (*S. linariifòlia*, A. Cunn.). A half-hardy perennial herb, usually simple, about 1½ ft. high, with linear or lanceolate lvs. about 1 in. long: spikes at first dense, then lengthening to 4–6 in.: buds pinkish when young; fls. white. B.R. 1917.—The plant in the Californian trade is apparently not the above species, for it is described as a tall robust shrub with fl.-heads 1–2 in. across, surrounded by imbricated bracts and bright yellow fls. with a purple-streaked keel.

F. W. Barclay.
F. Tracy Hubbard.†

STADMÁNNIA (named for Stadmann, a German botanist); also erroneously spelled *Stadtmannia*. *Sapindàceæ*. Branched pustulate trees, apparently very rarely cult.: lvs. alternate, without stipules, abruptly pinnate; lfts. 3–6 pairs, opposite and alternate, oblong, obtuse: panicles axillary, branched: fls. small, pedicelled, polygamo-dœcious; calyx subspherical, 5-toothed; petals none; disk thick, raised and lobed; stamens 8; ovary oblong, 3-celled: berry dry, oblong-spherical, indehiscent.—The only species of this genus that is well known is a tropical tree from the Bourbon Isls., there known as bois de fer or ironwood. This is a large tree with hard, heavy reddish wood, once frequent in the primeval forests of Mauritius but now scarce. It is not known to be in cult. in Amer. Nine other names appear in Index Kewensis, apparently all Brazilian species, but one of them is a bare name and the others were first described in the early 1860's in Linden's catalogue.

oppositifòlia, Lam. (*S. Sideróxylon*, DC.). Bois de Fer. Lvs. alternate, petioled, abruptly pinnate; lfts. 8–12, opposite, oblong, short-stalked, obtuse, coriaceous, entire, oblique at base: panicles dense, cylindrical, 3–4 in. long: fr. hard, globular, nearly 1 in. thick. Mauritius.

S. amábilis, Hort., is offered in the trade, but is not known botanically: it is said to be an imposing decorative plant for warmhouse cult. and to require the same treatment as gardenias.

F. Tracy Hubbard.†

STAG-HORN FERN: *Platycerium.* **S. Sumach:** *Rhus.*

STANDARDS OF COLOR MEASUREMENT. There is no universally acknowledged standard of color measurement, nor any international agreement between physicists and artists as to the constituents of such a

standard; consequently, those who wish to abide by some reliable system of color pitch and nomenclature are at liberty to choose between the publications of experts upon this subject without regard for professional or industrial limitations.

A standard of color exclusively useful in horticulture would be an absurdity, inasmuch as a standard would fail to be as far-reaching as the word implies if it did not meet the requirements of all classes of art, science, and industry. There is nothing logical in one normal red named one way for the horticulturist and another named differently for someone else. In the musical profession tone has been standardized by what is known as International Pitch at middle C of the pianoforte. All musical instruments throughout the world are commonly tuned to that pitch; it is an absolute standard. But as yet, the exact pitch of what is called normal red color is not standardized, and as a consequence the whole chromatic scale which by deduction and mathematical measurement should fall into line by the establishment of this one normal hue remains unfixed and is somewhat of a bone of contention between color experts.

A circle divided into the scientifically significant 360°, each one of which represents a distinct hue of the chromatic scale in tangible pigment, is by no means impossible though it is difficult of accomplishment. The writer successfully completed such a scale and finds it remarkably true to the scientific theory of color balance. At the present time, however, there is no mechanical process capable of reproducing such an exact scale with the fidelity it demands.

A diagrammatic representation of the color circle will be found on page 832, Vol. II, of this Cyclopedia, and the following table (Fig. 3675) indicates exactly the positions occupied in that circle of certain hues contained in the standards of authors mentioned below. A diligent comparison of the figures will demonstrate the lack of agreement among authorities.

Those independent standards of color which are accessible and have proved valuable as practical guides are the following: The extensive and admirable French work entitled, "Répertoire de Couleurs pour aider à la détermination des couleurs des Fleurs, des Feuillages et des Fruits, publié par la Société Française des Chrysanthémistes et Rèné Oberthür avec la collaboration principale de Henri Dauthenay," (etc.), Librairie Horticole, 84 bis Rue de Grenelle, Paris, 1905." The Prang Standard of Color," Louis Prang, Boston, 1898, now out of print. The concise and reliable guide entitled "Elementary Color," and the invaluable and popular Bradley Educational Colored Papers, Milton Bradley Co., Springfield, Massachusetts, 1915. The extensive and portable "Ridgway Color Standard and Nomenclature," Robert Ridgway, Washington, D. C., 1912. "The Mathews Chart of Correct Flower Colors" with text, F. Schuyler Mathews, published in the American Florist for August 17, 1895, Chicago. The interesting work entitled ' Color Problems," a practical guide for the lay student of color, Emily N. Vanderpoel, Longmans, Green & Co., London and New York, 1902. See also the article on *Color in Flowers*, page 830, Vol. II, of this Cyclopedia, and for the theoretic basis of spectral color measurement, the article entitled "The World Beyond our Senses," by Carl Snyder, Harper's Magazine for June, 1903.

F. Schuyler Mathews.

A TABLE OF COMPARATIVE COLORS BASED UPON MATHEMATICAL INTERVALS OF 360° OF THE CHROMATIC CIRCLE.

NORMAL HUES	DEGREES	REPERTOIRE DE COULEURS	MILTON BRADLEY	ROBERT RIDGWAY	LOUIS PRANG	F. SCHUYLER MATHEWS	EMILY N. VANDERPOEL
YELLOW	1	PL.20 N°3 5 dull	1 pale	LEMON YEL. 1 pale	1 pale	1 pale	1 light
ORANGE	60	PL.52 N°4 60 bright	60 slightly light	FLAME SCAR. 60 trifle dull	45 bright	50 dull	50 bright
SCARLET	80	PL.85 N°1 90 bright	R.O. 75 slightly light	80 clear	R.R.O. 90 bright	90 brilliant	—
RED	120	PL.159 N°4 120 bright	110 very intense	TYRIAN ROSE 122 bright	115 bright	120 bright	115 light
CRIMSON	130	PL.155 N°4 130 brilliant	—	—	R.R.V 130 dull pale	130 light	—
MAGENTA	140	PL.182 N°3 140 bright	V.R. 150 pale	RHODAMINE P. 140 brilliant	R.V 150 dull pale	140 dull pale	—
PURPLE	160	PL.190 N°4 165 dull	R.V. 170 pale	158 bright	V.R.V 160 dull pale	160 pale	—
VIOLET	180	PL.192 N°3 170 dull	180 dull pale	SPECTRUM V. 185 bright	175 dull pale	180 pale	185 light
ULTRAM	220	PL.212 N°3 230 grayish	—	PHENYL B. 220 lightish	B.B.V 220 dull pale	—	— 1916
BLUE	240	PL.213 N°3 245 clear	230 brilliant	METHYL B. 240 trifle dull	245 bright	250 light	245 pale
GREEN	300	PL.257 N°4 300 dull.	310 bright	EMERALD G. 305 clear	310 bright	—	305 light

3675. Standards of color.

STANGÈRIA (Wm. Stanger, of Natal). *Cycadàceæ.* A warmhouse cycad not very commonly cult.: caudex about a foot high, turnip-shaped: lvs. 3–4, long-petioled, about 2 x 1 ft., pinnate, very glabrous; pinnæ opposite and alternate, linear-lanceolate, spinulose-serrulate or subcrenate, rarely pinnatifid-lobed: male cone 6 x 1 in.; female cones smaller, 2–3 in. long.—One species, Subtrop. and S. E. Afr. Closely related to Encephalartos.

paradóxa, Moore. It is unique among the cycads by reason of the venation of its lfts.: in all the other members of the family the veins of the lf.-segms. are parallel and horizontal; in this one plant they are all free and run directly from the midrib to the margin. This pinnate venation is so extraordinary that the plant looks more like a fern than a cycad, and it was so described before the frs. were known. S. Afr. B.M. 5121. Gt. 63:1598. G.W. 6, p. 109.

Wilhelm Miller.

STANHÒPEA (named for the Earl of Stanhope, president of the Medico-Botanical Society, London). *Orchidàceæ.* Epiphytic orchids easily grown and very interesting, but the fugacious character of their flowers has been unfavorable to their extensive cultivation.

Pseudobulbs clustered on the short rhizome, sheathed with scales and each bearing a single large plaited lf. contracted to a petiole at the base: fls. produced on thick scapes, which bore their way through the material in which they are planted and emerge from the bottom of the basket, large, fragrant, and curiously formed; sepals and petals usually reflexed, subequal or the petals narrower; labellum remarkably transformed, basal part or hypochil boat-shaped or saccate, often with two horns on the upper margin, passing gradually into the mesochil, which consists of a fleshy central part and two lateral horns; the terminal lobe or epichil firmly or movably joined to the mesochil, usually fleshy and keeled but not saccate, base of the labellum continuous with the long-winged column.—About 50 species inhabiting Trop. Amer. from Mex. to Brazil. The fls. expand with a perceptible sound early in the morning.

Stanhopeas enjoy a shady, moist location. A temperature of 60 to 65° F. at night and 70 to 75° during the day should be maintained in winter, with a gradual advance of 10° toward midsummer. They should be grown suspended from the roof in orchid cabins or terra cotta baskets with large openings at the bottom, and if drainage is used it should be placed in such a manner that it will not interfere with the exit of the pendulous flower-scapes. Equal parts chopped sphagnum and peat fiber forms a good compost. By severing the rhizome here and there between the old pseudobulbs, new growths will be sent up and thus the stock may be increased. (R. M. Grey.)

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KEY TO THE SPECIES.

A. *Labellum with an excavated or saccate base and a plane terminal lobe.*
B. *Mesochil and pleuridia wanting*..... 1. **eburnea**
BB. *Mesochil and pleuridia present.*
C. *Hypochil boat-shaped, short and sessile*.....2. **Wardii**
CC. *Hypochil boat-shaped, long and stalked.*
D. *Fls. pale yellow.*
E. *The hypochil white, crimson-spotted, with 2 large brown basal spots*..... 3. **oculata**
EE. *The hypochil purplish crimson inside*..... 4. **platyceras**
DD. *Fls. orange*..... 5. **Bucephalus**
CCC. *Hypochil saccate or globose.*
D. *Epichil entire or obsoletely 3-toothed at the apex.*
E. *The hypochil spotted.*
F. *Purple inside; middle lobe cordate*..... 6. **insignis**
FF. *Not purple; middle lobe triangular*..... 7. **Shuttle-**
EE. *The hypochil not spotted, purple; middle lobe ovate*..... [**worthii**
8. **devoniensis**
DD. *Epichil evidently 3-toothed at the apex.*
E. *Sepals and petals spreading, the former broadly ovate.*
F. *Fls. yellow*..... 9. **tigrina**
FF. *Fls. white*.....10. **Martiana**
EE. *Sepals and petals strongly reflexed, the former oblong-ovate or oblong-lanceolate*...11. **saccata**
AA. *Labellum reduced to a saccate pouch*....12. **ecornuta**

1. **ebúrnea,** Lindl. (*S. grandiflòra*, Lindl. *S. calceolàta*, Hort.). Pseudobulbs conical, 1½ in. long: lvs. leathery, 8–12 in. long: scapes pendulous, with small bracts. 2–3-fld.: fls. 5 in. across, ivory-white; sepals broad; petals narrow; labellum 3 in. long, solid, fleshy, excavated at the base and bearing 2 hooked horns over the mouth, spotted above with reddish purple; column pale green, with broad wings toward the apex. Guiana. B.M. 3359. B.R. 1529. I.H. 14:531 (as var. *spectabilis*). L.B.C. 15:1414 (as *Ceratochilus grandiflorus*).

2. **Wárdii,** Lodd. Pseudobulbs 2 in. long: lvs. large, broad, and leathery: fl.-st. 9 in. long, bearing 3–9 fls., which are bright yellow to golden orange, spotted with crimson; lateral sepal round-oblong, concave, acute; petals lanceolate, revolute, the cavity in the base of the labellum deep velvety purple. Aug. Mex. and S. B.M. 5289. Gn. 51, p. 28. C.O. 2. Var. **aùrea,** Hort. (*S. aùrea*, Lodd.). Fls. golden yellow, with 2 dark spots on the hypochil. Fragrant.

3. **oculàta,** Lindl. (*S. guttulàta*, C. Koch). Fig. 3676. Lvs. ovate, with a blade 1 ft. long: scape 1 ft. long, clothed with scarious pale brown sheaths, 3–6-fld.: fls. 5 in. across, very fragrant, pale yellow, thickly spotted with purple; sepals 3 in. long, reflexed; petals half as large; hypochil narrow, white, spotted with crimson and having 2 large dark brown spots near the base. Mex. B.M. 5300. B.R. 1800. L.B.C. 18:1764 (as *Ceratochilus oculatus*). S.H. 2, p. 435. G.C. III. 19:264; 43: 19; 44:115; 52:121. J.F. 3:309–10. C.O. 6.—There are several varieties, differing in color and markings. Fig. 3676 is from an article by Safford on "Sacred Flowers of the Aztecs," named "the serpent-head orchid," in The Volta Review.

4. **platycèras,** Reichb. f. Pseudobulbs and lvs. as in *S. Bucephalus* but stouter: scape 2-fld., with ovate acute bracts half as long as the ovary: fls. 7 in. across, pale yellow, with numerous ring-shaped spots and blotches of purple; sepals triangular-oblong; petals broadly linear, acute; hypochil boat-shaped, 2½ in. long; horns 1 in. long, broad, pointing forward, parallel with the tongue-shaped middle lobe; the hypochil is deep purplish crimson inside, paler and spotted outside, the upper part of the labellum colored like the sepals. Colombia. Gn. 33:534.

5. **Bucéphalus,** Lindl. (*S. grandiflòra*, Reichb. f.). Pseudobulbs crowded, rugose: lvs. petioled, 9 in. long, pointed: the pendulous raceme bearing 4–6 large,

3676. Stanhopea oculata. (× about ⅓)

tawny orange fls. marked with large crimson spots; sepals and petals reflexed, the former broad; lower part of the labellum curved, boat-shaped, bearing 2 curved horns and a broad fleshy middle lobe; column green and white, spotted with purple. Aug. Mex., Peru. B.M. 5278; 8517. B.R. 31:24.—Fls. very fragrant. Distinguished by its very short ovaries.

6. **insígnis,** Frost. Figs. 3677, 3678. Pseudobulbs clustered: lvs. broadly lanceolate: scape 6 in. long, covered with dark brown scales, 2–4-fld.: fls. 5 in. across, dull yellow, spotted with purple; sepals broad, concave; petals narrow, wavy; hypochil globose, almost wholly purple inside, heavily spotted outside, horns 1 in. long, falcate, middle lobe cordate, keeled. July–Oct. Brazil. B.M. 2948, 2949. B.R. 1837. L.B.C. 20:1985. Gng. 2:117 (from which Fig. 3677 is adapted). G.W. 12, p. 283.—Marked by broad wings of column.

7. **Shúttleworthii,** Reichb. f. Pseudobulbs large, conical, sulcate: lvs broadly oblong, acute: raceme pendulous, loose: sepals, petals, and base of the labellum apricot-color with dark purplish blotches, front part of the labellum yellowish white; hypochil semi-globose; horns flattened, suberect, terminal lobe triangular; column whitish, green along the middle and spotted with purple in the inside. Colombia.

8. **devoniénsis,** Lindl. (*S. maculòsa*, Knowles & Westc.). Lvs. about 9 in. long: scape pendulous, 2–3-

fld.: fls. 5 in. across, pale brownish, with broad reddish brown blotches; sepals oblong to ovate-oblong, obtuse; petals narrow; hypochil rounded, saccate, purple, horns incurved, middle lobe ovate, channeled, obscurely 3-toothed. Peru. F.S. 10:974. F.C. 3:121.

9. **tigrìna,** Batem. Lvs. and pseudobulbs as in the genus: scape short, pendulous, clothed with large, thin brown scales: fls. 6 in. across, waxy and very fragrant; sepals broadly ovate, concave; petals oblong-lanceolate, both dingy yellow mottled toward the base with large blotches of dull purple; hypochil broad, cup-shaped; horns 1 in. long, fleshy, bent forward at right angles; middle lobe rhomboid, with 3 fleshy teeth at the apex; column large, spatulate. Mex. B.M. 4197. B.R. 25:1. G.M. 32:398; 38:149. F. 1845:59. G.C. III. 4:481. C.O. 7.—One of the most striking forms among orchids. Var. **lutéscens,** Hort. Brilliant yellow to orange marked with chocolate. Guatemala. Var. **supérba,** Hort. Van Houtte. Fls. yellow, with the sepals and petals heavily blotched with reddish brown. F.S. 7:713–15. G.M. 51:625. Var. **atrâta,** Hort., is advertised. Var. **splèndens,** Hort., had deeper-colored fls.

3677. Stanhopea insignis.

10. **Martiàna,** Batem. Lvs. lanceolate: sepals broadly ovate, creamy white with few purple spots on the lower half; petals narrower, blotched with purplish crimson; hypochil saccate, white; lateral horns broad, pointed, middle lobe oblong, obscurely 3-toothed; column subclavate, winged. Mex. F.S. 20:2112, 2113. Gn. 45, p. 470. G. 17:187. Var. **bícolor,** Lindl. Ground-color of the fls. white. B.R. 29:44. G.W. 15, p. 457.

11. **saccàta,** Batem. Fls. smaller than those of the other species, greenish yellow, changing to deeper yellow at the bases of the segms., regularly speckled with brown; lateral sepals ovate-oblong, the upper one oblong-lanceolate; petals narrower, oblong, all reflexed; hypochil deeply saccate; horns flat, a little twisted, epichil quadrate. Guatemala. I.H. 8:270 (as *S. radiosa*).

12. **ecornùta,** Lem. Pseudobulbs and lvs. large: scape short, clothed with green bracts, 2-fld.: sepals erect, 2 in. long, ovate, concave, white, petals smaller; labellum reduced to a fleshy sac-like hypochil, 1½ in. long, yellow deepening to orange at the base; column as long as the labellum and of the same color. Cent. Amer. B.M. 4885. F.S. 2:181. G.C. 1850:295.

S. Amesiàna, Hort.=S. Lowii.—*S. bellæréns*is=S. insignis ×S. oculata. R.H. 1896:232.—*S. convolùta,* Rolfe. Sepals and petals ivory-white, the latter with buff tips, the sepals elliptic-oblong, spreading, 2½–3 in. long, 1¼–1¾ in. wide, the petals connivent, inclosing column, about 2 in. long, 1¼ in. wide; lip buff-yellow, with the interior of hypochil orange, over 1½ in. long, 3-lobed; hypochil subglobose; epichil oblong, truncate. Colombia. B.M. 8507.—*S. costaricénsis,* Reichb. f. Fls. 4½–5 in. across, pale yellow, densely purple-dotted; lip with 2 prominent keels on each side; column with small triangular wing at apex. Costa Rica.—*S. elegántula,* Rolfe. Fls. primose-yellow, with base of petals and hypochil of lip orange, sparsely dotted with brown. Hab.(?).—*S. flórida,* Reichb. f. Infl. dense, about 7-fld.: fls. white, the inside of sepals and petals spotted with purple; lip with numerous small purple dots, the hypochil with a large blotch on each side. S. Amer. G.C. II. 16:561, 565; III. 19:265.—*S. gravèolens,* Lindl. Fls. ample; sepals greenish white flushed yellowish; petals pale yellow, oblong-ligulate, undulate, shortly acuminate; lip with the hypochil apricot; mesochil white; epichil entire, oval, pointed, white, purple-dotted. Guatemala. G.W. 3, p. 472. C.O. 4.—*S. Haselovìana,* Reichb. f. Fls. 6 in. across; sepals and petals dull gray on back, dull yellowish on surface, covered with annular pale rose spots; lip spotted with dark purple; hypochil quadrate; epichil 3-parted. Peru. B.M. 7452.—*S. inodòra,* Lodd. Lateral sepals ovate-oblong; hypochil subcompressed, short, saccate; epichil orbicular-ovate, entire; fls. pale flushed with yellow. Mex. B.R. 31:65. G.M. 57:54. G.W. 7, p. 27.—*S. Langlasseàna,* Cogn. Lip erect, rigid, closely pressed against the erect column; petals ascending, pressed against the column; sepals extended horizontally. Trop. Amer.—*S. Lòwii,* Rolfe. Sepals and petals creamy buff, the latter brown-dotted; lip ivory-white, the hypochil branded with dull maroon. Colombia. G.M. 36:352. G.C. III. 14:689. J.H. III. 45:193.—*S. Madouxiàna,* Cogn. Fls. fragrant, 5–7 in. across; sepals and petals cream-white, with large spots of carmine-rose, the sepals triangular-oval, obtuse, the petals broadly oblong, obtuse, undulate; lip fleshy, in color like sepals and petals, the inside of hypochil tinged with violet-black; epichil oval, pointed. Colombia. G.C. III. 24:135. C.O. 1.—*S. nigripes,* Rolfe. Sepals and petals yellow, with numerous small purple blotches, the sepals elliptic-oblong, acute, the petals linear-oblong, acute, undulate; lip yellowish white, purple-spotted at base and on epichil, the hypochil with a dark black-purple eye-like spot on each side, the inside the same color, the epichil ovate-orbicular. Origin unknown.—*S. peruviàna,* Rolfe. Fls. golden yellow; sepals obtuse, the dorsal oblong, the lateral obliquely and broadly ovate; petals linear-oblong, revolute; lip with the hypochil suffused dark purple on sides; epichil orbicular-ovate, purple-spotted. Peru. B.M. 8417.—*S. Rándii,* Rolfe. Fls. ivory-white, faintly shaded yellow on lip; sepals elliptic-oblong, acute; petals lanceolate-oblong, acute, lip with the hypochil papillate inside, the epichil triangular, acute. Brazil.—*S. Rodigasiàna,* Claes. Fls. about 6 in. across; sepals spreading, oblong-ovate, purple-marbled below, maroon-blotched above; petals triangular-lanceolate, attenuate above, pale green; lip very fleshy, the hypochil suffused with maroon-purple below, the remainder blotched; epichil reticulated, triangular, obtuse, spotted with dull purple. Colombia. B.M. 7702. G.M. 41:492. G.C. III. 24:31.—*S. Rúckeri,* Lindl. Resembles S. Wardii in color, but paler; hypochil obovate; epichil stained pink. Mex. A.F. 6:631.—*S. stenochìla,* F. C. Lehm. & Kränzl. Sepals pure white; petals apricot-colored, with purplish blotches; lip ivory-white at base, middle and interior parts yellow. Colombia.—*S. Wolteriàna,* Kränzl.=S. Martiana × S. tigrina. Fls. dull straw-color or pale orange; sepals obscurely marked with wine-red, the spots on the petals larger. G.C. III. 38:102.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

STANLÈYA (named for Edward Stanley, Earl of Derby, 1779–1849). *Cruciferæ.* Glaucous glabrous perennial herbs, similar to arabis in habit, suitable for the flower-garden: lvs. undivided or pinnatifid: racemes elongated, strict, many-fld.; fls. yellow; buds elongated, sepals short, spreading; petals narrow, elongated, long-clawed: silique long-stipitate, slender, 4-cornered to rather terete, compressed, valves carinately 1-nerved.—About 10 species, Calif.

pinnàta, Brit. (*S. pinnatífida,* Nutt.). Sts. flexuous: lvs. very variable, commonly pinnatifid; segms. lance-oblong or oblanceolate-elliptic, rarely linear, almost entire; terminal segm. larger: fls. deep golden yellow, according to D. M. Andrews. May–July. W. Kans. and Neb. to Texas and S. Calif., in dry clay or alkaline soils.

3678. Stanhopea insignis. (×⅓)

G.C. III. 29:381.—A hardy perennial herb about 3 ft. high with the general appearance of a cleome and fls. about 1 in. across borne in terminal spikes a foot or more long.

F. TRACY HUBBARD.†

STAPÈLIA (J. B. Van Stapel, Dutch physician, died in the early part of the seventeenth century, who wrote on the plants of Theophrastus). *Asclepiadàceæ.* CARRION FLOWER. Odd fleshy cactus-like plants usually grown with greenhouse succulents, both for the great oddity of their forms and for the singular and often large showy flowers.

Stems low, leafless, coarsely 4-angled, the angle coarsely dentate, usually more or less covered with tubercles and excrescences: fls. often large, generally fetid and commonly arise from the angles and notches of the sts., apparently in no regularity and are usually grotesquely barred and mottled with dark or dull colors; calyx and corolla 5-parted, corolla-segms. spreading, usually narrow and fleshy, mostly purple or marbled, in some species pale; crown in 2 rows, the outer horizontally spreading, deeply 5-lobed, the lobes entire or shortly 2–3-cleft, the inner of 5 scales adnate to the base of the anthers: fr. of 2 follicles, containing comose seeds.—About 60 species according to N. E. Brown in Dyer, Flora Capensis, vol. 4 (1909); Schumann, in Engler & Prantl's Pflanzenfamilien, considers that the genus contains 70–80 species; Decaisne, in DeCandolle's Prodromus, 8 (1844), describes 89 species, and makes references to several more. S. Afr. chiefly, 3 or 4 in Trop. Afr. Some of the species have fls. several inches across, although the plants themselves are relatively small; in fact, the fls. of *S. gigantea* are a foot across.

Most of the stapelias demand the treatment given to Cape euphorbias and to cacti,—a light, airy, rather dry position during the growing and blooming seasons and a soil made porous with rubble. They are mostly summer and fall bloomers. They should remain dormant in winter. Propagated easily by cuttings. They do best, however, when not grown so dry as cacti are grown. (See under Succulents, p. 2674.) The stapelias are known in cultivation mostly in botanic gardens and in the collections of amateurs. Only a few names occur in the American trade, and one of these (*S. cylindrica*) is an Echidnopsis. Several other species are likely to be found in fanciers' collections.

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KEY TO THE SPECIES.

A. *Corolla without a distinct raised ring on the disk.*
  B. *Inner surface of the disk and lobes glabrous and rugose or smooth.*
    C. *The corolla-lobes extended not more and usually less than 2 in. diam. (except perhaps in No. 9).*
      D. *Lobes of the corolla nearly smooth, ciliate with long flattened tapering hairs* ..... 9. **bella**
      DD. *Lobes of the corolla very distinctly ciliate with simple hairs* ..... 8. **similis**
    CC. *The corolla-lobes extended 2½–7 in. diam.*
      D. *Lobes of the corolla ciliate with simple hairs* ..... 6. **Pillansii**
      DD. *Lobes of the corolla not ciliate* ..... 7. **glabriflora**
  BB. *Inner surface of the disk or disk and lobes hairy, besides the border of cilia, usually transversely rugose.*
    C. *Corolla-lobes extended 8–14 in. diam., lobes 2⅔–5½ in. long.*
      D. *Center of corolla shallowly depressed* ..... 3. **gigantea**
      DD. *Center of corolla cup-shaped, about 1⅛ in. deep* ..... 4. **nobilis**
    CC. *Corolla-lobes extended 4½–6½ in. diam., lobes 1½–2¾ in. long.*
      D. *Transverse yellow lines on corolla absent* ..... 2. **grandiflora**
      DD. *Transverse yellow or whitish lines on corolla present* ..... 1. **hirsuta**
    CCC. *Corolla-lobes extended 3–4½ in. diam., lobes 1⅛–1¾ in. long* ... 1. **hirsuta var.**
    CCCC. *Corolla-lobes extended 2–3 in. diam., lobes 1–1⅓ in. long.*
      D. *Disk of corolla shortly and usually thinly pilose or pubescent with erect hairs* ..... 11. **maculosoides**
      DD. *Disk of corolla thickly or densely covered with fine long hairs* ... 5. **tsomoensis**
AA. *Corolla with a distinct raised ring or cushion on the disk.*
  B. *Inner lobes of the crown sometimes slightly humped at the base or connected to the outer row, but not produced into a distinct dorsal horn (see also No. 12 in which the outer horn is sometimes not more than ¼ line long)* ..... 13. **namaquensis**
  BB. *Inner lobes of crown distinctly 2-horned.*
    C. *Annulus or ring ½–2 lines high, erect, very obtuse or rounded at the top, not cushion-like nor with a spreading or recurved margin.*
      D. *The corolla pale yellowish or light yellow with spots and transverse lines on the basal part of the lobes dark purple-brown to dull purple, and their tips often entirely purple-brown, or in the variety entirely dark purple-brown with inconspicuous transverse yellow lines* ..... 10. **mutabilis**
      DD *The corolla pale yellow, sprinkled all over with dots or small spots of purple-brown, lobes 5–10 lines long, not ciliate* ..... 12 **pulchella**
    CC. *Annulus or ring very prominent, with an acute edge to the horizontally spreading or recurved margin* ..... 14. **variegata**

1. **hirsùta,** Linn. Sts. erect, 5–8, occasionally 12 in. high, softly puberulous, green: fls. 1–3 together, near the base of young sts.; corolla 4–5 in. diam., basal half of lobes cream-color, more or less tinted with purplish on the disk, upper half very dark purple-brown, marked with transverse cream-colored or yellowish and purple-brown lines, white-hairy. S. Afr. Var. **unguipétala,** N. E. Br. (*S. unguipétala*, N. E. Br.). Corolla 3½–4½ in. diam., disk with the center and 5 bands radiating to the sinuses, pale greenish ochre, margins of the upper half of the lobes much revolute, tips upcurved. S. Afr. G.C. II. 7:335; III. 44: 169.

3679. Stapelia grandiflora. (×⅓)

2. **grandiflòra,** Mass. Fig. 3679. Sts 6–12 in. high, gray-velvety-pubescent, with very compressed angles: fls. 1–3 together, near the base of the sts.; corolla 5–6 in. diam., velvety-pubescent, inner face dark purple-brown, lobes ciliate, darkest toward the tip, upper half rugose and transversely rugose, without markings, basal half white or pale-purple-haired. S. Afr. G.L. 27:67. R.B. 40, p. 186. R.H. 1858, p. 154.

3. **gigantèa,** N. E. Br. Sts. erect, branching from a short decumbent base, 4–8 in. high, pubescent, light

dull green, angles much compressed: fls. 1 or 2 together, near the base or toward the middle of the sts.; corolla 11–16 in. diam., disk-like, center shallowly depressed, inner surface transversely rugulose, pale-purple-hairy, light ochre-yellow, everywhere marked with transverse crimson lines, lobes 4–6¼ in. long. Trop. and S. Afr. B.M. 7068. G.C. II. 7:693; III. 4:729. G.F. 8:515. —"The requirements of *S. gigantea*," Watson writes, "are somewhat exceptional. It thrives only when grown in a hot, moist stove from April till September, when the growth matures and the flower-buds show. It should then be hung up or placed upon a shelf near the roof-glass in a sunny dry position in the stove."

4. **nóbilis,** N. E. Br. Sts. erect, decumbent and branching at base, 3–5 in. high, sides concave, softly pubescent, green: fls. 1–5 together, near the base or middle of the young branches; corolla very large, with a distinct campanulate tube about 1⅙ in. deep, lobes 2¾–4 in. long, light reddish purple on the back, inner face transversely rugulose, light ochre-yellow everywhere marked with irregular transverse crimson lines. S. Afr. B.M. 7771.

5. **tsomoénsis,** N. E. Br. Sts. 4–6 in. high, angles compressed and somewhat repand-dentate, opaque green: fls. 4–9 together, near the base of the young sts.; corolla 2½–3 in. diam., outside glabrous, light green, inside with a few raised transverse ridges on the upper half of the lobes, entirely dull smoky purple, darker at the tips of the lobes. S. Afr.

6. **Pillánsii,** N. E. Br. Sts. rather crowded, 4–7 in. high, sides concave, angles not much compressed, velvety-pubescent, green: fls. 2–5 together, near the base of the sts., 4–5½ in. diam., inner surface transversely rugose and glabrous, purple-brown without markings, shining, densely ciliate with soft light purple, simple hairs. S. Afr. G.C. III. 35:242; 44:187.

7. **glabriflòra,** N. E. Br. (*S. glabriflòlia,* Bailey, error. *S. grandiflòra* var. *mìnor,* Hort.). Sts. erect, 4–9 in. high, puberulous, green, angles much compressed: fls. 1–2 together at the middle or lower part of young sts.; corolla 3–4½ in. diam., velvety on the back, transversely rugose and quite glabrous on the inner face, not ciliate, dull reddish purple, darker at tips of lobes, whole surface transversely marked with very narrow linear, irregular yellowish white lines. S. Afr. G.C. II. 6:809; III. 44:186.

8. **símilis,** N. E. Br. Sts. erect, 3–6 in. high, 4–6-angled, minutely puberulent, dull purple or gray-green, purple-spotted; angles somewhat denticulate: fls. 3–6, borne at the base of the st.; corolla rotate, less than 1 in. across, outside minutely puberulent, inside transverse rugose, glabrous, not ciliate, dark purple, lobes ovate, acute. S. Afr.

9. **bélla,** Berger. Sts. erect, branching at or above the base, 5–7 in. high, sides concave, minutely pubescent, dull green: fls. 3–4 together at the base of the young sts.; corolla 1¾–2 in. diam., glabrous inside and out, inner face deep purplish red, browner toward the tips of the lobes, paler at the center, the small tube whitish, without markings, ciliate on the lobes. A hybrid of European raising. G.C. III. 31:138; 44: 168.

10. **mutábilis,** Jacq. Sts. 3–18 in. high, acutely 4-angled, with rather stout conical, spreading teeth, glabrous, green, sometimes tinged with purple, slightly glaucous: fls. 1–3 together, from near the base of the younger or higher up on the older sts.; corolla with lobes very much recurved and then about 1½ in. diam., glabrous on both surfaces, inner face slightly rugose to nearly smooth, the upper third of the lobes light or dark purple-brown, the remainder pale yellowish or greenish yellow, covered with transversely elongate spots or thick or narrow, irregular transverse purple-brown lines. S. Afr. Var. **díscolor,** N. E. Br. (*S. díscolor,* Tod.). Corolla dark purple-brown with inconspicuous yellowish transverse lines on parts of the disk; annulus yellow with irregular purple lines. S. Afr.

11. **maculosoìdes,** N. E. Br.; also erroneously spelled *masculosoides.* Sts. erect, about 3 in. high, obtusely 4-angled, glabrous: corolla about 2¾ in. diam., glabrous outside, center dark violet-purple, lobes 12–13 lines long, slightly rugose, marked with dark violet-purple transverse lines and spots on a light yellowish ground on the central part and with dark violet-purple margins and tips, ciliate. Probably a European hybrid.

12. **pulchélla,** Mass. Sts. 2–4 in. high, erect or decumbent at base, obtusely 4-angled, glabrous, green: fls. usually 3 or more together, near the base of the sts.; corolla 1¼–2¼ in. diam., smooth on the back, minutely tuberculate-rugulose and glabrous inside, not ciliate, sulfur-yellow, covered with numerous purple-brown dots, lobes sometimes narrowly edged with purple-brown. S. Afr.

13. **namaquénsis,** N. E. Br. Sts. procumbent or decumbent, 1½–3¼ in. high, obtusely 4-angled, with very stout, acute, conical spreading teeth, glabrous, green, marked with irregular purple stripes: fls. 1–4 together, near the base or middle of the young sts.; corolla 3–4 in. diam., back smooth and glabrous, inner surface very rugose with transverse papillate ridges on the lobes which are 1–1¼ in. long, yellow, dotted with purple-brown. S. Afr. Var. **ciliolàta,** N. E. Br. (*S. ciliolàta,* Ruest, not Tod.). Corolla shortly ciliate, with simple or subclavate white or white and dark purple hairs mixed, spotting variable.

14. **variegàta,** Linn. (*S. normàlis,* Jacq.). Plant glabrous: sts. erect from a decumbent base, 2–6 in. high, very obtusely 4-angled, green, often mottled all over or tinted with purple at the tips: fls. 1–5 together, at base of young sts.; corolla 2–3 in. diam., lobes smooth and green outside, inner surface rugose with crowded irregular transverse ridges on the lobes, pale greenish yellow, with dark purple-brown spots. S. Afr. B.M. 26. R.H. 1857, p. 43. Var. **atràta,** N. E. Br. (*S. atràta,* Tod.). Corolla-lobes deltoid-acuminate, ground-color dark purple-brown. Var. **atropurpùrea,** N. E. Br. (*S. atropurpùrea,* Salm-Dyck). Corolla-lobes ovate; ground-color blackish purple. Var. **clypeàta,** N. E. Br. (*S. Bufònis,* Sims). Corolla 2½–3 in. diam. spotted all over, with or without a few slender transverse lines at the base of the lobes. B.M. 1676. Var. **Cúrtisii,** N. E. Br. (*S. Cúrtisii,* Schult.). Outer lobes of crown very slightly notched; ground-color of corolla light yellow or rather bright sulfur-yellow. Var. **mixta,** N. E. Br. (*S. mixta,* Mass.). Corolla 2½–3¾ in. diam., light-colored; lobes with numerous rounded spots, those of the basal half connected by slender transverse purple-brown lines. Var. **trisúlca,** N. E. Br. (*S. trisúlca,* Donn.). Corolla in mature bud flat-topped, without a point, when expanded flat on the back of the disk.

S. álbicans, Sprenger. A hybrid with partly whitish sts.: corolla 2–2½ in. diam., dark purple-brown at the tips of the lobes, otherwise yellow with purple-brown transverse lines.—*S. Astèrias,* Mass. Starfish Flower. Dwarf: sts. mostly curved: corolla 4–5 in. diam., with spreading star-like segms., violet-purple with transverse, yellowish bars. B.M. 536. L.B.C. 5:453.—*S. atrosanguínea,* N. E. Br., with intense blackish crimson fls. is in reality a Caralluma, C. atrosanguinea, N. E. Br.—*S. cantabrigiènsis,* Berger (S. hybrida cantabridgensis). Hybrid: corolla 6½–8 lines across, broadly campanulate, greenish, suffused with red outside, brown-red inside, rather densely covered with red-brown hairs.—*S. Càroli-Schmídtii* is offered in the German trade.—*S. cylíndrica,* Hort.=Echidnopsis cereiformis.—*S. divérgens,* N. E. Br. Hybrid: corolla about 2 in. diam., inner surface slightly rugulose, light yellow, irregularly marked with brownish crimson lines.—*S. Engleriàna,* Schlecht. Fls. solitary; corolla dark brown, lobes triangular. S. Afr.—*S. Fléckii,* Berger & Schlecht., is offered in the German trade. S. E. Afr.—*S. fœtida,* Hort., is an American trade name which might apply to any species in the genus.—*S. Hanburyàna,* Berger & Ruest. Hybrid: corolla about 2½ in. diam., inner surface somewhat rugose, lobes pale greenish yellow, evenly marked all over with small transverse, purple-brown spots or short lines, narrowly edged with the same color.—*S. Leendértziæ,* N. E. Br. St. erect from a decumbent base, 3–5 in. high: corolla large, campanulate, tube 2–2½ in. long, 1¾–2¼ in. across, dull fuscous-purple. Trans-

vaal. B.M. 8561.—*S. longipedicellàta*, N. E. Br. (S. kwebensis var. longipedicellata, Berger). Sts. clustered, erect, 4–6 in. high: corolla 1½–1¾ in. across, tube short, purplish, lobes blackish. Trop. Afr.—*S. luxùrians*, Dammann. Hybrid: corolla about 3 in. diam., not ciliate, entirely dark purple-brown.—*S. mágna*, Berger. Hybrid: corolla dark brown, with yellowish markings, with violet-red curled hairs.—*S. Plántii*, Hort. Sts. stout and erect: corolla about 5 in. diam., hairy, brown barred with yellow, lobes margined with brown-purple. S. Afr. B.M. 5692. F.S. 19:2012.—*S. pórtæ-taurinæ* is offered in the German trade.—*S. pùtida*, Berger. Hybrid: sts. 1½–2 in. high: corolla-lobes yellowish with large purple-brown spots and a red line along the margin, not ciliate.—*S. rectiflòra*, Ruest. Hybrid: corolla about 2 in. diam. with a shallow cup-like disk and spreading sulfur-yellow lobes, with rounded and not very numerous purple-brown spots often confluent in longitudinal rows.—*S. Schínzii*, Berger & Schlecht., is offered in the German trade. S. E. Afr.

F. Tracy Hubbard.†

STAPHYLÈA (Greek, *staphyle*, cluster, referring to the inflorescence). *Staphyleàceæ*, formerly referred to the *Celastràceæ*. Bladder-Nut. Ornamental woody plants chiefly grown for their attractive white flowers and for their handsome foliage, and also for the inflated pod-like fruit.

Deciduous shrubs or small trees, with smooth striped bark: lvs. opposite, 3–7-foliolate; lfts. serrulate, like the lvs. stipulate: fls. perfect, 5-merous in terminal panicles; sepals and petals 5, of about the same length, upright; stamens 5; pistils 2–3, usually connate below: fr. a 2–3-lobed, inflated, membranous caps., with 1 or few subglobose rather large, bony seeds in each cell.—Eleven species in the temperate regions of the northern hemisphere.

The bladder-nuts are upright shrubs or small trees with handsome bright or light green foliage and ornamental white or pinkish flowers in nodding clusters followed by bladder-like fruits conspicuous by their size and pale green color. The species are all inhabitants of temperate regions, and *S. trifolia*, *S. Bumalda* and *S. pinnata* are hardy North, while *S. colchica*, *S. Bolanderi*, and *S. holocarpa* are hardy at least as far north as Massachusetts; *S. emodi* is more tender and seems not to be in cultivation in this country. They are all desirable shrubs and flower in early summer after the leaves except *S. holocarpa* which blooms in spring before or with the leaves. They are well adapted for shrubberies, but all except *S. Bumalda* are liable to become bare and unsightly at the base and are therefore not to be recommended for single specimens. *S. holocarpa* is perhaps the most beautiful species in bloom; also *S. elegans*, *S. colchica*, and *S. Bumalda* have very handsome flowers. *S. colchica* blooms at an early age and is sometimes forced, but *S. holocarpa* is probably even better adapted for that purpose. Staphyleas grow well in almost any kind of soil and position, but do best in a somewhat moist rich earth and partly shaded situation. They are always interesting although not showy. Propagation is by seeds, layers, and suckers. Greenwood cuttings from forced plants root readily.

A. *Lvs. 5–7-foliolate, only occasionally 3-foliolate: panicles stalked.*

B. *Panicle raceme-like, oblong, pendulous: fl.-buds subglobose.*

pinnàta, Linn. Upright shrub, attaining 15 ft., sometimes tree-like: lfts. 5–7, ovate-oblong, long-acuminate, sharply and finely serrate, glabrous and glaucescent beneath, 2–3 in. long: panicles 2–5 in. long, on peduncles about 2 in. long: sepals oval, whitish, greenish at the base, reddish at the apex, about as long as the oblong petals: caps. 2–3-lobed, much inflated, subglobose, about 1 in. long. May, June. Eu. to W. Asia. Gn. 34, p. 280. G. 4:473. H.W. 3, p. 52.

BB. *Panicle broad, upright or nodding: fl.-buds obovate-oblong.*

cólchica, Stev. (*Hoibrénkia formòsa*, Hort.). Upright shrub, attaining 12 ft.: lfts. usually 5, sometimes 3, oblong-ovate, acuminate, sharply serrate, glabrous and pale green beneath, 2–3 in. long: panicle 2–3 in. long and almost as broad, on a peduncle 2–3 in. long: sepals narrow-oblong, spreading, yellowish white; petals linear-spatulate, white: caps. obovate, much inflated, 1½–2 in. long. May, June. Caucasus. B.M. 7383. R.H. 1870, p. 257. J.H. III. 34:183. F. 1879, p. 123. G.C. II. 11:117; III. 2:713; 10:161. A.G. 18:423. Gt. 24:837; 37, p. 501. Gn. 34, p. 281; 76, p. 171. G. 2:323; 26:115 (forced plant); 27:170. G.M. 55:215. Gn.W. 5:49; 23:57. F.E. 23:585.—Var. **Coulombièri,** Zabel (*S. Coulombièri*, André). Of more vigorous growth, with denser foliage: lvs. larger and longer-stalked; lfts. long-acuminate: stamens glabrous: caps. 2–4 in. long, spreading at the apex.

AA. *Lvs. 3-foliolate.*

B. *Middle lft. short-stalked, stalk ½in. or less long: panicle sessile.*

Bumálda, DC. Shrub, 6 ft. high, with upright and spreading slender branches: lfts. broadly oval to ovate, shortly acuminate, crenately serrate, with awned teeth, light green, almost glabrous, 1½–2½ in. long: fls. about ⅛in. long, in loose, erect panicles 2–3 in. long; sepals yellowish white, little shorter than the white petals: caps. usually 2-lobed, somewhat compressed, ¾–1 in. long. June. Japan. S.Z. 1:95.

BB. *Middle lft. slender-stalked: panicles stalked.*

C. *Fls. after the lvs.*

trifòlia, Linn. American Bladder-Nut. Fig. 3680. Upright shrub, with rather stout branches, 6–15 ft. high: lfts. oval to ovate, acuminate, finely and sharply serrate, slightly pubescent beneath or almost glabrous, 1½–3 in. long: fls. about ⅛in. long, in nodding panicles or umbel-like racemes; sepals greenish white, petals white: caps. much inflated, usually 3-lobed, 1⅓–2 in. long. April, May. Que. to Ont. and Minn., south to S. C. and Mo. Gt. 37, p. 529. Var. **pauciflòra,** Zabel. Low and suckering: lfts. smaller, broader, glabrous at length: fls. in short, 3–8-fld. racemes: fr. often 2-lobed, 1⅓–1½ in. long.

3680. Staphylea trifolia. (×¼)

Bòlanderi, Gray. Fig. 3681. Shrub: lfts. broadly oval or almost orbicular, acute, sharply serrulate, glabrous, 2–3 in. long: fls. in many-fld. nodding panicles; stamens and styles exserted: fr. 3-lobed, much inflated, 2–2½ in. long. Calif., in the Sierra Nevada region. G.F. 2:545 (adapted in Fig. 3681). R.H. 1910, p. 305.—A rare shrub, probably not regularly in cult.

CC. *Fls. before the lvs.*

holocárpa, Hemsl. Shrub or small tree, to 25 ft.: lfts. 3, oval to ovate-oblong, short-acuminate, serrulate, pale and reticulate and glabrous or nearly so beneath, 2–4 in. long: fls. white or pinkish, nearly ½in. long, in pendulous slender-stalked panicles 1–4 in. long, axillary on last year's branchlets: fr. pear-shaped or ellipsoid, abruptly acuminate or sometimes lobed at the apex, 1½–2 in. long; seeds light grayish brown, lustrous, ¼in. long. Cent. China.—Very floriferous and handsome. The name has been misspelled *S. lobocarpa*. Var. **ròsea,** Rehd. & Wilson. Lfts. whitish tomentose beneath while young, later villous along the midrib beneath only: fls. pink, ½in. long. Cent. China.

S. élegans, Zabel. Intermediate between and supposed to be a hybrid of S. pinnata and S. colchica: lfts. usually 5: panicles very

large and nodding. A very free-flowering variety with pinkish tinged fls. is var. *Hésseï*, Zabel.—*S. emòdi*, Wall. Shrub or small tree: lfts. 3, oval to oblong, 2–6 in. long; stalk of terminal lft. about 1 in. long: fls. in peduncled, pendulous, raceme-like panicles: fr. 2–3 in. long. Himalayas.

ALFRED REHDER.

STAR-APPLE: *Chrysophyllum.* **Starfish Flower:** *Stapelia Asterias.* **S. Flower:** *Aster, Trientalis, Tritele a* and other plants. **S. Grass:** *Chloris truncata.* **Star of Bethlehem:** *Ornithogalum umbellatum.* **S. Thistle:** *Centaurea.* **S. Tulip:** *Calochortus.* **Starwort:** *Aster.*

STÂTICE (Greek name meaning *astringent*, given by Pliny to some herb). Syn., *Armèria*, Auth., not Linn. (see Vol. I, p. 395). *Plumbaginàceæ.* SEA-PINK. THRIFT. Interesting hardy border perennials, biennials, and annuals useful for both the many-flowered bright inflorescence and the stiff more or less evergreen foliage; flowers blue, lilac, white, yellow.

The genus Statice as defined by Linnæus, "Genera Plantarum," ed. 5 (1754), is based on Statice, Tourn., and Limonium, Tourn.: Statice of Tournefort is the Armeria of later authors, while Limonium of Tournefort is the Statice of later authors and of Linnæus in part. Consequently, in dividing the Linnæan genus we

3681. Staphylea Bolanderi. (×⅔)

must retain the name for that part of it which represents the origin of the name, which is exactly what Miller did in "The Gardener's Dictionary," ed. 8 (1768), retaining the name Statice for those species with a globular head and reëstablishing Limonium as the generic name of those species with an open inflorescence. This treatment is accepted by most recent authorities although it is not followed by Pax in Engler & Prantl's "Natürlichen Pflanzenfamilien."

Although the individual flowers are small, some of the sea-pinks are very showy because of the great numbers of clustered blossoms and the brilliant colors. The flowers are often scarious and may be treated as everlastings. The evergreen or semi-evergreen character of the tufted foliage also adds much interest. The plants are easy to grow, remaining for some years when well established, rooting deep. Usually grown from seed.

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KEY TO THE SPECIES OF STATICE.

A. *Calyx produced into a spur.*
  B. *Bracts between the fls. small, scarcely exceeding the fruiting pedicels*..... 1. **fasciculata**
  BB. *Bracts between the fls. about equaling the calices in the interior of heads.*
    C. *Lvs. linear*..... 2. **Welwitschii**
    CC. *Lvs. oblong-ovate*..... 3. **mauritanica**
AA. *Calyx not produced into a spur.*
  B. *Tube of calyx usually pilose all over.*
    C. *Inner lvs. of rosette not like the outer*..... 7. **juncea**
    CC. *Inner lvs. of rosette like the outer.*
      D. *Pedicel as long as the calyx-tube.* 4. **Armeria**
      DD. *Pedicel about half as long as the calyx-tube.*
        E. *Apex of lvs. rather acute*..... 5. **labradorica**
        EE. *Apex of lvs. obtuse*..... 6. **sibirica**
  BB. *Tube of calyx glabrous or pilose only on the ridges.*
    C. *Spikelets stipitate inside the involucre*.....15. **leucocephala**
    CC. *Spikelets sessile inside the involucre.*
      D. *Exterior lvs. of the rosette differing from the others.*
        E. *Involucre pale brown*.....13. **majellensis**
        EE. *Involucre white, showy*.....14. **undulata**
      DD. *Exterior lvs. of the rosette the same as the others.*
        E. *Lvs. oblong-lanceolate or broader*.....12. **pseudo-[armeria**
        EE. *Lvs. linear-lanceolate or narrower.*
          F. *The lvs. 3-cornered in cross-section*..... 8. **cæspitosa**
          FF. *The lvs. flat.*
            G. *Blades 3–7-nerved*.....11. **plantaginea**
            GG. *Blades 1-, occasionally obscurely 3-nerved in No. 9.*
              H. *Involucre pale brown.* 9. **montana**
              HH. *Involucre green*.....10. **purpurea**

For descriptions of the following species and varieties of Statice, see *Armeria* (Vol. I).

3. **S. mauritánica,** Hubb. (*Armèria mauritánica*, Wallr. *A. cephalòtes*, Hook., not Schousb.).

4. **S. Armèria,** Linn. (*Armèria marítima*, Willd. *A. vulgàris*, Willd.). Var. **álba,** Hubb. (*Armèria vulgàris* var. *álba*, Hort.) Var. **grandiflòra,** Hubb. (*Armèria vulgàris* var. *grandiflòra*, Hort. ex Bailey). Var. **Laucheàna,** Hubb. (*Armèria vulgàris* var. *Laucheàna*, Bailey. *A. Laucheàna*, Hort.). Var. **purpùrea,** Hubb. (*Armèria vulgàris* var. *purpùrea*, Hort. ex Bailey). Possibly a synonym of *S. purpurea*, so considered by some authors. Var. **rùbra,** Hubb. (*Armèria vulgàris* var. *rùbra*, Hort. ex Bailey). Var. **splèndens,** Hubb. (*Armèria vulgàris* var. *splèndens*, Hort. ex Bailey). Possibly the same as var. *Laucheana*.

6. **S. sibírica,** Ledeb. (*Armèria sibírica*, Turcz.).

7. **S. júncea,** Hubb. (*Armèria júncea*, Girard).

9. **S. montàna,** Mill. (*Armèria alpìna*, Willd.).

10. **S. purpùrea,** Koch (*Armèria purpùrea*, Koch).

11. **S. plantagínea,** All. (*Armèria plantagínea*, Willd.). Var. **leucántha,** Hubb. (*Armèria plantagínea* var. *leucántha*, Boiss.).

12. **S. pseudoarmèria,** Murr. (*Armèria latifòlia*, Willd., not *S. latifòlia*, Smith. *A. cephalòtes*, Link &

Hoffm., not Hook.). The name pseudoarmeria has also been used for two other species, but the Murray definition applies to this species and his is the oldest use of the name.

14. **S. undulàta,** Bory & Chaub. (*Armèria undulàta,* Boiss. *A. argyrocéphala,* Wallr.).

The following species and varieties, all of which are in the trade, are not included under Armeria in Vol. I. According to Otto Kuntze and others there is but one species of Statice, *S. Armeria,* all the others being variants of this polymorphic species. The great confusion in synonymy seems to uphold this view to some extent and it is certainly questionable whether the varieties of *S. Armeria, S. plantaginea,* and *S. pseudoarmeria* are all of them distinct.

1. **S. fasciculàta,** Vent. (*Armèria fasciculàta,* Willd.). Glabrous, subshrubby at base: lvs. glaucescent, linear, canaliculate, thick, stiff and pointed: involucral lvs. in several rows, fuscous, triangular-ovate, the inner ones white-margined: fls. pale pink. Spain, Corsica, and Sardinia.—The lvs. are somewhat yucca-like.

2. **S. Wélwitschii,** Hubb. (*Armèria Wélwitschii,* Boiss.). Base subshrubby, glabrous: lvs. glaucescent, linear, somewhat channeled, obscurely 1-nerved beneath, acuminate; involucral lvs. fuscous, white-margined, lowest triangular. Portugal.

4. **S. Armèria** var. **variegàta,** Hubb. (*Armèria marítima* var. *variegàta,* Hort.), forms prostrate masses of bright golden foliage and has heads of rose fls.

5. **S. labradórica,** Hubb. & Blake (*Armèria labradórica,* Wallr.). Lvs. glabrous, linear, flat, 1-nerved, rather acute: scapes 1 or 2, low, pubescent; involucral scales herbaceous on the back, the outer ovate, the inner broadly membranaceous-margined. Labrador and Greenland.

8. **S. cæspitòsa,** Ort., not Poir. (*Armèria cæspitòsa,* Boiss. *A. bélla,* Hort., not Alboff. *A. cæspitòsa* var. *vèra,* Hort.). Forming dense cushions: lvs. very short, narrowly linear, triquetrous, short, white-mucronate: scape pubescent; involucral lvs. brownish: fls. in small heads, blush-pink or pale lilac. Mountains of Spain and Portugal. B.M. 7596.—*S. cæspitòsa,* Poir., equals *S. Armeria;* probably at least some of the material grown as *S. cæspitosa* is that species.

9. **S. montàna** var. **álba,** Hubb. (*Armèria alpìna* var. *álba,* Hort.), is a white-fld. form.

11. **S. plantagínea** var. **álba,** Hubb. (*Armèria plantagínea* var. *álba,* Hort.), has large heads of white fls., 1 ft. high. Var. **gigantèa,** Hubb. (*Armèria plantagínea* var. *gigantèa,* Hort.), grows 3 ft. high, has rigid sts., and large heads of glistening pink fls. Var. **grandiflòra,** Hubb. (*Armèria plantagínea* var. *grandiflòra,* Hort.), grows 1 ft. high, and has large crimson fls. Var. **ròsea,** Hubb. (*Armèria plantagínea* var. *ròsea,* Hort.), grows 1 ft. high and has pink fls. Var. **rùbra,** Hubb. (*Armèria plantagínea* var. *rùbra,* Hort.), grows 1 ft. high and has red fls. Var. **spléndens,** Hubb. (*Armèria plantagínea* var. *spléndens,* Hort.), grows 1–1½ ft. high and has brilliant rose-colored earlier fls. May, June.

12. **S. pseudoarmèria** var. **álba,** Hubb. (*Armèria cephalòtes* var. *álba,* Hort.), has white fls. Var. **grandiflòra,** Hubb. (*Armèria cephalòtes* var. *grandiflòra,* Hort.), grows 1½ ft. high and has large heads of rose-colored fls. Var. **rùbra,** Hubb. (*Armèria cephalòtes* var. *rùbra,* Hort.), has rosy red fls. Var. **spléndens,** Hubb. (*Armèria cephalòtes* var. *spléndens,* Hort.), grows about 18 in. high, forming large tufts of foliage and has large heads of vivid rose fls.

13. **S. majellénsis,** Hubb. (*Armèria majellénsis,* Boiss.). Cespitose, glabrous, base hardened: sheaths persistent, spreading squarrose: lvs. spreading to somewhat recurved, short, stiff, rather broad-linear, margin cartilaginous, folded to channeled, obtuse, 3-nerved: scapes medium height; heads large; involucre few-rowed, pale. Italy.

15. **S. leucocéphala,** Hubb. (*Armèria leucocéphala,* Salzm. ex Koch). Cespitose, base hardened: sheaths withering: lvs. linear, flat, 1-nerved, margin narrowly excurrent, apex short-mucronate: scape slender, more or less tall: involucre few-lvd., lvs. much shorter than the head: fls. white or rose. Corsica.

Armèria arbòrea, Hort., is described in the trade as having thick, woody, much-branched sts., each terminating with tufts of grass-like foliage and reddish fls.; unknown botanically.—*A. bracteàta,* Hort., is described as a plant about 6 in. high, with bright crimson fls., flowering May–July; possibly equals Acantholimon bracteatum, Boiss., which is a cespitose plant, with a compressed, head-like spike, with large ovate-orbicular bracts. Var. *rùbra,* Hort., has bright crimson bracts 1–2 in. long.—*A. formòsa* var. *álba,* Hort., probably equals S. pseudoarmeria var. alba. Var. *hýbrida,* Hort., is not recognizable from the data at hand.—*A. leucophýlla,* Hort., is described as growing 9 in. high and having pale primrose fls.; not known botanically.—*A. magellánica,* Hort., is described as a pretty alpine species with bright rosy crimson fls.

LIMÒNIUM (Greek, *meadow* or *marsh,* referring to the place of growth of many species). Syn., *Státice* of most authors, not of Linn.; *Goniolimon. Plumbaginàceæ.* Sea Lavender. Mostly perennial herbs, rarely annual or subshrubby, useful for cut-flowers and for the rock-garden.

Leaves usually radical and tufted especially, in the herbaceous species, generally rather long, alternate along the st. in the shrubby species, linear, spatulate oblong or obovate, sometimes pinnatifid or dissected: fls. blue, lavender, white, red, or yellow, in little- or much-branched panicles, borne on a leafless peduncle or scape; bracts subtending the fl.-clusters scale-like, somewhat clasping, usually coriaceous on the back, and with membranous margins, usually with 1 or 2 fls. in their axils, sometimes with dense few- to several-fld. spikelets; calyx funnel-shaped, often colored, usually the showy part of the fl., and scarious or persistent.—About 180 species well scattered about the world, but mainly seacoast plants of the northern hemisphere and especially numerous in Asia. Limoniums are of easy cult. but prefer a rather deep, loose soil. From the delicate nature of the fl.-panicles the species are better suited to rockwork and isolated positions than for mixing in a crowded border. Many of the species are useful for cut bloom, especially for mixing with other flowers. Some of the species are adapted to greenhouse culture, especially the shrubby forms.

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KEY TO THE SUBGENERA AND SECTIONS OF LIMONIUM.

A. *Stigmas capitate.* Subgenus I. Goniolimon. Species 1–5.
AA. *Stigmas cylindrical-filiform.*
B. *Petals united in a tube, undivided.*
Subgenus III. Siphonantha. Species 30–32.
C. *Duration perennial.*
Section 1. Eusiphonantha. Species 30.
CC. *Duration annual or biennial.*
Section 2. Psylliostachys. Species 31, 32.
BB. *Petals only united at the very base, if at all, undivided.*
Subgenus II. Veralimonium. Species 6–29.
C. *Corolla yellow or yellowish white (Section 3 contains a few species with rose fls., but none of them occurs in the trade-lists and are probably not in cult.).*
D. *Limb of calyx strongly folded: scape and branches of infl. usually winged or 2-edged-flattened (not winged in Nos. 14, 15, and 16; scape terete at base in No. 7).* Section 1. Pteroclados. Species 6–16.
DD. *Limb of calyx lobed or erose: scape and branches of infl. angled above; branchlets often articulate.*
Section 3. Plathymenium. Species 18, 19.
CC. *Corolla rose to purple.*
D. *Scapes and branches of infl. crisped-winged or acute-angled.* Section 2. Ctenostachys. Species 17
DD. *Scapes and branches of infl. terete, the branchlets sometimes angled.*

EE. *Stigmas coiled: calyx indurated.*
Section 5. CIRCINARIA. Species 29.

Subgenus I. GONIOLIMON.

A. *Interior bracts undivided* ..... 5. elatum
AA. *Interior bracts 2–3-cuspidate at the apex.*
B. *Spikelets 1–2-fld.*
C. *Branches of the panicle recurved* ..... 1. tataricum
CC. *Branches of the panicle incurved* ..... 2. collinum
BB. *Spikelets 3–4-fld.*
C. *Panicle-branches narrowly 2-edged or winged, 3-angled* ..... 3. speciosum
CC. *Panicle-branches terete and pubescent.* .. 4. eximium

1. tatáricum, Mill. (*Státice tatárica*, Linn. *Goniolimon tatáricum*, Boiss.). Perennial, glaucescent, about 1 ft. high: lvs. 4–6 in. long, obovate or oblong-lanceolate, very narrowly marginate, abruptly or attenuately mucronate, narrowed to the petiole: scape corymbose-panicled slightly above the base; branches elongate, spreading-recurved, narrowly 3-winged; spikelets 1–2-fld., distichously arranged in rather dense terminal spikes: calyx white, green-nerved, tube short-puberulent inside and out, lobes oblong, obtuse, corolla ruby-red. June, July. S. Eu., Caucasus, Russia, and Siberia. B.M. 6537. Var. **angustifòlium,** Hubb. (*Státice tatárica* var. *angustifòlia*, Hort. *S. Besseriàna*, Schult. *S. incàna*, Bieb., not Linn. *S. incàna* var. *hýbrida*, Hort.), has, lanceolate, narrower lvs., often 1-fld. spikelets, and glabrescent calyx-tube. Var. **coccíneum,** Hubb. (*Goniolimon tatáricum* var. *angustifòlium*, Boiss. *Státice incàna* var. *coccínea*, Hort.), grows 9 in. high and has red and white fls. Var. **nànum,** Hubb. (*Státice tatárica* var. *nàna*, Hort. *S. incàna* var. *nàna*, Hort. *S. incàna* var. *hýbrida nàna*, Hort.), is a dwarf strain of the species.

3682. Limonium (Statice) Bonduellii. The flowers are about ⅓ inch across.

2. collìnum, Hubb. (*Státice collìna*, Griseb. *S. Besseriàna*, Friv., not Schult. *Goniolimon collìnum*, Boiss.). Perennial, glaucescent: lvs. oblong-lanceolate or lanceolate, aristate-mucronate, narrowed to the petiole: scape corymbose-panicled a little above the base; branches 3-angled, spreading-incurved; spikelets 1-fld., clustered in numerous short, straight, fasciculate spikes; fls. rose; calyx-tube glabrous, lobes oblong, obtuse. S. E. Eu., Asia Minor, and Syria.

3. speciòsum, Kuntze (*Státice speciòsa*, Linn. *Goniolimon speciòsum*, Boiss.). Perennial, glaucescent, about 1 ft. high: lvs. suborbicular or oblong-obovate, abruptly attenuate-cuspidate, shortly narrowed at base: scape densely corymbose above; branches narrowly 2-edged or winged, 3-angled; spikelets 3–4-fld., distichously and densely imbricated in short scorpioid-capitate spikes: calyx white, tube densely appressed-pubescent; corolla rose or purplish pink, very deciduous. July. S. Russia, Caucasus. B.M. 656. L.B.C. 14:1336.

4. exímium, Kuntze (*Státice exímia*, Schrenk. *Goniolimon exímium*, Boiss.). Perennial, glaucescent, 1–2 ft. high: lvs. oblong or obovate, short-mucronate, narrowly and crisped marginate, long-attenuate to the petiole: scape tall, panicled above; branches terete and pubescent; spikelets about 4-fld., densely imbricated in densely scorpioid-capitate spikes: fls. lilac-rose; calyx green, tube appressed-pubescent, lobes white-tipped, rather acute, crenulate. Aug. Cent. Asia. B.R. 33:2. Var. **álbum,** Hubb. (*Státice exímia* var. *álba*, Hort. *S. exímia flòre-álbo*, Hort.), has large white fls. Var. **supérbum,** Hubb. (*Státice exímia* var. *supérba*, Hort.), has large spreading heads of lilac fls. Aug., Sept.

5. elàtum, Kuntze (*Státice elàta*, Fisch. *S. scopària*, Hort. Vilm., not Pall. *Goniolimon elàtum*, Boiss.). Perennial, green, about 2 ft. high: lvs. obovate, very obtuse, apex often retuse, shortly mucronate, rather long-attenuate to the petiole: scape tall, elongate-panicled above; branches hairy, 3-angled, spreading-incurved; spikelets 2-fld., loosely imbricated in distichous ovate spikes: fls. blue or violet-blue; calyx-tube appressed, pubescent, lobes rather acute, July, Aug. S. Russia and Siberia.

Subgenus II. VERILIMONIUM.

Section 1. PTEROCLADOS.

A. *Interior bracts 2–3-cuspidate at the apex: wings of the scape produced below the branches into lf.-like linear or lanceolate appendages.*
B. *Calyx-limb undivided.*
C. *Limb of calyx blue or purple* ..... 6. sinuatum
CC. *Limb of calyx yellow* ..... 7. Bonduellii
BB. *Calyx-limb deeply 10-lobed* ..... 8. Thouinii
AA. *Interior bracts undivided, truncate: wings of the scape, when present, interrupted below the branches and produced into rotundate auricles: calyx-limb blue, large, erose-truncate.*
B. *Floral branchlets not winged.*
C. *Lvs. ½–¾ in. long* ..... 14. puberulum
CC. *Lvs. much longer.*
D. *Blades rotundate-triangular, nearly as broad as long; about 2½ in. long* ... 15. Preauxii
DD. *Blades broad-triangular or rhomboid-ovoid, longer than broad, about 5–6 in. long* ..... 16. Perezii
BB. *Floral branchlets winged.*
C. *Inner bracts keeled, keel broadened vertically at the top.*
D. *Lvs. about 4–6 in. long: auricles of the wings below the spikes triangular-falcate* ..... 9. arborescens
DD. *Lvs. about 1½–2 in. long: auricles of the wings below the spikes rotundate.* .10. fruticans
CC. *Inner bracts dorsally convex, with a membranaceous colored limb at the truncate apex.*
D. *The lvs. entire, obovate-spatulate* ..... 11. macrophyllum
DD. *The lvs. lyrate or lyrate-runcinate.*
E. *Spikelets 2-fld.: calyx-tube glabrous, limb very obtusely 5-denticulate-sinuate* ..... 12. brassicæfolium
EE. *Spikelets 3–4-fld.: calyx-tube somewhat hirsute, limb truncate-crenulate* ..... 13. imbricatum

Subsection ODONTOLEPIDEÆ.

6. sinuàtum, Mill. (*Státice sinuàta*, Linn.). Perennial or biennial, 1–2 ft. high, the whole plant hispid-scabrous, the hairs from tubercles: lvs. pinnatifid-lyrate, sinuses and lobes rounded, the terminal bearing a bristle: scape dichotomously paniculate-corymbose, 3–5-crimped-winged, the wings below the forks produced into 3 acute, linear-lanceolate appendages; branches 3-winged, the wings gradually broadening from the base; spikelets 3–5-fld., in short secund spikes: calyx blue or bluish, tube glabrous, limb truncate, crenulate; corolla yellowish white. Aug. Medit. region. B.M. 71. G.W. 7, p. 229.—Usually treated as an annual. Var. **candidíssimum,** Hubb. (*Státice sinuàta* var. *candidíssima*, Hort.), has pure white fls.—A good plant for edging. The material known in the trade as *Státice sinuàta hýbrida* are hybrid forms of this species.

7. Bonduèllii, Kuntze (*Státice Bonduèlli*, Lest.; also misspelled *Bonducellii*). Fig. 3682. Annual or biennial about 1 ft. or more high: lvs. radical, spreading, 3–5 in. long, spatulate, sinuate-lyrate, hairy and ciliate, terminated, by a subulate point, tapering below into a short winged petiole, lobes oval or rounded, sinuses obtuse, terminal lobe largest, subrhomboid: scapes several, dichotomously branched, rounded and hairy at base; branches triangular, wings narrow, sometimes broad, running out below the forks into 2 or 3 linear appendages; branchlets 2-edged or 3-winged, dilated upward, forked at the apex, slightly hairy; spikelets 1–3-fld.; bracts with hard green spines, some subulate others semi-hastate: calyx yellow, tube glabrous, limb campanulate, 5-toothed, minutely crenulate; corolla deeper yellow. June–Oct. Algeria. B.M. 5158. F.S. 20:2129. H.F. II. 2:230.—The Calif. material seems to have more broadly winged branches and branchlets than usual.

8. Thouínii, Kuntze (*Státice Thouínii*, Viv. *S. ægyptiaca*, Pers.). Annual, glaucescent, about 1½ ft. high: lvs. sinuate or pinnatifid-lyrate, lobes and sinuses rounded, margin short-ciliate: scapes corymbose above, more or less broadly 3-winged, wings produced below the upper forks into 1–3 triangular-lanceolate rather obtuse appendages; branches strongly dilated from the base upward, running out into acute triangular appendages below the spikes; spikelets 2–3-fld., distichous in short secund spikes: calyx white, tube glabrous, lobes 5, triangular-lanceolate acute; corolla yellow. May. Teneriffe and Medit. region. B.M. 2363.

Subsection NOBILES.

9. arboréscens, Kuntze (*Státice arboréscens*, Brouss.). Shrub about 2 ft. high: sts. terete, naked, branched only above: lvs. broad ovate-oblong, petioled, obtuse, mucronate, base attenuate, leathery: scape tall, branched above, broadly and subcorymbosely panicled, with the branches narrowly winged; branchlets very short, 3-winged, the wings narrowly dilated from the base upward and running out into 3 triangular-falcate acute appendages below the spike; spikelets 2-fld., laxly imbricated in fascicled short, secund spikes: calyx blue, tube glabrous, limb erose-denticulate; corolla yellow. July. Teneriffe. B.M. 3776. P.M. 4:217 (under the name *Statice arborea*).

10. frùticans, Kuntze (*Státice frùticans*, Webb. *S. arbòrea*, Brouss. *S. frutéscens*, Lem.). Shrub: st. short, naked, terete: lvs. at the base of the scape, leathery, ovate, obtuse, mucronate, shortly attenuate to the petiole: scape low, corymbose-panicled above, it and the branches puberulent, strongly compressed; branchlets 2-winged, wings at base very narrow, broadened upward, running out into short, unequal rotundate auricles below the spike; spikelets 1–2-fld., very few, imbricated in very short, secund spikes: calyx blue, tube glabrous, limb acutely erose-dentate; corolla yellow. Summer. Teneriffe. F.S. 4:325. H.U. 6, p. 164.—Closely allied to *S. arborescens* from which it differs in the 3 times smaller lvs. which are 1½–2 in. long, the scapes 4–6 in., 2-edged, not winged and the auricles of the branchlets rotundate.

11. macrophýllum, Kuntze (*Státice macrophýlla*, Brouss. *S. Hálfordii*, Hort.; also spelled *Hólfordii*.). Subshrub about 2 ft. high: lvs. rather glabrous, very large, sessile, obovate-spatulate, very obtuse, lower part long-attenuate, obsoletely sinuate: scape tall, amply and very much branched, corymbose-panicled above, it and the branches winged; branchlets 3-winged, wings dilated from the base upward, puberulent, net-veined, running out into short obtuse auricles below the spikelets or these may be nearly obsolete; spikelets 2-fld., grouped in 2's, erect at the ends of the branches: calyx blue, tube puberulent, limb very obtuse, 5-crenate-sinuate; corolla yellow or almost white. May. Teneriffe. B.M. 4125. B.R. 31:7.—Cult. in S. Calif. Makes a good pot-plant for winter-flowering in a cool greenhouse. T. D. Hatfield, in G. F. 9:496, says: "Old plants are somewhat subject to stem-rot. Plants should be grown in rather undersized pots, in a light soil with which some charcoal has been incorporated, and given perfect drainage, as excessive moisture at the roots is fatal. Propagation is effected by cuttings of the side shoots placed in a cool propagating-bed, or better by layering, which is well accomplished in summer by making a notch in each of the side branches and then burying the plant in ordinary garden soil below the incisions."

12. brassicæfòlium, Kuntze (*Státice brassicæfòlia*, Brouss.). Fig. 3683. Subshrub, 1½ ft. high: lvs. slightly short-velvety, margin somewhat ciliate, petioled, lyrate, terminal lobe largest, ovate-rotund, often irregularly lobed, very obtusely cuspidate, base subcordate; lateral lobes 2–4, ear-shaped, small, alternate, the bases often confluent: scape angled, paniculate-corymbose above; branches 2-winged, the wings very broad, coarsely undulate-lobate, running out into large auricles below the forks; branchlets 3-winged, wings dilated from the base upward running out into short, falcate auricles, glabrous; spikelets 2-fld., 2–3-fascicled at the ends of the branches: calyx purple, tube glabrous, limb very obtusely 5-denticulate-sinuate; corolla yellowish white. Aug. Canary Isls. B.M. 5162.

13. imbricàtum, Hubb. (*Státice imbricàta*, Webb). Subshrub, about 1½ ft. high, the whole plant shortly soft-tomentellous: lvs. lanceolate in outline, lyrate-runcinate, lobes on both sides 8–9, the upper larger, rotundate, setose-mucronate, 9–10 in. long, the lower lobes remote and retrorse: scape tall, large, corymbose above; branches undulately and broadly winged; branchlets 3-winged, narrowly dilated from the base, runing out into short, unequal, triangular auricles which are rather obtuse; spikelets 3–4-fld., few, fascicled in short spikes: calyx blue, tube somewhat hirsute, limb truncate-crenulate; corolla yellowish white. July, Aug. Teneriffe. F.S. 4:320–321.

14. pubérulum, Kuntze (*Státice pubérula*, Webb). Subshrub, 4–8 in. high, the whole plant white papillate-stellate or sparsely puberulous: lvs. ovate-rhomboid, rather acute, apex bearing a bristle, margin long-ciliate, short-attenuate to the equally long petiole, blade ½–¾in. long: scape low, paniculate-corymbose; branches and branchlets angled, somewhat 2-edged; spikelets 2-fld., a few distichously or laxly fascicled at the end of the branches: calyx violet, tube glabrous, limb obsoletely 5-angled, the nerves excurrent; corolla yellowish white. July. Canary Isls. B.M. 3701. B.R. 1450. H.F. II. 9:106.—**L. profùsum,** Hubb. (*L. pubérulum* × *L. macrophýllum*, the form known horticulturally as *Státice Halfordii*. *Státice profùsa*, Hort.). Subshrub, 1–2 ft. high: lvs. radical, 6–8 in. long, oval or spatulate, wavy, leathery, shining and dark green, narrower than the parents and intermediate in size between them: fls. freely produced in well-branched, corymbose panicles; calyx blue-purple; corolla yellowish white. A greenhouse hybrid. G. 8:69. G.L. 27:77. Gn.W. 22:782.—In the greenhouse old plants will attain a height of 3½ ft. and a diam. of 5 ft.

15. Preaùxii, Kuntze (*Státice Preaùxii*, Webb). Subshrub, 2 ft. high, glabrous: st. terete, naked: lvs. basal, rotundate-triangular, obtuse mucronulate, about 2½ in. long and the same wide, very coriaceous, base truncate and short-attenuate to a petiole 4–5 in. long with a sheathing base: scape angled, branched; branches flattened, scarcely winged; spikelets remote, in lax, rather erect, secund, terminal spikes: calyx-tube glabrous, limb lavender, obsoletely 5-angled; corolla pale yellow. Canary Isls.—Cult. in Calif.

16. Perèzii, Hubb. (*Státice Perèzii*, Stapf). Subshrub, less than 2 ft. high: lvs. long-petioled, broadly triangular or rhomboid-ovate, base usually truncate, but short triangular decurrent on the petiole: branches of infl. pubescent; bracts at the base of the branches sulcate-caudate, ciliate: calyx purplish blue, pubescent; corolla pale yellow. Canary Isls.—Cult. in Calif., where it is said to grow 3 ft. high.

Section 2. Ctenostachys.

17. pectinàtum, Kuntze (*Státice pectinàta*, Ait.). Subshrub, glabrous, calcareous-punctate: lvs. in a rosette at the base of the scape or fascicled or solitary at the axils of the scales of the scape, obovate, obtuse or retuse mucronate, attenuate to the petiole: scape erect or decumbent, alternately branched, it and the branches very narrowly 3-angled to winged; spikelets 3-fld. distichously dense-imbricated, in oblong, scorpioid-spreading spikes: calyx lavender, slightly pilose at base of the ribs and limb which is obtusely 5-angled; corolla rose. Sept. Canary Isls. B.R. 26:65.

Section 3. Plathymenium.

A. *Lvs. obovate-lanceolate: spikelets 2-fld.* .....18. **sinense**
AA. *Lvs. oblong-spatulate: spikelets 4–5-fld.* .....19. **australe**

Subsection Chrysanthæ.

18. sinénse, Kuntze (*Státice sinénsis*, Girard. *S. Fórtunei* Lindl.). Perennial, about 1 ft. high, glabrous: lvs. obovate-lanceolate, obtuse, long-attenuate to the petiole: scape tall, dichotomously branched a little above the base, corymbose-fastigiate, it and the branches smooth, acutely angled, often 2-edged; spikelets 2-fld., rather densely imbricated, in short, somewhat secund, terminal, ovate-scorpioid spikes: calyx white or pale yellow, tube pilose only on the ribs, limb 5-angled and folded; corolla yellow. April. China. B.R. 31:63. F.S. 2:92.

19. austràle, Kuntze (*Státice austràlis*, Spreng.). Perennial, about 1 ft. high, glabrous: lvs. oblong-spatulate, muticous, long-attenuate to the petiole, 1-nerved: scape acutely angled to sulcate, branched a little above the base; branches elongated, strict, subcorymbose-panicled; spikelets 4–5-fld., in straight terminal spikes or secund and scorpioid, lower remote: calyx whitish, tube very smooth, limb 5-lobed, lobes ovate, mucronulate; corolla yellow. April. China, Japan, and Austral.

3683. Limonium (Statice) **brassicæfolium.** (×⅐)

Section 4. Eulimonium.

A. *Calyx-limb somewhat 10-lobed, by reason of the minute teeth between the large lobes.*
B. *Blades broadly ovate or obovate.* .....22. **Gmelinii**
BB. *Blades oblong-lanceolate.*
C. *Lvs. glabrous: calyx white or bluish, tube more or less pilose on the ribs* .....20. **vulgare**
CC. *Lvs. tomentellous: calyx-tube reddish velvety* .....21. **tomentellum**
AA. *Calyx-limb 5-lobed.*
B. *Plant 1 ft. or more high.*
C. *The lvs. obovate-lanceolate, canaliculate-concave, acuminate* .....23. **lychnidifolium**
CC. *The lvs. oblong-elliptical, obtuse* .....27. **latifolium**
BB. *Plant 3–10 in. high.*
C. *Apex of lf. acute or rather so* .....24. **binervosum**
CC. *Apex of lf. obtuse.*
D. *Tube of calyx slightly puberulent* ....26. **minutum**
DD. *Tube of calyx appressed-hirsute or ciliate on the angles.*
E. *Limb of calyx reddish below, whitish above* .....25. **Gougetianum**
EE. *Limb of calyx pure white* .....28. **reticulatum**

Subsection Genuinæ.

20. vulgàre, Mill. (*Státice Limònium*, Linn. *S. marítima*, Lam. in part.). Fig. 3684. Perennial, 6–12 in. or more high, glabrous: lvs. oblong-lanceolate, 1-nerved, obtuse, with an incurved mucron from or below the apex, attenuate to a rather long petiole at the base: scape tall, nearly terete, paniculate-corymbose above; spikelets 1–3-fld., distichously and densely congested in secund, more or less

spreading or spreading recurved spikes: calyx white to bluish, tube more or less pilose on the ribs, lobes triangular, rather acute; corolla bluish lilac. Aug. to Oct. Eu., N. Afr., Asia Minor, and Syria. Var. **álbum,** Hubb. (*Státice Limònium* var. *álba,* Hort.), has a white calyx, height 1 ft. July–Sept. Var. **macroclàdum,** Hubb. (*Státice Limònium* var. *macroclàda,* Boiss.), is often glaucescent, panicles very much branched, branches elongate, very spreading, spikes laxly or densely scorpioid. Medit. region and Syria.

21. **tomentéllum,** Kuntze (*Státice tomentélla,* Boiss. *S. sareptàna,* Becker). Perennial, about 9–12 in. high: lvs. oblong-lanceolate, obtuse, short-attenuate to the petiole, 1-nerved, densely tomentellous beneath on the nerves, margin somewhat ciliate, otherwise glabrous: scape tall, terete, somewhat angled above, slightly and strictly branched, all densely short reddish tomentellous: spikelets 2–3-fid., distichously and densely aggregated in oblong, secund, scorpioid spikes: calyx-tube obconical, reddish velvety, lobes rotund, very obtuse; corolla rose. S. Russia.

22. **Gmélinii,** Kuntze (*Státice Gmélinii,* Willd.). Perennial, 1½–2 ft. high: lvs. glabrous, green, broad-ovate or obovate, 1-nerved, very obtuse, very short-petioled or subsessile: scape tall, terete below, somewhat angled above, corymbose-panicled; spikelets rather 2-fid., densely imbricated in short secund subscorpioid spikes: calyx-tube pilose on all or some of the ribs, limb small, dark purplish blue, lobes rotundate; corolla rose. July–Sept. Caucasus and Siberia.

Subsection Densifloræ.

23. **lynchnidifòlium,** Kuntze (*S. lychnidifòlia,* Girard. *S. Willdenòwii,* Poir.). Perennial, glabrous, about 1–2 ft. high: lvs. large, coriaceous, obovate-lanceolate, canaliculate-concave, acuminate, attenuate to a short petiole which is glutinous at its base: scape tall, alternately and distichously branched above; branches erect-spreading, forming a pyramidal subsecund panicle; spikelets 3–4-fid., distichously and rather densely imbricated in secund, spreading-recurved spikes: corolla rose. S. W. Eu. and Morocco.

3684. Limonium (Statice) vulgare. (×⅓)

24. **binervòsum,** C. E. Salmon (*L. occidentàle,* Kuntze. *Státice binervòsa,* G. E. Smith. *S. occidentàlis,* Lloyd. *S. auriculæfòlia,* Vahl). Cespitose perennial, 6–10 in. high, glabrous: lvs. 1–4 in. long, lanceolate-spatulate, without nerves, rather acute, provided with an elongated bristle below the apiculate apex, long-attenuate to the often longer petiole: scape slender, flexuous, very much branched almost from the base, forming an oblong panicle; spikelets 2–4-fid., rather densely disposed in slender, straight or erect-spreading short spikes: calyx white; corolla bluish purple. July, Aug. Eu.

25. **Gougetiànum,** Kuntze (*Státice Gougetiàna,* Girard; also misspelled *Gongetiana*). Perennial, 3–4 in. high, glabrous: lvs. densely rosulate, small, obovate or oblong-spatulate, very obtuse, margin crinkled, revolute, attenuate to the petiole, both surfaces rugulose to somewhat scabrous: scapes dwarf, regularly and subdichotomously alternate, branched almost from the base; branches short, strict, forming a short panicle; spikelets 2–3-fid., densely and distichously imbricated in spreading or erect-spreading, oblong spikes: calyx-tube short, appressed-hirsute, limb reddish below, whitish above; corolla lavender. July, Aug. Italy.—Foliage evergreen, fine for sunny nooks in the rockery.

Subsection Steirocladæ.

26. **minùtum,** Kuntze (*Státice minùta,* Linn.). Perennial or subshrub, about 9 in. high; glabrous, rarely puberulent, rather cespitose: lvs. rosulate, small, obovate or lanceolate-spatulate, obtuse or retuse: scapes dwarf, slender, branched from the base; branches strict, slender, lower ones sterile, upper corymbose-fastigiate; spikelets 2–3-fid., disposed in lax often fasciculate straight terminal spikes: calyx-tube slightly puberulent or glabrous, limb white, deeply 5-lobed, lobes ovate, plicate, rather obtuse; corolla reddish. July, Aug. S. France.

Subsection Hyalolepideæ.

27. **latifòlium,** Kuntze (*Státice latifòlia,* Smith. *S. latifòlia magnífica,* Hort.). Perennial, 1–2 ft. high, soft-velvety with short stellate hairs: lvs. very large, oblong-elliptical, obtuse, long-attenuate to the petiole: scapes tall, very much branched, terete to angled, panicle large and effuse; spikelets 1-, rarely 2-fid., rather remote, forming lax, slender, secund, subrecurved spikes: calyx-tube obconical, short, glabrous or slightly hairy, limb white, 5-lobed, lobes triangular acute; corolla bluish lavender. June, July. Russia, Bulgaria, and Caucasus. G. 1:100; 28:367. Gn.M. 15:162.—Deep-rooting so that it should be given a very deep soil in a sunny position and left undisturbed. Var. **álbum,** Hubb. (*Státice latifòlia* var. *álba,* Hort.), has panicles 2–2½ ft. across: fls. white. Var. **ròseum,** Hubb. (*Státice latifòlia* var. *ròsea,* Hort.), is a form with rose-colored fls.

28. **reticulàtum,** Mill. (*Státice reticulàta,* Linn. *S. bellidifòlia,* Gouan. *S. cáspia,* Willd.). Perennial, 4–8 in. high, glabrous, the whole plant granulate-scabrous: lvs. obovate or lanceolate-spatulate, often only ½in. long, obtuse, mucronulate or muticous, attenuate to the petiole: scapes branched from the base, lower branches sterile, capillary and many-forked, articulate, rather strict, upper branches densely floriferous, corymbose-paniculate; spikelets 2–3-fid., densely and distichously clustered in short spikes or subcapitately at the ends of the branches: calyx-tube short-conical, ciliate on the angles, limb white, lobes ovate, rather acute, denticulate; corolla pale lilac. July, Aug. Eu., Caucasus, and Siberia.

Section 5. Circinaria.

29. **purpuràtum,** Hubb. (*Státice purpuràta,* Linn.). Subshrub 1 ft. or more high, glabrous: sts. short, leafy: lvs. 1 in. long, ½in. broad, leathery, glaucescent, about 3-nerved, obovate, lanceolate or linear-spatulate, attenuate to a long petiole which is sheathing at the base, entire, obtuse, mucronate: scape tall, terete, smooth or scabrous, dichotomously corymbose; spikelets 1-fid., secund and distant along the branches or nearly touching: calyx-tube leathery, terete, obsoletely 10-ribbed, limb 10-lobed, purplish at the top; corolla rose. S. Afr. Var. **longifòlium,** Hubb. (*Státice longifòlia,* Thunb. *S. purpuràta* var. *longifòlia,* Boiss.), has lvs. oblanceolate or nearly linear, up to 10 in. long, 2 lines wide, usually much smaller. S. Afr.

Subgenus III. Siphonantha.

Section 1. Eusiphonantha.

30. **cæsium,** Kuntze (*Státice cæsia,* Girard. *S. élegans,* Coss.). Perennial, 1–3 ft. high, the whole plant pruinose with calcareous dots, subtuberculate, bluish gray to whitish: lvs. all radical, small, obovate or retuse: scapes numerous, rather stout, very much branched from the base, lower branches sterile, upper elongated, slender, effuse and much branched, paniculate; spikelets 1-fid., very slender and erect, laxly or subdistichously arranged in few-fid., short, lax spikes: calyx-tube slender, glabrous, limb dirty white, 5-lobed, lobes ovate, obtuse; corolla rose, rather large. May, June. Spain.

Section 2. Psylliostachys.

A. *Calyx-tube hispid, limb slightly erose-dentate.* 31. **spicatum**
AA. *Calyx-tube somewhat glandular-pubescent, limb 5-toothed* ..... 32. **Suworowii**

31. **spicàtum,** Kuntze (*Státice spicàta,* Willd.). Annual, about 6 in. high: lvs. soft, in outline lanceolate-oblong, pinnately parted to runcinate, lobes obtuse, triangular-oblong, alternate, confluent at base: scapes erect, surpassing the lvs., terete, slightly papillose-lanate, bearing long dense cylindrical spikes often interrupted at base or branched; spikelets 2–3-fid., densely clustered: calyx-tube hispid, limb obsoletely erose-dentate; corolla rose or white, lobes ovate. Summer. Caucasus region to Persia. G. 3:155; 11:281.

32. **Suwórowii,** Kuntze (*Státice Suwórowii,* Regel). Annual, 9–16 in. or more high: lvs. all basal, glabrous, long-lanceolate or oblanceolate, 6–8 in. long, entire or usually coarsely runcinate, the teeth or lobes triangular, acute: scapes several, stout, obtusely angled, bearing a long terminal spike and several distant, sessile lateral ones, 4–6 in. long, nearly ½in. diam.; spikelets 2–3-fid., crowded: calyx-tube somewhat glandular-pubescent, green, limb 5-toothed, rose-red; corolla tubular, rose-red, lobes ovate-rotund. June, July. W. Turkestan. B.M. 6959. Gn. 72, p. 338. Gn.W. 25:195. J.H. III. 60:149. R.B. 25:97. Gt. 31:1095. Var. **álbum,** Hubb. (*Státice Suwórowii* var. *álba,* Hort.), is a form with white fls. G.M. 56:477. Useful for cut-flowers.—**L. supérbum,** Hubb. (*L. Suworowii* × *L. leptostachyum. Státice supérba,* Regel.). Annual, up to 28 in. high: lvs. bright green, pinnately lobed, midnerve red: scapes 5 or more, erect, covered with fls. almost from the base, winged, the spikes forming a small densely crowded panicle: fls. rose-red. A garden hybrid. Var. **flòre-álbo,** Hubb. (*Státice superba* var. *flòre-álbo,* Benary. *S. supérba* var. *álba,* Benary), is a form with white fls.

The following species are mentioned in the trade and belong in Limonium unless otherwise stated, but cannot be placed in the key or are of minor importance.—*Státice altàica,* Hort. ex Don, is unknown botanically, but is said to grow 2½ ft. high and have purple or blue fls. July–Sept.—*Státice Bùtcheri,* Hort., is offered as having blue fls.—*Státice coccínea,* Hort., is offered in the trade as a perennial.—*Státice excélsa,* Hort., is offered in the trade.—*Limònium leptostàchyum,* Kuntze (Statice leptostachya, Boiss.), is a glabrous annual: lvs. linear in outline, pinnately parted; segms. linear: calyx-tube appressed-hirsute; corolla white. Persia.—*Státice nàna álba,* Hort., is offered in the trade; possibly is a form of L. tataricum.—*Státice penduliflòra,* Hort., is offered in the trade but is unknown botanically.—*Státice spatulàta,* is offered by one firm as having ornamental green lvs. and purple-and-white fls., growing 1 ft. high, flowering July to Sept. and by a second firm as growing 1½ ft. high, with very graceful sprays of blue fls. in July and Aug.—Not really possible to say with certainty what it is, perhaps L. binervosum.

F. Tracy Hubbard.†

STAUNTÒNIA (named for Sir G. L. Staunton, physician, 1740–1801). *Lardizabalàceæ.* Scandent shrubs, hardy and evergreen, useful for ornamental purposes: lvs. digitately parted, 3–7 lfts.: fls. purple or greenish, in axillary corymb-like racemes, monœcious; sepals 6, petaloid, the outer broader; petals none; stamens 6:

berry globose, finally splitting open.—About 10 species, China and Japan.

The stauntonias are beautiful evergreen climbers and well adapted to the soil and climate of the South Atlantic and Gulf regions. Both *S. hexaphylla* and the related *Holbœllia latifolia* (known also as *Stauntonia latifolia*) grow well in the writer's Florida garden, although they are not such very luxuriant climbers as are the allamandas, thunbergias, and bignonias. It requires a few years before they are fully established. They are excellent subjects to be planted on old stumps and on small trees, such as catalpa and mulberry trees, which they perfectly cover in the course of time with their pretty evergreen leaves and their rather insignificant but powerfully fragrant flowers. They will not flourish in dry hot sandy soil, demanding for their welfare rather moist shady spots containing a profusion of humus. A little commercial fertilizer containing a fair amount of nitrogen and potash will also prove very beneficial. The need of some kind of a stimulant is shown by the plant itself, which assumes a rather yellowish cast in the green color of the foliage. A few

3685. Stauntonia hexaphylla. (×⅓)

days after it has received some plant-food the foliage shows a very beautiful dark green color. These two species and the beautiful *Kadsura japonica* are valuable additions to the garden flora of the southern states. (H. Nehrling.)

hexaphýlla, Decne. Fig. 3685. A handsome vine becoming 40 ft. high: lfts. oval, about 2 in. long, stalked: fls. in axillary clusters, white, fragrant in spring: berry about 4 in. long, splashed with scarlet. Japan. A.G. 12:139. F. W. Barclay.

STAURÒPSIS (Greek, *cross* and *appearance*, alluding to the shape of the flower). Syn., *Fièldia*. *Orchidàceæ*. Epiphytic herbs with leafy stems and without pseudobulbs, grown in the warmhouse.

Leaves distichous, spreading, leathery, and flat: fls. borne on lateral peduncles in a raceme which is sometimes short, simple and rather large- and few-fld., sometimes long, lax-branched and quite numerous, small-fld.; sepals about equal, free, spreading; petals similar to the sepals; labellum affixed to the base of the column, spreading, concave, not spurred, narrow, the lateral lobes short, the midlobe rather long-concave and bent in at the tip; column short, thick, not winged and footless; pollinia 2; caps. oblong-clavate, not beaked.—About 10 species, India and China, Malaya and the Philippines. Treatment similar to vanda.

lissochiloìdes, Pfitz. (*S. Bàtemannii*, Nichols. *Fièldia lissochiloìdes*, Gaudich. *Vánda lissochiloìdes*, Lindl. *V. Bàtemannii*, Lindl.). Sts. stout, 1–5 ft. high or more: lvs. 18–24 in. long, broad, coriaceous: scapes 12–20-fld.: fls. about 3 in. across; sepals and petals yellow, densely spotted with red-purple, purplish crimson beneath; labellum 3-lobed, saccate at base, the side lobes erect, buff-yellow or purple-crimson, the midlobe boat-shaped, purple-crimson. Philippines. B.R. 32:59. J.H. III. 52:471. Described also under Vanda.

luchuênsis, Rolfe. Scandent herb with sts. 1 ft. long: lvs. oblong, very shortly 2-lobed, 4–6 in. long: scapes suberect, 6–16 in. long, bearing a many-fld. raceme: fls. showy, yellow with brown spots; sepals oblong; petals somewhat narrower; labellum fleshy, slightly 3-lobed, saccate at base. Liukiu Isls. F. Tracy Hubbard.

STAUROSTÍGMA (Greek, *cross* and *stigma*, in allusion to the cross or star-shaped stigmas). *Aràceæ*. Tuberous stoloniferous herbs, adapted to the warmhouse: lvs. long-petioled, hastate-cordate in outline, pinnately cut or 1–2-pinnately parted, the pinnæ sessile, acute: peduncles solitary or several, as long as the lvs.; spathe erect, lanceolate, base convolute, gaping or open above; spadix cylindrical: fls. monœcious, all perfect, the male and female contiguous; perianth wanting: berries subglobose, deeply 2–5-sulcate, 2–5-celled, the cells 1-seeded.—About 7 species, Trop. Amer. The oldest name for this genus is Asterostigma. *S. concínnum*, Koch. About 1½ ft. high: young lvs. reniform, pedately cut, the segms. obovate-lanceolate, the older 3-parted, the middle part pinnately cut, elongated-oblong, the lateral parts cymosely bisected or trisected; the petioles marked with pale violet and dark purple: spathe narrow-lanceolate, very acute; spadix white and purple, the male part dense-fld.; peduncle livid purple, shorter than the petioles. Brazil. L.B.C. 16:1590 (as *Caladium luridum*). Variable. *S. Luschnathiànum*, Koch (*Asterostigma Luschnathiànum*, Schott). Lvs. 1–2 ft. long, deep green, pinnatifid, broadly ovate, the 2 lower segms. deflexed, deeply cut into 3–5 lobes, the remaining segms. 4–6 pairs, sessile, remote; the petioles 6–12 in. long, whitish with black-purple streaks: spathe deep green within and speckled with brown, reticulated externally, 2–4 in. long, erect, cylindric, acute; spadix cylindric; anthers scarlet; ovaries white; scape similar to the petiole. Brazil. B.M. 5972. *S. Riedelìànum*, Engl. About 2 ft. high: lvs., the adults, 3-parted, the middle one pinnately cut, the segms. linear-oblong, sessile, abruptly and rather long-cuspidate at the apex; the lower parts short-decurrent: peduncles spotted and variegated: spathe yellowish, greenish outside; spadix slender; peduncles many, variegated. Brazil. F. Tracy Hubbard.

STEIRONÈMA (Greek, *sterile threads*, referring to the staminodia). *Primulàceæ*. Loosestrife. Erect glabrous herbs useful for borders in damp soil.

Leaves opposite, or rarely whorled, entire: fls. rather large (6–12 lines broad), yellow, axillary, solitary or clustered: peduncles slender: corolla rotate, 5-parted; lobes erose and often cuspidate, each separately involute around its stamen; stamens 5, opposite the lobes, with 5 alternating subulate staminodia; filaments distinct, or nearly so; ovary superior, 1-celled with free central placenta, becoming capsular in fr.; seeds many; style and stigma 1. Differs from Lysimachia in the presence of the sterile stamens, and in the æstivation of the corolla.—About 5 species, N. Amer. All perennials. Offered by collectors of native plants, for colonizing, borders and wild-gardens.

A. *Lvs. membranaceous with pinnate veins.*

ciliàtum, Raf. (*Lysimàchia ciliàta,* Linn.). St. 1–4 ft. high, sparingly branched: lvs. 2–6 in. long, ovate-oblong to ovate-lanceolate, acute or acuminate; base rounded or subcordate; petioles ½in. long, coarsely ciliate. Moist thickets, U. S.

lanceolàtum, Gray (*Lysimàchia lanceolàta,* Walt. *L. hýbrida,* Michx.). Plant 1–3 ft. high: lvs. lanceolate, 1–4 in. long, narrowed into a short margined petiole, or subsessile, the lower sometimes broader. E. U. S.

AA. *Lvs. firm, linear, usually 1-nerved.*

quadriflòrum, Hitchc. (*Lysimàchia quadriflòra,* Sims. *L. longifòlia,* Pursh. *S. longifòlium,* Gray). St. 4-angled, 1–3 ft. high: lvs. thick and firm, sessile, subacute at both ends, 1–4 in. long, smooth and shining: margins slightly revolute; basal often broader; veins obscure. E. U. S. B.M. 660. K. M. Wiegand.

STÈLIS (an old Greek name used by Theophrastus for some parasitical plant). *Orchidàceæ.* Epiphytic herbs, some of them adapted to the warmhouse and others to the intermediate house: sts. cespitose or creeping, with simple branches 1-lvd. at the tip and frequently 1–3-sheathed below the lf., not pseudobulbous: lvs. leathery, often contracted at the base to the petiole which is frequently concave or channeled and sometimes articulate near the base: fls. small to minute, short-pedicelled in an elongated raceme at the base of the terminal lf., secund, rarely somewhat distichous; bracts alternate, various; sepals frequently subequal, broad or triangular, spreading, more or less connate; petals much shorter, broad, the margins thickened; labellum sessile at the base of the column, equal and similar to the petals or narrower and sometimes shortly 3-lobed; column equaling or shorter than the labellum; pollinia 2: caps. small, ovoid or oblong, not beaked, often 3-edged.—About 200 species, Mex. and W. Indies southward to Brazil and Peru. Treatment the same as for Pleurothallis.

S. barbàta, Rolfe, is a species differing from S. Endresii in having long-bearded sepals and a tridenticulate lip: its fls. are greenish ochre-yellow with purple hairs and red-purple blotches. Costa Rica.—*S. Binòtii,* Wildem., grows about 2 in. high: lvs. thick, 2–3 in. long, deeply channeled above: racemes 1–3, many-fld.: fls. green, not spotted; sepals membranaceous; petals concave, very short; lip hooded, about as long as the petals. Brazil.—*S. Bruchmuèlleri,* Reichb. f., has lvs. 1½–2 in. long: fls. yellowish purple outside, pale purple within, disposed at intervals along the rachis; sepals broadly ovate, acute, spreading, hairy within; petals and lip minute, the latter undivided. Mex.(?). B.M. 6521.—*S. canaliculàta,* Reichb. f., is about 8 in. high, has cuneate-oblong, obtuse, thick lvs. which are plainly channeled in the middle: fls. dull yellowish green, very small, secund in dense racemes; bracts and rachis whitish. Colombia.—*S. ciliàris,* Lindl. (S. atropurpurea, Hook.), grows about 6 in. high: lvs. broadly oblong, narrowed at base: spike naked half way then closely fld.: fls. deep purple; sepals ovate, long-fringed; petals compressed-rhomboid, fleshy; lip ovate, fleshy, channeled at base. Mex. B.M. 3975.—*S. dolichopus,* Schlechter, has sts. about 6 in. high: lvs. rather thick, oblong-ligulate, up to nearly 4 in. long: raceme only 1¼–1¾ in. long: fls. pale yellow. Probably Colombia.—*S. Endrèsii,* Reichb. f., has lvs. cuneate, oblong-ligulate, obtuse, emarginate and apiculate, thick: raceme distichous: fls. greenish white; sepals coalescing toward the base; lip fleshy, transversely subrhomboid, excavated. Costa Rica.—*S. glòssula,* Reichb. f., is densely tufted: lvs. cuneate, oblong-ligulate, minutely bilobed with a small tooth at apex: fls. brownish, in 2 transverse rows; the upper sepal having a longer extent than the whole of the other floral organs together; lip fleshy, papilliform. Costa Rica.—*S. grandiflòra,* Lindl., has sts. 3 in. high: lvs. oblong, petiolate, emarginate, 4½ x 1 in.: spike dense; spathe large, acuminate: fls. chocolate-colored, large for the genus; sepals equal, obtuse; petals ovate; lip ovate, concave, emarginate. Brazil.—*S. grossilàbris,* Reichb. f. Plant tufted: lvs. cuneate, spatulate, obtuse: racemes shorter than the lvs.: fls. light greenish, small; lip thick and fleshy. Hab.(?).—*S. Hennisiàna,* Schlechter, has slender sts. up to 2½ in. long, 1-lvd.: lvs. lanceolate-ligulate, about 3 in. long, petiole 1¼ in. long: racemes slender, 1-sided, many-fld., usually slightly longer than the lvs.: fls. dark purple-red. Colombia.—*S. macroglòssa,* Hort., is offered in the trade.—*S. micrántha,* Swartz, grows 3–6 in. high: lvs. lanceolate-oblong, rather blunt, 1–2½ in. long: raceme slender, spike-like: fls. whitish, red within, nodding, 1-sided-distichous; sepals deltoid; petals and lip truncate. Jamaica. L.B.C. 11:1011.—*S. ophioglossoìdes,* Swartz, has the st. shorter than the lvs., which are 2½–6 in. long, oblong-linear, rather blunt, long-tapering at the base: raceme slender, 1-sided, pedunculate: fls. greenish, with a tinge of purple, minute. W. Indies. B.R. 935. L.B.C. 50:442.—*S. sesquipedàlis,* Lindl., is about 6 in. high: lvs. broadly ovsl, shortly petiolate, 1½–4 in. long: spike 7–10 in. long: fls. pale yellow, secund, large; sepals roundish ovate, obtuse; petals oblate; lip oblate, hooded. Venezuela.—*S. venòsa,* Hort., said to have 6 lvs., is offered in the trade.—*S. zonàta,* Reichb. f., has a short st.: lvs. very thick, cuneate-oblong, blunt: raceme 1-sided: fls. light ochre; sepals brown at base; petals with a mauve middle zone. Guiana. F. Tracy Hubbard.

STELLÀRIA (Latin, *star,* referring to the form of the flower). *Caryophyllàceæ.* Annual or perennial herbs, mostly diffuse, tufted or weakly ascending, glabrous or pubescent, of little cultural value.

Leaves opposite, simple: fls. usually white, in terminal or axillary, naked or leafy paniculate cymes or rarely subsolitary; sepals 5, very rarely 4; petals just as many as the sepals, 2-cleft or rarely laciniate or only emarginate; stamens 10 or fewer by abortion; ovary 1-celled: caps. globose, ovoid or oblong, dehiscent by as many or twice as many teeth as there are carpels.—About 100 species, scattered all over the world but chiefly in the temperate regions.

A. *Fls. 7–10 lines across.*

Holóstea, Linn. Easter Bell. A hardy perennial, erect, 6–18 in. high, simple or somewhat branched, from a creeping rootstock: lvs. sessile, lanceolate, 1–3 in. long: fls. white, abundant, in a terminal leafy panicle; sepals one-half or two-thirds as long as the petals. May, June. Eu., Asia. B.B. 2:22.—This and the next are desirable for dry banks where grass will not grow well and for other carpeting purposes.

3686. Stellaria media. (Flower ×3)

AA. *Fls. 2–5 lines across.*

B. *Lvs. narrow.*

gramínea, Linn. A slender-stemmed, hardy perennial plant not usually over 6 in. high, from a creeping rootstock: lvs. sessile, linear-lanceolate, usually about 1 in. long: fls. white, in terminal or lateral scarious bracted open panicles; sepals and petals nearly equal in length. May, June. Eu.; naturalized in Amer. B.B. 2:23. Var. **aûrea,** Hort., Golden Stitchwort, has pale yellow lvs. and is lower and more matted in growth. Well adapted for sandy banks where grass does not grow well.

BB. *Lvs. ovate.*

mèdia, Cyrill. Chickweed. Fig. 3686. A low, decumbent annual weed common in all rich, moist, cult. soils, especially troublesome during the cooler months of the growing season and in frames, and the like, during winter. Lvs. 2 lines to 1½ in. long, the lower petioled, the upper sessile: fls. axillary or in terminal leafy cymes; sepals longer than the petals. Eu., Asia; naturalized. B.B. 2:21.—It is considered to be a good fall and winter cover-plant in orchards and vineyards, but is never cult. It is a surface-rooting plant. F. W. Barclay.

STEMÒNA (Greek, stamen, alluding to the foliaceous stamens). Syn., *Roxbúrghia. Stemonàceæ;* by some the family is called *Roxburghiàceæ.* Tall climbing perennial herbs, from a tuberous fusiform root, suitable only for the warmhouse: lvs. opposite, alternate or whorled, ovate, 3–9-costate: fls. solitary, or few and subracemose; perianth-segms. 4, lanceolate, many-nerved; stamens subhypogynous, the connectives produced in very long linear-lanceolate appendages; ovary free: caps. ovoid or oblong.—About 15 species, India, China, and Malaya

CVII. Effective shrubbery border.—Spireas in good form.

to Austral. *S. Cúrtisii*, Hook. f. St. twining, leafing and flowering at the same time: lvs. 4–5 in. long, alternate; the petiole very long and slender: fls. small, apparently unisexual. India. B.M. 7254. Similar to the following. *S. tuberòsa*, Lour. (*S. glorioso*ìdes, Voigt. *Roxbûrghia glorioso*ìdes, Jones. *R. glorìosa*, Peers. *R. viridiflòra*, Smith). Tubers cylindric, 6–12 in. long: st. woody below, twining, leafing and flowering at the same time; branches terete: lvs. 4–10 in. long, broadly ovate-cordate, acuminate, membranaceous, shining: peduncle 1–2 in. long, usually 2-fld.: fls. erect, fetid; perianth spreading and revolute, segms. lanceolate, acuminate, greenish with many purplish nerves: caps. ovoid-oblong, 5–8-seeded. India and Assam. F.S. 2:86. B.M. 1500. H. U. 3, p. 353. The plants are allied to the lily family.

STENÁCTIS: *Erigeron.*

STENÁNDRIUM (Greek, *narrow anthers*). *Acanthàceæ.* Nearly stemless or short-stemmed herbs, frequently villous or pubescent, adapted to the warm- or coolhouse: lvs. often radical or clustered at the base of the st., very entire: spikes scape-like, peduncled, dense or interrupted: fls. usually small at the axils of the opposite bracts, solitary, sessile, spicate; calyx 5-parted, segms. narrow, acute; corolla-tube slender, cylindrical, limb oblique, 5-lobed, lobes obovate, retuse; stamens 4, didynamous: caps. oblong or subfusiform, subterete, 4-seeded or by abortion fewer-seeded.—About 30 species, Trop. and Subtrop. Amer.

Líndenii, N. E. Br. A low-growing compact plant, with broadly elliptical lvs. rounded at the apex and long-attenuate on the petiole, velvety in appearance, of a dark green with a feathering of white or yellow along the veins, somewhat purplish underneath: spikes 2–3 in. long, narrowly cylindrical: fls. not showy, about ¾in. long, yellow: bracts ovate, acute, serrate, green. I.H. 38:136; 40:173 (4). G.W. 3, p. 160.—Tender foliage plant. F. W. Barclay.

STENÁNTHIUM (Greek, *narrow flower;* referring to perianth-segments). *Liliàceæ.* Bulbous plants, useful both out-of-doors and in the greenhouse.

Stems erect, tall, simple except for the infl.: lvs. radical or at the base of the st. long, linear or linear-lanceolate, smaller upward along the st. or none: fls. polygamous, whitish, greenish or dark purple, sometimes in lax slightly branched racemes, sometimes very numerous and smaller in pyramidal panicles, pedicelled, frequently nodding; perianth narrowly or broadly campanulate, persistent, segms. connate at base in a very short, turbinate tube, spreading above, narrow or lanceolate, acuminate, 3–7-nerved; stamens 6; ovary ovoid, 3-celled: caps. ovoid-oblong, partially dehiscent into 3 carpels.—About 5 species; one native of Sachaline Isl., another Mexican, the others W. American.

occidentàle, Gray. St. slender, 10–20 in. high: lvs. linear-lanceolate, acuminate, 6–10 in. long: raceme simple or branched at base; pedicels slender, spreading or recurved: fls. campanulate, nodding, brownish purple; perianth-segms. 6–8 lines long, oblong to lanceolate, acuminate. Rocky banks, Ore. to Brit. Col. and Idaho.

robústum, Wats. Sts. stout, 3–5 ft. tall, usually very leafy: lvs. often 1 ft. long, lower 4–10 lines broad, upper reduced to bracts: panicle dense, usually compound, branches spreading or ascending: fls. greenish or white, 6–8 lines broad: caps. ovoid-oblong. Moist soil, Pa. and Ohio to S. C., Tenn., and Mo. B.B. (ed. 2) 1:490. Gn. 68, p. 177; 74, p. 513. G.W. 14, pp. 676, 677. F.E. 22:440. F. Tracy Hubbard.

STÈNIA (Greek, *narrow*, alluding to the form of the pollen-masses). *Orchidàceæ.* Epiphytic herbs with short sts. and clustered pseudobulbs which bear 1–2 lvs., grown occasionally in the warmhouse: lvs. oblong or narrow, leathery, midrib prominent: scapes short at the axils of the sheaths, below the lvs. or pseudobulbs, recurved, with 1 rather large fl.; sepals subequal, free among themselves, spreading, the lateral a little broader; petals similar to the dorsal sepals; labellum continuous with the foot of the column, inbent, fleshy, broad, concave, nearly saccate, the lateral lobes minute, midlobe undivided or all broader and fimbriate; column rather thick and erect; pollinia 4, oblong-linear: caps. unknown. Two species, Trop. S. Amer. Treatment much as in maxillaria. *S. guttàta*, Reichb. f., is similar to the following, but differs in having blunter sepals and petals which are straw-colored with purple spots and in the lip being blotched and having only seven callous teeth. Peru. *S. pállida*, Lindl. St. wanting: lvs. 2–5, oblong, acute, slightly narrowed and keeled at the base, sheathed with brownish spathaceous scales: scapes radical, prostrate: fls. pale citron-color, 1½ in. or more diam.; sepals and petals linear, acute; lip spotted with red, nearly saccate, entire, fleshy, ovate. Guiana. B.R. 24:20. F. Tracy Hubbard.

STENOCÁRPUS (Greek, *narrow fruit*, referring to the follicles, which are long and narrow). *Proteàceæ.* Trees, sometimes grown in the warmhouse or the greenhouse.

Leaves alternate or scattered, entire or deeply pinnatifid with few lobes: peduncles terminal or in the upper axils, sometimes several in an umbel or short raceme, each bearing an umbel of pedicellate red or yellow fls.; bracts none or falling off early: fls. hermaphrodite; perianth slightly irregular, tube opening along the lower side, limb nearly globular and recurved; segms. at length separating; anthers broad, sessile within the concave laminæ; ovary stipitate, ovules several, imbricate downward in 2 rows: follicle usually narrow, coriaceous.—About 18 species, 3 endemic to Austral., the others natives of New Caledonia.

Cúnninghamii, R. Br. Tall, bushy shrub or small tree, glabrous or the infl. slightly pubescent: lvs. about 2–4 in. long, oblong-lanceolate, obtuse or acuminate, tapering to a short petiole, faintly 3–5-nerved: ovary glabrous, fls. otherwise as in *S. salignus*. Austral.

salígnus, R. Br. Moderate-sized tree, glabrous or the infl. minutely pubescent: lvs. 2–4 in. long, in the typical form ovate-lanceolate or elliptical, acute, acuminate or rarely obtuse, tapering to a short petiole: peduncles slender, bearing an umbel of 10–20 fls., occasionally up to 30 fls.: fls. greenish white; perianth usually less than ½in. long; ovary slightly silky-pubescent or nearly glabrous. Austral. B.R. 441.—Cult. in Calif.

sinuàtus, Endl. (*S. Cúnninghamii*, Hook., not R. Br.). Tree said to grow to a height of 60–100 ft., glabrous or the infl. minutely tomentose: lvs. petioled, either undivided, oblong-lanceolate and 6–8 in. long, or pinnatifid and over 1 ft. long, with 1–4 oblong lobes on each side, mostly obtuse, quite glabrous, but reddish beneath, penninerved and minutely reticulate: peduncles terminal, either 2 or more together in a general umbel or several at some distance forming a short broad raceme, each peduncle 2–4 in. long, bearing an umbel of 12–20 bright red fls.: perianth 1 in. long; ovary densely pubescent on a glabrous stipe. Austral. B.M. 4263. F.S. 3:189. P.M. 14:1. F. Tracy Hubbard.†

STENOCHLÆNA (Greek, *narrow* and *covering*). *Polypodiàceæ.* A genus of tropical ferns with long climbing sts. and with usually 1-pinnate lvs.: fertile lvs. much reduced in tissue, and bearing the sporangia entirely covering the under sides, sometimes spreading over the margins. The general relationship of the species is with Lomaria, but owing to the way in which the sporangia are borne, they have often been referred to Acrostichum. Culturally they belong with epiphytic plants; they do best on tree fern stems and the like.

palústris, Bedd. (*S. scándens,* J. Smith). Rootstock widely climbing: lvs. 1–3 ft. long, with pinnæ 4–8 in. long; fertile pinnæ slender, 6–12 in. long; texture leathery. India. S. 1:224.—A vigorous grower and coarse feeder, much used in cooler houses of large ferneries. It will form a mass of rootstocks several feet long if grown on a fern stem, producing a large number of the rather pale lvs.

sorbifòlium, Linn. Rootstock climbing, often prickly: lvs. 12–18 in. long, 6–12 in. wide, with close veins; fertile pinnæ 2–4 in. long, narrow. E. and W. Indies to Brazil. R. C. Benedict.

STENOGLÓTTIS (Greek, *narrow* and *tongue,* referring to the narrow lip). *Orchidàceæ.* Terrestrial herbs, with short sts. and tuberiferous or thickened fleshy fasciculate roots, which are suitable for the intermediate house, but not commonly cult.: lvs. radical, numerous, rosulate or tufted: fls. small, short-pedicelled, arranged in loose somewhat 1-sided racemes; bracts small; sepals free, subequal; petals somewhat narrower than the sepals and suberect; lip continuous with the base of the column, cuneate-oblong without a spur, 3–5-cleft at the apex; column very short and broad; pollinia granular: caps. oblong, erect. Three species, Trop. and S. Afr. *S. fimbriàta,* Lindl. Lvs. numerous, oblong or narrowly lanceolate-oblong, acute, bright green, usually with few or numerous blackish or purple-black blotches: scapes erect, slender, 6–12 in. high: racemes 1½–6 in. long, lax, many-fld.: fls. light purple with a few elongated dark purple blotches on the lip; sepals broadly ovate, obtuse or subacute; petals ovate, subacute; lip linear-oblong, 3-cleft or 3-parted: caps. narrowly oblong. S. Afr. B.M. 5872. *S. longifòlia,* Hook. f. Lvs. numerous, ensiform, or linear-oblong, acuminate, uniformly light green, 3–7 in. long: scapes erect, often stout, 9–21 in. high, with numerous linear-lanceolate, somewhat recurved sheaths; racemes 4–10 in. long, many-fld.: fls. light purple with a few minute darker dots on the lip, occasionally white; sepals broadly ovate, subobtuse; petals ovate, subacute; lip linear-oblong, 5-fid or 5-parted. B.M. 7186. G.C. III. 16: 563. G.W. 14, p. 653. F. Tracy Hubbard.

STENOLÒBIUM: *Tecoma.*

STENOLÒMA (Greek, *narrow-fringed*). *Polypodiàceæ.* A generic name for a group of tropical ferns now referred to *Odontosoria,* which see.

STENOMÉSSON (Greek, *small* and *middle,* alluding to the corolla-tube, which is usually contracted near the middle). *Amaryllidàceæ.* Bulbous herbs grown in the warm- or coolhouse.

Leaves developing with the fls., linear or broadly strap-shaped: fls. in several umbels, rarely reduced to one, pedicels often recurved, making the fls. pendulous; involucral bracts 2; perianth red, golden, or tawny, tube elongated, subcylindrical, slightly contracted above the base or toward the middle, lobes erect or more or less spreading; ovary 3-celled: caps. subglobose or 3-furrowed, loculicidally 3-valved; seeds black.—About 22 species, Trop. Amer.

Stenomessons require a good soil and a sunny house with a temperature never below 45°. During the growing season they should have plenty of water, but when at rest comparative dryness is necessary. The offsets should be removed from the old bulbs before growth commences. The plants continue in bloom a number of weeks in spring and summer.

A. *Style shorter than the perianth.*

incarnàtum, Baker (*Cobúrgia incarnàta,* Sweet). A tender plant: bulb globose, 2–3 in. through: lvs. thick, glaucous, obtuse, about 1½ ft. long, strap-shaped: scape 2 ft. high: fls. 2½–3 in. long, few to many in an umbel, variable in color but typically crimson, with a green spot on each segm. Aug. Peru. I.H. 38:123 (perianth-limb light yellow). Gn. 50:62.

AA. *Style longer than the perianth.*

flàvum, Herb. A tender plant: bulb somewhat globose, 1 in. through: lvs. about 1 ft. long, oblanceolate, obscurely petioled, at first compressed on the margin: scape 1 ft. high: fls. bright yellow, 1½–2 in. long, usually few in an umbel. B.M. 2641. B.R. 778 (as *Chrysiphiala flava*). F. W. Barclay.

STENORHÝNCHUS (Greek for *small* and *beak*). *Orchidàceæ.* Terrestrial plants: scape arising from a rosette of lvs., bearing a raceme or spike: fls. with a distinct chin; dorsal sepal and petals forming a helmet, parallel; lip with a broad base and narrower apex, the base surrounding the column; beak narrow and long.—About 10 species, in Trop. and warm Temp. Amer.

speciòsus, Rich. (*Spiránthes coloràta,* N. E. Br. *S. cólorans,* Hemsl.). Lvs. elliptic, green: bracts acuminate, oblong-lanceolate, as long as fls.: fls. crimson. Trop. Amer. B.M. 1374 (as *Neottia speciosa*). George V. Nash.

STENOSPERMÀTION (Greek for *small* and *male element*). Sometimes written *Stenospermàtium. Aràceæ.* Climbing warmhouse plants: lvs. with long-sheathed petioles; blades elliptic or lanceolate, inequilateral, the primary lateral nerves numerous, ascending: peduncles rather long, at first nodding at apex, later erect: spathe convolute, at length expanding; spadix stipitate, cylindric, white: fls. perfect; stamens 4.—About 20 species, natives of the Andes of Peru and of N. Brazil.

multiovulàtum, N. E. Br. Three to 6 ft. tall: blades 12–16 in. long, 4–6 in. wide, oblong or narrowly elliptic-oblong, coriaceous, opaque green, paler beneath: peduncle 12–18 in. long: spathe 5–6 in. long; spadix 4½–6½ in. long. Colombia. George V. Nash.

STENOTÁPHRUM (Greek, *stenos,* narrow, and *taphros,* a trench, the spikelets being partially embedded in the rachis). *Gramíneæ.* Creeping grasses with compressed culms, flat divergent blades and narrow flat spikes: spikelets as in Panicum, imbedded in the surface of a broad rachis forming terminal spikes.—About 3 species of tropical regions, one species found along the Gulf coast, especially in Fla., where it is utilized as a lawn grass. In this respect it is similar to Bermuda-grass, being naturally adapted to a sandy soil, which it binds by its rhizomes and creeping habit as does that grass.

3687 Stenotaphrum secundatum. (×¼)

The introduced form of St. Augustine grass is one of the most valuable lawn grasses for the extreme South. It will grow on almost any soil and thrives even in shade. The leaves are rather broad, never over 6 inches high and require little mowing. This grass does not become coarse, does not hold dew or rain, and is particularly good for house lots and lawns. It does not

need as much water as Bermuda or St. Lucie grass. It is propagated mostly by cuttings. (E. N. Reasoner.)

secundàtum, Kuntze (*S. americànum,* Schrank). St. Augustine Grass. Fig. 3687. Flowering branches erect, 6–12 in. high. Var. **variegàtum,** has lvs. striped with white, and is used as a basket-plant. G.W. 15:681 (as *S. glàbrum*). Dept. Agric., Div. Agrost. 20:42.

A. S. Hitchcock.

STEPHANÁNDRA (Greek, *stephanos,* crown, and *aner, andros,* male stamen, alluding to the persistent crown of stamens). *Rosàceæ.* Ornamental shrubs grown chiefly for their handsome graceful foliage.

Deciduous: lvs. alternate, lobed and serrate, stipulate: fls. slender-pedicelled, small, with cup-shaped calyx-tube; sepals and petals 5; stamens 10–20: carpel 1; pod with 1 or 2 shining seeds, dehiscent only at the base.—Four species in China and Japan. Closely allied to Neillia and distinguished chiefly by the cup-shaped calyx-tube and the incompletely dehiscent 1–2-seeded pod.

The stephanandras in cultivation are low graceful spreading shrubs with slender more or less zigzag branches, bright green medium-sized or rather small lobed leaves and small white flowers in loose terminal panicles. They are hardy as far north as Massachusetts, but *S. incisa* is sometimes killed back in severe winters; it grows, however, freely from the base and is not injured in its appearance except that it remains rather low. They are well adapted for borders of shrubberies or rocky banks on account of their graceful habit and handsome foliage. Propagation is by greenwood cuttings under glass, which root readily, and by seeds; also by division, and *S. incisa* by root-cuttings with bottom heat in early spring.

incìsa, Zabel (*S. flexuòsa,* Sieb. & Zucc.). Fig. 3688. Shrub, to 8 ft. high, but usually lower, almost glabrous, with angular spreading distinctly zigzag branches: lvs. triangular-ovate, cordate or truncate at the base, long-acuminate, incisely lobed and serrate, the lower incisions often almost to the midrib, pubescent only on the veins beneath and grayish green, ¾–1½ in. long: fls. white, about ⅛in. across, in terminal, short, 8–12-fld., usually panicled racemes; stamens 10. June. Japan, Korea. Gn. 55, p. 141.—"Closely allied to Spiræa and has the spirea style of beauty. It has long, slender branches which are densely and regularly interwoven in a fan-like manner. Its habit of growth is fountain-like, the branches being gracefully pendent. Its fls. are snowy white and, although minute, are so numerous that the plant becomes very showy. It is especially fitted for the back of herbaceous borders or for the front of larger shrubs. Its foliage, which is deeply toothed, is tinted red in early spring and deep glossy green during spring and summer. In the autumn it puts on unusual tints of reddish purple. The foliage becomes so dense that the growth of weeds beneath its thickly set branches is effectually prevented. Prop. by cuttings and layers."
(J. W. Adams.)

3688. Stephanandra incisa. (×⅓)

Tanákæ, Franch. & Sav. (*Neillia Tanákæ,* Franch. & Sav.). Fig. 3689. Shrub, 5 ft. high, almost glabrous: lvs. triangular-ovate, slightly cordate at the base, abruptly long-acuminate, usually 3-lobed and doubly serrate or lobulate, pubescent only on the veins beneath, 1½–3 in. long: fls. in terminal loose panicles, slender-

3689. Stephanandra Tanakæ. (×½)

pedicelled, ⅛in. across; stamens 15–20. June, July. Japan. B.M. 7593. Gt. 45:1431. G.W. 4, p. 6.—Handsome shrub much resembling neillia in foliage, coloring in fall brilliant orange and scarlet or yellow.

Alfred Rehder.

STEPHÀNIA (perhaps a personal name; or by some derived from the Greek word for a garland or crown). *Menispermàceæ.* More than 30 climbing shrubs (rarely herbs) of the Old-World tropics, as defined by Diels in Engler's Das Pflanzenreich, hft. 46 (IV. 94), 1910, differing from Cocculus in the solitary ovary, often more than 3-merous fls., and a nearly basal rather than nearly terminal style-scar: lvs. usually peltate: fls. in axillary, simple or compound clusters, diclinous; males with 6–10 free sepals, 3–5 fleshy petals, and 6 connate anthers; females with 3–5 sepals, petals like those of the males, 1 ovary with 3–6-parted style: fr. a glabrous drupe with ring-like seed. The species are little known in cult., although the following may be expected in southern regions or sometimes under glass as an ornamental climber. **S. herandifòlia,** Walp., in India, Austral., Afr., and Malaya, has striate glabrous branches, and ovate or somewhat deltoid obtuse or acute more or less pubescent lvs. 3–6 in. across: fls in capitate peduncled puberulent umbels of 8–12 rays: drupes red. *S. japónica,* Miers (*Cócculus japónicus,* DC.), a common roadside weed in parts of China and Japan, has glabrous lvs. and infl.; probably not cult.

STEPHANOPHÝSUM (Greek, *crown* and *bladder,* in reference to the shape of the crown). *Acanthàceæ.* Herbs with more or less dentate or entire lvs., the fls. in lateral umbellate cymes: fls. red; calyx 5-parted; corolla-tube short, the lobes erect or more or less spreading; stamens 4, didynamous: caps. contracted from the base to the middle. Trop. Amer. with the exception of the below-mentioned. The genus is now included in Ruellia. *S. Baìkiei,* Hook. Subshrub, 2–3 ft. high, branches 4-angled, opposite: lvs. opposite, about 6 in. long including the petiole, ovate-lanceolate, entire, acuminate, attenuate at base: panicle terminal, many-fld.: fls.

opposite, sessile, scarlet; calyx-segms. narrow, erect, linear-subulate; corolla more than 2 in. long, tubular-funnelform, curved, the lobes triangular; ovary sunk in a large, fleshy, cup-shaped disk. Trop. Afr. B.M. 5111. H.F. II. 3:162.—This species is apparently not known today and has not been recently treated in works on Trop. Afr.

3690. Stephanotis floribunda. (×¼)

STEPHANÒTIS (from Greek words for *crown* and *ear*, alluding to the five ear-like appendages on the staminal crown). *Asclepiadàceæ*. Twining glabrous shrubs of the Old-World tropics, of about fifteen species, one of which, *S. floribunda*, is one of the best of greenhouse climbers.

Leaves opposite and coriaceous: fls. large and showy, white, in umbel-like cymes from the axils; calyx 5-parted; corolla funnelform or salverform, the tube cylindrical and usually enlarged at the base and sometimes at the throat, the lobes 5; crown mostly of 5 scales that are usually free at the apex and adnate to the anthers on the back, the anthers with an inflexed tip or membrane: fr. a more or less fleshy follicle.

There are few plants that have all the good qualities of *S. floribunda*. It is a splendid grower, has good foliage, is very free-flowering, and the flowers last well on the plant or when cut for decorative work. Cuttings are secured from half-matured wood, and can be rooted at any time of year, although spring is the most convenient time. Pot the cuttings singly, in small pots, in a sandy mixture of peat. Place them in a tight case in 70° night temperature. Shade them from the sun and keep the cuttings in a moist condition until they begin to grow. When the small pots are filled with roots, shift them into two or three sizes larger, in a good strong fibrous loam with enough sand added to keep the soil porous. When the shoots have grown to a height of about 2 feet, cut them back several joints. This will make the plants break into several leads. As *S. floribunda* comes from Madagascar, it can stand a good heat, but does not like so humid an atmosphere as many other tropical plants. About 65° will generally be found sufficient after it has started growing in the spring. By midsummer the young plants may receive another potting, and again be cut back to make sure of having a good foundation for the following year. About the end of October, begin to withhold water from the roots, and cease syringing, which must be attended to during the period of active growth. Reduce the temperature to 55° to 60° during the night and give only enough water to keep the leaves from shriveling. As the sun gets higher in March, they will show signs of activity and the weak wood may be all cut back, and the plants repotted in a good strong loam with ample drainage. If not wanted for a specimen plant, stephanotis may be planted out on a well-drained bench and trained to wires over the roof. It is astonishing the amount of space a single plant will cover in course of time. For specimen plants, the shoots should be trained to strings until they set flowers, when they may be trained on a trellis in any shape desired. They will do in the same size of pot for many years, if fed during their growing period as advised for ixoras. Mealy-bug and scale are sure to locate on stephanotis, but during the winter they may be treated to fumigations with hydrocyanic gas, as already advised for other plants, and if syringed well when out of flower, will be easily held in check. (Geo. F. Stewart.)

floribúnda, Brongn. Fig. 3690. Glabrous, 8–15 ft.: lvs. elliptic, with a short point, thick and shining green, entire: fls. 1–2 in. long, of waxy consistency, white or cream-color, very fragrant, in many umbels, the calyx one-fourth or less the length of the corolla-tube: fr. 3–4 in. long, ellipsoid, glabrous, fleshy, containing melon-like seeds which are provided with a tuft of hair. Madagascar. B.M. 4058. G. 6:29, 291; 10:468; 13:622; 25:144; 37:397. Gn. 21, p. 441 (showing a pygmy plant blooming in a small pot and not climbing); 46, p. 208; 55, p. 150; 73, p. 211. G.C. II. 14:169 (a dwarf variety, the Elveston); 24:817; 25:137; III. 17:50. R.H. 1874, p. 368; 1885, pp. 438, 439. H.U. 1, p. 72. J.H. III. 50:165.

S. Thouársii, Brongn., from Madagascar, appears to be the only other species in cult., but it is not in the American trade. It has obovate lvs., fls. in 3's, and sepals about one-third the length of the corolla-tube. L. H. B.

STERCÙLIA (*Sterculius* of Roman mythology, from *stercus*, manure; applied to these plants because of the odor of the leaves and fruits of some species). *Sterculiàceæ*. Trees grown in the greenhouse, but also outdoors in the South.

Leaves undivided, lobed or digitate: infl. paniculate or rarely racemose, frequently axillary, with the terminal fls. commonly feminine and earlier: fls. unisexual or polygamous; calyx 5-cleft or 5-parted, rarely 4-merous, often colored; petals none; stamens united in a column which bears a head of 10–15 sessile anthers; pistil of as many carpels as calyx-lobes and opposite them, each carpel 2- to many-ovuled, the stigmas free and radiating: fr. follicular, each carpel distinct and either woody or membranaceous and sometimes opening and spreading into a lf.-like body long before maturity (Fig. 3691); seeds 1 to many, sometimes arillate or winged, sometimes hairy.—About 100 species, natives of the warmer regions of the world, most abundant in Asia. Sterculias have very various foliage, the lvs. of different species being simple, palmately lobed or digitate. The fls. are mostly in panicles or large clusters, sometimes large and showy, varying from greenish to dull red and scarlet. The species are grown mostly for street and lawn trees. The kinds that are generally known in this country are *S. platanifolia*, *S. diversifolia*, and *S. acerifolia*, the last two known in Calif. as brachychitons. All are easily grown from seeds. By Bentham & Hooker, Brachychiton is merged in Sterculia; by Schumann in Engler & Prantl it is kept distinct. See *Brachychiton*.

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KEY TO THE SPECIES.

A. *Carpels expanding before maturity into lf.-like bodies, exposing the seeds* ..... 1. **platanifolia**
AA. *Carpels not becoming lf.-like.*
B. *Lvs. all digitately compound*..... 2. **fœtida**
BB. *Lvs. entire or only lobed (sometimes compound on some branches of Nos. 8 and 9).*

cc. *Surfaces of blade, at least the lower, tomentose or pubescent.*
d. *Fls. yellowish white* ..... 3. **apetala**
dd. *Fls. red* ..... 4. **Bidwillii**
cc. *Surfaces of blade glabrous.*
d. *Calyx tubular, the tube much longer than the lobes* ..... 5. **colorata**
dd. *Calyx broadly campanulate, deeply lobed.*
e. *Fls. glabrous* ..... 6. **acerifolia**
ee. *Fls. tomentose, at least outside.*
f. *Follicles globose, about 5 in. diam.* ..... 7. **alata**
ff. *Follicles ovoid, 1–3 in. long.*
g. *Lvs. ovate or ovate-lanceolate, sometimes more or less 3-, rarely 5-lobed or -parted* ..... 8. **diversifolia**
gg. *Lvs. oblong-linear or lanceolate, sometimes 5–9-digitate, parted on some branches* ..... 9. **rupestris**

1. platanifòlia, Linn. f. (*Firmiàna platanifòlia,* Schott & Endl.). Japanese Varnish Tree. Chinese Parasol Tree. Fig. 3691. Strong-growing, smooth-barked, round-headed tree of medium size, with deciduous foliage: lvs. very large, glabrous, cordate-orbicular, palmately 3–5-lobed like maple lvs., the lobes sharp-pointed: fls. small, greenish, with reflexed calyx-lobes, in terminal panicles: carpels 4 or 5, bearing globular pea-like seeds.—Said to be native of China and Japan. Hemsley admits it to the Flora of China, and Sargent says in Forest Flora of Japan that it is one of the several Chinese or Korean trees grown in Japan. Bentham, in Flora Hongkongensis, says that it is native to China. Franchet and Savatier, in Enumeratio Plantarum Japonicarum, admit it as an indigenous Japanese species. Now a frequent tree from Ga. south. Hardy also at Washington, D. C. Excellent for lawns and shade. A peculiarity of this tree is that before maturing the frs. are filled with a brownish black fluid which when the pods burst is liberated. Var. **variegàta,** Hort., has lvs. variegated with creamy white. Intro. into Calif.

2. fœtida, Linn. Tall, handsome tree, with all parts glabrous except the young foliage: lvs. crowded at the ends of the branchlets, of 5–11 elliptic, oblong or lanceolate, entire, pointed, thick lfts.: fls. large, dull red, in simple or branched racemes, appearing with the lvs.: fr. large and woody follicles, glabrous outside, often 3 in. or more in diam. and containing black seeds the size of a hazelnut. Trop. Afr. and Asia to Austral.—Grown in S. Fla. In its native countries the seeds are said to be roasted and eaten.

3691. Mature follicles or fruits of Sterculia platanifolia, bearing seeds on the margins. (×½)

3. apétala, Karst. (*S. carthaginénsis,* Cav. *Helictéres apétala,* Jacq.). Tree, about 40 ft. high: lvs. cordate-rounded, usually more than 1 ft. diam., 5- (–3-) lobed to the middle, glabrous above, velvety beneath, lobes elliptical, obtuse, or oblong: fls. yellowish white with purple spots, about ¾in. across. Mex., Cent. Amer., and Colombia; intro. into Jamaica and Fla.

4. Bidwillii, Hook. (*Brachychìton Bidwillii,* Hook.). Shrub or tree, softly pubescent or tomentose all over: lvs. usually deeply 3-lobed, green, soft-villous on both sides, lobes acuminate: calyx narrow tubular-campanulate, 1–1½ in. long, red. Austral. B.M. 5133.

5. coloràta, Roxbg. Large tree, bark ashy: lvs. roundish, 5–9 x 5–12 in., glabrescent, palmately 3–9-lobed, lobes triangular, acuminate, base cordate; petiole 4–9 in. long: panicle terminal, many-fld.; pedicels covered with orange-red tomentum: calyx ¾in. across, tubular, clavate, orange-downy outside, pilose within: follicles 2–3 in. long, stipitate, glabrous, membranous. India.—Intro. into Calif.

6. acerifòlia, A. Cunn. (*Brachychìton acerifòlium,* F. Muell.). Brachychiton. Flame Tree. Evergreen tree, reaching a height of 60 ft., glabrous: lvs. long-petioled, large, deeply 5–7-lobed, the lobes oblong-lanceolate to rhomboid, glabrous and shining: fls. brilliant scarlet, the calyx about ¾in. long, in large, showy trusses: follicles large, glabrous, long-stalked. Austral.—A most showy tree when in bloom, and planted on streets and lawns in Calif. Thrives in either dry or fairly moist places. (See also page 538.)

7. alàta, Roxbg. Large tree, the young parts yellow-pubescent, the bark ash-colored: lvs. large, cordate-ovate, acute, 7-nerved: fls. about 1 in. across, in few-fld. panicles shorter than the lvs., and which arise from the leafless axils, the calyx tomentose and the segms. linear-lanceolate: follicles 5 in. diam., globose, with wide-winged seeds. India.—Intro. into S. Fla.

8. diversifòlia, Don (*Brachychìton populneum,* R. Br.). Brachychiton. Tall tree, glabrous except the fls.: lvs. very various, mostly ovate to ovate-lanceolate in outline, often entire, sometimes variously 3–5-lobed on the same tree, all parts acuminate: fls. tomentose when young, bell-shaped, greenish red and white or yellowish white, in axillary panicles: follicles 1½–3 in. long, ovoid, glabrous, stalked. Austral.—Planted in Calif., and commoner than the last. (Page 538.)

Var. **occidentàlis,** Benth. (*Brachychìton Grégorii,* F. Muell. *S. Grégorii,* Hort.). Lvs. deeply 3-lobed, the lobes narrow, sometimes with short lateral ones: fls. salmon-color; calyx smaller and more tomentose. W. Austral.—Offered in S. Calif.

9. rupéstris, Benth. (*Delabèchea rupéstris,* Lindl.). Bottle-Tree. Considerable tree: trunk often swelling out to a large size, contracted top and bottom: lvs. glabrous, either quite entire and oblong-linear or lanceolate, 3–6 in. long, or digitate, consisting of 5–9 linear-lanceolate, sessile lfts. often above 6 in. long: calyx about 4 lines long, campanulate, tomentose both inside and out: follicles ovoid, acuminate, about 1 in. long, on stalks longer than themselves. Austral.

S. acuminàta, Beauv.=Cola acuminata.—*S. Russellìana,* Hort., is said to be an aralia-like plant with the main st. and petioles light green and the narrow divisions of the lf. very dark green. Offered in the trade but not known botanically.

F. Tracy Hubbard.†

STEREOSPÉRMUM (Greek, *hard seed*). *Bignoniàceæ.* About 12 species of tropical evergreen trees in Afr. and E. India, with handsome once- or twice-pinnate foliage and large bignonia-like fls., pale yellow or rose-colored to purple, in large and loose terminal panicles; calyx campanulate, 2–5-lobed or 5-toothed; corolla funnelform-campanulate, with round crisped or toothed lobes; stamens 4, included; disk cupulate: caps. terete or 4-angled, 2-valved; seeds in 2 rows, with the thick nutlets deeply impressed in the thick spongy septum. Only the following species seems to be in cult.

S. suavèolens, DC. Tree, 30–60 ft.: lvs. simply pinnate, 12–18 in. long; lfts. 7–9, broadly elliptic, acuminate or acute, entire or serrulate, hairy while young, about 5 in. long: panicle many-fld., viscous-pubescent: calyx campanulate, with 3–5 short lobes; corolla 1½ in. long, pale or dark purple, puberulous outside, with crenately crisped lobes: caps. 18 in. long. Ind'a.—Adapted for tropical or subtropical regions only and prop. by seeds or cuttings, also by air-layering.

S. sinicum, Hance=Radermachia sinica.

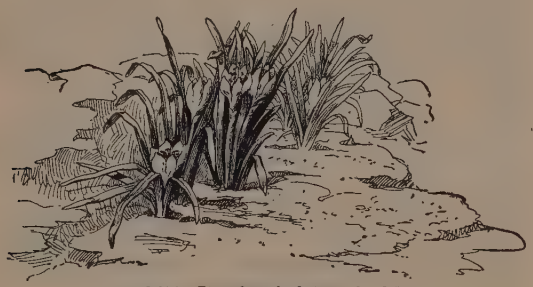
Alfred Rehder.

STERIPHÒMA (Greek, *foundation*, alluding to the large peduncle of the fruit). *Capparidàceæ*. Unarmed shrubs with the branches and infl. stellate-pubescent, grown in the warmhouse: lvs. long-petioled, with 1 lft. which is lanceolate, entire; the petiole thickened at the top: fls. showy, orange, in terminal racemes; the pedicels bent or curved down, 1-fld.; calyx cylindrical-campanulate, 2–4-lobed at the top; receptacle very short, expanded into a ring-like disk; petals 4, sessile; stamens 6; ovary ovate or oblong: berry globose or angulate, corticate, pulpy.—Four species, Trop. Amer.

paradóxum, Endl. (*S. cleomoìdes*, Spreng.). Leafy shrub, 4–10 ft. high: branches erect or ascending, slender: lvs. alternate, crowded toward the ends of the branches, 4–7 in. long, oblong or ovate-oblong: raceme terminal, dense-fld., 1–3 in. long: fls. abruptly deflexed from the apex of the orange-yellow pedicels; calyx bright orange, oblong-cylindric, irregularly split halfway down; petals linear-oblong, pale yellow: fr. said to be cylindrical. Venezuela. B.M. 5788. F.S. 6:564–565. Gt. 57, p. 242.

STERNBÉRGIA (named for Count Caspar Sternberg, a botanist and writer, 1761–1838). *Amaryllidàceæ*. Low-growing bulbous herbs, hardy and used for outdoor planting.

Leaves produced after or with the fl., strap-shaped or linear: scape short: fls. frequently solitary, rarely 2, bright yellow; perianth funnel-shaped, erect, tube short or rather long, lobes linear or lanceolate, erect-spreading; filaments filiform, free; ovary 3-celled: fr. fleshy, ovoid or oblong, scarcely dehiscent; seeds subglobose.—About a dozen species, E. Eu. to Asia Minor. The



3692. Sternbergia lutea. (×⅙)

bulbs should be planted rather deeply, about 6 in. J. N. Gerard says of their culture in G.F. 10:158 that they require a rather heavy soil, in a somewhat dry sunny position where they will be well ripened in summer.

A. *Fls. and lvs. appearing together.*

B. *Blooming in fall.*

lùtea, Ker-Gawl. (*Amarýllis lùtea*, Linn.). Fig. 3692. Bulb about 1½ in. through: lvs. 6–8 to a bulb, strap-shaped, becoming 1 ft. long: fls. yellow, 1–4 to a bulb; tube less than ½in. long; perianth-segms. about 1½ in. long. Medit. region of Eu. and Asia. B.M. 290. Gn. 44, p. 365; 47, p. 114. G.C. II. 13:21. J.H. III. 45:227. Var. **màjor,** Hort., has fls. much larger than those of the type.

BB. *Blooming in spring.*

Fischeriàna, Roem. Has the habit of *S. lutea*, but differs in season of bloom and stipitate ovary and caps. Wm. Watson says (G.F. 8:144) that the fls. are a brighter yellow and as large as the largest forms of *S. lutea*. Caucasus. B.M. 7441. Gn.W. 22:307; 24:131.

AA. *Fls. and lvs. appearing at different seasons.*

B. *Lvs. linear: fls. small.*

colchiciflòra, Waldst. & Kit. Bulb about ½in. through: lvs. appearing in spring, 3–4 in. long: fls. yellow, in fall; segms. about 1 in. long by 2 lines broad. E. Eu., Asia Minor. B.R. 2008.

BB. *Lvs. strap-shaped: fls. large.*

macrántha, J. Gay. Bulb globose, 1½ in. through, with a long neck: lvs. becoming 1 ft. long, nearly 1 in. wide, fully developed in June: fls. bright yellow, 3–5 in. across; segms. about 1 in. broad. Oct. Asia Minor. G.C. III. 23:97; 28:265. Gn. 47:114. B.M. 7459. G. 24:497; 25:297. G.M. 44:47. H.F.II. 3:248 (as *Oporanthus macranthus*, Hort.).—A handsome species.

F. W. Barclay.

STEUDNÈRA (bears the name of Steudner, a German botanist). *Aràceæ*. About 5 or 6 perennial herbs of E. Asia, sometimes seen under glass in choice collections, requiring the treatment of other aroids. Plant with a mostly short ascending sheathed caudex, and ovate-oblong long-stalked peltate lvs.: spathe ovate-lanceolate, recurving above the middle and convolute at base, much surpassing the spadix: fls. imperfect, the female with a subglobose 1-loculed ovary and 2–5 short staminodia: fr. a many-seeded berry. **S. colocasiæfòlia** Koch. St. short and fleshy: lvs. green above and paler beneath, the petioled often colored: spathe yellowish, purple or reddish inside; spadix whitish, erect, one-third as long as the spathe. **S. díscolor,** Bull (*S. colocasiæfòlia* var. *díscolor*, Hort.), has purple-blotched lvs., and spathe yellow on both surfaces but reddish at base. These plants are warmhouse subjects, grown for the foliage and interesting habit, as well as for the infl.

STEVENSÒNIA (named after one of the governors of Mauritius). *Palmàceæ*, tribe *Arèceæ*. A monotypic genus of tropical palms from the Seychelles. Tall trees, spiny throughout or at length nearly smooth, with ringed caudex: lvs. terminal, spreading-recurved, the cuneate-obovate blade convex, bifid, oblique at the base, plicate-nerved, the margins split, segms. deeply cut, the midnerves and nerves prominent, scaly beneath; petiole plano-convex; sheath deeply split, scaly, spined; spadix erect: peduncle long, compressed at the base: branches thickish: spathes 2, the lower one persistent, prickly, the upper one smooth, woody, club-shaped, deciduous: fr. ellipsoidal, small, orange-colored. For cult., see *Palm*.

grandifòlia, Duncan (*Phœnicophòrium sechellàrum*, Wendl.). Caudex 40–50 ft. high, very spiny when young, less so when old; petiole 9–18 in. long, pale green; blade cuneate-obovate, shortly bifid, about 6–7 ft. long and nearly as broad: spadix 3–6 ft. long, bearing many yellow fls. Seychelles. I.H. 12:433. B.M. 7277. Gn. 23, pp. 173, 320.—Probably not cult. in Amer. The name Phœnicophorium (Thief-Palm) commemorates the alleged theft of one of the original plants from Kew by a gardener in 1857. Phœnicophorium is antedated by Stevensonia, although a nomen nudum.

Jared G. Smith.
N. Taylor.†

STÈVIA: for the Stevia of florists, see *Piqueria*. True Stevias are described in horticultural literature, but it is not known that any of them are now in the American trade.

STEWÁRTIA (in honor of John Stuart, Earl of Bute, a patron of botany; 1713–1792). Sometimes spelled *Stuártia*. *Ternstrœmiàceæ*. Ornamental woody plants chiefly grown for their large and showy flowers.

Deciduous shrubs or trees with smooth flaky bark: lvs. alternate, short-petioled, serrate: fls. axillary or subterminal, short-stalked, with 1 or 2 bracts below the calyx; sepals and petals 5 or sometimes 6, the latter obovate to almost orbicular, usually concave, with crenulate margin, connate at the base with each other and with the numerous stamens; styles 5, distinct or

connate: fr. a woody, usually hirsute caps., loculicidally dehiscent into 5 valves; seeds 1–4 in each locule, compressed, usually narrowly winged.—Six species in E. N. Amer. and E. Asia.

The stewartias are very desirable ornamental plants, with handsome bright green, rather large foliage which turns deep vinous red or orange and scarlet in fall; they are very attractive in midsummer with their white cup-shaped flowers, which are in size hardly surpassed by any others of our hardier shrubs. *S. pentagyna* and *S. Pseudo-Camellia* are hardy as far north as Massachusetts, while *S. Malachodendron* is tender north of Washington, D. C. They thrive best in deep, rich, moderately moist and porous soil, preferring a mixture of peat and loam, and, at least in more northern regions, a warm, sunny position. Propagation is by seeds sown soon after maturity and by layers; also by cuttings of half-ripened or almost ripened wood in late summer under glass.

A. *Styles united; petals always 5.*

B. *Stamens purple, spreading: caps. subglobose.*

Malachodéndron, Linn. (*S. virgínica,* Cav.). Shrub, 6–12 ft. high: lvs. oval to oval-oblong, acute at both ends, serrulate, light green, pubescent beneath, 2½–4 in. long: fls. 3–4 in. across, with obovate spreading petals: seeds wingless, shining. May, June (July and Aug. in the N.). Va. and Ark. to Fla. and La. Gn. 14:136; 18, p. 628; 34, p. 280. G.C. II. 8:433; III. 42:32; 44: 132. F.S.R. 1, p. 71; 3, p. 264. G. 29:309. B.M. 8145. —This is one of the showiest species, but tender.

BB. *Stamens with whitish filaments, incurved: caps. ovate, pointed.*

C. *Bracts beneath the calyx large and lf.-like.*

sinénsis, Rehd. & Wilson. Shrub or tree, to 30 ft.: lvs. oblong-elliptic to elliptic-obovate, acuminate, serrulate, glabrous or sparingly pubescent beneath, 2–4 in. long: fls. with large serrulate or entire bracts at the base, white, 2 in. across; stamens connate at the base, pubescent: fr. subglobose, pointed, ¾in. across. Cent China.

3693. Stewartia Pseudo-Camellia. (×½)

monadélpha, Sieb. & Zucc. Shrub or small tree: lvs. oval to oval-oblong, acute at both ends, remotely serrulate, slightly pubescent beneath, light green, 1½–2½ in. long: fls. white, 1½ in. across, with flat, spreading, obovate petals; stamens connate at the base; anthers violet: fr. about ½in. across. Japan. S.Z. 1:96.—This is the least desirable species and probably as tender as the preceding; it is doubtful whether it is in cult. Plants intro. under this name seen by the writer proved to be *S. Pseudo-Camellia.* Also the closely allied *S. serràta,* Maxim., differing in its glabrous lvs. and larger fls. with serrate sepals and distinct stamens is apparently not yet intro.

3694. Stewartia pentagyna. (×½)

CC. *Bracts small, shorter than calyx.*

Pseùdo-Camèllia, Maxim. (*S. grandiflòra,* Briot. *S. japónica* var. *grandiflòra,* Hort.). Fig. 3693. Shrub, with upright branches, or tree attaining 50 ft. or more in Japan: trunk with smooth red bark, peeling off in larger thin flakes: lvs. elliptic to elliptic-lanceolate, acute at both ends, or often acuminate at the apex, thickish, bright green, glabrous or nearly so beneath, 1⅓–3 in. long: fls. hemispherical, 2–2½ in. across; petals almost orbicular, concave, silky-pubescent outside; anthers orange-colored: seeds 2–4 in each cell, narrowly winged, dull. July, Aug. Japan. B.M. 7045. R.H. 1879:430. G.C. III. 4:187. Gn. 43:172. G.F. 9:35 (adapted in Fig. 3693). M.D.G. 1900:480. R.B. 28, p. 81. F.S.R. 3, p. 263. J.H. III. 54:57. S.I.F. 1:73.

AA. *Styles 5, distinct: petals often 6.*

pentágyna, L'Her. (*Malachodéndron ovàtum,* Cav.). Fig. 3694. Shrub, 6–15 ft. high: lvs. ovate to oblong-ovate, acuminate, usually rounded at base, remotely serrate, sparingly pubescent and grayish green beneath, 2½–5 in. long: fls. cup-shaped, 2–3 in. across; petals obovate, with wavy crenulate margin; stamens white, with orange-yellow anthers: caps. ovate, pointed, sharply 5-angled; seeds narrowly winged. July, Aug. N. C. and Ga. to Tenn. and Fla. B.M. 3918. B.R. 1104. M.D.G. 1900:479. H.U. 3, p. 366. This shrub is handsomer than the preceding species and as hardy. Var. **grandiflòra,** Bean. Fls. 4–4½ in. across, with purple stamens. A very desirable variety which was found along with the yellow-stamened one in the woods of Ga.; the flowers are as beautiful as those of *S. Malachodendron,* and the plant is much hardier.

ALFRED REHDER.

STIGMAPHÝLLON (Greek, *stigma* and *leaf;* referring to the leaf-like appendages of the stigmas). Sometimes written *Stigmaphyllum*. *Malpighiàceæ*. Woody vines, grown in the warmhouse and also out-of-doors in the extreme South.

Leaves usually opposite, entire or denticulate, rarely lobed; petiole with 2 glands; stipules minute: fls. yellow, in umbel-like corymbs which are peduncled and axillary; calyx 5-parted, 8-glandular; petals clawed, unequal, glabrous, stamens 10, unequal, 6 perfect, 4 without anthers or deformed; ovary 3-celled, 3-lobed, dorsal lobe gibbous: samaræ 1–3, extended above into a wing.—About 55 species, Trop. Amer.

ciliàtum, A. Juss. A tender woody twining vine: lvs. evergreen, smooth, opposite, cordate, ciliate: fls. bright yellow, large, in peduncled axillary clusters of 3–6. P.M. 15:77. Gn. 33:170.—Apparently the only species in the trade and possibly the handsomest of the genus. G. W. Oliver says that *S. ciliatum* is one of the best medium-sized vines for outdoor trellis-work. For pot culture it is of little service and thrives in the greenhouse only when planted out. Sept. is the best month for prop. On outdoor plants much of the wood is useless for this purpose, being thin and soft. Choose the wood made early in the season; a heel or joint is not necessary; root in bottom heat and carry through the winter in the greenhouse as small plants. It is said that in S. Calif. it must have shade, protection from dry or hot winds, and an open soil. Under the right conditions it flowers admirably.

littorâle, A. Juss. A tall leafy climber: lvs. opposite and alternate, long-petioled, 2–5 in. long, varying in shape: fls. yellow, in profusion, borne on pedicels ½–1½ in. long; peduncles axillary, solitary; corymbs terminal, simple or compound; corolla 1 in. diam. Autumn. Argentina. B.M. 6623.

F. Tracy Hubbard.†

STILLÍNGIA (for Dr. Benj. Stillingfleet, an English botanist of the eighteenth century). *Euphorbiàceæ*. Shrubs or herbs, chiefly of the American tropics, one rarely cultivated and used in medicine.

Glabrous, juice milky: lvs. alternate, simple, short-petioled to sessile, the petiole and bracts biglandulose: fls. in terminal spikes, monœcious, apetalous, the staminate above with the 2–3-lobed calyx imbricate, stamens 2–3, filaments free; the pistillate few, at the base of the spike; ovary 2–3-celled, 1 ovule in each cell: base of the caps. persistent as a 3-pointed piece; seeds usually carunculate.—About 25 species. Related to Sapium and Hura. The root of *S. sylvatica* is used in medicine. The plant is occasionally grown and will stand temperatures at least to —10° F. It is readily grown from seeds but is not easily transplanted.

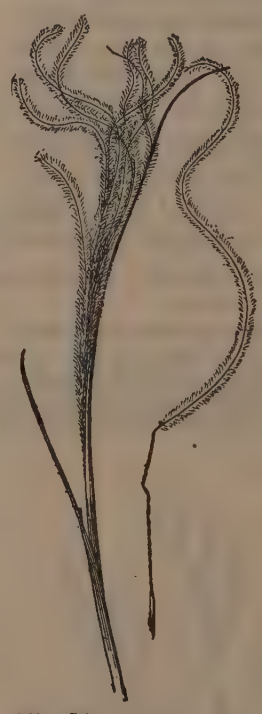
sylvâtica, Linn. Queen's Delight. Queen's-Root. Yaw-Root. Root perennial, woody: sts. clustered, herbaceous, 1–3 ft. high, with an umbel-like top: lvs. lanceolate to oval or oblong, glandular, crenulate to obtusely serrate, acute or obtuse: spikes 2–3 in. long: fls. small, yellow. Spring to fall. Va. to Texas.

S. sebíferum=Sapium sebiferum.

J. B. S. Norton.

STÌPA (Greek, *stipe*, tow, in allusion to the plumose awns of some of the species). *Gramíneæ*. Perennial grasses with narrow involute lvs. and usually loose panicles: spikelets 1-fld.; glumes membranaceous, longer than the indurated lemma; lemma with a sharp hairy callus below and a stout persistent twisted awn above, falling from the glumes at maturity.—A large genus of about 100 species, throughout the world except the colder parts. Particularly characteristic of the plains, savannas, and steppes. The long-awned, sharp-pointed frs. of some species are troublesome or even dangerous to stock, especially sheep, on account of their tendency to work through the skin and into the vital organs. The species here mentioned are cult. for ornament, including the making of dry bouquets.

3695. Stipa elegantissima. (×⅓)



3696. Stipa pennata. (×⅓)

A. *Awns and pedicels not plumose.*

B. *Fr. or mature lemma, excluding the long awn, ½–1 in. long.*

capillàta, Linn. Similar to *S. spartea:* fls. more numerous but smaller in every way; lemma about ½in. long; lower part of awn only minutely pubescent, the upper or bent portion sinuous. Plains, Eu.

spártea, Trin. Porcupine-Grass. Culms 2–3 ft., in bunches: panicles contracted; glumes broad, nerved, about 1½ in., tapering to a slender point; lemma nearly 1 in.; awn usually about 6 in. long, the lower half erect, pubescent but not plumose, strongly twisted, the upper half bent to one side, rough. Ill. to Calif. Dept. Agric., Div. Agrost. 20:62.

BB. *Fr. or mature lemma, excluding the short awn, less than ¼in. long.*

arundinàcea, Benth. (*Apèra arundinàcea*, Hook.). Culms 2–5 ft.: panicles open, large, nodding; spikelets minute, 1½ lines long, the awn about ⅓in. long. New Zeal. Hook. Fl. New Zeal., pl. 67. Exaggerated figure shown in G.C. III. 22:283.

spléndens, Trin. (*Lasiagróstis spléndens*, Kunth). Culms 3–6 ft.: panicles rather dense, about 1 ft. long, nodding; spikelets numerous, small, the glumes less than ¼in., pearly and shining, tinged with purple at the base; lemma ⅜in., villous, the awn ¼–½in. Steppes of W. Asia.

AA. *Awns or pedicels plumose.*

B. *The pedicels plumose.*

elegantíssima, Labill. Fig. 3695. Culms 2–3 ft., erect from a horizontal rhizome: lvs. narrow and erect: panicle very loose, 6–8 in. long, the capillary panicle branches and pedicels plumose; spikelets 4–6 lines long; awn 1¼ in. long. Austral.—Thrives in sandy soil.

BB. *The awns plumose.*

pennàta, Linn. Feather-Grass. Fig. 3696. Culms 2–3 ft., in bunches: glumes narrowed into awns an inch or more long; lemma ½in. or more long; awn about a foot long, the lower portion smooth and twisted, the upper very plumose, giving the panicle a feathery ornamental appearance. Sometimes erroneously called *S. gigantea.* Steppes of Eu. and Siberia. Gn. 9, p. 199. V. 3:247. R.H. 1890, p. 489.

tenacíssima, Linn. Esparto-Grass. Culms 2–3 ft., in bunches: lvs. narrow, smooth, cylindrical, elongated: panicles contracted; awn 1–2 in., plumose below the bend. Spain and N. Afr.—The lvs. furnish fiber from which are made ropes, mats, paper, and the like. In Afr. it is called halfa or alfa. A. S. Hitchcock.

STIZOLÒBIUM (name refers to the stinging pods). *Leguminòsæ.* Velvet Bean. Some of the species are grown as ornamental vines in warm countries, as the growth is very strong, but the genus is valuable mostly for its forage species and therefore does not demand extended treatment here.

These plants are allied to Glycine, which includes the soybean. The lvs. are large and 3-foliolate: fls. in axillary clusters, long or oblong, large, dark purple (sometimes white or yellowish) but turning black when dried, the corolla much longer than the narrow-lobed calyx; the keel long, boat-shaped and usually twice or thrice longer than the obtuse standard and also longer than the wings; stamens diadelphous (9 and 1) the anthers not uniform in kind: pod often hairy, bristly or pubescent, containing pea-like seeds.—Species perhaps a dozen, tropics of Old World. The genus Stizolobium was formerly included under Mucuna, but is now distinguished from that genus (which see, p. 2074, Vol. IV) by its seed and other characters. In Stizolobium the seeds are nearly spherical, or flattened-oval in shape, with the hilum covering often less than one-sixth of its circumference and never more than one-fourth, while in Mucuna the seeds are nearly circular in outline, flattened, and with the hilum extending at least three-fourths of its circumference. In germination Mucuna has alternate scale-like lvs., while Stizolobium has petioled, trifoliate lvs. with cordate lfts. Mucuna is perennial, while Stizolobium is strictly annual. Such species of Stizolobium as are cult. for forage have pods which are nearly smooth, or are covered by a dense velvety pubescence; but there are a number of other species, notably *S. pruriens,* grown in the tropics, in which the pods have a dense covering of bristly stinging hairs, and are known under the common name of "cowage" or "cowitch."

The principal economic use of the velvet beans or stizolobiums is as a winter pasture crop in the southern states. They are commonly planted with corn, the stalks of which give the necessary support, without which they produce few seeds. Some cultivators plant two rows of corn and then one row of the beans, while others plant the beans in alternate hills with the corn; the former method gives more corn to the acre, while the latter yields the heavier crops of beans. The crop is seldom cut for hay, as the vines are too long and tangled to be handled easily, but is left in the field until it is killed by frost, and is then grazed, as the vines, leaves, and seeds may remain on the ground a long time without injury from frost or rain. There are many varieties of this bean, some of which mature in about one hundred days from planting, while others fail to ripen without ten to eleven months free of frost. Some varieties produce profitable crops as far north as Tennessee, while others often fail to mature even in southern Florida. Among the many kinds now cultivated in the United States the best known is the Florida velvet bean (*S. Deeringianum,* Bort). This is of unknown origin, but it has been cultivated as an ornamental vine in Florida many years. About 1890 its value as a forage plant attracted attention,

3697 Stizolobium pruriens, or cowitch. Flower-cluster usually longer and more tapering. (× about ¼)

and thousands of acres are now grown for feeding cattle and hogs. This species makes a wonderful growth, producing vines 60 to 100 feet in length, and bearing clusters of large purple pea-shaped flowers which are followed by pods 2 to 3 inches in length containing four to six nearly spherical seeds. In recent years several sports or varieties have been developed, which mature seed in 110 to 130 days from planting, and are now cultivated largely in the region from Florida northward to northern Georgia and Tennessee. Among the more common of the recently introduced kinds are the Lyon velvet bean (*S. niveum,* Kuntze) which bears racemes fully 3 feet in length with white flowers; the Chinese, which is similar but has shorter racemes and matures much earlier; the Black (*S. capitatum,* Kuntze), which has very long racemes with purple flowers, and late-ripening pods covered with a velvety pubescence; and the Yokohama (*S. Hassjoo,* Piper & Tracy), which matures within three to four months from planting. In addition to these there are numberless crosses and hybrids. As all the species are natives

of tropical or semi-tropical regions they require a long season without frost for their successful cultivation. For botanical and other accounts, see Bulletins Nos. 141 and 179, Bureau of Plant Industry, United States Department of Agriculture; also Belling on inheritance problems in crossing stizolobiums, Report of Florida Experiment Station for 1914.

The varieties mostly grown for ornament are the Lyon, with flowers in racemes often 3 feet in length; the Chinese, which is very similar to the Lyon but has shorter racemes and blooms much earlier; and varieties of *S. chlorospermum*, Piper & Tracy, with flowers light purple. All of these have pods 5 to 6 inches in length, *f*-shaped (the ends curved in opposite directions), somewhat brown- or gray-bristly. The most common species in this country is the Florida Speckled, *S. Deeringianum*, Bort. (Fig. 3697), which has been grown in Florida many years, and has been commonly known as "the vine." This seldom matured much seed north of central Florida, but in recent years several varieties have been developed which mature as far north as Tennessee. The pods of this species are usually less than 3 inches long, and are covered with a black velvety pubescence. All are annual climbers, growing to a great length. The branches are somewhat appressed-hairy, the leaves more or less silky beneath, leaflets ovate, or the lateral ones rhombic-ovate, obtuse but apiculate.

The cow-itch or cowage, *S. pruriens*, Medic. (*Dolichos pruriens*, Linn. *D. multiflorus*, Hort. *Mucuna pruriens*, DC.), is apparently the oldest species known, and has become naturalized in the West Indies, but is not grown in the United States. The pods of this species are red or reddish black in color, nearly straight, and 4 to 5 inches in length. They are very bristly-hairy, the bristles are easily dislodged by a touch and are extremely irritating to the skin, often producing troublesome blisters. In the West Indies a decoction of these hairs is often used as a remedy for intestinal worms. Only varieties with a minimum growth of these stinging hairs are ever cultivated for either ornament or for forage.

3698. Double stock.—Matthiola incana var. annua. (×⅛)

It is an interesting fact that when any two distinct forms, both having relatively smooth pods, are crossed, the first generation always produces forms heavily covered with stinging hairs, although the second generation usually shows a large percentage of nearly smooth pods. This seems a strong indication that *S. pruriens* is the original type of the genus. Cattle have been fed successfully on the meal made of the beans ground in the pod, but persons have been made sick by eating the green cooked beans, and chickens have been killed by both raw and cooked beans. Because of its vigorous growth, the velvet bean promises well as a soil-renovator, as the cowpea does, although it can not be grown so far north as that plant. It is a good ornamental plant, growing 10 to 20 feet high when supplied with support. The handsome globular beans (⅛ to ½ inch diameter.) have marking which suggests the castor bean.

S. M. Tracy.

STOBÆA (named for D. Stobæus, a Swedish patron of Linnæus). *Compósitæ*. Somewhat shrubby plants or herbs commonly with aspect of thistles as to the foliage. Leaves usually decurrent, dentate, pinnatifid or pinnatisect, lobes dentate and spiny: heads small to large, solitary or somewhat corymbose; rays usually yellow.—About 70 species. Now considered to be only a section of the genus *Berkheya*, and so named below.

B. membranifòlia, Hubb. (*Stobæa membranifòlia*, DC.). St. herbaceous, erect, cobwebby above: lvs. thin membranaceous, glabrous above, white-tomentose beneath; radical long-petioled, bordered with slender spines, oblong or elliptical, sinuate; cauline more copiously woolly beneath, more or less sinuous or pinnatifid, decurrent in ciliate-spinose sinuous st.-wings: heads solitary: fls. pale yellow. July, Aug. S. Afr.

B. purpùrea, Benth. & Hook. (*Stobæa purpùrea*, DC.). A half-hardy, probably biennial plant 2–3 ft. high: lower lvs. about 1 ft. long, irregularly lobed, spiny on the margins, cottony beneath, dark green above: st.-lvs. smaller, long-decurrent: fl.-heads 3 in. across, purple to white, resembling a single dahlia. G.C. 1872: 1261.—To be recommended for growing with half-hardy alpines. It can be wintered in a coldframe. Prop. by seed and division.

B. Rádula, Hubb. (*Stobæa Rádula*, Harv.). St. herbaceous, erect, angle-furrowed: radical lvs. obovate-oblong, obtuse, tapering to the base, some somewhat petioled, roughly setose at first then scabrous with hard points above, white-woolly beneath; cauline lvs. small, narrow-oblong or linear, very spiny, decurrent in long, narrow, very spinose st.-wings: infl. racemose-corymbose; heads short-radiate. S. Afr.

F. Tracy Hubbard.

STOCKS. Popular florists' flowers, single and double, white, blush, pink, purple, yellowish, valuable for cut-flowers (Fig. 3698). They are divided into two groups, summer and winter stocks. The former are annuals and therefore bloom the first summer; the latter are biennials and bloom the second year, or, if sown very early, late in the fall or the winter of the first year. Fall or intermediate stocks are between these two groups; they bloom profusely in the autumn. See *Matthiola;* also *Cheiranthus* for the closely related wallflower (also *Wallflower*). Virginian stock is a very different plant and is not a regular florists' flower; it is grown for its small fragrant single fls.; see *Malcomia.*

Florists now frequently grow stocks in benches instead of carrying them through as potted plants. They are in considerable demand for Memorial Day. After the early bedding plants are removed to the frames, the benches are filled with soil and the plants that have been growing in pots since the seed was sown in December are then planted in them. Stocks may also follow chrysanthemums, the seed having been sown in August.

The seed of the summer stocks, or, as they are commonly called, "ten-weeks' stocks," is sown from the end of February until April, mostly in a lukewarm hotbed, which must be sunny and well aired. Good clean garden soil, well mixed with sand and free of manure, is proper soil in which to sow the seed. The seed will germinate in six to ten days, the light-seeded sorts germinating more quickly than the dark-seeded kinds. Air must be admitted as soon as the seeds have sprouted, very much in warm weather and less when the weather is raw, until finally the sash may be entirely removed during the day. If the seedlings need water it should be given in the morning, so that they are dry at night. If

the sun is hot the seedlings must be shaded. If the seed is to be raised from pot-grown plants a good well-manured, sandy garden soil should be used which contains an admixture of well-rotted sod or the soil taken from river-bottoms. The pots are about 6 inches high, with a diameter of 7 inches. When they show their fourth leaf the seedlings are planted firmly into these pots with a dibber, pots being well filled with the above soil; care should be taken that the roots are inserted vertically. From six to eight plants are put into such a pot. These pots are then placed on sunny stages, usually protected by tilt-roofs. The development of the plants depends now principally on careful watering, which is done mostly with watering-pots and at the beginning with a fine spray attached to the spout of the pot. After a crust has formed on the top of the soil, the spray is discontinued and the pots are watered with the pipe of the can. This watering is done at night during warm weather and in the morning when the weather is cold. Very little watering is necessary in continuously cloudy or rainy weather. The watering of the stocks is the most particular and important part in the cultivation in pots, for if due care is not exercised a white maggot will make its appearance while the plants are in bud and destroy the roots. The common flea-beetle is another of the enemies of stocks; this often appears in large numbers and eats the leaves of the young plants. Frequent syringing with water is the only remedy found so far against these pests when they infest stocks.—After the plants have been in bloom for some time the double-flowering specimens are cut out and the watering is continued carefully until the seed-pods which form in the single plants show indications of ripening, which is in October. The plants are then pulled and tied in bundles, which are hung up in dry sheds until the middle or the latter part of November and December, in which time the seed fully matures in the pods. Now comes the most important part of seed-saving of stocks. The bundles of plants are taken down, the roots and part of the stems cut off, and the stalks are taken in hand by expert gardeners who sort them for common seed and also for the seed-stock. The pods indicate by their shape, size, and form whether the seeds contained therein will produce a high percentage of double flowers the following year, and the selection is made with care. The seed that goes on the market can be vastly improved by the removal of "wild" pods, which contain seeds that produce nothing but single flowers. The seeds are removed by hand from the pods, mostly by women and children. CARL CROPP.

STOKÈSIA (Jonathan Stokes, M.D., 1755–1831, English botanist). *Compósitæ*. STOKES' ASTER is one of the choicest and most distinct of American hardy perennial herbs, although little planted.

Heads many-fld.; marginal fls. much larger, deeply 5-cut: involucre subglobose; outer leafy, the inner with foliaceous, pectinately spinulose-ciliate, spreading appendages; receptacle fleshy, flat, and naked: achene 3–4-angled, smooth: pappus of 4–5 thread-like, deciduous scales. The species is a blue-fld. plant about a foot high which at first glance has points in common with China asters, centaureas, and chicory. The heads are 3 or 4 in. across in cult. The marginal row of fls. is composed of about 15 ray-like corollas, which have a very short tube at the base and are much broadened at the apex and cut into 5 long, narrow strips.

The plant is hardy as far north as Rochester, New York, and Boston, Massachusetts. Probably many persons have been deterred from trying it because it is native to South Carolina and Georgia, and because it is considered a greenhouse subject in some standard works on gardening. The fact that it is found wild in wet pine-barrens is also deceptive, for the roots, as Woolson and Keller testify, will decay if water stands on the soil in winter. Moreover, the plant has been praised by Meehan for its drought-resisting qualities. Stokes' aster should be planted in a well-drained sandy loam, not in cold and heavy clay. It blooms from August until hard frost. According to Chapman, the heads of wild specimens are only an inch across, but the size of heads in cultivated plants is stated by many horticultural experts to be 3 to 4 inches across. The heads are

3699 Stokesia lævis. (×⅓)

frequently used for cut-flowers. In the wild the heads are few in a cluster or solitary; in cultivation a good branch sometimes bears as many as nine heads. No double form seems to have appeared but a white-flowered form is now on the market.

lævis, Hill (*S. cyánea*, L'Her.). Fig. 3699. Much-branched, hardy perennial herb, 1–2 ft. high: branches often purplish, sometimes hairy when young: lvs. lanceolate; radical ones entire, tapering at the base into long, flattened stalks; cauline lvs. gradually becoming sessile, the uppermost with a few teeth near the base and half-clasping: fls. blue or purplish blue, 3–4 in. across. Aug.–Oct. S. C., Ga., to La. B.M. 4966. Mn. 5, p. 214. A.G. 25:117. F.E. 16:650. G.M. 49:563. R.H. 1863:211. Var. **álba,** Hort., has white fls. Var. **præcox,** Hort., is a lavender-fld. sort. WILHELM MILLER.

STONECROP: *Sedum*.

STORAGE and refrigeration of fruits and vegetables. The storage house has become a very important adjunct to fruit-growing. In fact, fruit-growing would not be possible in present-day large-scale practice without storage, or some means to preserve the fruit from deterioration. Without some way to hold fruits in sound condition during the time required to transport them from the place of production, the development of the large fruit industries of the West and South would be impossible. The two most important factors underlying the success of modern fruit-growing are the discovery of methods of controlling insects and diseases and the application of refrigeration to the transportation and storage of the crops. The time required to transport fruit crops to the centers of consumption varies from a few hours to ten days, and in some cases two or three weeks are required, especially when the fruit is exported to foreign countries. Under these conditions, the trip to market really becomes a period

of storage and the application of storage principles is as important as transportation principles. The object of refrigeration in the transportation of fruits involves only the holding of the fruit in sound condition long enough to reach the consumer. Storage, on the other hand, includes the holding of the product for a long or short period, thereby lengthening the season of marketing as well as increasing the territory over which it may be distributed. The lengthening of the season of marketing or period during which the product may be sold, is very essential when the production of fruit crops has reached a point greater than can be consumed during the normal season. This is aside from the general advantage of having a product out of season, for which many consumers are willing to pay fancy prices. The conservation of the surplus crops through storage enables the equalization of the selling or marketing season, giving the consumer the advantage of obtaining supplies during a longer period, and giving the producer a chance to market larger crops at profitable prices. The application of storage to the apple industry has resulted in making this fruit an all-the-year-round staple food, as supplies are easily held from one season to the next. The advantages of this to both consumer and producer are manifest. If all the apples produced had to go into consumption during the normal season of this fruit, there would be alternate periods of plenty and scarcity. The same is true, although to a less extent, of other fruit crops, such as pears, grapes, lemons, and oranges. Many of the vegetable crops are likewise held successfully in storage for longer marketing periods than their normal seasons. Potatoes, celery, cabbage, onions, and even lettuce and cauliflower are successfully stored for varying periods.

Storage also finds application in other horticultural industries. The nurserymen are enabled to hold their stocks of trees, plants, cions, or cuttings until the proper season of planting or propagation arrives. Bulbs, lily-of-the-valley crowns, and cut-flowers are also successfully held in cold or cool storage much longer than would otherwise be the case. All of these examples are mentioned to indicate the wide application of storage to horticultural industries.

There are several different methods of conserving or preserving food products. Among these methods may be mentioned curing, drying, salting, smoking, canning, use of chemical preservatives, and by refrigeration. Of these the last method is the only one by which the products are held in their original or "fresh" condition. All other methods involve a change in the character of the product. Cold-storage conservation aims to hold the product in such a condition that it may be used as fresh. If the storage does not accomplish this, it falls short of its principal object.

Two kinds or methods of storage are recognized at present: These are (1) cold storage, and (2) common storage, sometimes known as "dry storage." The objects of these two methods of storage and their accomplishment are the same. "Cold" storage is designated as artificially cooled storage, or the holding of the products in rooms or buildings which are artificially refrigerated, i. e., the cooling is effected by means of machinery or ice. "Common" storage is the term applied to storage without ice or mechanical refrigeration, the cooling effect being obtained from the natural low temperature of the outdoor air. The aim of common storage is "to conserve the natural cold" in buildings which are specially constructed and equipped with proper ventilating devices or openings. It is difficult to determine the exact reason for designating this type of storage as "dry" storage. Both cold and common storage must be dry, excessive moisture in either case being detrimental. A possible explanation of the use of the term "dry" in this connection is the fact that in the first cold-storage houses ice was the refrigerant with necessarily more or less dampness about the plant; while in common storage, no ice is used ordinarily and consequently there is no dampness from this cause.

Contrary to general belief, the use of cold storage is not confined to modern civilization. Frank N. Meyer, Agricultural Explorer for the United States Department of Agriculture, reports the finding of the use of cold-storage methods applied to fruits in remote parts of China, wholly out of touch with modern civilization. Meyer states that the Chinese have practised cold-storage methods for centuries. They are able to hold grapes from one year to the next by storing them in deep cellars which are kept cold with baskets of broken ice placed among the baskets of fruit. He found also that the Chinese fruit merchants keep perishable fruits in large thick-walled earthen jars, in the bottom of which a layer of broken ice is kept and over this, in wicker baskets, the fruit is held. The jar is covered by a wooden felt-covered lid. It is a long step from these ancient Chinese ice-cooled cellars and jars to the modern mechanically refrigerated storage house, but it is certainly of interest to find that the ancients understood the fundamental principles of the conservation of foods through the reduction of their temperature.

There has been much discussion during the past few years regarding the application of storage (cold or refrigerated storage principally) to the conservation of foods. It seems unfortunate that the bulk of this discussion has taken a rather condemnatory stand. The dangers of the use of cold-stored food products have been over-emphasized. The present high cost of living has been at least partly ascribed to the supposed pernicious practice of "cornering" foodstuffs during their normal seasons at low prices, and holding them in storage to be sold at arbitrarily high prices. While there is no doubt that attempts have been made to corner foodstuffs in this way, experience shows that these attempts have been few and almost uniformly disastrous financial failures so far as the promoters were concerned. As will be shown later in this article, the holding of fruits or other foods in storage is rather expensive and not so simple as it seems to be at first sight. Not all products are uniformly suitable for storage and unless the greatest care is exercised both in selecting the product and preparing it for storage, serious losses from deterioration are certain.

Another unfortunate fallacy, that cold-stored products are necessarily inferior as such, has become widely prevalent, due to campaigns in newspapers and magazines with a view mainly of casting odium upon stored products. There can be no doubt that much poor cold-stored food materials have been sold. Deteriorated foods have frequently been foisted upon consumers. The fallacy lies in attributing the deterioration alone to cold storage. Such deterioration can usually be traced to the poor condition of the product at the time it was placed in storage, to improper methods of preparing the product for storage, or to attempts to hold it too long. The application of the low temperature is not detrimental unless the temperature is low enough to injure the product by freezing. No product can be improved through cold storage. If it is in poor condition when it is placed in storage, it will be in much poorer condition when it is withdrawn. If it is in good condition at the time it is stored, it will remain in first-class condition throughout its normal life, provided always that the storage plants or rooms have been properly operated.

Many fallacious arguments have been offered tending to prove that holding in cold storage is itself sufficient to render a given food product unwholesome. While unwholesome cold-stored products have at times been placed on the market, as admitted in the preceding paragraph, the condition of the goods was due to the three causes above enumerated and not alone to the application of refrigeration. The attempts to hold supplies which have deteriorated before they are placed in

storage are frequently responsible for untimely deterioration, and the practice should be discouraged; but so far as fruits and vegetables are concerned, it is perfectly safe to state that no injurious effects have ever followed the use of these cold-stored foods. The evidences of deterioration are plainly visible in fruits and vegetables and there are no hidden germs or ptomaines. No one is likely to be deceived into eating a deteriorated fruit or vegetable.

The agitation against cold-stored food products has resulted in a demand for legal regulation of the storage business. Several states have passed laws prescribing certain conditions which must be met. Attempts have been made to obtain federal regulation, and no doubt federal laws concerning the cold storage of foods will eventually be enacted. The state laws now in effect and the proposed federal legislation place arbitrary limits upon the time the products may be held; provision is also made regarding the marking of the products, and the inspection of the goods from time to time is provided. Legal regulation of this business is desirable and wise, but it is not wise to present arbitrary obstacles to the development of refrigeration. It is questionable whether the adoption of an arbitrary length of time for holding all products is wise or safe. Not only does the length of time vary for different classes of goods, but within the same class the condition of the product at the time it is placed in storage or its treatment previous to storage very materially influences the time the product may be held in wholesome condition. Thus, not all apples of a given variety may be held the same length of time. The length of the period of successful storage will depend upon the condition of the fruit, its stage of maturity, the care with which it has been handled, and also the promptness with which it has been cooled. The same principle holds true for all other fruit and vegetable products. It would seem, therefore, that some provision for the inspection of food products to determine their fitness for storage would be wise and would result in preventing many losses now sustained through the storage of unfit goods. So far, none of the laws passed or proposed makes this provision.

This argument is not offered to defend the cause of cold-storage warehousemen. They have not been entirely free from blame in the past. The possibilities and the advantages of cold storage should be fully appreciated by consumers and producers alike. The necessity for refrigeration in horticultural industries will undoubtedly become more and more urgent, and the use of this important adjunct to modern fruit-growing is bound to extend its scope and receive wider application in the future.

Cold storage is a modern economic necessity. Through this system of food conservation, the extension of markets and the territory over which different commodities may be distributed are very materially increased. In the use of cold storage or refrigeration, the first establishments depended on ice for the refrigerating medium. In the earliest plants natural ice was used. This was gathered or "harvested" during the winter and used during the spring and summer months. There is a very large quantity of natural ice used under modern conditions, but the manufacture of ice is increasing and the use of "artificial" ice is likewise extending, even in districts where natural ice may be obtained without difficulty.

Systems of refrigeration.

In modern cold-storage plants two systems of refrigeration are used: (1) ice refrigeration, and (2) mechanical refrigeration. There are several methods of applying each system. In the use of the first, ice alone may be the refrigerant, or a mixture of ice and salt may be used to obtain lower temperatures than are possible from ice alone. In the application of the ice-and-salt refrigerant, several systems may be used, as will be explained later. The ice used may be manufactured or natural, depending on the relative cost.

In the mechanically refrigerated plant, the refrigeration is secured directly without first producing ice. It is apparent that the direct application of the refrigeration results in a very material saving in both time and energy. In this way, the cumbersome method of first manufacturing the ice and the consequent inconvenience in handling it are avoided.

There are two kinds or styles of cold-storage plants—the general warehouse, provided with cold-storage equipment for handling all classes of commodities; and the storage plant constructed specially for the storage of a particular class of commodities—fruit or dairy products for example. It is evident that the large general warehouse may have a very great advantage in economy of operation. The general warehouse handles a mixed business which often results in a more economical distribution of overhead operating expenses than is possible when the entire burden of expense must be borne by a single commodity or single class of commodities. It is easy to see that the greatest efficiency and economy of operation occur where practically the entire capacity of the plant can be utilized during the year. This is hardly feasible with fruits, with the possible exception of apples which are now held largely during the greater part of the year. But even in the case of apples, there cannot be a full use of the equipment continuously, as the withdrawals will be gradual throughout the season. Nevertheless, the construction and operation of cold-storage plants for apples or other fruits is constantly increasing. These plants may be owned by special corporations or may be built and operated by growers' organizations or by growers who have sufficient acreage to warrant the extra provision of storage facilities. In some instances the ownership or control of cold-storage facilities has rendered fruit-growers independent of buyers' or speculators' manipulations of prices or marketing facilities.

Mechanical refrigeration depends on the compression of a gas or vapor. The compression exerted heats and, in some instances, liquefies the gas. The heat is absorbed by means of cooling water, and when the gas is allowed to expand, an equal number of heat units is absorbed from the surrounding medium. This, briefly, is the general principle upon which depends the operation of refrigeration machines. The gases used may be air, ammonia, sulfur dioxide or carbon dioxide, commonly known as carbonic-acid gas. In the cases of air machines, the air is simply compressed under very heavy pressure and cooled by means of water. There is no liquefaction of the air attempted in the case of these machines. The advantages of the air-compressors are that they are comparatively easy to manipulate and there are no injurious effects in case of leakage from the compressed vapor. These machines are used to a great extent on shipboard, and in England to a much greater extent than in the United States. Improvements in the construction of air-compressing machines are resulting in their increased use. The disadvantage of the air-refrigerating machines is that they are relatively inefficient for low temperatures. There being no liquefaction of the gas, the advantage of the latent heat due to the change of state is absent, and consequently there is a loss of efficiency to the extent of the latent heat necessary, first, to change the gas to the liquid and then back from the liquid to the gaseous state.

In the machines which utilize a liquefiable gas, that is, a gas which may be liquefied at comparatively high temperatures, the latent heat due to the change of state adds greatly to the efficiency of the machines, and consequently, much lower temperatures can be secured for a given amount of power. One of the essential qualities of the gas which may be used for this purpose

is that it must be comparatively inexpensive and must be within the means of utilization by a comparatively simple apparatus. Ammonia, sulfur dioxide, and carbon dioxide are in general use in about the order named. Ammonia is the most common, and is in many respects the easiest to handle. It may be liquefied at a lower pressure and a higher temperature than either carbon dioxide or sulfur dioxide. Carbon dioxide is, therefore, somewhat less efficient to the extent that the high pressure requires more power, there is greater friction to overcome, and colder water is needed for condensation. These conditions are not always obtainable within ordinary means. Carbon dioxide has the advantage of being a non-irritating and non-poisonous gas. If leaks occur in the system, there is no great danger of serious injury either to the operators of the machinery or to the goods stored in the rooms. If leaks occur in the ammonia system or in the sulfur dioxide machines, there is very great danger of injury to the workmen about the plant and the food commodities exposed to these gases may be very seriously injured, even with a slight leakage. Nevertheless, the greater ease with which the ammonia machines can be manipulated is considered a sufficient advantage, and this type of machine is much the commonest now in use.

The system of operation of the refrigerating plant is comparatively simple although rather complicated machinery is required. It is not essential that the fruit-grower who contemplates the erection of a refrigerating plant be conversant with all of the complicated details. It is well, however, that he understand the principles upon which the machines are designed. For the erection and planning of a complete storage plant depending on refrigerating machinery, the services of a competent refrigeration engineer are essential. While it may be possible for a mechanically inclined fruit-grower to design and have erected a complete refrigerating plant, it must not be forgotten that slight errors in the calculation of the power required and the capacity of the machinery necessary to yield given results will frequently render the operation of the plant very much more expensive than need be, or the efficiency of the plant may be very seriously impaired. Refrigerating machinery is, of necessity, expensive; it is likewise delicate in many respects.

There are many styles and designs of refrigerating machines. All, however, are dependent upon the same general principles. There is, first of all, the motive power which may be either the gasoline or electric motor, or the steam engine, which furnishes the power to operate the compressor. The compressor exerts pressure on the gas, heating it to a rather high temperature. If the machine is operating with ammonia gas, the compression results in a dense hot vapor. From the compressor, this hot vapor passes to the condenser, which is a system of pipes arranged in such a way that streams of cooling water may be passed continuously around the pipes containing the hot gas. The absorption of the heat from the dense vapor condenses it into liquid ammonia. This liquid is ordinarily run into a receiver or reservoir, where it is kept for use as needed. From the receiver, the liquid ammonia is forced into what is known as expansion coils. These coils consist of series of pipes into which the liquid ammonia is allowed to enter. The liquid boils at a low temperature and changes from the liquid to the gaseous state, and in changing its state and expanding absorbs considerable heat from the surrounding medium; in this way the refrigeration is obtained. After expansion, the ammonia gas is passed back to the compressor where it is again compressed and afterwards liquefied, the same gas being used over and over again.

Instead of the compressor, the same effect can be obtained from what is known as the absorption system. This is a combination of a chemical and mechanical process. No compressor is used. Dense aqua-ammonia, which is simply a strong solution of ammonia gas in water, is heated in a reservoir, and as the ammonia escapes from the solution, it is under heavy pressure and becomes a dense vapor. From this tank the gas is passed through condensing coils and liquefied, just as is done in the compression system. After liquefaction, it is allowed to expand in coils and the gas is then returned to a tank or a series of tanks known as absorbers. These absorbers contain cool water which readily absorbs or dissolves the ammonia gas. From the absorber, the solution is pumped into the heating tank, again heated, and the process repeated.

When one contemplates the installation of refrigerating machinery, one of the most important factors to consider is the supply of water needed for condensing. This is ordinarily of very much greater importance than is appreciated. Large quantities of water are needed unless the temperature of the water is very low. The higher the temperature of the water-supply, the larger the quantity needed. The same water may be used continuously if there is some means at hand to cool it after it has served to absorb the heat from the condensing ammonia. In large refrigerating plants this is taken care of by means of large racks or towers located in some exposed place. In these towers, the water is run through screens which break it into many fine streams, thus increasing the evaporation and cooling the water by the absorption of its heat. Unless some means is at hand to cool the water, a constant supply must be provided; otherwise, the efficiency of the machinery will be very greatly reduced. This point is of the utmost importance when refrigerating plants are to be located in fruit-growing districts. In fact, the practicability of operating the refrigerating plant successfully depends primarily on the presence of a sufficient supply of water for condensation.

Ice systems.

Refrigeration may be obtained from the use of ice alone. In this instance, however, only cool-storage effects can be obtained, except in winter and in climates where the outdoor temperature is low enough to offset the lack of refrigerating effects from the ice. The minimum temperature obtainable from ice is its melting point, which is just above 32° F. or, under the very best conditions, about 33° or 34°. Generally, ice-cooled chambers cannot be maintained below a temperature of 38° or 40° and these temperatures are obtainable only under the most favorable conditions. To obtain a low temperature from ice, the addition of salt is necessary. The mixing of salt with the ice lowers the melting-point and, consequently, the temperature is lowered, although the rapidity with which the ice is consumed is very greatly increased. When the mixture of ice and salt is used, the quantity of ice necessary for storage is much greater. A lower temperature is necessary to hold the storage chambers at 32° F. because of the heat leakage into the chambers through the walls.

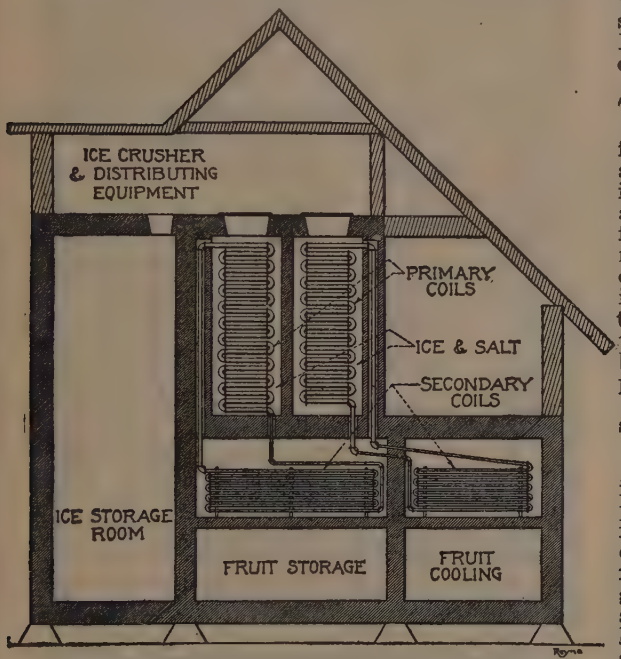
There are two methods of obtaining refrigeration from ice and salt. One of these is the indirect method, known as the gravity-brine system, and the other is the direct circulation of air through the ice and salt mixture.

The gravity-brine system, the invention of Madison Cooper, acts as the reverse of a hot-water heating system. It depends on the principle of the greater density of a cold liquid, and its consequent downward flow when confined in a system of pipes. The system consists, first of all, of coils of pipes filled with a strong solution of calcium chloride brine. One end of the pipe system is contained in a tank which holds ice and salt. The cooling effect of the ice and salt results in greatly reducing the temperature and increasing the density of the brine. From these "primary" coils the brine is conducted into what is known as secondary coils which are placed in the rooms or chambers to be cooled.

The cold brine passes through the secondary coils, and, as it absorbs the heat from the rooms or chambers, its density is decreased and it flows upward and is returned to the top or primary coils, where it is cooled and the process repeated. Fig. 3700 is a diagram illustrating the principle upon which the Cooper gravity-brine system depends. At the top of the illustration the primary coils are shown and the methods of placing the pipe systems or coils is indicated.

The cooling effects secured from the Cooper brine system are indirect in that the refrigeration obtained from the ice-and-salt mixture is first exerted upon the brine solution and this solution is the means of carrying the refrigeration to the place where it is needed. There is an inevitable loss in the indirect method because of the loss of refrigeration in the conducting pipes.

In the second system of securing refrigeration from ice and salt, the air is passed directly through the mixture and, consequently, the refrigerating effect is obtained directly from the mixture. Experiments



3700. Diagram of Cooper gravity-brine system.

have shown that very low temperatures can be obtained by passing a current of air through an ice-and-salt mixture, the temperature depending on the proportion of salt used in the mixture. The higher the percentage of salt the lower the temperature obtainable. The device for obtaining refrigeration in this way is simple. It consists of a tank for holding the crushed ice and salt. At the bottom of this tank openings are provided through which a current of air can be forced. The particular working out of the design for obtaining refrigeration in this way has been accomplished by S. J. Dennis, of the United States Department of Agriculture. Dennis' apparatus has been used successfully in several plants on the Pacific coast, and owing to the fact that it was developed as a part of the Departmental investigations, its use by the citizens of the country is free. It is essentially an ice-and-salt tank of "magazine" type. As the ice is melted at the bottom the supply from above drops down. From 7 to 10 per cent salt has been found to yield satisfactory temperatures. The apparatus can be constructed by almost any ordinary mechanic who can follow detailed drawings or instructions. A fan is used to draw the air through the ice-and-salt mixture and to force the refrigerated air into the storage chambers. Ducts are provided for the return of the air, and in this way the same air is used continuously.

There is another method of securing refrigeration from ice and salt which may be designated as the "tube system." In this system the mixture of ice and salt is contained in tubes located at the sides of the room. The tubes are filled with the mixture from the top and the refrigeration is obtained by the cooling of the air in contact with the tubes. The number of tubes necessary to cool a given quantity of goods depends upon the character, size, and insulation of the room. The tubes are constructed of galvanized iron and are about 8 or 10 inches in diameter. The tops of the tubes open above the storage room, so that the filling can be done without opening the room itself. A proper arrangement of pipes at the bottom to carry off the meltage is necessary, and in arranging for this meltage outlet, a proper trap must be provided in order to prevent the wastage of the cold air. This system has found considerable application in the Hudson River Valley of New York state, and is very effective for a short season of storage.

Systems of applying refrigeration.

Refrigeration may be defined as the cold obtained from a refrigerating medium or directly from mechanical appliances. The temperature-reducing properties of the ice-and-salt mixture and those of the liquid ammonia are the refrigerating qualities of these agencies. Refrigeration is ordinarily measured in terms of ice-melting capacity in a day of twenty-four hours. For example, a machine which is rated as yielding a capacity of ten tons a day is based upon the meltage of ten tons of ice in that time. Ordinarily, it is not the quantity of ice which can actually be produced by the machine, except when ice manufacture is the primary object.

There are three systems of applying the refrigeration secured by mechanical means: (*a*) direct expansion; (*b*) brine circulation; (*c*) air circulation.

In the direct-expansion system, the expansion pipes in which the gas is allowed to expand, and thereby produce the refrigeration, are located in the storage rooms. The claims for this system are that the work is direct; therefore there is no loss in conducting the refrigeration obtained from the pipe surface. The greatest objection to this system, especially with ammonia or sulfur dioxide plants, is the danger of leaks. Small leaks may allow a sufficient quantity of gas to escape to damage the goods stored in the rooms; there is also great danger to the workmen, which has already been referred to. The greatest care is necessary in constructing the direct-expansion system. With the perfection of mechanical devices for welding and fastening pipes, the danger from leaks has been reduced to a minimum, and there are many direct-expansion systems in operation in which no injuries have ever been recorded. One disadvantage is the fact that there is no reserve power except that which is contained in the liquid receivers. Should it be necessary to shut down the machinery for repairs for any considerable length of time, there would not be sufficient reserve to continue the refrigerating effects and the temperature of the storage rooms would be likely to rise to a considerable extent.

In the brine-circulation system, the expansion coils are surrounded by a non-congealable brine such as a solution of calcium chloride, which has a very low freezing-point. The brine is cooled in the pipes and this cold brine is circulated through coils in the rooms by means of pumps. In applying this method, there is, first, what is known as a brine-cooler in which the actual cooling of the brine takes place; the cold brine is then

collected in a brine tank of sufficient capacity to operate the plant for a considerable length of time. This really acts as a reservoir of cold, and from this reservoir the cold brine is circulated throughout the entire cold-storage plant, the temperature and quantity of the brine circulated being governed by the results desired.

The coils of pipes in the rooms are commonly referred to as the "piping." These coils or racks of pipes are the room's equipment for refrigeration, and the number of coils or length of piping depends upon the size of the room and the temperature desired. Low-temperature rooms or freezers have a large number of coils and a great length of pipes. Pre-cooling rooms should also have heavy piping and many pipes. The advantages of the brine-circulation system are that there is no danger from leakage of ammonia or other irritating gas. The statement is also made that there is a more uniform temperature, the flow of the brine being under constant and easy control. The temperature of the brine is also under definite control. Perhaps the greatest advantage is that the supply of cold brine acts as a reservoir of refrigeration and a reserve supply can be drawn upon in case of necessary shutting down of the machinery.

In placing the pipes in cold-storage chambers, it is important to have them located at the upper part of the room. Ordinarily, the dependence for the circulation of refrigeration throughout the room is on the natural circulation of the air within the room. The air in contact with the pipes is cooled and, being rendered more dense, flows to the floor, the warmer air from other parts of the room taking its place. In this way, a constant circulation throughout the room is maintained. It is easy to see, therefore, that the placing of the pipes in the upper part of the rooms is essential; otherwise, there is danger that the parts of the room above the pipes may be beyond the refrigerating effects. The air is, therefore, the medium of applying the refrigeration. It is due to convection currents that the transfer from the refrigerating pipes is effected, and it is very difficult to obtain a uniform cooling in all parts of the room unless the pipes are carefully placed.

In the air-circulation system of applying refrigeration, there is a forced air circulation. The air is forced through conduits or ducts by means of fans. In this system the expansion coils of pipes are in groups or batteries in what are known as bunker rooms, or more correctly, coil rooms. The refrigerating capacity of the plant is, therefore, concentrated in one place. In arranging the coil pipes, baffles are placed in such a way that the air passing through the coil rooms must come in contact with all of the pipes. If all of the pipe surfaces are not reached by the air, the full refrigerating effect of the plant is not obtained. The coils may be direct-expansion coils or brine-circulating coils, that is, have the brine circulating through them. The Cooper gravity-brine system may also be used. For this purpose, the secondary coils are located in coil rooms where the air to be cooled can be forced through.

In placing the fans for such a plant, the arrangement must be such that the air is drawn from the coil room and forced through ducts to the storage chambers. With this arrangement there is a constant pressure in the rooms which is preferable to the exhaustion of the air. Any leakage which occurs, therefore, is outward from the room instead of inward. Return ducts are provided which conduct the air back to the coil rooms, the same air being used continuously. Impurities from the storage rooms are absorbed by the air and deposited in the moisture which freezes on the cold pipes. The impurities, therefore, are very largely absorbed by the frost, and the circulation of the current of air through the coil rooms acts largely as a purifier of the air of the storage rooms. Some ventilation, however, is frequently desirable. The problem of ventilating a cold-storage chamber is a difficult one and special appliances must be provided for this purpose. The outer air cannot be admitted directly into the storage chamber unless it is at the same temperature as the air of the storage room. In warm weather, therefore, the admitted air must be cooled and in extremely cold weather it must be warmed. There are special mechanical devices for accomplishing both of these purposes.

Shape of storage plants.

Many storage plants are planned without consideration of the factor of the most economic shape; that is, the most efficient as well as the most economical size of plant to be constructed. The first consideration is that the plant should be planned to supply the required floor space and cubical capacity. In figuring the size of storage rooms to accommodate packages of fruits, the size of the fruit packages must be taken into consideration and enough space must be made to allow the air to circulate between the stacks or bales of packages. A barrel of apples, for example, requires 8 to 10 cubic feet. Another factor which must be considered is the economical handling of the packages in the storage rooms. Where the storage season is comparatively short, the extra expense of piling in high stacks must be considered. Where, however, the storage season is to be long, higher stacks may be made and, consequently, rooms of greater height will be most economical. After the size and the cubical contents of the chamber are determined, the next consideration is the shape of the plant or room.

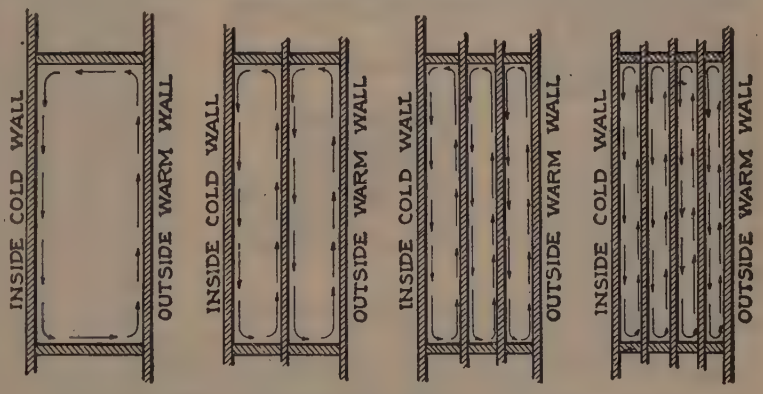
The most economical shape for a storage plant is the cube. This is due to the fact that the ratio between cubical contents and exposed outside surface is smaller for the cube than for any other shape. It is important to take this into consideration because of the fact that there is no perfect insulating material and, consequently, when the ratio of exposed outside surface is very high, the rate of heat leakage into the room is increased considerably when the shape of the room differs materially from the cube. Such a room must have either much heavier insulation or considerably more power must be supplied to offset the greater heat leakage. Sometimes limitations of space, as for example, utilizing parts of buildings, require that the rooms be of odd shapes. When this is necessary, it will require considerably more insulation or power, as suggested. The capacity of the plant must be determined by the nature of the commodity to be stored. Large rooms are easier to maintain at a desired temperature after the entire load of the room is reduced to the required temperature. In large rooms, however, it is more difficult to cool uniformly unless some special attention is given to the placing of the pipes, or the duct openings where forced air circulation is used. For periods of short storage, such, for example, as the more perishable fruits like berries, rooms of smaller capacity are more desirable than very large rooms.

Insulation.

There are three ways in which heat may be transferred: radiation, conduction, and convection. Radiation is the transference of heat from one body to another through a third medium without perceptibly affecting the medium. The heat which one feels when standing before a fire is radiant heat. The conduction of heat is accomplished by the passing of heat from one body to another by contact with the heated body. The heat that one feels when the hand is placed on a warm pipe is conducted heat. Heat is transferred by convection by means of a third medium, usually air. In attempting the construction of storage houses, all three methods of heat transference must be taken into consideration. The heat actually radiated is comparatively small in storage buildings. The quantity of heat transferred by conduction is greater, but the most

important problem of heat transference is through convection currents. In order to offset this heat transference, specially constructed walls must be provided. A storage chamber is a room so constructed that the temperature may be maintained at or near a constant point. In order to offset changes of temperature, sufficient refrigerating capacity must be provided, or some means to prevent the actual transmission of the heat from the outside to the inside of the room. The latter provision is known as the insulation of storage rooms. Therefore, the rooms are constructed in such a way that the walls act as barriers against the transmission of outside heat into the room, or the loss of heat of the storage room to the outside in extremely cold weather. The best insulation against heat transmission is a vacuum. If it were possible to surround storage rooms with vacuum walls, the heat leakage into the room would be very slight, and after the rooms were once cooled to the desired point, it would not require machinery of great capacity to maintain a low temperature. It has been found difficult, however, to maintain a vacuum under ordinary circumstances. The outer air pressure is constant and leakage of air into the vacuum walls, although slight, gradually destroys the insulating effect. Attempts at vacuum construction on a large scale have not been successful.

Air spaces, that is, walls made air-tight so that the air is closely confined, have been thought to be efficient insulation. Still air is a necessity where this method of insulating the wall is used. A slight leakage into the wall is sufficient to allow outer air to enter and, consequently, to destroy the insulating effects. In walls constructed of free air spaces, convection currents occur within the spaces, which act as effective transferers of heat either inward or outward, as the case may be. Fig. 3701 shows the action of convection currents within air spaces. When one air space is used, the transfer of the heat is very easily accomplished, as shown by the direction of the air currents—shown by the arrows in the diagram. Simply thickening the walls, therefore, does not act as a sufficient insulation. The insulating effect of air spaces is considerably improved by breaking up the walls into smaller air spaces. The diagram shows the convection currents occurring in walls of one, two, three, or four air spaces. As the number of spaces is increased, the effect of convection is very greatly reduced, so that a wall consisting of four air-tight spaces may be considered as fairly efficiently insulated. It is, however, extremely expensive to construct these air-tight divisions, and some other means of insulation is desirable.



3701. Diagrams illustrating convection currents in walls consisting of one to four dead-air spaces.

It is preferable to use some material to fill the walls. Such a filler breaks up the air spaces within the walls and confines the air in the small interstices between the particles. In this way, the air held within the wall approaches more nearly the desirable "dead-air" condition. Convection currents actually occur in filled walls, but they are very sluggish and the effect is very slight. Filled walls are effective barriers against heat conduction or radiation, provided, of course, that poor conductors of heat are used.

The most effective insulating material is a substance of low-heat conductivity which has many pores or cells. These cells are filled with air (practically still air); consequently the efficiency of the heat barrier is increased. A number of substances are effective as insulation for storage walls. The requirements for an insulating material, besides non-conductivity of heat, are as follows:

1. Odorless; any strong odor would affect the goods stored in the rooms.

2. Moisture-proof or low capacity for moisture; dampness decreases the efficiency as an insulating material, and some substances ferment or rot when damp.

3. Vermin-proof; there should be no inducement for rats or mice to nest in the walls.

4. Non-liability to inherent disintegration or spontaneous combustion.

5. Lightness in weight; not only on account of the reduction of the actual weight of the walls, but because light materials are usually the best non-conductors of heat.

6. Elasticity; when packed firmly in the walls the material should not settle, as any settling within the walls results in open spaces in the insulation. After the walls are once constructed, these inequalities cannot be reached for repairs without completely rebuilding the walls.

7. Relative cheapness and economical handling; the material should not be so high in cost as to be prohibitive. In addition, the material must not be of such a nature that its economical handling is impracticable.

8. Must allow of practical application in general work; very specialized material which would not lend itself to general conditions could not be considered as efficient insulating material.

The list of materials available for insulation may be divided into two classes: Those that can be considered as commercial insulation—that is, materials which are manufactured especially for insulating purposes; and common or waste materials.

Among the most common of the first class are the following: granulated cork, cork sheets or boards or bricks, hairfelt, linofelt, mineral wool, and lith.

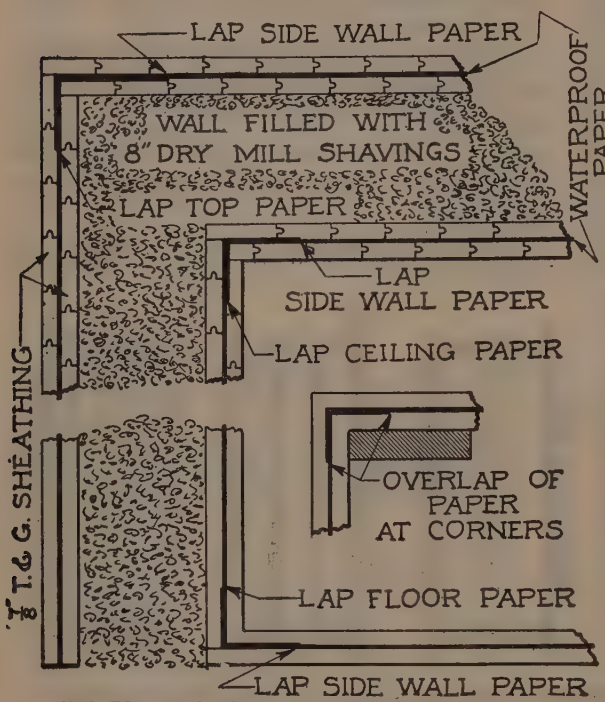
Granulated cork is considered to be one of the best and most effective insulating materials. It is prepared from the trimmings of cork mills, and when used in the granulated state is simply filled into the walls and packed tightly. Cork sheets, bricks, or boards are manufactured of the cork particles which are compressed in molds at a high temperature. There is no cementing material used, the heat and pressure being sufficient to liquefy the natural gums and resins of the cork and these hold the particles together. Cork boards or sheets are also made by the addition of asphaltum pitch which renders the particles water-proof but may decrease the insulating efficiency.

Hairfelt is manufactured of waste cattle hair which is washed and deodorized. It is pressed or felted together by special machinery into sheets from ¼ to 1 inch in thickness.

Linofelt is a patented material manufactured fr—

flax fibers. It is prepared in sheets or quilts, from ¼ to ½ inch thick, somewhat like cotton-batting. These sheets are ordinarily quilted between water-proof paper. This material is used largely for insulating household refrigerators and refrigerator cars.

Mineral wool is also known as rock-wool, rock-cotton, rock-cork, or silicate cotton. This material is usually made from the slag of blast furnaces with the addition of limestone. Rock-wool is usually made from a mixture of granite particles and limestone. The crushed rock is mixed with coke and fused in furnaces at a temperature of about 3,000° F.; the molten slag or rock is run out through the bottom of the furnace by a high-pressure steam blast. This blows the slag into very fine shreds or fibers, much resembling fleece or wool. The result is a material which contains from 92 to 96 per cent air spaces and, although consisting primarily of a substance of high-heat conductivity, is fairly efficient as insulation. It is practically vermin-proof, fire-proof, and not liable to decay. It absorbs moisture very easily, and one of the greatest disadvantages is the difficulty of handling. The fibers are very penetrating and are glass-like, which result in considerable inconvenience in handling the material.



3702. Diagram showing proper construction of wall insulated with mill shavings.

Lith is a manufactured insulation composed of flax fibers, lime rock-wool, and water-proofing compound. It is prepared in boards of standard sizes and thicknesses and is accepted as a standard insulation by refrigerating engineers. It is a very efficient insulating material.

Common forms of insulating material which are usually at hand or can be easily obtained for the construction of storage buildings are: straw, chaff, hay, dry grass, dry leaves, hulls of various grains, sawdust, and mill shavings.

All except sawdust and mill shavings can be considered as suitable only for temporary structures. These materials are all fairly efficient as non-conductors of heat provided they are dry and means are used to keep them in a dry condition after being built into the walls. There is also some danger from the depredations of rats, and the greatest possible care must be used to prevent these rodents from gaining entrance. Sawdust from different woods has about the same insulating effect. The sawdust must be thoroughly dried, otherwise its efficiency as insulation is very greatly impaired and, in addition, there is danger of fermentation and heating, and even spontaneous combustion. It is more difficult to obtain dry sawdust than mill shavings, and whenever sawdust is used it should be very carefully dried before being placed in the walls. It has not as great elasticity as mill shavings and, consequently, is likely to settle after packing unless very carefully pressed into place.

Mill shavings consist of small chips and shavings from planing mills. This material has largely replaced sawdust for insulating purposes and is much more effective. It is obtained easily in a dry condition, owing to the fact that the mills of this kind usually work dry lumber. It is much more elastic than sawdust and does not pack or settle down. If thoroughly dry, and means are taken to keep it so, it is a very efficient insulating material and will remain in good condition for many years. It should be packed in the walls at the rate of eight or nine pounds to a cubic foot.

Whenever walls are filled with insulating material in loose condition, much will depend upon the method of constructing the walls. Not only is it necessary to use the lumber and insulating material in a dry condition, but unless the walls are properly built, the insulation will not remain dry any great length of time. Walls that are not practically air-tight allow the outside air to gain entrance and to mix with particles of insulating material; condensation of moisture takes place, and the insulating efficiency of the material is seriously impaired. The conditions for the condensation of moisture upon the insulation particles are ideal unless special means are used to prevent it. Contact with the inside walls lowers the temperature of the insulation to such an extent that when the warmer air from outside comes into contact with it, the moisture is deposited and absorbed. Therefore, it is necessary to build the walls in such a way that they will be practically air-tight. This is accomplished by having layers of elastic water-proof paper on the outside and inside of the walls. The proper method of constructing such walls is shown in Fig. 3702. The wall consists of two layers of matched boards on each side, between which the water-proof paper is placed. The figure also shows the proper method of overlapping the paper at the corners. It is very essential that these details be attended to; it is also necessary to prevent the tearing or breaking of the paper when placing it, and for this reason only elastic paper should be used. The more brittle forms of paper are so easily broken that it is almost impossible to place them without seriously injuring them. Any breaks at the corners or tears in the paper will allow considerable air leakage into the walls and very seriously impair their efficiency. This is probably one of the most important details in the construction of storage houses, both for cold-storage and for common-storage purposes. Too great stress, therefore, cannot be placed on this point.

Storage temperatures; humidity.

The general principles governing the application of low temperatures to the preservation of fruit products depend primarily on the fact that temperature is the most important factor governing the life activities of these products. A fruit or vegetable is a living organism in which the functions or life processes are continually proceeding as long as the body remains in a normal condition. The various processes of ripening depend upon the chemical and physiological changes within the

organism. Contrary to common belief, the life processes do not cease when the fruit is removed from the parent plant. These processes continue until the life cycle of the organism is completed. The fruit organisms respire and transpire just as plants do and the measurement of the end products of these respiration and transpiration processes serves as an index of the rate at which the life activities are proceeding. Definite measurements on a large scale show that the temperature factor is the most important from the standpoint of the rate at which the life activities proceed. Each fruit organism has a definite life span or life cycle, and it is easy to see that if in any way these activities can be retarded, the life span can be lengthened. The reduction of the temperature of the organism materially reduces the life processes, and the rates at which these activities proceed is slackened to such an extent that the definite life functions of the organism may continue slowly during a long period. The retardation of the life activities through the reduction of the temperature thus induces a slowness of the rate and a consequent increase of the length of the life span. This is the essential physiological principle upon which the cold storage and common storage of fruits depend.

The most satisfactory temperature for storage purposes is one which is low enough to reduce the life activities to a minimum but not sufficiently low to stop them entirely. It is important to remember that a complete stoppage of the life functions of a fruit organism means the death of it, and when this occurs, the fruit soon thereafter becomes unfit for food.

Much careful investigation remains to determine the most satisfactory temperatures for various fruit products. Many factors are involved. One of the most important of these is the condition of the product when it is placed in storage. Fruits of the same kind and even of the same variety may have different storage qualities and require different storage treatments, depending upon the place where the fruit is grown or its previous handling. Until these factors are all known and controlled, it is unsafe to say that any particular temperature is exactly correct for all fruits. For this reason, it is difficult to limit storage periods by law, because no arbitrary limit can be satisfactory for all fruits. It would not be safe, for example, to state that apples should not be kept longer than a certain length of time. The same is true of pears, but with this fruit the conditions are even more extreme. Different varieties of apples and pears may be held in storage different lengths of time, and all warehousemen know by experience that the same varieties of fruits produced in different districts or in different seasons have different storage qualities.

The proper storage temperature for a fruit should be the lowest possible—that is, the lowest temperature at which the fruit can be held without actual injury. This is due to the fact that when other conditions are satisfactory, the lower it is possible to hold a given product the longer it will remain in good condition. This means, then, that the freezing point of the fruit can be safely approached under ordinary conditions. There are, naturally, some important exceptions to this general rule.

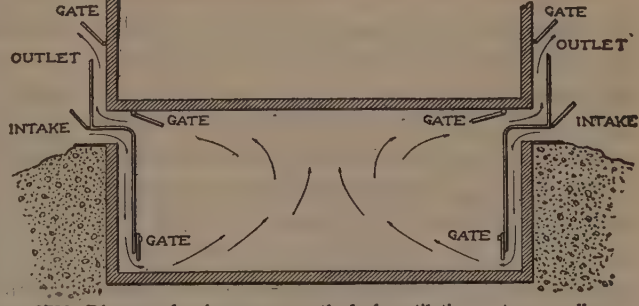
As has been indicated above, different fruits have different rates of life activities, and the more perishable fruits are those that have the most rapid rate. For example, perishable fruits like berries, peaches, and some varieties of grapes have very rapid life activities, while the less perishable fruits such as apples, pears, and the citrous fruits have a very low rate of life activities. This condition affects the storage period of a given fruit even under the most satisfactory condition. It is a well-known fact that the more perishable soft fruits cannot be held in storage for any great length of time. The naturally short life can be lengthened considerably but not to the same extent that the life span of the hardier fruits can be lengthened.

Berries of various kinds, cherries and cranberries, may be hard frozen and held in such condition for several months when the product is intended for use in making sauce or pies. When the hard-frozen fruits are removed from storage they must be used immediately, as they soon become soft and break down physiologically.

The most desirable cold-storage temperature for a fruit, according to present knowledge of the subject, is 32° F. for apples, pears, peaches, plums, strawberries, raspberries, loganberries, blackberries (short time), cherries, grapes, mangoes, celery, lettuce (short time). An apparent exception is in the case of apples from the middle coast section of California. The apples produced in this section require a somewhat higher storage temperature, due to the fact that a peculiar discoloration of the flesh develops when this fruit is held at the standard 32° temperature. This fruit is more safely held at about 35°. The varieties which are affected by this trouble are principally Yellow Newtown, Missouri Pippin, and, to a less extent, Yellow Bellflower. This apparent storage weakness seems to be confined to the mid-coastal district; apples from the mountains and other districts of the Pacific coast seem to possess normal storage qualities.

For potatoes, 35° to 40° F., for citrous fruits, 45° to 50° F., are the most satisfactory temperatures. Citrous fruits seem to be an exception to the general rule that fruits of low life activities can be held at temperatures near their freezing-point. Investigations show that temperatures below 45° F. are injurious to citrous fruits, except for a very short period. The low temperature seems to affect the skin of the fruit, inducing the deterioration by scald or stains and the development of various fungous diseases. At a temperature of 45° to 50°, or a common-storage temperature of 50° to 60°, citrous fruits may be held for several months without serious deterioration, provided means are taken to prevent shriveling. Lemons are sometimes held from four to six months at common-storage temperatures without serious deterioration, when humidity conditions are carefully attended to.

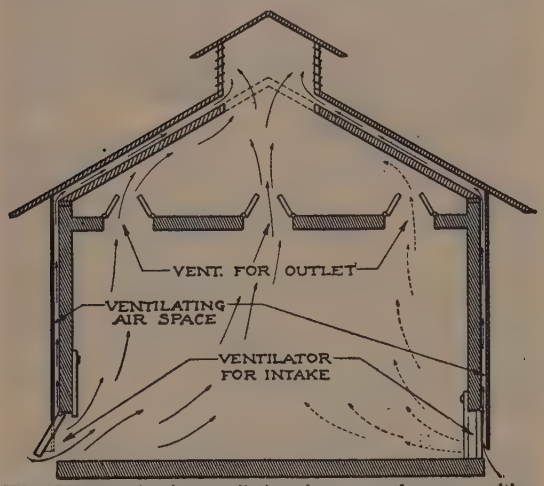
The proper humidity of the air of storage rooms is an important factor. Very little investigation of this important problem has been undertaken and, consequently, the fundamental factors governing the general principles of humidity conditions in storage rooms have not been definitely determined. Much shriveling of fruits in cold storage has been due largely to excessive evaporation on account of the free transpiration activities of the fruits. Transpiration, or the giving-off of moisture, occurs freely at high temperatures, less freely at low temperatures. The moisture, however, is being constantly given off even at low temperatures



3703. Diagram showing proper method of ventilating a storage cellar.

and when the air of the storage rooms becomes excessively dry, the fruit may become seriously wilted by excessive evaporation. The reduction of the temperature of the air reduces its water-holding capacity; consequently, as the air temperature is reduced to the freezing-point or below, all the excess moisture is removed and the air becomes saturated with water vapor for the temperature at which it is held. The total volume of water vapor is thereby greatly reduced. When the temperature of the air rises without the addition of moisture, its capacity for absorbing moisture from the fruit increases and, consequently, the drying effects due to refrigeration may be seriously overdone. The most satisfactory humidity condition in the storage room has never been correctly determined. Experience shows that the humidity condition should be as high as possible to prevent shrinkage from evaporation, but without danger from excessive moisture, which may induce the growth of mold.

Excessive wilting of fruits in storage is not always due to evaporation. Fruits which are picked in an immature condition wilt and shrivel seriously under the most satisfactory storage conditions.



3704. Diagram showing ventilating air space and proper positions of ventilators in a common fruit storage house.

From what has been said, it will be seen that humidity conditions in artificially refrigerated chambers very largely take care of themselves, due to the ameliorating effects of the refrigeration of the air. The control of the conditions becomes more important at high storage temperatures, e. g., it is very important in the storing of citrous fruits without artificial refrigeration. Under these conditions the humidity of the storage rooms or cellars must be held relatively high, because the higher temperature has a decided effect upon the life activities of the fruits, and a correspondingly high humidity is, therefore, essential. The fruit must be very carefully watched; otherwise, mold will occur when humidity conditions are too high. A relative humidity of about 80 to 85 per cent at a temperature of 50° F. has been found to be most satisfactory under the conditions which exist in California lemon-storage houses. It would not be safe to say that this humidity percentage is exactly correct, because the complexity of accurately measuring humidity conditions under different temperature conditions renders the problem very difficult.

Common storage.

The difference between common storage and cold storage has been explained (page 3246). The principal difference is that with cold storage, artificial refrigeration is used while in common storage there is no artificial refrigeration. Common storage is sometimes referred to as "dry storage," inferring that cold storage must necessarily be wet. This assumption is incorrect; cold storage is not in any way connected with moisture nor is it more likely to produce moisture in storage rooms, provided they are carefully conducted, than is common storage. Any excess of moisture in the cold-storage room means some defect in the construction of the plant or in its operation. It has been said that cold-stored fruits are more moist when withdrawn from storage than common-stored fruits. Here again, the difference is due to the difference in the temperature. The cold fruit from the artificially cooled storage chamber, coming in contact with the warm moist air, will condense moisture on its surface. Fruits from the ordinary storage rooms may not be cold enough to condense moisture; hence, the assumption that the cold-stored fruit is more moist than that from common storage.

Common storage is not practicable for all fruits. The very active or highly perishable fruits cannot be held satisfactorily under common-storage conditions because there are no ready means at hand to cool them to the desired temperatures. Citrous fruits are eminently adapted for common storage. The curing of lemons is really a process of common storage. Winter varieties of apples and pears are also suitable for common storage. This method of storage is used to a considerable extent in New York and is coming into wide use in the Pacific Northwest. In the operation of common-storage rooms, dependence is placed on the ventilation for the cooling. There is a vast difference between ventilation due to the actual change of air by the opening of windows or flues into the room and the circulation of air. Ventilation means the admission of outer air, and circulation may refer merely to the movement of the air within the room or plant, the same air being used over and over again. This distinction is necessary because frequently the circulation of the air within the room is designated as ventilation.

In the operation of common-storage rooms, the rooms are ventilated, or outside air is admitted, when its temperature is low enough to cool the fruit. The ventilators are closed during the day and during warm periods, thus conserving to a certain extent the low temperature obtained through the low-temperature outside air. It is essential, therefore, that there be cold nights or cold weather; otherwise, common-storage plants become mere cool-storage chambers, and the storage season is considerably shortened, due to the fact that the relatively high temperatures result in a high rate of life activities in the stored products. When the temperature of the common-storage room can be maintained somewhere near 32° early in the season there is no apparent reason why the storage period should not be extended to almost the same length of time that can be obtained under cold-storage conditions.

In the early part of the season, especially when there are few cold nights, it is difficult to reduce the temperature of the fruit to the desired point. This is the critical period, as the rapidity with which the temperature of the fruit can be reduced determines the length of time the fruit may be held in good condition. It is easy to see, therefore, that under common-storage conditions, usually the fruit must remain at a comparatively high temperature for a considerable length of time. The ripening which occurs during this period of high temperature cannot be offset by low temperatures later on. The developments which take place in this period of high temperature shorten the life span under storage conditions, and when the temperature is high and the fruit held warm for a considerable length of time, the storage period may be very materially shortened. There are frequent warm spells during the fruit harvest, and the nights are not so cold.

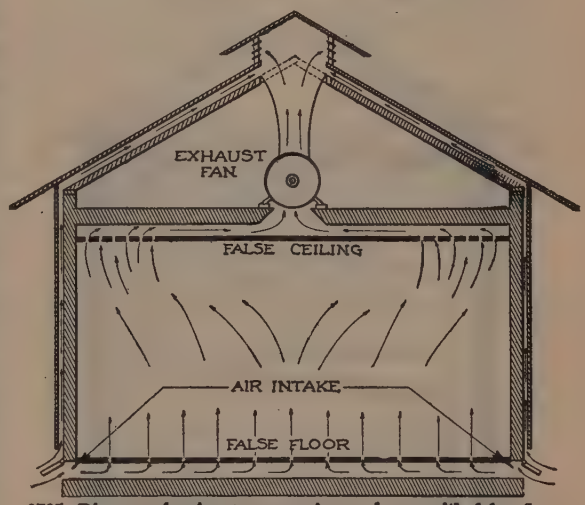
There is a widespread notion that common-stored fruits are better than cold-stored. It is difficult to understand how this opinion has become so fixed in the minds of many persons. It is probable that one reason is the fact that a comparison of fruit from common storage and from cold storage is really a comparison of fruits held under different conditions. The common-stored fruit is usually withdrawn after a shorter period and, therefore, may be in good condition. The cold-stored fruits are usually held for a long period and frequently the period is too long for the best condition of the product. Many carefully planned experiments show conclusively that cold-stored fruit remains in better condition during a longer period and, when carefully handled, remains in better condition after withdrawal than common-stored fruit. If the fruit is promptly and rapidly cooled at the beginning of the storage period, its life activities will be retarded to such an extent that the life span will be very materially increased. If this can be done under common storage, there is no reason why the fruit cannot be held in good condition. Frequently the fruit is placed in common storage during the fall and early winter; frequently also the common-storage room where the fruit is held is only a makeshift. After being held in this unsatisfactory condition for a time, the fruit is placed in cold storage later in the season when market conditions have not been favorable. This is the wrong way to store fruit. The time when cold storage is most urgently needed is at the beginning of the storage period, in order that the fruit may be promptly cooled. It would be more reasonable to remove the fruit from cold to common storage later in the season, because common-storage rooms may then be held in a satisfactory condition and the fruit would be in a much better condition for holding.

It has been suggested that a combination of cold and common storage is really the solution of many of the problems of successfully holding the fruit in the district where it is produced. Where ice can be obtained at a reasonable price, it can be used at the early part of the storage season to cool the fruit promptly and quickly. After weather conditions are such that cool nights prevail, the place can be operated as an ordinary common-storage plant for the remainder of the season.

Common-storage buildings.

The earliest form of common-storage buildings for fruits was caves or pits. These were used for the storage of fruits under the impression that the earth is cool and also to protect the fruit from freezing in extreme winter weather. The earth is cooler than the outside air in summer; in winter it is warmer, under ordinary conditions. Ordinarily, the temperatures of the ground range from 50° to 60° and this temperature remains fairly uniform below the frost line which, of course, varies materially under different climatic conditions. The protection against freezing in winter, therefore, is ideal, but unless some artificial method of cooling the room is at hand, the temperature of the earth itself is too high for best storage conditions. In the later development of the cave storage, ice was used to cool the chambers; this was naturally not satisfactory, due to the dampness and to the difficulty of ventilating.

Cellars have been a favorite place for common storage. They are open to the same objection as caves. Unless specially constructed and special means be provided for ventilation, the cellar is not an efficient fruit-storage chamber, except for short periods of time and for the protection of the products against freezing in winter. Cellars are difficult to ventilate unless special appliances are used. They may be ventilated by means of flues but the efficiency of such conduits is dependent upon differences in temperature, otherwise there will not be any appreciable movement of the air. Wind flues may be used; these are flues which have a funnel-like arrangement at the top, so designed that the mouth of the funnel is kept to the wind by means of a vane. The pressure of the wind entering the funnel creates a circulation of air through the cellar. In some instances these wind flues are found to work the reverse way during periods when the wind does not blow. In ventilating a cellar, there must be an outlet opening corresponding to the inlet opening. This is to allow the escape of the warm or foul air from the room. If it is possible to provide openings on all sides of the cellar, a current of air can be easily circulated through the room, especially if there is a breeze. The intake flues should open near the floor of the cellar. Fig. 3703 shows the proper placing of the inlets and outlets designed to ventilate cellar rooms. There should be a large number of openings to facilitate the ventilation of the cellar as rapidly as possible. Cellars are useful only for relatively high-temperature storage, and the necessity for insulating the walls of them is not sufficiently appreciated. The insulation must be sufficient to protect the cellar against the comparatively high temperature of the earth; otherwise, the temperature



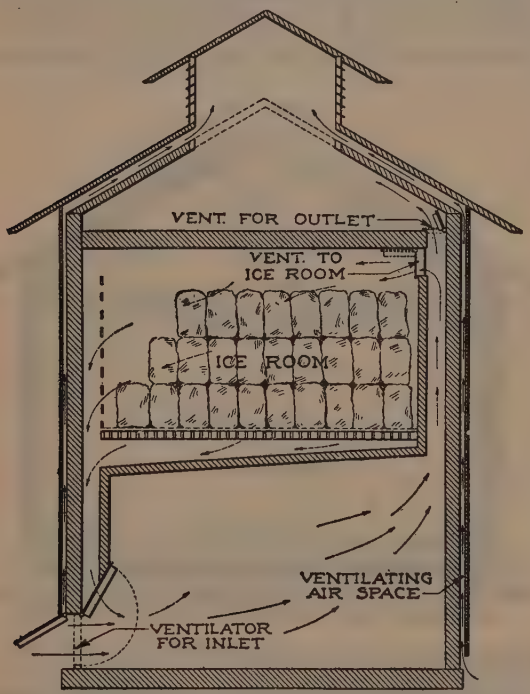
3705. Diagram showing common-storage house with false floor and false ceiling, and exhaust fan for forced ventilation.

of the storage room cannot be held materially below the earth temperature.

Common-storage rooms are frequently very cheaply constructed. The idea is prevalent that any old shed can be made to serve the purposes of a common-storage room for fruits or other products. The insulation is poor and, as a consequence, there is great fluctuation in the temperature. Proper insulation in the construction of a common-storage room is really more important than that for cold storage because there is no means of regulating the temperature except by ventilation or change of air, while the cold-storage room has artificial or mechanical means, the capacity of which can be increased to offset the heat leakage. To be effective, all common-storage plants must "conserve cold," and the necessity to provide efficiently against heat leakage through the walls, therefore, becomes doubly urgent.

The insulation for a common-storage room or building may be of the commercial kinds, which have been described, or use can be made of some of the cheaper common materials, such as straw, chaff, dry leaves, sawdust, and mill shavings. The principles of constructing the walls and using the insulation are all applicable to common-storage buildings and should be followed carefully if one expects to secure the best results. In addition to the insulation of the walls, an outer ventilat-

ing space is effective, especially during warm weather. Fig. 3704 is a diagram which shows the proper method of constructing a common-storage wall with an outer ventilating space designed to carry off most of the heat absorbed by the outer wall. Windows are not satisfactory for ventilating common-storage plants. The openings should be at or near the floor and there should be corresponding openings at the top, as shown in the diagram illustrated by Fig. 3704. The taking-in of the outer air depends upon the difference in temperature between the bottom and top parts of the building; therefore the greater the number of openings, the more rapidly the air of the room can be changed. A false floor is a distinct advantage, and will add very materially to the efficiency of the plant. The construction and use of such a false floor is illustrated in Fig. 3705. When the false floor is used, the openings or ventilators should open directly under the floor, so that the outer air may



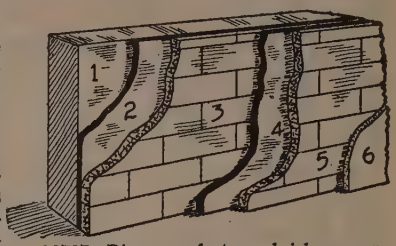
3706. Diagram showing construction and proper arrangement of ventilators in combined ice and common fruit storage room. Dotted arrows show directions of air when ice cooling is used.

have an opportunity to pass directly beneath the product stored in the room. A forced circulation is very much more satisfactory and will result in a more rapid change of air. In order to accomplish this, an exhaust fan should be placed at the top of the chamber, so that the air of the room can be drawn to the fan and exhausted into the outer air, thus creating a reduction of the air pressure within the rooms and the consequent drawing-in of the air to the room when the ventilators or traps of the room are open. Fig. 3705 shows a cross-section of such a chamber and the proper location of the fan.

In the combination of the ice cooling and common storage, ice and salt or even ice alone can be used to cool the fruit at the early part of the season. The tube method may also be used with ice and salt or the gravity-brine system before described can be advantageously utilized.

A diagrammatic cross-section of a combined ice-cooled and common-storage plant is shown in Fig. 3706. The design permits of the closing of ventilators and the opening of trap-doors, to utilize direct cooling from the ice stored above. A similar arrangement for the use of ice in small rooms can be made with the ice room or bunker placed at the end or side of the chamber.

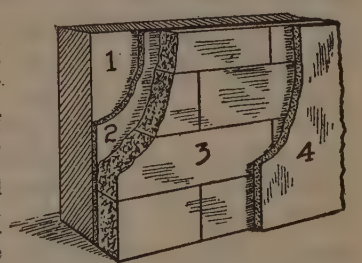
The Figs. 3707 to 3713 are diagrams showing the proper construction of walls and the method of insulating walls, ceilings, and floors both with commercial insulation and common materials. Figs. 3707, 3708, and 3709 show the proper method of applying insulation to stone, brick, and concrete walls; while Figs. 3710, 3711, 3712, and 3713 show the method of applying insulation to ceilings and floors.



3707. Diagram of stone, brick, or concrete wall with two layers of commercial insulation. *1*, 8-inch wall; *2*, asphalt or cement; *3*, 2-inch commercial insulation; *4*, asphalt; *5*, 2-inch commercial insulation; *6*, cement finish or T and G boards.

In the operation of common-storage plants, the fruit must be carefully watched at all times. The temperature should be taken frequently. It is very desirable that the actual temperature of the fruit itself be recorded from time to time. For this purpose, glass thermometers, the bulbs of which can be imbedded in the fruit, are desirable. Long-stem thermometers can be obtained which have the bulb at the end of a long tube and the recording scale at the upper end, thus allowing the temperature to be taken at the interior of the package. It is possible to note temperature conditions of the fruit by observing the influences of the temperature within the package upon the temperature of the room. When the fruit is thoroughly cooled throughout the mass, there will be little change in temperature after the closing of the ventilators. If the insulation of the room is effective, the change in the temperature of the air of the room will be very slight. If, however, there is any considerable heat left in the body of the fruit, there will be a marked and rather abrupt rise in the temperature after closing the ventilators.

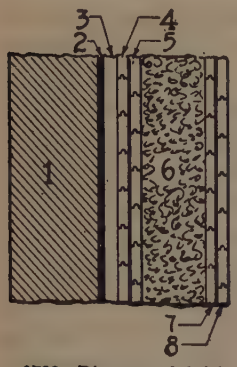
Careful attention to the condition of the fruit is necessary also to determine whether the humidity of the room is too high or too low. This will be shown by the appearance of the fruit. Excessive ventilation, i. e., the circulation of large volumes of air through the room, will cause shrinkage or shriveling, while insufficient circulation will favor mold. Special recording hygrographs which record the changes in humidity almost instantly upon a chart are very convenient adjuncts to storage rooms in order to observe the humidity conditions. Instruments which record both relative humidity and temperature on the same chart are obtainable. When one desires to operate properly, an investment in such an instrument is a distinct advantage.



3708. Diagram of stone, brick, or concrete wall with one layer commercial insulation. *1*, 8-inch wall; *2*, cement or asphalt; *3*, 4-inch commercial insulation; *4*, cement finish or T and G boards.

The length of time which different fruits may be held varies for the kind of fruits and even for different varieties of the same kinds of fruits. The importance of storage, then, is relative; it is most important for fruits

which may be held longest. A short period of storage may be relatively as important for the short-season fruits, such as the perishable berries. The ability to hold these fruits even for a few days may result in a great profit due to changes in market conditions. The holding of short-period fruits for a brief time is important for canneries because the fruit may be held in its best condition and this may result in a great saving to the canneries or factories when sufficient help cannot be obtained.

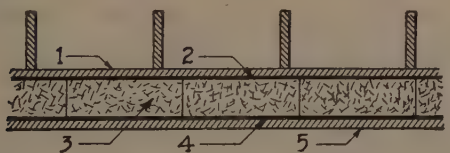


3709. Diagram of brick, stone or concrete wall, with insulation of mill shavings. *1*, 8-inch wall; *2*, asphalt; *3*, 1-inch air space; *4*, ⅞-inch T and G sheathing; *5*, ⅞-inch T and G sheathing; *6*, 6-inch dry mill shavings; *7*, ⅞-inch T and G sheathing; *8*, ⅞-inch T and G sheathing. Waterproof paper between adjoining sheathings.

Storage is most important for the apple. This fruit has the longest storage period of all. There are cases in which apples have been held in fair condition for as long as two years. It is, of course, not profitable or desirable to hold apples as long as this. The most important season is during the winter and spring months and until the fresh fruits come into the markets. As indicated above, the cold storage of the apple has resulted in making it an all-the-year-round fruit. Many varieties are held from one season until the summer apples of the next season are available. The so-called winter varieties are held to the best advantage.

There are three classes of apples: summer, fall, and winter. The summer varieties have the shortest storage season. The fall apples have a longer season but not so long as the winter varieties. It is upon the last class that dependence is placed for late-season supplies. The following fall varieties are the ones chiefly used for storage and, as a general rule, these may be held in first-class condition until the Christmas holidays or until the middle of January: McIntosh, Fameuse, Yellow Bellflower, Jonathan, Grimes. The following winter varieties are the ones of most importance for storage purposes: Baldwin, Ben Davis, Winesap, Yellow Newtown, Gano, Rome Beauty, Esopus, Northern Spy, Stayman Winesap, Banana, Ortley, Delicious, Lawver, Rhode Island Greening, Northwestern Greening, and York Imperial.

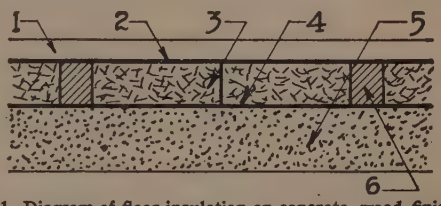
The varieties of pears which may ordinarily be used for storage are: Bosc, Easter, Anjou, Clairgeau, Comice, Howell, Winter Nelis, Duchess, Sheldon, and Kieffer.



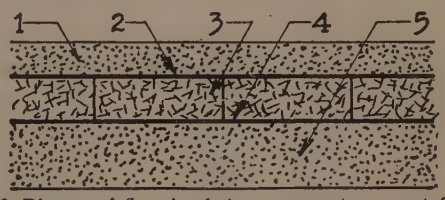
3710. Diagram of ceiling with commercial insulation. *1*, T and G sheathing; *2*, paper and asphalt; *3*, 4-inch commercial insulation; *4*, paper and asphalt; *5*, cement or T and G finish.

Factors underlying successful storage.

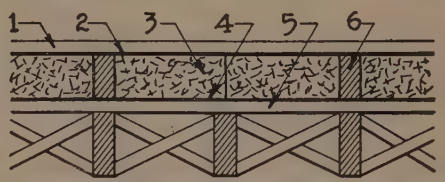
By means of investigations of the United States Department of Agriculture, the factors which govern the successful storage of fresh fruits have been carefully determined. The investigations have been extended through a number of years, since the work of Powell with apples in 1901–1902. There has been more work with apples than with other fruits but studies of the storage of grapes, peaches, pears, plums, cherries, and small-fruits have also been made. It is beyond the scope of this article to give in detail the results of researches with all of these fruits. In general, it has been found that there is a very definite relationship between the character of the fruit and the treatment given it in preparing it for storage, and its behavior in storage. The results from extensive experimental storage holdings have been consistent throughout; there have been no exceptions to the general principle of this definite relationship. It has been found, for example, that the influence of the place of production is frequently of great importance. The place and condition under which the fruit may be grown have a material influence on its behavior in storage. This is contrary to prevailing impressions but it is definitely certain. The character of the soil upon which the fruit is grown may have an important bearing on its storage quality. For example, apples from the lighter loam soils have better keeping quality than fruit grown on heavy or wet soils. In the study of the storage of grapes, it was found that the fruit grown in certain types of soils have better market and storage qualities. Some Tokay grapes, grown in California in light sandy soil, reach the limit of their market condition in November, while grapes of the same variety grown in heavy black soil may be kept in good condition until after Christmas. The Emperor grape, which has become an important storage fruit in California, is produced under best conditions in the red soils of the higher benches of the foothills of the Sierras. The same variety grown under valley conditions where the soil is of a different character, does not color so well and does not have as good storage qualities. The same is true of the Almeria grape, which is likely to become a very important storage fruit in California. At present the supplies of this grape come almost exclusively from Spain. The grapes are packed in granulated cork and the Spanish product is frequently held for several months in common stor-



3711. Diagram of floor insulation on concrete, wood finish. *1*, flooring; *2*, asphalt; *3*, 4-inch commercial insulation; *4*, asphalt; *5*, concrete; *6*, floor sleeper.



3712. Diagram of floor insulation on concrete, cement finish. *1*, concrete and cement floor; *2*, asphalt; *3*, 4-inch commercial insulation; *4*, asphalt; *5*, concrete.



3713. Diagram of floor insulation, frame construction. *1*, floor; *2*, asphalt and paper; *3*, 4-inch commercial insulation; *4*, asphalt and paper; *5*, floor sheathing; *6*, floor sleeper.

age. California-grown Emperor and Almeria grapes are packed in redwood sawdust and are successfully held in cold storage, the former until the middle of January, and the latter several months later.

Differences of one to three months in the storage qualities of the same varieties of apples have been found to be due to the place of production. Mention has already been made of the storage weakness of the Yellow Newtown and other varieties grown in the Central Pacific coast district of California. The same varieties grown in the Pacific Northwest and in Virginia and other sections of the country are free from this particular weakness.

The care of the orchard and method of culture given the trees have been found to be important factors. The character of tillage, pruning, age of trees or vines are also considerations, especially when taken in connection with different climatic conditions. The fruit from young trees or vines has weak storage qualities; it is usually large, coarse, sappy, and cannot be held in storage nearly so long as fruit of the same variety from older and more mature trees. Dense-headed trees produce fruit of poor color; the green, poorly colored apples produced under such conditions do not have high storage quality. Such fruit is very susceptible to the trouble known as storage-scald; the loss from this source may be avoided and the storage quality of the fruit may be much improved by better orchard methods. Pruning to open up the crowns of the trees will improve light conditions, especially where intense sunlight does not naturally prevail. Some growers actually cut away the leaves of the vines to allow light to color and mature the grapes to better advantage. In sections such as the arid regions of the Pacific coast, where intense light conditions prevail, the opening-up of the tree crowns must be done with greater care. It is not necessary to open up the trees to such an extent as is necessary where intense light is not naturally available.

Late growth also affects the storage qualities, as it prevents the proper maturing of the fruit. In irrigated districts, the late application of water may stimulate the growth while the fruit is maturing and this may result in sappy poorly colored fruit of low storage quality. The question is often asked whether the fruit produced in irrigated districts has as good storage qualities as that from non-irrigated districts. The impression seems to prevail that it does not. This is erroneous, as has been shown by extensive investigations. It is manifestly impossible to compare directly fruit grown under irrigation in one district with fruit grown without it in another. The varieties are different and other factors may operate to change conditions in the one case or the other. There are thousands of boxes of irrigated fruits held in the best possible condition in storage, and this would seem to be a direct answer to the question of the keeping qualities of fruits grown under irrigation. It is necessary, of course, to have the irrigation properly applied; if overdone by applying large quantities of water late in the year in order to induce large sappy growth, the results are fruits of poor storage qualities.

In sections which have dry summers, where tillage is depended on to conserve the moisture, the work must be thoroughly and properly done; otherwise, the moisture supply in the soil will be deficient, and the trees or vines will be under stress on account of the lack of sufficient moisture. Fruit produced under such conditions has very low storage quality. Any condition of soil, climate, and orchard treatment which results in the production of abnormal fruits may be important governing factors in their behavior in storage. Spraying for the control of insects and diseases is important from the storage standpoint. It is necessary that this work be thoroughly and properly done, as insect and disease injuries render the fruit liable to deterioration. The insect or disease may be of itself the cause of the decay or deterioration. There is also an indirect effect: when the trees are weakened by the effect of insects and diseases, the results may be weak fruit of poor storage quality.

Seasons affect the quality as well as the quantity of the crop. In seasons of unusual drought, for example, the fruit may be so weakened that its storage qualities may be seriously impaired. On the other hand, unusually wet seasons result in the production of sappy fruits which deteriorate rapidly. In seasons of unusual drought, the orchards under irrigation have a distinct advantage, provided the application of the water is properly adjusted. The effect of frost may be beneficial or otherwise: A crop may be thinned to such an extent that its condition may be somewhat improved since over-production by the tree may result in weak fruit, while the thinning will improve this condition. On the other hand, where the frost is sufficient to destroy most of the crop, the remaining fruits may be sappy and overgrown and otherwise weak. The frost-injured fruits themselves have not as high storage qualities. During an unfavorable season, fruit which has been placed in storage must be carefully watched throughout the entire storage period. Its condition should determine the length of time it is held. The effect of storage is such that attempts to hold the fruit beyond its normal life period result in serious losses. Fruit of low vitality, when the limit of its life is reached, will deteriorate very rapidly after withdrawal from cold storage. It is important, therefore, not to wait until the fruit is ready to break down before withdrawal.

Fully matured well-colored fruit keeps best and longest. Early notions that fruit for storage should be picked in an immature condition are erroneous. The fruits which are picked before full maturity have low storage qualities. There is serious deterioration from shriveling and, in case of apples, there is a definite relationship between the occurrence of scald and the state of maturity at which the fruit is picked. This disease is a peculiar browning or scalding of the skin of the fruit. It does not extend into the flesh except under very severe conditions. Immature fruit is seriously affected while fully mature fruit of the same variety may be held without deterioration from this cause.

Full maturity means that the "ground color" is plainly developed, the flesh of the fruit firm, and the seeds fully grown and colored. This principle is correct for all fruits with the possible exception of most varieties of pears and lemons. Over-ripeness must be avoided. A designation of the proper stage of maturity for picking fruits is difficult; it must be learned by actual experience. Over-ripeness or over-maturity occurs when the fruit begins to soften. In some instances, growers are in the habit of allowing the crop to remain on the trees until all the fruits are fully colored. This is a wrong practice, as some fruits mature before others, and if allowed to remain until all are colored, may become over-ripe or over-mature. It is best to make more than one picking, especially with the earlier ripening varieties. Fruits on the outer branches exposed to full light ripen first and the best results in storage are obtained when these are held separately, unless the trees are well and properly pruned.

Reference has been made to the importance of cooling the fruits promptly and rapidly, in connection with the ripening processes and life activities and the effects of temperature on these factors. Delay in storage, which means delay in cooling, during warm weather may shorten the storage period from one-third to one-half. Experiments with apples held at a comparatively high temperature for a period of ten days or two weeks before cooling, showed that fruit thus treated could be held only from one-third to one-half as long as the same varieties promptly stored and cooled after pick-

ing. There is also a direct influence on the occurrence of scald. Prompt cooling, as a rule, prevents the occurrence of this disease. This factor is of special importance for early-season fruits or early varieties of apples like Jonathan. The practice which prevails in many sections of allowing the fruit to accumulate for some time before placing it in storage is likely to result disastrously if the season happens to be warm. This is especially true where the fruit must be packed while warm. The ideal condition is the placing of the fruit under refrigeration immediately after picking from the tree and the nearer this can be approached in practice, the longer the fruit can be held in storage.

The proper storage temperature for different kinds and varieties of fruits has already been referred to. The influence of a low temperature, especially for apples, is most important. Experiments show the occurrence of scald to be less severe at 32° than at a higher temperature. The use of a low temperature is also important because of the rapidity with which the fruit within the package can be cooled. In operating either a common- or cold-storage plant, the temperature of the fruit is an important factor to consider. When a fruit is first placed in the storage room, a considerable length of time may be required to reduce its temperature to the desired point, if means are not at hand to increase the cooling effects. In cold-storage rooms the cooling can be hastened by holding the air of the rooms at a temperature several degrees lower than the desired temperature. A temperature of 25° to 27° F. may be safely maintained until the fruits in the packages approach the storage temperature. In this way the operator can materially hasten the cooling effect, and this hastening is desirable. It is commonly assumed that the cooling should be gradual, but as yet there is no experimental evidence to indicate that rapid cooling is at all injurious.

The investigations of the United States Department of Agriculture show conclusively that the character of the treatment given the fruit in preparing it for market or storage has a material influence upon its keeping quality. Fruits which are roughly handled and bruised or injured to any extent have their storage qualities seriously affected, and decay and deterioration follow the injuries. There are some forms of decay or deterioration which cannot develop unless there are injuries of some kind on the fruit. A break in the skin will allow blue mold to gain entrance, while a sound skin may prevent the development of this form of decay. Blue mold is one of the most common forms of loss both in common and cold storage and occurrence of this trouble is due almost exclusively to rough handling. The blue mold does not grow upon the sound skin of a healthy fruit. The importance, then, of handling the fruits with extreme care throughout all the processes of picking, grading, and packing cannot be too strongly emphasized. Bruises or breaks in the skin may mean a decayed fruit. This general principle has been established through a long series of careful investigations and thus far there has been no exception.

There are other decays which affect apples and other fruits: the principal diseases affecting apples are brown- or ripe-rot, anthracnose, and bitter-rot. These diseases are not dependent upon the care in handling the fruit so far as the occurrence of bruises or injuries is concerned. The spores are present on the fruit when it is packed and the control of the disease in storage goes back to the orchard treatment and the control of the fungi on the trees. All three of these decays occur on the trees as canker spots and the spores which inhabit the fruits develop from these cankers. Control of the cankers by cutting out or spraying will materially reduce the occurrence of decay in storage.

There are other forms of deterioration which, so far, have not been traced to any definite organism. These are obscure physiological diseases and result in the breaking down of the flesh of the fruit, or in burning of the tissues, or in a scalded appearance of the skin. These physiological troubles have been found to be due, at least to some extent, to rough handling or to pressing. A physiological breakdown also occurs in fruit which is over-ripe when it is stored. It also occurs seriously in fruit which has been delayed in cooling after picking. Physiological breakdown also occurs in fruit which is held beyond its normal life limit.

Ordinary storage-scald has already been referred to. The nature of this disease is unknown but it is supposed to be due to the action of enzymes upon the skin of the fruit. There is another form of scald which, for want of a better term, has been designated as "soft scald." Ordinary storage-scald does not soften the skin except in the most advanced stages. The soft scald produces a softening of the skin and also of the flesh directly beneath the skin. It occurs also in more or less distinct areas or zones, sometimes extending completely around the fruit. The nature of this disease is obscure and, so far, storage treatment, orchard treatment, and temperature effects do not seem to have any bearing on it. It has been attributed to the freezing of the fruit in storage and, while definite results from the effects of freezing have not been obtained, it is possible that in storage rooms of uneven temperature conditions portions of the rooms may have temperature conditions sufficiently low actually to injure the fruit.

For discussion of precooling, see the article *Transportation.*

A. V. Stubenrauch.

STOVE PLANTS. The term "stove" applied to plants undoubtedly originated from the method of heating the structures in which plants were grown before the advent of hot water and steam. Glasshouses such as then existed were heated by stoves and flues, usually made of bricks. Such structures came to be called stovehouses or stoves, and the plants grown in them "stove-plants." (A "greenhouse" was in those days an unheated glasshouse in which plants were merely kept alive over winter.) These terms still exist in England, but are applied to strictly tropical plants or those requiring a warm temperature for their successful culture in glasshouses. In this country such plants are usually spoken of as warmhouse or tropical plants.

In England, at the present time, more distinction is made in the names applied to plant-houses than in this country. For example, "greenhouse" in England means the coolest glasshouse only, while in this country the name is usually indiscriminately applied to all glasshouses. The names applied to plant-houses in England are therefore: stove, for tropical plants; intermediate house, for plants hailing from warm-temperate climates; greenhouse, for those plants requiring the least degree of heat. A conservatory or show-house is one in which plants are placed while in flower and usually kept at a cool temperature.

In practice such terms may be greatly modified to suit local conditions; for example, glasshouses are sometimes named cool-temperate house, warm-temperate house, tropical house, palm-house, acacia- and succulent-house, experiment-house and propagating-house, the temperatures and moisture conditions being regulated to suit the requirements of each class of plants.

The cultivation of stove plants is too heterogeneous a subject to be treated exhaustively in a single book, because the stove contains thousands of dissimilar plant treasures from the tropics, especially those found at low altitudes. In general, the stove is the house which requires the most expense and care, the greatest heat and the highest atmospheric moisture. For the general principles of its management, consult *Greenhouse Management*, p. 1408.

Edward J. Canning.

STRANVÆSIA (for Wm. Fox-Strangways, English botanist). *Rosàceæ*, tribe *Pòmeæ*. Ornamental woody plants grown for the handsome foliage and the attractive flowers and fruits.

Evergreen trees or shrubs: lvs. entire or serrate, with subulate stipules: fls. white, in terminal many-fld. corymbs; calyx turbinate, 5-toothed; petals 5, generally obovate, clawed, stamens about 20; styles 5, connate to the middle or higher; ovary 5-celled, the cells 2-ovuled: fr. a small pome, crowned by the persistent incurved calyx-teeth, the cells usually 1-seeded.—Two or 3 species in China and Himalayas. These are handsome evergreen small trees or shrubs with generally oblong rather large or medium-sized lustrous lvs. and small white fls. with quickly deciduous petals in often ample corymbs, followed by attractive red subglobose pea-sized frs. They are suited for warmer temperate regions, but *S. Davidiana* var. *undulata* seems to be hardier and with protection survives the winter as far north as Mass. Prop. is by seeds or by cuttings of half-ripened wood under glass.

Davidiàna, Decne. (*S. Hénryi*, Diels). Shrub, 4–20 ft.: young branchlets silky-villous: lvs. on slender hairy petioles ½–¾in. long, oblong to oblong-lanceolate or oblanceolate, acuminate, cuneate at the base, entire, green and glabrous on both sides except pubescent on the midrib above and often beneath, 2½–4½ in. long: fls. white, ⅓in. across, in loose, more or less villous corymbs 3–4 in. across; stamens about as long as petals, with red anthers: fr. subglobose, scarlet, ¼–⅓in. across. June. W. and Cent. China. Var. **undulàta,** Rehd. & Wilson (*S. undulàta*, Decne.). Lvs. elliptic-oblong to oblong-lanceolate, usually wavy on the margin, 1½–2½ in. long: corymbs 1½–3 in. across, sometimes nearly glabrous. B.M. 8418.

Nússia, Decne. (*S. glaucéscens*, Lindl. *S. glaùca*, Baill.). Small tree: young branchlets like the infl. villous at first, soon glabrous: lvs. obovate to oblanceolate, short-acuminate, serrulate, 2–5 in. long: fls. white, ½in. across, in corymbs 2–5 in. broad; stamens about half as long as petals, with yellow anthers: fr. subglobose, orange, ⅓in. thick. June. Himalayas. B.R. 1956.

ALFRED REHDER.

STRATIÒTES (Greek, *soldier*, referring to the sword-shaped leaves). *Hydrocharitàceæ*. WATER SOLDIER, or WATER ALOE. Perennial hardy aquatic herb of small ornamental value but considerable botanical interest: st. very short, stoloniferous: lvs. clustered, all sessile, submerged, linear-lanceolate, fleshy, acute, margin with many pointed teeth: scapes short or elongated: spathes extending above the water, unisexual, 2-lvd.: fls. white; male fls. 2 to several in a spathe, pedicelled, perianth 2-rowed, 3-merous; stamens 11–15; pistils rudimentary or none; female fls. solitary in the spathe, short-pedicelled, perianth similar to male; staminodes many, linear; ovary oblong, somewhat 6-celled: fr. on a recurved pedicel, laterally exserted from the spathe, ovoid, acuminate.—One species, Eu. The plant has a distinct calyx which is not the rule among monocotyledons.

One of the peculiarities of stratiotes is that in summer the whole plant rises to a point near the surface when it is only partly submerged, and later in the season it drops below the surface. Young plants do not act thus. It is propagated by side shoots from the base of the leaves. Toward fall and early winter these shoots are merely bulblets and are readily detached from the plant and are in a good condition for traveling. It is not desirable for the aquarium on account of its spiny leaves. (Wm. Tricker.)

aloìdes, Linn., is the only species in the genus. It is sometimes called CRAB'S CLAW or FRESHWATER SOLDIER. In England the planting of this species is discouraged from the fact that it spreads too rapidly. Peduncles rising from among the lvs. to a few inches above the water, much thickened at the top, bearing a spathe of 2 bracts: ovary and stigmas nearly as in Hydrocharis, but the fr. is ovoid and somewhat succulent. G. 2:466.

F. TRACY HUBBARD.†

STRAWBERRY. The species of Fragaria, grown for the fruit. (For the morphology of the strawberry fruit, see Vol. I, page 40.)

The strawberry is an herbaceous perennial. It naturally propagates itself by means of runners that form chiefly after the blooming season. Seedage is practised only with the Alpines, and in raising new varieties. Division of the crown is useful for propagating varieties that are practically runnerless, as the Bush Alpine and Pan-American. The runner plants, either transplanted or allowed to remain where they form, will bear the following year. Usually the plants will continue to bear for five or six years, but the first and second crops are generally the best. Good results are sometimes secured from plants over ten years old, especially when they are grown under hill training and intensive culture, but this is a special practice. It is therefore the custom to plow up strawberry beds after they have borne from one to three crops. The better the land and the more intensive the cultivation, the shorter the rotation. In market-gardening areas and in some of the very best strawberry regions, the plants are allowed to fruit but once. The plants therefore occupy the land only one year and the crop works into schemes of short-rotation cropping. When the bed is fruited more than one year it should be renewed immediately after the crop is harvested. In the case of matted or spaced rows, this consists of reducing the number of old plants, using the plow, disc-harrow, cultivator, or hoe, and in stirring the soil to provide favorable conditions for the rooting of new runners. It is customary, also, to mow the leaves and burn them. In the case of hill or hedge-row plants, renewal consists of mowing and in drawing about an inch of fresh soil around the plants, so that new roots will form above the old ones. Throughout the North, and as far south as Kentucky and Missouri, beds are fruited but one year, occasionally two, rarely longer. In Florida and the coastal plain of the Gulf states, the plants occupy the ground but six to eight months. In the lower Mississippi Valley and on the Pacific coast, beds are fruited three to six years. The strawberry delights in a rich rather moist soil and a cool season. It can be grown in the cool part of the year in the South and thereby becomes one of the most cosmopolitan of fruits. The young plants may be separated from the parent and put into new plantations in August; but under average conditions in the North it is usually better to wait until early the following spring, since the weather is likely to be too hot and dry in the late summer or fall. South of Virginia, Tennessee, and Arkansas, and on the Pacific coast, most of the planting is done in the fall or winter months. Plants that have not borne are best for setting. They are plants of the season: that is, plants

3714. Strawberry plant ready for setting.

CVIII. Strawberry.—The Climax variety

which start in the spring of 1916 are fit for planting in the late summer or fall of 1916 or in the spring of 1917. These plants have many long, fresh, light-colored roots. Fig. 3714 shows such a plant, with the roots trimmed for planting. Fig. 3715 shows a plant that has borne. This plant bore fruit, say, in 1915, and has thrown up a new crown in 1916. The old dead crown is seen at the right. The young growth is lateral to this old crown. The roots are relatively few and are hard and black. These plants sometimes make good plantations under extra good care, but generally they should be avoided.

Two- or 3-inch pots are sometimes plunged under the new runners in June and July, and they become filled with roots in two or three weeks. These pot-grown plants are excellent for fall setting in the home-garden, but they are seldom employed in extensive commercial practice on account of their expense. Almost as good results can be secured by setting strong layer plants. (Fig. 3716.)

3715. Old strawberry plant, usually not desirable for setting.

In Florida and in the coastal plain of Georgia, Alabama, Louisiana, Mississippi, and Texas, beds need to be reset annually, in September or October; plants set at this time produce a good crop in the following February, March, and April. The plants may be produced at home, but more commonly are secured from the North.

In hill training, each plant is allowed a space by itself, cultivation is given both ways, and no runners are allowed to set. Hill or stool training is practised commercially in Florida, the Gulf States, and on the Pacific coast, and, to a slight extent, in northern market-gardens. It is the most practicable method under irrigation, and in a very humid climate. The chief disadvantage is the heavy expense of removing all the runners. Hills give choicer berries than narrow matted rows, but the yield is not so heavy. For commercial results, plants are generally trained in narrow rows. The old method was to plant in rows 3 to 3½ feet apart and the plants from 12 to 15 inches apart in rows, keeping off the runners until late in July and then allowing the runners to grow and root at will, making a wide matted row. In this system some plants are almost on top of others, the roots barely in the ground, and they suffer in a season of drought. The rows are so wide that to pick fruit in the center it is almost necessary to crush fruits on the outside of the row. This system gives few large first-class fruits, and is now passing away. The largest and highest colored fruits are found on plants along the outside of the rows; therefore have as many outside rows as possible. This may be accomplished by having rows closer together and much narrower. The rows are made from 30 to 36 inches apart and the plants from 18 to 24 or even 30 inches apart in the rows, much depending on the prolificacy of the variety as a plant-maker. If the plants used for a new bed are strong and start into growth vigorously, the first runners are used, as it has been found that under most conditions the plants about twelve months old yield the greatest number of fine fruits. These first runners are usually "bedded-in," i. e., planted by hand, training them along the wide way of the rows, using from four to eight of the first runners and cutting off those growing later. This method of planting allows cultivation both ways until the runners start, retaining moisture and saving labor in hoeing. In the "narrow matted row," which is now used more than any other method of training, the runners are allowed to set at random until they have made a row 12 to 24 inches wide; subsequent runners that encroach upon the tilled middles are cut off. In the "spaced row," the early runners are set by hand at more or less regular distances apart until a row 12 to 24 inches wide has been formed; thereafter all other runners are cut off. In the "hedge row," two to four runners are set from each mother plant, and are kept in alignment, forming a single, double, or triple hedge row; all other runners are removed. The drift is steadily away from the matted row toward the spaced row and hedge row. Surplus runners are pulled off or are cut off with a knife, hoe, or one of the many types of runner-cutters that may be attached to the cultivator. Circular cutters are used for hill plants. In late fall, the matted row may be thinned by pulling out the weaker plants with an iron rake or spike-toothed harrow.

3716. Pot-grown strawberry plant.

In the North, strawberries are usually mulched in the fall, in order to protect them from alternate freezing and thawing in the winter and early spring and to prevent the soil from heaving. In some cases the mulch is allowed to remain on the plants rather late in the spring, in order to retard the season of bloom. Sometimes the crop may be retarded a week or ten days by this means. It should not be removed until settled spring weather has come, nor left on so long that the plants bleach. The mulch is more necessary in regions of light and precarious snowfall than in those in which

3717. Heavy mulching of strawberry plants, as practised in parts of the North.

the snow blanket is deep and lies all winter. In regions of deep and continuous snowfall, a heavy mulch is likely to prove injurious. Experience has shown that the best mulch is some strawy material. Along the seacoast, salt hay from the tide marshes is much used. In interior places clean straw, in which there is no grain to sprout and to make weeds, is very largely employed. (Fig. 3717.) In the South, pine needles are used. Some-

times loose strawy manure is used, and the mulch adds fertilizer to the soil as well as affords protection. Corn fodder, leaves, brakes, seaweed, evergreen boughs, and other wild herbage are used occasionally. Cowpeas and sorghum are grown for mulching material when straw is scarce. The practice of growing oats, barley, or some other small grain between the rows of strawberries, to fall down and mulch the berries, is not generally advisable. Under ordinary conditions the mulch is 3 or 4 inches deep over the plants after it is fairly well packed down. It is not always possible, however, to mulch as heavily as this, since the material is likely to be expensive when one has a large area. The mulch is usually applied late in the fall after the ground has frozen, and, if the material is abundant, both the plants and the intervening spaces are covered. In the spring the mulch is raked from the plants as soon as they begin to start. Some persons allow it to lie between the rows as a cover to retain moisture and to keep the berries clean. The most expert growers, however, prefer to take the mulch from the field and to till the plantation once or twice before the plants are in bloom; the material is then returned and spread on the loose soil between the rows and beneath the vines. In the northern prairie states, heavy mulching is essential. For western Minnesota and Dakota a covering of at least 6 inches of straw is advised. This mulch is easily provided, since straw is so abundant in that country that it is often burned as the readiest means of getting rid of it. When not mulched in that region, the plants are likely to be killed outright or to start with a very weak growth. Mulching for winter protection is not necessary south of Virginia and Missouri, but mulching to keep the fruit clean is as profitable in the South as in the North. The fruiting mulch is applied after the plants begin to bloom. Pine "straw" is used most. A large handful is dropped upon each plant; the leaves soon push through. Rarely is it desirable to cover the entire area between the rows. On the Pacific coast, strawberries are not mulched, as it is not necessary for winter protection, and it would interfere with irrigation.

3718. Sexes of strawberry flowers: at the left a perfect flower; at the right a pistillate flower; in the middle, stamens few.

Strawberry flowers may be either perfect or imperfect, and the nature of the flower is characteristic of the variety. In some kinds, the flower is perfect or hermaphrodite (having both stamens and pistils) and is consequently self-fertile. These are commonly called staminate varieties. In others it is pistillate, producing little or no pollen, and requiring a pollen-bearing variety to pollinate it. (Fig. 3718.) There are no modern varieties bearing only staminate or sterile flowers, although such forms were common about 1840. The perfect-flowered varieties differ greatly in the amount of pollen they produce. Some, as the Crescent and Glen Mary, bear so few stamens that they are practically pistillate or sterile. Any variety will fertilize any other variety if it bears sufficient pollen and if the two kinds bloom at the same time. The variety used as a pollinizer does not affect the shape, color, and quality of the fruit of the pistillate sort, as was once thought. It is preferable to plant an early-blooming pollinizer on one side of the rows of the pistillate sort, and a late-blooming pollinizer on the other side. When planting pistillate varieties, every third row should be a pollen-bearing kind. Pistillate varieties as a class are somewhat more productive and hardy than staminate varieties as a class; but this fact has little weight, since some staminate sorts are fully as prolific and hardy as the best pistillate varieties. It is an inconvenience to be obliged to mix varieties for pollination; hence pistillate varieties are steadily declining in popularity. In time, all North American varieties will be staminate, as is now the case in England. The horticultural bearing of the sexual characters of the strawberry flower was first clearly explained in this country by Nicholas Longworth, of Cincinnati (see page 1585; also his essay on the subject in his "Cultivation of the Grape," 1846, and the "Strawberry Report" of the Cincinnati Horticultural Society, 1848). When many of the achenes or "seeds" of the strawberry are not fertilized or are killed by frost or other means, the berry fails to develop at that point and a "nubbin," or imperfect berry, is the result (Fig. 3719). Nubbins are usually most abundant late in the fruiting-season, when the pollen-supply is small and when the plants are relatively exhausted.

3719. Strawberry nubbin.

Ordinarily the common varieties bear but once a year, in the spring. Under certain conditions of temperature and moisture they may become "double croppers," and give a fall crop, also. In the South, particularly in southern California, the bearing season may be extended over several months; but no varieties were consistently everbearing in the North until 1898, when Samuel Cooper, of Delevan, New York, found the Pan-American in a row of Bismarck. European everbearers, which are hybrids of the common strawberry and the Alpine, do not succeed here. The numerous descendants of the Pan-American are true everbearers; they yield a small quantity of berries throughout the season from spring-set plants. It is better, however, to cut off all blossoms until midsummer; then there will be considerable fruit from August until frost, but not so much as a good crop from a spring-bearing variety. The culture of the everbearers does not differ materially from that of other sorts, save in the cutting of the blossoms weekly, which is a heavy expense. They require rich soil and an equable supply of moisture; they fail in a dry season. The market for berries in late summer and fall is limited, and the cost of picking is heavy. The following spring, a year from the time they were set, the everbearers produce a good crop, perhaps equaling that of single-bearing sorts. This is one point in which the North American everbearers are distinctly superior to those of Europe. The everbearers have little commercial future merely for supplying summer and fall berries, but their habit of bearing a heavy spring crop, also, may make them useful to some growers who cater to personal or near markets. They are not likely to find favor with those who grow strawberries for the wholesale market. The everbearers are valuable mainly for the home-garden.

The cost of growing an acre of strawberries under commercial conditions in Oswego County, New York, is approximately as follows:

Rent of land, two years	$11 00
Plowing and fitting	6 00
Plants	15 00
Setting plants	4 00
Cultivation	16 00
Straw for winter and fruiting mulch	15 00
Labor—hoeing, pulling weeds, etc.	10 00
Total cost	$77 00

Many northern growers raise berries at a much less cost, and a few exceed this sum, especially when located near a large town where rents are high; but it would be safe for one about to engage in strawberry-growing to figure close to this total, aside from the cost of fertilizer.

A Michigan grower estimates that the cost of producing and marketing an average yield of 200 sixteen-quart crates to the acre is $1.56 a crate; and the average net return 88 cents a bushel, giving a profit of $88 an acre. This is fairly representative of field culture in the North. The high cost of production in Florida is in marked contrast. As reported by a Plant City grower it is:

Interest on investment and land	$20 00
Interest on equipment	10 00
Preparation of land	10 00
Fertilizer	40 00
Plants	40 00
Setting plants	5 00
Cultivation	10 00
Picking 3,000 quarts at 2½ cents	75 00
Grading and packing at 1 cent	30 00
100 crates at 15 cents	15 00
3,000 boxes	11 00
Hauling to station	10 00
	$276 00

Still another phase of strawberry economics may be observed in southern California. There it costs 3½ cents to produce and market a pint box of strawberries, and the average selling-price is about 5 cents. Although yields of 10,000 to 15,000 quarts to the acre are common, the expense of picking is very heavy, since the season lasts six to eight months, and it costs $150 an acre to set a new field, since it requires 30,000 plants to the acre. These examples serve to illustrate the very wide range of conditions. The average yield, according to recent census statistics of the United States and Canada, is 1,700 quarts to the acre. The average selling-price, net to the grower, is 6 to 7 cents a quart. Authentic yields of 25,000 to 27,000 quarts to the acre have been secured under intensive culture.

3720. Wilson strawberry. (×⅓)

New varieties of strawberries are raised from seed with the greatest ease. The generations of strawberries are short and new varieties soon find favor. The varieties change so frequently in popular estimation that it is impracticable to recommend a list of them in a work like this. The first great American berry was the Hovey, introduced in 1838. (Fig. 1861, Vol. III.) The most popular single variety has been the Wilson (Fig. 3720), introduced in 1854 and still popular in Canada and the northern Pacific states. It held almost undisputed control of the market from 1860 to 1880, when the Crescent and Sharpless secured recognition. These three are the most important North American varieties; two-thirds of the 348 varieties of known parentage have descended from them. Other old favorites, now no longer grown, are the Cumberland, Triumph, Downer Prolific, and Charles Downing. European varieties do not succeed here; notable exceptions are Jucunda, and Triomphe. Over 1,800 varieties of North American origin have been introduced but less than 150 of these have attained prominence. The oldest North American variety now cultivated is the Longworth, introduced in 1851; it is still prized in the San Francisco market. The dominant commercial varieties of today are the Dunlap, Haverland, Marshall, Klondyke, Aroma, Gandy, Glen Mary, Bubach, Brandywine, Clark, Warfield. At least fifty others are grown to a considerable extent. The accompanying pictures (Figs. 3720–3725) show types of American strawberries.

3721. Gandy strawberry. (×½)

The strawberry has been in cultivation but a short time, as compared with other fruits. It has been grown in gardens less than 600 years, and was not cultivated commercially to any extent until early in the nineteenth century. The first record of garden culture is in France, early in the fourteenth century. This was the wood strawberry, *Fragaria vesca*. The common wild strawberry of eastern North America, *F. virginiana*, was introduced into Europe early in the seventeenth century. Neither species showed much promise under cultivation. *F. chiloensis*, which is native to the Pacific coast of America, was brought to Europe from Chile in 1712, by M. Frezier, a Frenchman. See *Fragaria*. Although the berries are large, this species found little favor because of shy bearing and poor quality; it gave practically no improved varieties. Near the middle of the eighteenth century the Pine strawberry (referring to the pineapple fragrance of the fruit) appeared in Europe, and became the principal progenitor of the garden strawberry. The botanical origin of the Pine is obscure. One view is that it was a form of *F. chiloensis;* another, that it resulted from the hybridization of that species with *F. virginiana* in European gardens; all the early importations of the Chile were pistillate plants, and varieties of the Scarlet were commonly planted with them. The first of the modern race of large-fruited varieties was the Keens' Seedling, originated by Michael Keens, of England, in 1819; it was a Pine, and from it have sprung most of the European varieties of today. The Hovey, from which modern North American varieties have descended in large measure, was undoubtedly a Pine in part, but there is considerable evidence that one of its parents was a variety of *F. virginiana*.

Wild strawberries were so abundant in North America that there was no garden culture of this fruit until about 1770. The Alpine and Hautbois types of strawberries (*F. vesca* and *F. moschata*) were introduced then from Europe, but did not become popular; preference was given to transplanted wildings of the Scarlet. These species have never been grown here except by a few amateurs. Commercial strawberry-culture began soon after 1800, mainly in the vicinity of the four largest towns of that period—Boston, New York, Philadelphia, and Baltimore. The varieties used were slightly improved forms of *F. virginiana*, notably Large Early

Scarlet, Hudson's Bay, Early Hudson, and Crimson Cone. These persisted until the introduction of the Wilson. The first variety of any fruit produced in North America by hand-crossing was the Hovey, originated by C. M. Hovey, of Boston, in 1836. The Hovey was a failure as a market variety, except in a few places, but it was an excellent amateur variety and greatly increased interest in strawberry-culture. The heated discussion of "Longworth's Theory" (1841–1845) concerning sex in the strawberry also stimulated interest and offered a practical solution of a pressing cultural problem. As yet, however, the strawberry was mainly a fruit of the open fields and home-gardens; the commercial planting was very limited. The total quantity of fruit marketed in 1854 was less than 40,000 bushels, the product of about 1,400 acres.

3722. Haverland strawberry. (×⅔)

The variety that marked the beginning of commercial strawberry-culture in North America was the Wilson, originated by James Wilson, of Albany, New York, in 1851. Until then, strawberry-culture had been difficult, and the results very uncertain; the Wilson thrived under even indifferent care. Its introduction was followed by a remarkable increase, coincident with the extension of railroads, in commercial planting. The "strawberry fever" that swept over the country between 1858 and 1870 has not been equaled in intensity by the boom days of any other fruit. The inevitable reaction came between 1870 and 1885. This was emphasized by the heavy losses from shipping berries long distances without refrigeration. The experiments of Parker Earle, of Cobden, Illinois, resulted in the first successful use of the modern refrigerator-car system, in 1887, and made possible the great shipping districts of today, many of which are over 1,000 miles from their markets. There are now approximately 150,000 acres of strawberries in the United States, and 14,000 acres in Canada. The value of the crop is $20,000,000 annually. The strawberry is fourth in commercial importance among deciduous fruits, being preceded by the apple, peach, and grape. The most important shipping districts, according to the Census of 1909, are Maryland, 14,292 acres; Tennessee, 10,761; Missouri, 9,048; New Jersey, 8,684; Michigan, 8,051; Arkansas, 7,361; Ontario, 7,702; Delaware, 7,194; Virginia, 6,606. Sussex County, Delaware, has the largest county acreage, with 6,404 acres in 1909.

There are several serious fungous diseases and insect pests of the strawberry. White grub is controlled by avoiding newly plowed sod land when setting the bed: weevil, by planting largely of pistillate varieties or profuse-blooming staminate sorts; leaf-roller, by spraying with arsenate of lead, and burning the leaves; root-louse, by setting clean plants in clean land. The several types of leaf-blight (Fig. 3726) may be prevented to a considerable extent by spraying with bordeaux, but it is more practicable to plant resistant varieties. The fundamental treatment of all these is to fruit the bed but once, or at most but twice, and to grow succeeding crops on other land, cleaning up the old plantation thoroughly after the last fruiting. Short, quick, and sharp rotations and clean culture do much to keep all enemies in check.

The American book writings on the strawberry are: R. G. Pardee, "A Complete Manual of the Cultivation of the Strawberry," New York, 1854, and subsequent editions; A. S. Fuller, "The Illustrated Strawberry Culturist," New York, 1862, and subsequent editions; J. M. Merrick, Jr., "The Strawberry and its Culture," Boston, 1870; Charles Barnard, "The Strawberry Garden," Boston, 1871; T. B. Terry and A. I. Root, "How to Grow Strawberries," Medina, Ohio, 1890; L. J. Farmer, "Farmer on the Strawberry," Pulaski, N. Y., 1891; A. F. Wilkinson, "Modern Strawberry-Growing," 1913. Aside from these writings, the strawberry is well treated in various books devoted to small-fruits and to fruit in general, and in the horticultural periodicals. S. W. Fletcher.†

Strawberry-growing in the South.

The strawberry is by far the most important small-fruit grown in the South, being raised commercially in every state. The industry is more concentrated in the South than in the North. This concentration is probably due to the fact that nearly all of the strawberries are shipped by freight to distant markets. The strawberry industry in the South has developed as an independent unit, or as an adjunct to truck-growing rather than in connection with other fruit-growing enterprises.

An important consideration in growing strawberries for northern markets is the selection of a location where the soil and climatic conditions are conducive to early ripening of the fruit, so that there will be little competition from regions farther north. In many southern sections where strawberries are grown on a commercial scale, shipments practically cease as soon as berries from a more northern location begin to move in car lots. This is due to the fact that toward the end of the picking-season the berries are small and cannot compete successfully with the larger fruit from a region nearer the market that is just beginning to harvest its crop.

While strawberries are grown on nearly all types of

soil in the South, sandy and gravelly loams are considered best. A warm quick soil, although poor, is preferable to a heavy retentive soil well supplied with plant-food. Plant-food can be supplied by the addition of fertilizers, but the physical condition of the soil can be modified only with difficulty and loss of time by cultivation, drainage, and the addition of humus. The soil for strawberries should be well supplied with humus in a well-decomposed state. Many growers think that new land is essential for good results, but when old soils are well supplied with organic matter they will yield as large crops as new soils.

Few soils in the South that are adapted to strawberry-growing are rich enough to produce large crops of fruit without the addition of fertilizers. Stable or barnyard manure is the best fertilizer for strawberries as it supplies both humus and plant-food. It is best, however, to apply the manure to the crop preceding the strawberries in order that it may become well-decomposed, and so that most of the weed seeds will have germinated.

When manure is not available, commercial fertilizers are applied in large quantities, but these should be used in connection with green-manure crops such as cowpeas, soybeans, velvet beans, vetch, and clovers. Some growers use as high as one ton, or even as much as a ton and a half, of commercial fertilizer to the acre. However, under most conditions, 1,000 to 1,500 pounds of a fertilizer analyzing 2 to 3 per cent of nitrogen, 6 to 8 per cent of phosphorus, and 6 to 8 per cent of potash, should be sufficient. On land where legumes have been grown, a part of the nitrogen may be left out. It should be borne in mind that large applications of commercial fertilizers are profitable only when used on soils in good physical condition, and well supplied with humus.

There are three systems of growing strawberries in the South: the hill system, the hedge-row system, and the matted-row system.

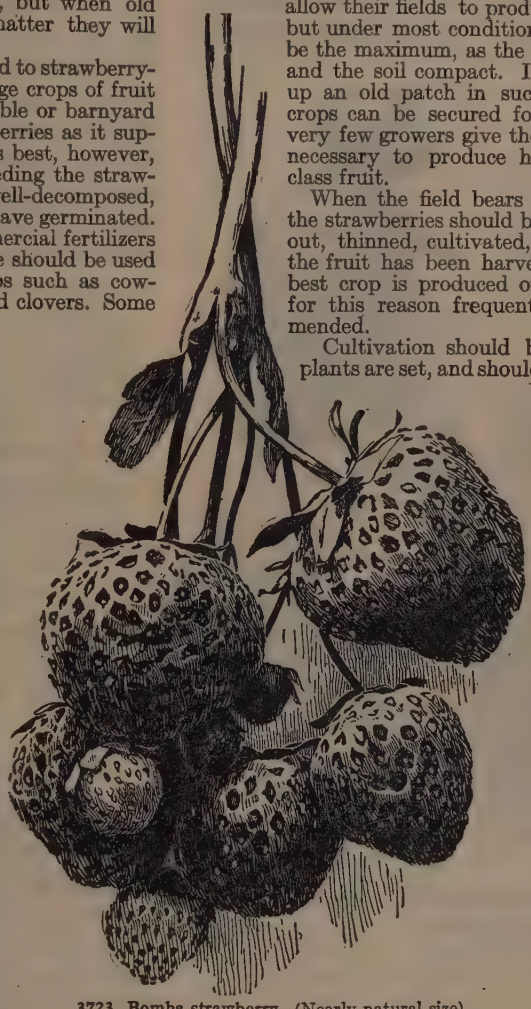
In the hill system the plants are set separately, one plant in a place, and no new plants are allowed to form. The plants are set 12 to 14 inches apart in rows 3 to 3½ feet apart. This makes a large, vigorous plant, producing large uniform berries which ripen evenly. This system is followed in Florida. The quantity of berries produced is not so large as under the other systems, but the quality is better and the percentage of first-class berries larger.

In the hedge-row system the plants are set 10 to 18 inches apart in rows 3 to 3½ feet apart, and runners are allowed to form plants along the row in a strip a few inches wide. This system is practised in the southern part of the lower tier of southern states, with the exception of Florida, where the hill system is used.

In the matted-row system the plants are set 15 to 18 inches apart in rows 3½ to 4 feet apart. The runners are allowed to form plants 6 to 9 inches on either side of the row. Sometimes the plants are allowed completely to cover the ground. This system probably produces the largest crop of berries, but the fruit is usually smaller and does not ripen so well as under the other systems.

Strawberries are planted in Florida any time from June to November, whenever the soil and climatic conditions are favorable. In other southern sections of the South Atlantic and Gulf Coast states, the plants are set in late summer or autumn. In all other sections of the South, the plants are usually planted in late winter or early spring, and no crop is allowed to be produced the first season.

The length of time that a field should be allowed to produce fruit depends upon many conditions and varies in different parts of the South. In sections where weeds and grass grow very rapidly and where the picking-season is long, as is the case in the lower South, usually only one crop is grown. In the upper sections of the South, two or more crops are produced. Some growers allow their fields to produce five or six crops, but under most conditions two crops should be the maximum, as the fields become weedy and the soil compact. It is possible to clean up an old patch in such a way that large crops can be secured for several years, but very few growers give the fields the attention necessary to produce heavy crops of first-class fruit.



3723. Bomba strawberry. (Nearly natural size)

When the field bears more than one crop, the strawberries should be thoroughly cleaned out, thinned, cultivated, and fertilized after the fruit has been harvested. As a rule, the best crop is produced on new plantings and for this reason frequent renewal is recommended.

Cultivation should begin soon after the plants are set, and should be continued whenever weeds start or a crust forms. Frequent shallow cultivation will make it unnecessary to do much hand-hoeing or hand-weeding. A cultivator which merely breaks the surface without disturbing the roots is to be preferred. Any weeds which interfere with the development of plants or fruits during the picking-season are pulled by hand, or cut off with sharp hoes.

In most sections of the South, some form of mulch is used to hold moisture during the picking-season when the soil is not stirred, to keep the berries clean, and to prevent "heaving out" in regions where freezes occur. The materials used for mulch are pine straw, oat, wheat, or rye straw, leaves, and marsh hay. These materials are of value as humus when turned under. In sections where freezes do not occur, the mulch is usually applied in late winter.

For best results in growing strawberries a good system of rotation should be followed. In any system of rotation, a leguminous crop should be turned under once in three or four years, and a cultivated crop grown on the area the season before the strawberry plants are set. The following system of rotation is a good one for the South:

1. Strawberries one or two years, followed by cowpeas after the strawberry plants are plowed under.

2. Early vegetables followed by cowpeas or late vegetables.

3. Corn with cowpeas between the rows. The corn stubble and the cowpeas should be turned under for

strawberries the following year, in case the plants are set in the spring.

In sections where vegetables are not grown commercially, oats may follow the cowpeas turned under the second season.

The varieties of strawberries grown in the South are Klondyke, Missionary, Lady Thompson, Excelsior, Aroma, Gandy, Chesapeake, and Early Ozark. In the lower sections of the South, the Klondyke and Missionary are grown more than all others. For a succession of crops the Excelsior or Early Ozark may be grown for early fruit, the Missionary, Klondyke, and Lady Thompson for medium, and the Aroma or Gandy for late ripening. In the upper sections of the South, the Early Ozark, Chesapeake, Klondyke, Aroma, and Gandy are all grown, but very rarely does any grower raise more than two varieties for commercial purposes.

3724. Belmont strawberry. (Natural size.)

As a large part of the strawberries grown in the South are shipped to distant markets, they must be picked before they are fully ripe. For long distances the berries should be fully grown and about three-fourths ripe. When picked before they are at all colored the berries will shrink and wither, making them unfit for sale.

The berries should be well graded and packed before being shipped. When experienced pickers are employed the best results can be secured by grading the berries in the field, as they are picked, so as to avoid rehandling and the consequent bruising and deterioration of the fruit. The common practice, however, is for expert packers to do the grading and packing in a packing-shed to which the fruit is delivered by the pickers. The top layer of berries should be placed so as to hold them in place, but care should be taken not to put small inferior berries in the center and large berries on top. All types of berry boxes are in use in the South, but the tendency is toward a standard full-size quart box. In some sections of the South, particularly in Louisiana, pint boxes are used for the early shipments. The fruits carry better and the price received is higher; later in the season as fruits become more abundant and the price is lower, fruit from these same regions is shipped in quart boxes in crates holding twenty-four or thirty-two quarts. A long narrow box is objectionable.

Berries which are well graded and sorted and put in clean, neat, attractive packages of standard sizes command the highest price and sell most readily. The type of crate depends upon the boxes used. Any crate that is substantially built and well ventilated is satisfactory, but the cost is an important consideration, as they are not returned to the shipper. The largest crate that can be handled conveniently is the one to use, as the large ones are cheaper in proportion to the quantity of berries they carry. The twenty-four- and thirty-two-quart crates are in most common use, although in some sections the sixty-quart crate is employed. Crates with hinged lids have the advantage that they can be opened easily and quickly, and as a result invite inspection. A large part of the Florida crop is packed in quart boxes which are placed in pony refrigerators for shipment to northern markets.

The cost of growing strawberries in the South is from $75 to $150 an acre, divided about as follows:

Interest on investment (land and equipment)	$8 00	to	$15 00
Preparation of land	5 00		10 00
Manure or fertilizer	10 00		25 00
Plants	10 00		20 00
Setting plants	8 00		12 00
Cultivating and hoeing	20 00		35 00
Mulching	15 00		25 00
Total for growing	$76 00	to	$142 00
Picking, grading, and packing 2,000 quarts	$40 00	to	$70 00
Crates and boxes	20 00		25 00
Hauling to station, loading, etc.	5 00		10 00
Total for picking, packing, grading, etc.	$65 00	to	$105 00
Total for growing	76 00		142 00
Grand total	$141 00	to	$247 00

The lower estimate is about the average for most sections of the South, while the higher figures cover the extreme cost. The average cost in Florida is between the two estimates, but nearer the higher.

H. C. Thompson.

The strawberry in California and northward.

California conditions include both those most favorable and most trying for the growth of strawberries. There are situations where, through local topography and proximity to the ocean, winter temperatures are very seldom too low for the growth and fruiting of the plants and where, by summer irrigation to maintain this continuous activity of the plants, it is possible to gather fruit every month in the year. This fact is not, made of much commercial account, however, nor is it widely true that one can have strawberries all the year round in the open air. It is true, however, that even on the lowlands, where the commercial crops are chiefly grown, the winter is so mild that strawberries begin to ripen in shipping quantities as early as March and by proper cultivation and irrigation the fruiting is continued until late in the autumn, and the grower has therefore a very short closed season. The trying condition for the strawberry is found in the long dry summer, which enforces dormancy as early as June on light loams in the more arid localities of the interior. Such soils become dry and hot to a depth of several inches in spite of surface cultivation and cause the dwindling and death of a shallow-rooting plant like the strawberry unless frequent irrigation is begun in time. This trouble is less acute on more retentive soils in regions of lower summer temperature and greater rainfall, and plants in such situations may survive the summer dormancy, but it is true that everywhere in California and even in the more humid states on the north that strawberry-grow-

ing without irrigation results either in failure or only partial satisfaction and the venture is seldom to be commended. It is usually so easy, however, to secure the small amount of water necessary for home production, and the plant when fairly treated is so highly productive, that a general exhortation to strawberry-growing on an irrigation basis is fully warranted.

3725. Shuster (Gem) strawberry. (×½)

There are several species of strawberries indigenous to California, and they are of both littoral and alpine types. Albert F. Etter, of Ettersburg, Humboldt County, California, has worked continuously with these species for more than twenty-five years, by selecting seedlings, and by crossing the species among themselves and with the leading cultivated varieties. He has established an Ettersburg group of new varieties, which for vigorous growth of plant, resistance of drought and true everbearing habit are very notable. Some of them have strictly evergreen foliage under California conditions. For abundant fruiting and for firmness of fruit, some of these varieties have shipping and canning characters new to the strawberry. Etter describes his work in detail in the Pacific Rural Press of San Francisco for March 4, 18, and April 1, 1916.

The varieties chiefly grown in California are different from those popular at the East. New varieties from the eastern states and from Europe are freely tried, but few are successful and they retain local popularity after abandonment in their birthplaces. A striking instance of this fact is the continued popularity of Longworth Prolific, Sharpless, Monarch of the West, Wilson, Albany, and the like. Longworth has survived more than fifty years' continued growing. Other popular varieties are Melinda, Jessie, Dollar, Brandywine, Marshall, and Lady Thompson. Brandywine (Fig. 3730) is the most widely approved variety in the state and is standard in southern California, Excelsior and Klondyke standing next in popularity as early varieties, and Americus and Iowa as autumn-fruiting varieties. In the central regions of the state, the Dollar and Marshall lead among the newer kinds and the Banner is exclusively grown by some producers for the San Francisco market. Jessie and Dollar are largely grown for shipment to interior states and to the northern coast before the local fruit ripens.

3726. Leaf-blight of strawberry. (×½)

The growth of strawberries is almost wholly in matted rows, the rows usually occupying low ridges only sufficiently elevated to allow the slightly depressed intervals to serve as irrigation ditches and as walks during picking. The slight elevation of the plants also assists in surface drainage, when heavy rains fall during the early part of the fruiting-season, and this promotes early growth and fruiting of the plants. Where the soil is too coarse to permit free rise of water from the depressed ditches, the conditions are reversed and low levees are made to inclose blocks of plants which are irrigated by flooding the inclosures. In the chief commercial regions a fine loam is used and irrigation from the small ditches on both sides of the ridges, which are about 2 feet wide, is the ruling method. Nearly level land is selected and grading is done before planting to reduce dry knolls and fill low places so that the water will flow slowly and will evenly moisten the whole field. Subirrigation by tile has been often advocated but never has been employed to any extent.

One of the chief strawberry-shipping districts in central California is characterized by a shallow loam underlaid by an impervious indurated clay or hardpan, which prevents the percolation of the irrigation water and enables growers to maintain a large acreage by means of the small water-supply secured by windmills. In this case water is applied very frequently, even oftener than once a week in some cases, but the total amount for the season is small. Quite in contrast to this is the growth on light deep loams where water sinks so rapidly that the plants suffer, although water is almost constantly running in the ditches. In such cases mulching and sprinkling are the price of success, and these are too costly except on a small scale for home supply. The largest producing districts have soils midway between the extremes above noted, viz., deep retentive loams, situated rather low in the valleys and with irrigation available either by ditch system or by wells both flowing and pumped. The pump wells require usually only a short lift, and abundant water is secured cheaply by the use of modern pumps and motors.

3727. Fancy packing of strawberries, each quart wrapped in paper; a picking-stand on the left.

In addition to supplying the home markets, which are very good, California strawberry-growers find a good outlet for the fruit all through the region west of the Missouri River. Southern California supplies the southern portion of this district, while the growers in central California, chiefly near Florin in Sacramento County, make large shipments eastward as far as Colorado and northward to all the great interior states and to Oregon,

Washington, and British Columbia before the locally grown fruit in those regions is available.

The states of Oregon and Washington in their areas lying west of the Cascade Mountains have conditions excellently suited to the growth of the strawberry. Their conditions more nearly resemble those in the eastern states than any other part of the coast. The cooler weather and more abundant moisture give a better spring season than that of California, but the season is on the whole much shorter because of the longer winter. Irrigation is also necessary in most places for continued fruiting during the summer. The most famous district is Hood River, Oregon, where arid conditions east of the Cascade Mountains are modified by western influences which reach through the gap in these mountains where the Columbia River flows through. Irrigation is regularly employed and a large commercial product grown. The varieties chiefly grown in this region and in adjacent parts of Washington and Idaho are of local origin, the Hood River (Clark Seedling) and Magoon being widely approved. Jessie, Sharpless, Wilson, Haverland, Crescent, Cumberland, Jucunda, and Parker Earle are also commended by growers in the northwestern states. E. J. Wickson.

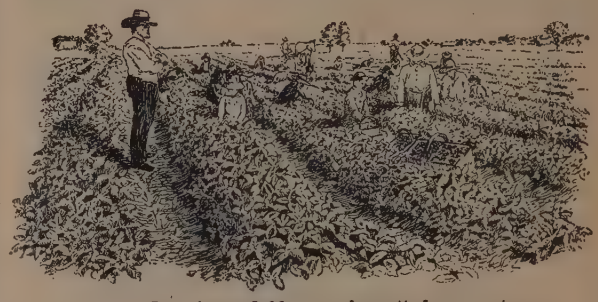
Cultivation of the strawberry on home grounds.

Of all the fruits which can be grown in the garden, the strawberry offers to the amateur the greatest inducements on account of ease of growing, delicious quality, long season and comparatively quick-bearing habit, and wide geographical range. No garden should be without this important fruit. It can be grown in almost any soil and in so many different ways that even in a most crowded garden some space may be found for it.

The strawberry thrives best in a sunny location but will also do well in partial shade like that from small-fruit bushes or young fruit-trees. Heavy shade draws the vines up, and while a luxuriant growth of foliage ensues there will be but little fruit. On the other hand southern slopes where the berries are exposed to the unbroken rays of the sun will result in scalded fruit unless some artificial protection can be given.

The location of the strawberry-bed in the garden is very important and should be governed to a large extent by the other crops. Remembering that the strawberry will occupy the land for at least two seasons, such tall-growing crops as corn, pole beans, or asparagus should not be planted too near. Soils often govern location to a great degree. While the strawberry will thrive in almost any soil it is better to choose one which has good water-holding capacity, for although the strawberry will make splendid plant growth in light soil the fruit will not be so good or large if there is a lack of water at the fruiting-season. While artificial watering may be practised, it is often done at the expense of quality in the fruit. Soils may be easily improved. A light soil can be well filled with manure or humus of some sort, and a heavy soil drained with tile. If possible the land should have a slight slope to turn off surplus water in the winter, but if this is impossible, be sure that the bed is not placed in a depression where water collects during the winter.

3728. A prolific row of strawberries, the fruit resting on a mulch.



3729. Strawberry-field grown in matted-row system.

The preparation of the soil is very important, for a finely rooted plant like the strawberry needs soil well pulverized and free from clods of earth. The land should be planted at least one year with some crop which will require good cultivation. Avoid planting on sod land or land where witch-grass and perennial weeds are abundant. Spading to a depth of at least 1 foot and mixing through the soil a good liberal amount of well-rotted manure will be good preparation for the strawberry-bed. There is, however, on soil naturally rich in nitrogen, danger in putting on too much manure, as an excess will often produce foliage but not fruit. Other fertilizers should be added during the season as the plants grow. Mixed fertilizer should contain about 5 per cent of nitrogen, 10 per cent of phosphoric acid, and from 5 to 6 per cent of potash. All of the artificial fertilizers should not be applied at one time. It is best to make at least three applications during the season as the plants grow and the amount will be governed by the growth of the plants. Artificial fertilizers should not be spread on the foliage. Generally speaking, one pound of the mixture given above in three applications should be ample for six plants during the growing season.

Having prepared the ground as outlined, the next question to settle is the system under which to grow the bed. There are three systems which may be used for the garden strawberry-bed: the wide matted-row, the hedge-row, and the single-hill systems; and as the plan of a system depends very much on the variety grown it will be necessary to consider variety in this connection. In the selection of varieties for the home-garden, the following conditions should be carefully considered: quality, attractiveness of the fruit, productiveness, vigor of plants, season. Many very productive varieties lack quality and attractiveness while as a rule the quality berries are not good commercial varieties and it is often difficult to procure the plants of the better varieties in the nursery.

As it is practically impossible to obtain all of the points outlined above in one variety, it is generally best to plant at least three, not alone to insure a longer season but variety in the fruit is very essential; also some years one variety alone does not do well while with a number of varieties some are sure to succeed. This will be found especially true when late spring frost may entirely ruin one variety and not injure another.

Vigorous-growing varieties with good clean-growing

foliage should be chosen. Such varieties are generally to be relied upon. In choosing varieties one should secure those which do well in one's vicinity, for in some cases quality in a variety depends to a large degree on environment.

It is always best to plant at least three varieties so that a long season will be assured. While it is impossible not to have varieties overlap, an abundance at one time during the season is no detriment, for at this time preserving may be done and there are so many ways in which strawberries can be used that an abundance should be sought.

The strawberry is bisexual in its bloom and therefore it will be necessary either to choose varieties which have perfect flowers or have those of both sexes in order to insure perfect pollination. Sex in strawberries does not seem to have any direct bearing on quality or productiveness, although there is a common fallacy that pistillate varieties are most productive and staminate varieties of the better quality.

In the matted-row system of planting, the plants are set 4 by 2 feet apart, and allowed to run so that a row from 2 to 3 feet wide is formed. This is probably the easiest way in which to grow the strawberry. There is great danger, however, that too many plants will be allowed to grow in this system and, in consequence, through overcrowding, the fruit will be small and rather poor. In this system plants should not be allowed to set closer than 6 inches apart and all runners which are made beyond those necessary to cover the ground when at this distance should be removed.

In the hedge- or narrow matted-row system, set plants 3 by 2 feet apart, and allow each to make four or six new plants, which are set so that there are practically three separate rows with the plants in the row about 8 to 10 inches apart. All other plants and runners are removed.

In the hill system, the plants are set in various ways, first in straight rows, 3 feet apart, and the plants in the row from 12 to 20 inches apart, or plants are set in beds 14 by 14 inches or 18 by 18 inches or even 20 by 20 inches apart, and from three to four rows are set, depending on the variety. In this system all of the runners are removed from the parent plant and the bed is generally allowed to remain for about three years.

To obtain strawberries earlier they may be raised in frames as other perennials are grown. The plants are set in August or September about a foot apart in rich garden loam and given good cultivation. The frames should not be more than 8 inches deep. Hill culture is practised in this system and plants are protected during the winter by a light mulch. Glass frames are put on early in March, careful cultivation given, plenty of air and careful watering. This method will advance the crop two to three weeks ahead of the outdoor crop. Such varieties as are suitable for greenhouse culture should be used for growing in frames.

Growing strawberries in a barrel, or rather on a barrel, is practised by those who have very limited space, and while there are many drawbacks to doing this successfully it can be accomplished with care. A clean cider barrel should be used and several 1-inch holes bored in the center of the bottom and a ring of 1½-inch holes about 8 inches apart around the barrel with a space of 8 inches between the rows of holes. If the holes are started near the bottom, it will be possible to get three rows of holes and about eight holes around the barrel. Good strong pot-grown plants should be secured and a good compost of garden loam. Place in the barrel and over the holes cut in the center of the bottom a piece of 6-inch drain-tile about a foot long, filling the center of the tile with coarse gravel or small stones. Put the roots of the plants into the 1½-inch holes in the sides of the barrel and fill the barrel with the compost, adding pieces of tile to that in the center as the barrel is filled so that the drain-pipe comes up to the top of the barrel. A row of plants may be planted on the top of the barrel so that sides and top are covered. Watering should be done through the drain-pipe and if the coarse material used inside the drain is satisfactory, the plants will take up about the proper amount of water before it all passes through the barrel. The barrel should be carefully protected in winter by covering with straw and pine branches and the top protected so that excessive rain will not get in; elevating the barrel on stones will help the drainage.

Having decided upon the method or system of growing strawberries, the season for planting should be the next consideration. As a rule the early spring, from April 1 to May 10, is the best time to plant in the North, although in many gardens which have to economize space, August and September planting is made necessary, as the strawberry has to follow some of the other early crops, as peas, beans, lettuce, and the like. For August or September setting, pot-grown plants are better than the runner plants unless one can take runner plants directly from one's own bed and transplant them under favorable weather conditions.

3730. Brandywine strawberry.

To obtain the best pot-grown plants, the runners of the current season's growth should be used, as these make better plants than those of last season's growth which have been placed in cold storage and potted after their natural season of planting has gone by. If layer plants are used in spring, great care should be taken in planting so that the plants may be assured of a good start. Remove practically all of the foliage and cut back the roots at least one-half. If the ground has been prepared carefully the hand may be used in making the hole for the roots, but in stony ground it is best to use a trowel. Be sure that the crown of the plant is not set either too deep or too far above ground. The crown should be on a level with the surface of the soil. When setting, spread the roots out fan-shape and be sure to press the soil firmly about them. Be sure that the rows are straight. Various devices are used on commercial

farms but for garden culture nothing is better than a line for securing straight rows.

Whether set in spring or fall, cultivation of the soil should begin as soon as the plants are set and kept up until late September, when cultivation should cease and the plants given a chance to harden up for the winter. Cultivation, whether done by wheel-hoe, hand-hoe, or weeder, should be shallow, never more than 2 inches deep, as the strawberry roots are near the surface and light cultivation of the surface soil does as much good as any other form. Weeds of all kinds should be kept down and comparatively little weeding will be necessary provided the ground is kept stirred.

3731. The forcing of strawberries under glass.

During the summer at least three applications of fertilizer should be made, preferably before or during a rain. If the fertilizer mentioned previously cannot be obtained, bone-meal will give good results, particularly if wood-ashes are added.

If the season is particularly dry or the land is inclined to dry out rapidly, artificial watering may be practised, but it is better not to use water if it can be avoided. Plenty of cultivation will grow good plants on nearly all soils.

In the late fall after heavy frosts have come and the ground freezes slightly at night, it will be necessary to put some winter protection on the strawberry-bed. Many kinds of materials may be used, but first it is best to have a light mulch of well-rotted stable-manure scattered among the plants and worked under the foliage. Following this the winter protection may be put on. This should be of coarse hay, cornstalks, or very strawy manure, care being taken not to put on too much. A good rule to follow in placing a covering is that it must not be too close to prevent seeing some of the foliage of the strawberry plants under the mulch. The mulch may be held in place by brush, light cordwood or even soil, and in places where there is little snow great care must be taken to keep the mulch in place. It must be borne in mind that this careful protection is not to prevent the ground from freezing but rather to prevent the alternate freezing and thawing of unprotected ground in winter. In the spring as soon as danger from extreme frosts is past, the material for holding the mulch in place should be removed and also a part of the mulch itself, leaving some of the covering on the land to serve as protection to the fruit in the fruiting-season and to keep the soil moist. Some persons prefer to remove all the mulch and to cultivate the ground, and in some cases this is desirable; but, when the plants have had good culture the previous year it is just as well not to do much cultivating in the spring. Fertilizers should be added at this time, preferably bone-meal and wood-ashes mixed at the rate of one-half pound of ashes to one pound of bone-meal and put on about one-eighth pound to the square foot.

If the weather is dry and the soil more or less inclined to dry out, water may be added at this time and up to the time the fruit is well set, being careful not to water during the daytime when the sun is shining. The question of watering strawberries is a very difficult one as so many conditions enter into the discussion. Some soils are naturally moist, and when water is added artificially to these, the tendency is for the plants to go to foliage or soft fruit or decayed berries. Too much water on a dry soil, particularly if added as the berries are coloring, is likely to injure the quality of the fruit while increasing the size, so that quality often is sacrificed to bulk. Generally speaking, in most seasons, if the land has been well cultivated the season before and the bed has been well mulched, there will be enough moisture in the land to carry the crop to maturity.

As quality in the strawberry depends very much upon ripeness and condition, it is well not to begin to pick too soon, but wait until the fruit has colored all over and has taken on the characteristic depth of tint which may be common to the variety. Be sure to pick the fruit early in the morning before the sun gets hot, keeping what berries are not used early in the day on ice. Pick the fruit with a stem; and for household use berries are much more attractive when picked in a shallow basket with some kind of foliage.

Within the past few years a new race of strawberries has been developed commonly called everbearing from their habit of producing fruit after the regular strawberry season has passed. This strain has now been permanently established and it is a great source of satisfaction to strawberry-lovers to have fruit after the regular season is over. There are several varieties of these everbearing strawberries, and every garden should have a few of them. They may be planted in any of the ways suggested for the regular varieties but they should have plenty of water during the summer to insure the full development of the fruit. In most locations in the northern states these varieties begin to ripen early in August and continue until heavy frosts. It is advisable to cut off the blossoms in May if a large crop is wanted in August, but they will fruit at both times after a short rest in July. Many of these varieties have a tendency to make too many plants and it is well to follow the same general directions as given for growing the standard varieties. Most of these everbearing varieties do very well in the usual hill culture.

WILFRID WHEELER.

Forcing of strawberries. (Figs. 3731, 3732.)

The forcing of strawberries for a winter crop has not as yet become of any great commercial importance in North America. Some gardeners grow a few potted plants for either Christmas or Easter decoration. Very few, if any, commercial growers are forcing strawberries exclusively to any profitable extent. The few strawberries that are forced are grown either in pots or planted out on benches. The former method is the one generally employed. There are several good reasons for this, some of which are: first, the confinement of the roots; second, the ability to ripen the crowns in the fall; third, the control of fertilizers and liquid manure; fourth, the privilege of having the crop grown in several houses at one time or brought from a coolhouse into heat; and fifth, the opportunity to supply particular demand of the potted plants or their fruits. The first expense of the pot method is considerably more than when the plants are grown in the benches, but after

the pots are once purchased the cost of each method should be about the same.

The pot method as practised at Cornell University is about as follows: As early in the spring as possible large plants are set in well-enriched soil. The first strong runners made by these plants are secured and potted. Numerous 2- or 3-inch pots filled with good soil are plunged to the rim along the strawberry row. The runners are trained to these pots, and a small stone is placed on each runner to keep it from growing beyond the pot. When the pot is filled with roots the young plant is cut from the parent stock, the pots lifted and taken to the potting-shed or other convenient place, where they are at once shifted into the fruiting-pots (usually a 6-inch pot). The soil used at this time should be three parts fibrous loam and one of good sharp sand. This potting-soil should have mixed with it bone-flour or dissolved rock at the rate of about one pint to two bushels of soil. Ample drainage should be given, as through the season of ripening the crowns and the following forcing-period, a large quantity of water must be given and none should be allowed to stand around the roots.

The pots should then be plunged to near the rim in some coarse material, preferably coal-ashes, which, if deep enough to extend from 4 to 6 inches below the plunged pots, will prevent the earthworms from entering the pots. The use of a frame in which to plunge the pots is recommended for protection against heavy rains or early frosts. Attention to watering is all that will be necessary through the growing season. Late in September or early in October the pots will be filled with roots and the plants will have attained their full growth. At this time larger and firmer crowns will be had by careful attention to watering and subsequent drying off to almost the wilting stage than by watering the plants up to the time of freezing weather. The drying process seems to represent the late fall season and causes the plant to store up material in the crowns at an earlier period. At the coming of cold weather the soil in the pots may be allowed to freeze. It is very desirable that the soil be on the dry side before freezing, for if the ball of earth is wet there is danger of breaking the pots when the cold becomes intense. The period of forcing,

3732. A good winter strawberry plant in bloom.

from the time the frozen plants are brought in until the ripening of the fruits, will be about eight weeks. The time will vary slightly under different conditions of heat and sunlight. When first brought in, the plants should be cleaned of all dead or diseased leaves. The pots should be plunged to near the rim in some material that will retain moisture, e. g., tanbark or coal-ashes. The benches or shelves should be as near the glass as convenient. A thorough spraying with bordeaux mixture or some other fungicide should be made at once. For the first few days the house should be held at about 35°, with little if any rise through the day. After a week a rise of 10° may be given. At the end of the second week 50° at night, with a rise of 10° to 15° through the day, will be about right.

Strict attention must be given to syringing the foliage every pleasant day. Keep the walks wet until the time of blossoming. This moisture keeps down the red-spider. At blossoming time the house should be allowed to dry out, and a free circulation of air should be maintained through the middle of the day, in order to ripen the pollen. It is necessary to pollinate each flower by hand. The pollination may be done in the middle of the day while the houses are dry. A small camel-hair brush is useful for distributing the pollen. A ladle or spoon should also be provided in order to carry the surplus pollen. The surplus pollen may be used on varieties that are pistillate or do not have pollen enough to set their own fruits. Six to eight fruits are enough for a 6-inch pot. When these are set the remaining flowers should be cut off, in order that the entire strength of the plant may go to swelling the chosen fruits. After swelling begins, liquid manure should be given. During the first week give one dilute application. After this give two applications a week, increasing the strength of the manure liquid each time. Well-rotted cow-manure or sheep-droppings furnish good material for this purpose. When the fruits are coloring the liquid manure should be withheld and only clear water given. As they swell, the fruits will need support, and the best method of furnishing this is probably by using small-meshed window-screen wire cut into suitable squares. These squares may be laid on the pot, under the clusters of fruits. They hold the fruits away from the sides of the pots, protect them from any water or liquid manure that is given the plants, and enhance the beauty of the potted plant. After one fruiting, the plants are worthless.

C. E. Hunn.

STRAWBERRY BUSH: *Evonymus americana.* **S. Geranium:** *Saxifraga sarmentosa.* **S.-Raspberry:** *Rubus illecebrosus.* **S. Tomato:** *Physalis Alkekengi* and other species of *Physalis.* **S. Tree:** *Arbutus Unedo.*

STRELÍTZIA (for the wife of King George III, Charlotte Sophia, of the family Mecklinburgh-Strelitz, a patron of botany). *Musàceæ.* Bird-of-Paradise Flower. Perennial herbs, adapted to the warmhouse, grown for the banana-like foliage and the very odd showy flowers.

Rhizome sometimes subterranean, sometimes an erect woody st.: lvs. large, long-petioled: scape terminal or in the upper axils, short-exserted from the sheaths of the lvs.: bracts large, spathe-like, boat-shaped, acuminate, solitary at the end of the scape or 2 slightly distant: perianth long-exserted; sepals free, long, carinate; petals very dissimilar; stamens 5; ovary 3-celled, many-seeded.—About 5 species, S. Afr. The genus has been monographed by K. Schumann in Engler's Pflanzenreich, hft. 1 (IV. 45) 1900.

The *Strelitzia Reginæ* requires a strong soil, a copious supply of water, and considerable sunlight. It is a serviceable plant for house decoration or for the porch or lawn in summer. It will endure much neglect, but unless well cared for it may fail to bloom regularly and well. A night temperature of 50° is sufficient. This plant may be induced to set seed if the flowers are hand-fertilized. The usual method of propagation, however, is by suckers and division.

A. *Plant nearly stemless.*

B. *Lvs. ovate or ovate-oblong, margin crisped.*

Reginæ, Banks. Bird-of-Paradise Flower. Fig. 3733. About 3 ft. high: roots large, strong-growing: lvs. oblong, about 1 ft. long, stiff, concave; lf.-stalks all radical, 2–3 times as long as the lvs.: scape higher

than the lvs.: spathe about 6 in. long, nearly horizontal, purplish at the base, about 6-fld., the fls. orange and blue-purple. Winter. B.M. 119, 120. G.C. III. 54:86. Gn. 60, p. 412; 76, p. 168. Gn.W. 23:185. R.H. 1909: 308. Var. **citrina,** Hort., is cult. abroad. Gn. 78, p. 30.

BB. *Lvs. linear-lanceolate, margin flat.*

parvifòlia, Dry., is at once distinguished by its linear-lanceolate lvs. with an equal base and flat margin. S. Afr.—The species is probably not cult. Var. **júncea,**

3733. Strelitzia Reginæ. (×1/4)

Andr. (*S. júncea,* Link), has lvs. with practically no blade: spathe green margined with magenta, sepals orange, petals rich blue, white-tipped. S. Afr. B.R. 516. R.B. 29, p. 184.

AA. *Plants with finally tall woody sts.*

B. *Base of lvs. cordate: interior petals white.*

augústa, Thunb. (*S. angústa,* D. Dietr.). Becoming 18 ft. high: lvs. at the summit of the st. 2–3 ft. long, oblong, acute; petiole 4–6 ft. long: peduncle short, from a leaf-axil: spathe deep purple: fls. on short purple pedicels, all parts of the fl. pure white; petals round at the base. B.M. 4167; 4168. G.C. III. 35:402.

kewénsis, Hort. (*S. augusta* × *S. Reginæ*). Plant about 5 ft. high: lvs. as in *S. augusta* but the blades 2 x 1¼ ft.: fls. vertical, pale watery yellow, more resembling those of *S. Reginæ,* but the small hooded petal is more like the other parent as are the lilac-pink patches at the base of the sepals. Garden hybrid. G.C. III. 47:217; 54:87.

BB. *Base of lvs. obtuse: interior petals blue.*

Nícolai, Regel & C. Koch. Resembling *S. augusta* in habit and foliage, but the fls. and spathe are much larger and the petals are hastately combined and blue in color. B.M. 7038. F.S. 13:1356. Gt. 7:235.

F. Tracy Hubbard.†

STREPTÓCALYX (*twisted calyx*). *Bromeliàceæ.* There are 7 species of Streptocalyx, according to Mez (DC. Monogr. Phaner., vol. 9), of Brazil. The genus differs from Bromelia in having strongly imbricated broad sepals and long corolla-tube. No species are in the American trade, but *S. Fürstenbérgii,* Morr., is described in horticultural literature (sometimes as *Æchmea Fürstenbergii,* Morr. & Wittm.). It is a stemless pineapple-like plant, with 30–40 rigid lanceolate lvs. in a dense rosette: cluster a central dense panicle 1–1½ ft. long, with many 2-sided spikes of rather dull fls. *S. longifòlius,* Baker (*Bromèlia longifòlia,* Rudge), has densely rosulate lvs. 3–6 ft. long, vaginate at base, spinulose at apex and margin, dark-colored on the edges, scaly. Guiana.

STREPTOCÁRPUS (Greek compound, meaning *twisted fruit*). *Gesneriàceæ.* Cape Primrose. Herbs, frequently villous or lanate, adapted to greenhouse culture; choice plants, grown for the showy bloom.

Stemless, with 1 or more spreading radical lvs. or rarely with a st. and opposite lvs.: peduncles scape-like or axillary, sometimes 1–2-fld., sometimes cymose, several-fld.: fls. pale purple or blue, showy; calyx 5-parted; corolla-tube elongated, cylindrical or spreading above, limb obliquely 2-lipped, posterior lip 2-cleft, anterior larger, 3-cleft; perfect stamens 2; disk short-annular; ovary superior, imperfectly 4-celled: caps. linear, terete, splitting in 2, rarely 4 valves.—About 60 species, natives of S. Afr. and Madagascar. In Oct., 1826, there bloomed at Kew a most interesting gloxinia-like little plant, seeds and specimens of which had been collected in S. Afr. by Bowie, on the estate of George Rex, at Knysna. The plant was described as *Didymocarpus Rexii.* It is a stemless plant, with 1 or rarely 2 long-tubular nodding pale blue fls. on each of several short scapes, and with several clustered root-lvs. It proved to be a profuse bloomer and easy to grow. "So abundantly does it produce seed," wrote W. J. Hooker, in 1830, "that new individuals come up as weeds in the neighboring pots, and a succession of flowers may be obtained at almost every period of the year." In 1828, John Lindley made the genus Streptocarpus for this plant, calling it *S. Rexii,* the name it now bears. It appears to have been nearly thirty years after the intro. of *S. Rexii* that another streptocarpus bloomed in England. This second species was *S. polyanthus,* which may be taken as the type of a group that has one leaf lying on the ground and from the midrib of which arise successive several-fld. scapes. The intro. of this curious plant seems to have revived the interest in streptocarpuses, an interest that has been kept alive by the frequent intro. of other species. The chief stimulus to the systematic breeding of these plants seems to have been the intro. of *S. Dunnii,* said by J. D. Hooker to be "quite the monarch of its beautiful genus" (but now excelled by *S. Wendlandii*). Seeds of this species were sent to Kew in 1884 by E. G. Dunn, of Cape Town. It is one of the monophyllous section to which *S. polyanthus* belongs. In the meantime, *S. parviflorus,* a species allied to *S. Rexii,* had been intro. from the Cape region. With the three species, *S. Rexii, S. parviflorus,* and *S. Dunnii,* Wm. Watson of the Royal Gardens, Kew, set to work systematically to breed a new race of streptocarpus, and his efforts met with unqualified success. When the hybrids came to notice in 1887, the Gardener's Chronicle made the following comment on the value of the work: "The results are very striking, and we can hardly doubt that Mr. Watson has set the foundation of a new race of plants, parallel in importance to the Achimenes and Tydæas." Several hybrid races have now been produced and several interesting species have been intro. from the wild, so that Streptocarpus seems to be destined to become a very important and popular garden genus.

Bentham and Hooker's treatment divides the Ges-

neriaceæ into two great tribes: Gesnereæ, with ovary more or less inferior and fruit a capsule; Cyrtandreæ, with ovary superior and fruit sometimes a berry. The latter tribe, the species of which have been monographed by C. B. Clarke in vol. V of DeCandolle's "Monographiæ Phanerogamarum," contains the genera Streptocarpus, Episcea, Cyrtandra, Æschynanthus, Ramondia, and others. Streptocarpuses are of three groups: the stemless monophyllous species, with one prostrate leaf from the midrib of which the scapes arise (this leaf is really an enlarged cotyledon, the other cotyledon not enlarging); the stemless species, with several or many radical more or less primula-like leaves (whence the English name "Cape primrose"); the stem-bearing species, with opposite cauline leaves. The cultivated species chiefly represent the first two sections. In the American trade, four specific names chiefly occur, *S. Rexii, S. Galpinii, S. Dunnii,* and *S. Wendlandii;* but since the hybrids represent several other species, these additional species are inserted in the following account. Streptocarpus is an African genus. The stem-bearing section is confined to central Africa and Madagascar, and the others to South Africa. Clarke's monograph, 1883, describes nineteen species, but *S. Dunnii, S. Wendlandii, S. Galpinii,* and many others have since been discovered.

Streptocarpuses are not difficult plants to grow. They are usually raised from seeds, the seedlings blooming in eight to fifteen months from starting. The seeds are very small, and care must be taken not to cover them too deep. Give an open sunny place in an intermediate temperature. They are not stove or warmhouse plants. Of the new hybrid forms, seeds sown in February or March should produce plants that will bloom the following fall and winter; after blooming, the plants may be discarded, for better results are usually secured from new plants than from those more than one season old. The season of most profuse bloom is summer, but the bloom continues until winter. The monophyllous species can be propagated also by cuttings of the leaf. Some fanciers of Cape primroses advise propagating select types by leaf-cuttings or by division.

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3734. Streptocarpus Rexii. (×⅓)

KEY TO THE SECTIONS.

A. *Plants of native origin.*
B. *Sts. elongated: lvs. opposite.*
Section I. Caulescentes. Species **1.**
BB. *Sts. lacking or very short: lvs. all radical.*
C. *Lvs. several, forming a rosette.*
Section II. Rosulati. Species 2–6.
CC. *Lvs. solitary.*
Section III. Unifoliati. Species 7–12.
AA. *Plants of hybrid origin.*
Section IV. Hybrida. Species 13–17.

Section I. Caulescentes.

1. cauléscens, Vatke. Caulescent, hirsute: lvs. long-petioled, oval-oblong, entire, rather repand, apiculate, obtuse, base contracted to the petiole, puberulent above, villous beneath: fls. blue, ½in. across; calyx hirtellous, lobes linear; corolla up to nearly ¾in. long, 6 times longer than the calyx, limb strongly unequal. Trop. Afr. B.M. 6814.

Section II. Rosulati.

A. *Scapes 1–2-fld.*
B. *Fls. blue or mauve* ..... **2. Rexii**
BB. *Fls. pale lavender to rosy pink or rosy mauve* ..... **3. cyaneus**
AA. *Scapes 3- to many-fld.*
B. *Corolla-tube cylindric, nearly straight, limb slightly 1-sided.*
C. *Lvs. not decurrent on the petiole* ..... **4. parviflorus**
CC. *Lvs. attenuated into the petiole* ..... **5. luteus**
BB. *Corolla-tube much curved, limb very oblique* ..... **6. Junodii**

2. Réxii, Lindl. (*S. Gárdenii,* Hook.). Fig. 3734. Acaulescent: lvs. several, suberect, 8 x 2 in., oblong, crenate, hairy on both surfaces: scapes several, 4–12 in. high, 2–1-fld.: calyx-lobes narrowly oblong, hairy; corolla 2 in. long, about as wide, blue or mauve, tube 1⅛ in. long, very narrowly linear-funnel-shaped, lobes a little unequal. S. Afr. B.M. 3005; 4862. B.R. 1173. L.B.C. 14:1305. F.S. 12:1214. Var. **biflòrus,** Ortgies, differs in having stouter 2-fld. scapes. Gt. 6:204.

3. cyàneus, S. Moore. St. prostrate, slightly elongated, bearing 4 lvs.: lvs. linear-oblanceolate, narrowed below the middle into a narrow petiole-like portion, apex obtuse: scape always 2-fld.: fls. varying from pale lavender or blue to rose-pink or rosy mauve, with a few streaks of red on the 3 lower lobes and a blotch of yellow in the throat; calyx-lobes linear-oblong, pilose-pubescent; corolla about 1¼ in. long, puberulent outside. Transvaal. B.M. 8521. G.C. III. 55:31.—Allied to *S. Rexii.*

4. parviflòrus, Mey. Acaulescent: lvs. several, spreading or suberect, nearly or quite sessile, elliptic, up to 9 x 3½ in., crenate and bullate, shaggy, dark green above, nearly white beneath: scapes several, 6–10 in. high, reddish, shaggy, bearing 3–10-fld. cymes: fls. about ¾in. across; calyx glandular-pubescent, lobes narrowly oblong; corolla-tube glandular-pubescent, ⅔–¾in. long, cylindrical, obscurely widened upward, purplish outside, mouth a little oblique, lobes orbicular, white. S. Afr. B.M. 7036.

5. lùteus, C. B. Clarke. Lvs. several, petioled, elongate-oblong, 8–13 x 2–2¾ in., obtuse, attenuate at base, crenate, villous on both surfaces, almost tomentose beneath: peduncles and fls. almost as in *S. parviflorus:* corolla shorter, white, throat yellow, or almost white penciled with purple, tube slightly widened upward: caps. densely silky. S. Afr. B.M. 6636 (as *S. parviflorus*).

6. Junòdii, Beauverd. Acaulescent, cæspitose: lvs. 4–6, rugose, base attenuate, villous, veins prominent beneath: peduncles erect from the lf.-axils, pilose, 3–4½ in. high: fls. 3–6, pendulous, blue-lilac; calyx 5-parted, segms. unequal, linear, recurved; corolla hirsute outside, 1½–2 in. long, arched, limb 5-lobed,

oblique, lobes rotund, the lower yellow-blotched at base. S. Afr.

Section III. Unifoliati.

A. *Corolla-tube broader than long*..... 7. **Galpinii**
AA. *Corolla-tube longer than broad.*
B. *Fls. rose to reddish*..... 8. **Dunnii**
BB. *Fls. bluish or purplish.*
C. *Tube of corolla linear-cylindrical*... 9. **polyanthus**
CC. *Tube of corolla more or less widened at the mouth.*
D. *Limb of corolla much shorter than the tube*.....10. **grandis**
DD. *Limb of corolla nearly as long as the tube.*
E. *Lf. rarely over 1 ft. long: corolla usually less than 1 in. across*.....11. **Saundersii**
EE. *Lf. usually much over 1 ft. long: corolla usually more than 1¼ in. across*.....12. **Wendlandii**

7. Gálpinii, Hook. f. Acaulescent: lf. solitary, sessile, ovate-oblong, obtuse, very entire, base subcordate, silky-villous above, fleshy nerves which are strongly red beneath: scapes several, they and the pedicels densely glandular-pubescent: fls. racemose, on stout erect or spreading pedicels, violet; calyx-segms. linear, obtuse; corolla campanulate, tube slightly incurved, lobes 5, equal, spreading-recurved, orbiculate. Transvaal. B.M. 7230. J.H. III. 23:389. G.C. III. 11:139.

8. Dúnnii, Mast. Fig. 3735. Acaulescent, soft glandular-pubescent or tomentose: lf. solitary, very large, 2–3 ft. long, sessile, ovate-oblong, obtuse, margin irregularly lobulate and crenate, bullate between the reticulate veins, midrib thick and villous beneath: scapes very numerous, clustered, produced serially, stout, 1 ft. or more high, bearing many-fld., secund panicles: fls. 1½ in. long, pale brick-color to rose, short-pedicelled, inclined or nodding; calyx-segms. linear-oblong; corolla curved, tubular-funnel-shaped, puberulent, lobes short rotund, ciliolate. S. Afr. B.M. 6903. G.F. 3:609 (adapted in Fig. 3735).—A plant sometimes produces more than 100 fls.

9. polyánthus, Hook. Acaulescent: lf. solitary, 5–7 x 3 in., round or elliptic, obscurely crenate, hairy on both surfaces: scapes 1–3, up to a foot or more high, rather stout, 4–10-fld.: calyx hairy, teeth linear; corolla pale blue, about 1¼ in. across, tube linear-cylindric, curved, limb unequal, the 3-lobed lip much longer than the 2 upper segms. S. Afr. B.M. 4850. Gt. 6:206.

3735. Streptocarpus Dunnii. (× about ⅓)

R.H. 1862, p. 250; 1889, p. 398; 1896, p. 12. **Var. grandiflòrus,** Hort., is a large-fld. form. H.F. II. 1:128. —Said to be a garden hybrid.

10. grándis, N. E. Br. Acaulescent: lf. solitary, radical, 2–3½ ft. long, 1–2¼ ft. broad, ovate, base cordate, crenate, pubescent on both sides; cauline lvs. none or few, small, ovate, sessile: peduncles several,

3736. Streptocarpus Wendlandii. (×⅓)

1½–3½ ft. high, bearing above 2–6 lax racemes, pubescent: fls. in 2's, lavender or light blue outside, white within, marked with 2 broad lilac stripes in the throat; corolla-tube about 1 in. long, bent downward, upper lobes pale blue or lavender. Zululand. B.M. 8042.

11. Saùndersii, Hook. Acaulescent: lf. solitary, sessile, flat on the ground, 14 x 12 in., very broadly elliptic, short-hairy on both surfaces, crenate, yellowish green above, purple-rose beneath: scapes 1–5 from the axil, 10–18 in. high, sometimes bearing a small lf. near the base; cyme repeatedly divided, 40–80-fld.: calyx-lobes narrow-oblong, hairy; corolla pale blue with purple blotches in the throat, tube somewhat funnel-shaped, a little curved, limb oblique, 2 lobes much shorter. S. Afr. B.M. 5251. F.S. 17:1802. Gt. 24:826.

12. Wéndlandii, Sprenger. Fig. 3736. Acaulescent: lf. solitary, attaining a size of 30 x 24 in., crenate, closely hairy, red-purple beneath: scapes several, 1–2½ ft. high, forked; infl. 6–8 in. long, 30-fld.: calyx-lobes linear, hairy; corolla violet-blue, tube about 1 in. long, slightly curved, limb 1½ in. across, oblique, lobes broad and entire. S. Afr. B.M. 7447 (part of which is copied in Fig. 3736). G.C. III. 22:275. Gn. 45, p. 511; 50, p. 394. J.H. III. 28:223. G. 17:181.—One of the finest species in cult.

Section IV. Hybrida.

(For colored pictures of modern hybrid types, see Gn. 29:545; 41:843; 50:1092.)

13. achimeniflòrus, Hort. Acaulescent: lvs. several, radiating or opposite, rather elliptical, somewhat fleshy, brilliant light green: fl.-st. stiff, most often 1-fld.: fl. as large as a gloxinia, but with the corolla divisions more deeply cleft, and finely dentate, bright lilac tinted with marine blue through pale lilac to pure white, the lower part of the corolla is always striped with deeper color. Possibly a garden hybrid. R.H. 1906, p. 309. **Var. álbus,** Hort., is offered in the trade as a large-fld. white form. Var. **gigantèus,** Hort., is offered as a lavender-blue form. **Var.ròseus,** Hort., is offered as a soft delicate rose form.

14. Bruántii, Hort. (*S. Rexii* × *S. polyanthus*). Lvs. very large, not cordate, very velvety, bright green: scapes up to 14 in. high: fls. about double the size of

those of *S. polyanthus*, about 1½ in. long, blue or bright mauve, throat yellowish white. Garden hybrid.

15. **Dŷeri**, W. Wats. (*S. Wendlandii* × *S. Dunnii*). Acaulescent: lf. solitary, 2 x 1¼ ft., rich olive-green above, vinous purple beneath, soft-hairy: fl.-st. 1–2 ft. high, several from a lf.: fls. numerous, long-tubular, bright red-purple. A garden hybrid.

3737. Streptocarpus kewensis. (×⅛)

16. **kewénsis**, Hort. (*S. Rexii* × *S. Dunnii*). Fig. 3737. Lvs. 2 or 3, large, but not so large as those of *S. Dunnii*, oblong or elongate-ovate, bright green: fl.-sts. numerous, each 6–8-fld., forming a tolerably compact mass: fls. bright mauve-purple, striped with dark brownish purple in their throat; corolla about 2 in. long, 1¼–1½ in. across. Garden hybrid.

17. **Wátsonii**, N. E. Br. (*S. luteus* × *S. Dunnii*). Lf. solitary, similar to but smaller than that of *S. kewensis:* scapes several, bearing 10–16 fls. each: fls. about 1¼ in. long and 1 in. across, bright rose-purple, with a white throat, which is striped with brownish purple. Garden hybrid. G.C. III. 2:215.

The following species are either little known or have not found their way into general cult.: *S. Armitàgei*, Baker & Moore, is closely allied to S. Dunnii, differing in having a corolla much less funnel-shaped and straighter, with less spreading lobes; originally described as solitary-lvd., but 4 lvs. are said to have developed in the cult. plant. S. Afr.—*S. Bánksii*, Lynch (S. Wendlandii × some hybrid), has 2 lvs. about 19 x 13 in. for the lower, the second somewhat smaller: fls. large, purple-blue. Garden hybrid. G.C. III. 56:192.—*S. biflòrus*, Pucci, is a name appearing in horticultural journals for some unknown plant, which is said to have several blue fls.—*S. biflòro-polyánthus*, Duch., is a hybrid, the female parent of which is S. polyanthus, the male the above-mentioned S. biflorus: it is said to have 5 ovate-oblong, crenate, rugose lvs.; several scapes with 2–4 pale lilac fls. F.S. 23:2429.—*S. Blýthinii*, Lynch (S. Wendlandii × S. cyaneus), has 2–5 lvs., the largest of which is 15 x 9 in. and another is 12 x 7 in., green beneath, in some cases reddish toward the tip, in others with the color here and there: scapes 9–10, each with 5–14 fls., about 14 in. high: fls. about 1½ in. across, lavender or bluish purple; petals marked with dark purple stripes. Garden hybrid. G.C. III. 56:260.—*S. cantabrigiénsis*, Lynch (S. cyaneus × S. Dunnii), has several lvs. which are 7–8 x 3 in.: scapes about 7 in. high, 2–12-fld., conspicuously hairy: calyx-segms. linear-lanceolate; corolla 2 in. long, about 1¾ in. across, tube funnel-shaped, lobes rounded, throat white with 7 deeply colored lines, limb deep rose. Garden hybrid. G.C. III. 59:131.—*S. Gaudínii*, Hort., is offered in the trade.—*S. Greènii*, Hort. ex Wilson (S. Saundersii × S. Rexii), is dwarfer and more compact than the former parent, the scapes many-fld.: fls. pale lilac-blue. Garden hybrid. G.C. II. 17:303. Said to be the first hybrid streptocarpus.—*S. Hòlstii*, Engl., resembles S. caulescens; plant about 1½ ft. high, producing a large number of sts., each bearing 6–8 dark violet-blue fls. ¾–1 in. long, spotted with white on the midlobe of the lower lip. German E. Afr. (Section I.) B.M. 8150.—*S. hýbridus*, Hort., is a name applied to garden hybrids in general.—*S. Kírkii*, Hook. f. Caulescent; st. 4–6 in. high, stout, erect, hairy: lvs. 1–2 in. long, broadly ovate, obtuse, crenate, finely pubescent on both surfaces, base rounded or cordate; petiole ⅛–½in. long: scapes axillary, very slender, 3–4 in. high: fls. drooping, opposite; calyx-lobes lanceolate, pubescent; corolla ¾in. long, pale lilac, tube hairy, upcurved, broad and subcampanulate, mouth expanded, lobes short rounded, ciliate. Trop. E. Afr. B.M. 6782. (Section I.) Allied to S. caulescens.—*S. lichtensteinénsis*, Hort. (S. Wendlandii × S. Watsonii), has 2 lvs., 1 prostrate and the other smaller and erect: fls. numerous, lilac-blue. Garden hybrid.—*S. Mahònii*, Hook. f. Acaulescent: lf. solitary, 1 ft. or more long, flat on the ground, sessile, ovate-oblong, crenulate, tip rounded, base cordate: scapes many, crowded, densely pilose: fls. long-pedicelled; calyx-segms. pubescent, linear, corolla violet, tube ⅔in. long, pubescent, decurved, somewhat inflated above; lobes rotundate. Brit. Cent. Afr. B.M. 7857.—*S. multiflòra*, Laing., is a seedling of S. Rexii, with up to 30 large bluish purple fls., which have darker purple lines in the throat and running up onto the lower lip. Garden hybrid. G.C. III. 18:211; 32:327. I.H. 43, p. 67.—*S. orientàlis*, Craib. Caulescent; st. solitary, erect, simple, 6–16 in. high, leafy: lvs. ovate to elliptic-ovate, apex obtuse, base cuneate, crenate or crenate-serrate, 1–3½ x ¾–2¾ in., both surfaces glandular-pilose; petioles up to 2 in. long: infl. axillary, cymose: calyx-lobes lanceolate or linear-lanceolate, white-glandular-hairy outside; corolla purple outside, paler within, tube over 1 in. long, limb about ¾in. across, lobes reflexed-spreading, wide oblong, tip rounded. Siam. B.M. 8526.—*S. Veitchii*, Hort., is offered in the trade.

F. Tracy Hubbard.†

STRÉPTOPUS (Greek, *twisted stalk*, referring to the peduncles). *Liliàceæ*. Twisted Stalk. Perennial herbs, with the aspect of Polygonatum, hardy and adapted to the wild-garden; should be grown in shade or with rich, loose, and moist soil in sunlight.

Stems erect from a short dense, or longer, repent rhizome, simple or slightly branched: lvs. alternate, ovate or lanceolate, membranaceous, sessile or clasping: fls. medium-sized, solitary or paired in the axils, nodding, rose or whitish; perianth campanulate, segms. distinct or connate at base; stamens 6; style 3-cleft; ovary sessile, ovoid, 3-celled: berry subglobose, indehiscent.—About 6 species, Eu., Temp. Asia, and N. Amer. Woodland plants closely related to Disporum which has terminal fls.

A. *Fls. purple or rose.*

rôseus, Michx. Fig. 3738. Rootstock short, stout: st. 1–2 ft. high: lvs. sessile, only partially clasping, 2–4 in. long: peduncles less than 1 in. long, mostly 1-fld.: fls. about ½in. long: berry red, ½in. thick. May–July. Moist, rich woods in the northern states, S. to Ga.

3738. Streptopus roseus. (×½)

AA. *Fls. greenish white.*

amplexifòlius, DC. Rootstock short, stout: st. usually taller than *S. roseus:* lvs. clasping, 3–6 in. long: peduncles 1–2 in. long, usually 2-fld.: fls. about ½in. long: berry red. May–July. Moist rich woods, N. U. S. and Canada south to N. C. and New Mex.; also in Eurasia.

F. W. Barclay.

STREPTOSÒLEN (Greek, *streptos*, twisted, *solen*, tube, with reference to the form of the corolla-tube). *Solanàceæ*. Scabrous-pubescent shrub, suitable for greenhouse culture and for outdoors, as an ornamental, in the extreme S. Lvs. entire, not large, rugose: fls. orange-red, pedicelled, in a terminal corymbose panicle; calyx tubular-campanulate, shortly 5-cleft; corolla-tube elongated, spirally twisted below, widening above, limb spreading, 5-lobed, lobes broad, very obtuse; perfect stamens 4, didynamous; ovary stipitate, 2-celled: caps. somewhat leathery, valves 2-cleft.—One species, Colombia.

3739. Streptosolen Jamesonii. (×½)

Jàmesonii, Miers (*Browállia Jàmesonii*, Hort., & Benth.?). Fig. 3739. Handsome evergreen scabrous-pubescent shrub, 4–6 ft. high, hardy and much cult. in Calif. as far north as San Francisco. June. G.C. II. 21:797. Gn. 26:6. R.H. 1883:36. B.M. 4605. F.S. 5:436. P.M. 16:6. G.M. 39:200. V. 7:298; 9:147.—An old favorite in northern greenhouses. F. Tracy Hubbard.†

STRICKLÁNDIA (named in honor of Sir C. W. Strickland). *Amaryllidàceæ*. Perianth narrowly funnelform, tube short, segms. oblanceolate, equal; stamens not declinate, filaments united half-way up in a cup, lanceolate above it, without any teeth between; ovary globose, 3-lobed, 3-celled: caps. short, deeply 3-lobed, loculicidally 3-valved; seeds many, small. One species, Andes of Ecuador. *S. eucrosioìdes*, Baker (*Leperìza eucrosioìdes*, Baker. *Phædranássa eucrosioìdes*, Benth. & Hook. f. *Stenómesson Stricklándi*, Baker). Bulb ovoid, 2 in. diam.; tunics brown, membranaceous: lvs. 2 to a st., produced after the fls., thin, green, oblong, 6–9 in. long: peduncle slender, terete, 1 ft. high: fls. 3–4 in an umbel, horizontal or cernuous; spathe-valves linear; perianth-tube green, lobes red, laxly nerved, not keeled nor tipped with green. Andes of Ecuador. G.C. III. 30:263. Cult. as for Phædranassa.

STROBILÁNTHES (Greek, *cone* and *flower*, referring to the inflorescence). *Acanthàceæ*. Herbs or shrubs, erect, sometimes tall, glabrous, scabrous-pubescent or villous; greenhouse, or out-of-doors in extreme South.

Leaves opposite, in a few species strongly separated, entire or toothed: fls. blue, violet, or white, rarely yellow, solitary at the axils of the opposite bracts, sessile or short-pedicelled, sometimes in dense or interrupted terminal spikes or the peduncles clustered at the axils; calyx deeply 5-cleft or almost 5-parted, segms. linear; corolla-tube slender at the base, widened above; limb spreading, 5-lobed, lobes ovate; perfect stamens 4 or 2: caps. oblong or linear, 2-celled at or near the base.—About 200 species, India, Malaya, China, and Japan, also 1 in Trop. Afr. Adapted to the warmhouse.

Strobilanthes are mostly erect half-shrubby plants cultivated for their flowers and foliage. Only young, well-grown plants are attractive, the older ones becoming weedy and unattractive. Some species are grown as ornamental foliage bedding plants, but they are not so desirable for general use as the coleus, the slightest cool weather changing the color of their leaves to a very undesirable shade. In the greenhouse they make fine decorative foliage plants but require at all times a high temperature and an abundance of moisture and much syringing. Under unfavorable conditions they lose their leaves and become unsightly.

anisophýllus, T. Anders. (*Goldfùssia anisophýlla*, Nees). Branches somewhat zigzag: lvs. broadly lanceolate, acuminate, serrulate, opposite, but one of each pair much smaller than the other: fls. purplish and white; corolla funnel-shaped, very broad at the mouth, with a somewhat irregular 5-lobed limb. India. B.M. 3404. B.R. 955 (as *Ruellia persicifolia*). R.B. 29:36.—Similar to *S. isophyllus* in habit and use.

callòsus, Nees. Shrub, 6–8 ft. high: lvs. elliptic-lanceolate, acuminate, puberulous, narrowed into a long, slender petiole which is winged to the middle: fls. in short, oblong spikes, large, pale violet-blue; corolla-tube very short, dilated into a subcampanulate throat and expanding into a limb 2 in. across; lobes orbicular, undulate. B.M. 7538.—A native of W. India, where it forms a shrub 6–8 ft. high; said to flower in its third year.

Dyerìanus, Mast. An erect, branching, soft-wooded stove shrub: st. hirsute: lvs. opposite, 6–8 in. long, elliptic-lanceolate, serrulate, cordate at base, sessile, variegated with iridescent tints of blue and lilac, rose-purple beneath: fls. in erect spikes, 1½ in. long, pale violet; calyx unequally 5-lobed, lobes linear, obtuse; corolla-tube curved, ventricose, limb of 5 short, broad, revolute lobes. Burma. B.M. 7574. R.B. 20:133. J.H. III. 26:359. A.G. 17:297. V. 19:67. G.M. 46:149.—Used for bedding.

gossýpinus, T. Anders. Shrubby, covered with dense yellowish wool: lvs. 4 x 2 in., ovate, acute, base broad-rhomboid, subcoriaceous, entire, wool of upper surface deciduous: spikes 1–3 in. long, linear-oblong, woolly, compound, becoming paniculate: fls. violet; calyx-segms. narrowly lanceolate; corolla nearly straight. India. B.M. 7790. G.M. 56:958.

isophýllus, T. Anders. (*Goldfùssia isophýlla*, Nees). A low, much-branched, bushy shrub, 2–3 ft. high, swollen at the joints: lvs. short-petioled, opposite, narrowly lanceolate, distantly serrulate or entire: peduncles axillary, shorter than the lvs., bearing several fls.: corolla 1 in. long, funnel-shaped, blue and white; limb 5-lobed; lobes emarginate. India. B.M. 4363. B. 5:244.—Used either for bedding or for pots. Blooms profusely either in winter or summer, according to treatment.

Micholítzii, Ridley. Subshrub, 3–4 ft. high: st. 4-angled, dilated at the nodes: lvs. lanceolate or ovate-lanceolate, 6 x 2 in., one of the pair much larger than the other, acuminate at both ends: racemes axillary, very numerous, cone-like, ½–¾ in. long; bracts rounded, white, tipped with green: fls. white, projecting slightly from the cone. Sumatra.

S. auriculàtus, Nees. Shrub, 2–6 ft. high, glabrous, except the more or less hairy tips of the branches: lvs., one sometimes 10 x 2¼ in., the other 3 x 1½ in., ovate, serrulate: spikes terminal, solitary: fls. pale purple. India. H.U. 6, p. 196.—*S. glomeràtus*, T. Anders. Shrub, with branches often horizontal and hairy upward: lvs. ovate and acute, complanate (flattened), serrate, hairy or villous above: fls. purple, about 2 in. long. India. B.M. 3881 (as Goldfussia glomerata).—*S. Wállichii*, Nees. Weak subalpine shrub with angled branches: lvs. elliptic, acuminate: fls. blue, in pairs or solitary. Himalaya. B.M. 5119 (as Goldfussia Thomsoni).

Heinrich Hasselbring.
F. Tracy Hubbard.†

STROMÁNTHE (Greek, *couch* and *flower;* said to allude to the form of inflorescence). *Marantàceæ.* Perennial herbs grown in the warmhouse for the foliage.

Stems leafy, erect, from a thick horizontal rhizome, somewhat branched, the base covered by the long lf.-sheaths: lvs. short-petioled: infl. rather lax, terminal on a long peduncle, more or less compound, rarely narrow, almost raceme-like, frequently all colored blood-red; bracts and bractlets spathe-like, colored; sepals 3, free, oval-oblong; petals 3, slightly narrower than the sepals; ovary 1-celled, 1-ovuled: fr. subglobose.—About 12 species, S. Amer. (Schumann, in Engler's Das Pflanzenreich, hft. 11.—IV. 48). Closely allied to Calathea, Maranta, Phrynium and Thalia. It agrees with Maranta and Thalia in having a 1-loculed caps., and thereby differs from Calathea and Phrynium, which have 3 locules. From Maranta it differs in having a very short perianth-tube and the segms. not standing opposite each other. From Thalia it differs, as does Maranta, in having 2 side staminodia rather than 1. For cult., see remarks under *Calathea.*

Porteàna, Griseb. (*Maránta Porteàna,* Koern.). Two to 4 ft. high, with maranta-like lvs., the blades long-elliptic or ovate-lanceolate, varying from acuminate to almost obtuse, purple beneath, bright green above with transverse stripes or bars of silvery white: fls. solitary or twin on the rachis, blood-red, the infl. simple or compound. Brazil. Lowe 26.

sanguínea, Sonder (*Thàlia sanguínea,* Lem.). Lf.-blades about 1 ft. long, oblong-acuminate, purple beneath and green above: scape 12–20 in. tall, red toward the top, bearing a panicle of bright red and red-bracted fls. Probably Brazilian. B.M. 4646 (as Phrynium). F.S. 8:785. J.F. 3:268; 4:401.—An old garden plant. Thrives in an intermediate house and attains a height of 5 ft. when planted in a border. Var. **spectábilis,** Eichler (*S. spectábilis,* Lem. *Maránta spectábilis,* Koern.). Lvs. particolored with green beneath. L. H. B.

STRONGYLÒDON (Greek, *round* and *tooth;* the lobes of the calyx are rounded). *Leguminòsæ.* Glabrous twining shrubs or subshrubs: lvs. pinnately 3-foliate, stipelled; stipules small: fls. red, showy, fasciculately racemose on elongated, axillary peduncles; calyx-teeth broad, obtuse; standard ovate-oblong, acute, recurved, finally reflexed, 2-appendaged inside above the claw; wings shorter than the standard and adherent to the keel which is beaked, strongly incurved, equaling the standard and connate with the petals; stamens free from the standard; ovary stipitate, 1- or few-ovuled: legume stipitate, obliquely ovate-oblong, 2-valved.—About 20 species, Madagascar, Ceylon, to N. Austral. and the Pacific islands. May be planted far S.

pseudolûcidus, Craib. Climbing shrub: lvs. 3-foliate, nearly 5 in. long; lfts. more or less ovate, 3½x2–2¼ in.: racemes axillary, up to 3 in. long: fls. bright red, about 1 in. long. Madagascar, Ceylon, N. Austral. B.M. 8494.

STROPHÁNTHUS (Greek, *twisted cord* and *flower,* alluding to the corolla-segms.). Incl. *Roupéllia. Apocynàceæ.* Shrubs, often scandent, glabrous or more or less hairy, with persistent or deciduous foliage, suitable for the warmhouse: lvs. opposite, rarely ternate: infl. terminal, often at the ends of short branches, corymbose, many- or few-fld. or reduced to solitary fls.: fls. mostly showy; sepals 5, imbricate, sometimes foliaceous; corolla funnelform or campanulate, tube cylindrical, long or short, mouth with paired appendages alternating with the lobes which are 5, acuminate and produced into very long filiform tails; disk none: mericarps 2, follicular, oblong or fusiform, divaricate.—About 40 species, Trop. and S. Afr. and Trop. Asia.

S. dichótomus, DC. Erect shrub with stout branches: lvs. elliptic-oblong or obovate, 3–5½ x 2–3 in., obtuse, acute or apiculate, rather coriaceous: cymes much shorter than the lvs., dichotomous, few-fld.: sepals subulate from an ovate base; corolla-tube and throat ¾–1 in. long, whitish tails 5–7 in. long, purple: follicles very large, 8 x 2 in., divergent. India, Malaya, and Java. H.U. 2, p. 225. —*S. grandiflòrus,* Stapf (S. Petersianus var. grandiflorus, N. E. Br.). Dense shrub, 5–6 ft. high, with long, slender, reddish brown branches: lvs. ovate to elliptic-oblong, shortly acuminate, 2–3 x ¾–1 in., membranous: cymes terminal on leafy branches, usually reduced to a single fl.: sepals oblong to lanceolate-oblong, erect; corolla wide, purplish without, milk-white or creamy within, the lobes ovate, produced to filiform tails about 6 in. long. Trop. and S. Afr. B.M. 7390.—*S. grátus,* Franch. (Roupellia grata, Wall. & Hook.). Small glabrous tree or shrub: lvs. oblong, short-acuminate, base obtuse or subacute, leathery: cymes terminal, sessile, few- to 12-fld.: fls. white or tinged with pink, large; sepals broad, oblong or obovate; corolla-tube 1½ in. long, lobes broad, obovate, ¾–1 in. long; ovary glabrous: follicles obtusely acuminate. Trop. Afr. B.M. 4466. G.C. III. 28:151. J.F. 1:16.—*S. Ledièni,* Stein. Shrub, with softly and sparingly pubescent branches, brown when young: lvs. obovate, abruptly cuspidate, cuneate at the base: cymes sessile, terminal, 3–7-fld.: sepals linear from an elliptic base, acute; corolla-tube pale yellow, the lobes deep yellow, ovate, 6–8 in. long, including the tails: follicles slender, brown, mottled with yellow, coriaceous. Trop. Afr. Gt. 36:1241.—*S. Preùssii,* Engl. & Pax. Rambling or climbing shrub, up to 12 ft. high: branches glabrous, brown or red-brown: lvs. elliptic or oblong to obovate or ovate, abruptly acuminate, 2–5 x 1½–2 in.: cymes terminal, corymbose, many-fld.: sepals linear-oblong or linear; corolla cream-colored to orange with purple spots and streaks in the throat and purple tails, the lobes ovate, suddenly constricted and produced into tails 1 ft. long. Trop. Afr. B.M. 8250.—*S. speciòsus,* Reber (S. capensis, A. DC.). Glabrous, rambling shrub: branches trailing on other shrubs, sometimes running high up, olive-green: lvs. in whorls of 3–4, rarely the uppermost opposite, oblong-lanceolate to lanceolate, acute, rarely acuminate, 1½–3½ x ½–1 in., leathery: cymes terminal or pseudo-axillary, corymbiform, few- to 12-fld.: sepals lanceolate to linear, sometimes recurved; corolla cream-colored to yellow or orange spotted with red, the lobes attenuate from a somewhat broader base into linear spreading tails about 1–1½ in. long: follicles very slender, lanceolate, about 6 in. long. S. Afr. B.M. 5713. F. Tracy Hubbard.

STROPHOLÍRION (Greek for *twisted rope* and *lily,* referring to the twining stem). *Liliàceæ.* Herbaceous, with a cormed base, used for outdoor planting: lvs. few, radical: scape simple, leafless, often twining several feet fls. rose, numerous in a terminal umbel; perianth urn-shaped, 6-lobed; stamens 3; ovary sessile, ovoid, 3-

3740. Strophòlirion californicum. (×⅓)

celled: caps. included in the persistent calyx, globose.—One species, Calif. Very like Brodiæa, and sometimes referred to that genus, but differing in always having 3 stamens and a perianth which is contracted at the throat and saccate at the base. **S. californicum,** Torr. (*Brodiæa volubilis*, Baker). Fig. 3740 (adapted from Pacific R. R. Rep.). In many ways it resembles *Brevoortia Ida-Maia*, except that the scape is climbing to a height of 3–4 ft., and bearing an umbel of delicate rosy pink fls. The scape twines readily about any stick or bush that stands near it. Lvs. 1 ft. or more long, keeled, ½in. or less broad: corm about 1 in. diam. Cent. Calif. B.M. 6123. G.C. III. 20:687. Cult. as for *Brevoortia Ida-Maia*.

CARL PURDY.

STRUTHIÓPTERIS: *Matteuccia.*

STRÝCHNOS (an old Greek name used by Theophrastus for some plants belonging to Solanaceæ). *Loganiàceæ.* Scandent shrubs with short tendrils, or trees, of economic importance; some of the species have been introduced into the southern United States.

Leaves opposite, in scandent species some axils bear short clavate tendrils, the adjacent lf. being often suppressed: cymes terminal or lateral; bracts small: fls. white to yellowish; calyx 5–4-lobed; corolla 5–4-cleft, tube short or long or hardly any, lobes valvate; stamens 5; ovary 2-celled (or 1-celled above): berry globose or oblong.—About 220 species, tropics of both hemispheres.

Nux-vómica, Linn. Tree attaining a height of 40 ft.: lvs. ovate, 5-nerved, glabrous, 3½ x 2 in.: cymes terminal, short-peduncled, 1–2 in. diam.; pedicels hardly any: fls. numerous; corolla-lobes glabrous: berry 1½ in. diam., globose, many-seeded. India.—The seeds yield the drugs, nux-vomica and strychnine, and the bark is somewhat used as a tonic.

potatòrum, Linn. f. Tree attaining a height of 40 ft.: lvs. elliptic, 2½ x 1 in., 3-nerved, subsessile, glabrous or nearly so: cymes axillary, nearly sessile, 1 in. diam.: berry ½–⅔in. diam. India and Ceylon.—The seeds are known as the clearing-nut as they have the property of clearing muddy water when they are rubbed on the inside of the vessel into which it is put.

spinòsa, Lam. Low tree: branchlets slender, armed with pungent spines from the nodes: lvs. obovate or suborbicular, 5-nerved from near the base, glabrous, subcoriaceous: cymes short, dense, terminal, very compound: fls. greenish; calyx-tube very short, segms. linear; corolla-tube short, campanulate, the lobes usually 5, ovate: fr. the size and color of an orange, the shell leathery, the pulp abundant and edible; seeds large. Trop. and S. Afr., Madagascar, and Seychelles.—A promising fr. intro. into the S. U. S.

S. Schumanniàna, Gilg (S. Schumanni, Hort.). Tree, 12–22 ft. high with axillary recurved spines: lvs. decussate, elliptical, gray-pilose on both surfaces: cymes terminal on the gray branches, many-fld.: calyx gray-hirsute, lobes linear; corolla-lobes deltoid-ovoid: fr. edible. Trop. Afr. Reported as intro. into S. Calif. but not successful.—*S. Vólkensii*, Gilg. Tree, 30–40 ft. high: branchlets armed at the nodes with curved pungent spines: lvs. oblong or oblong-ovate, glabrous: cymes lax, many-fld., from the tip of the branches; sepals ovate; corolla-lobes ovate: fr. shaped like an orange, edible. Trop. Afr. Reported as intro. into S. Calif. but not successful.

F. TRACY HUBBARD.

STRYPHNODÉNDRON (Greek, *astringent* and *tree;* the bark has a puckery taste). *Leguminòsæ.* Unarmed trees, usually small, with thick branches, grown in the greenhouse and also outdoors in the extreme S.: lvs. twice pinnate, lfts. small, many-paired, frequently rather broad: fls. small, hermaphrodite or somewhat polygamous, borne in short-peduncled, axillary spikes, 5-merous, sessile; calyx campanulate; petals connate to the middle, finally free; stamens 10, free; ovary short-stipitate, many-ovuled: legume linear, compressed, thick.—Nine species in Trop. Amer.

guianénse, Benth. Branchlets subterete, they and the petioles rusty-tomentellous: pinnæ 6–12 pairs; lfts. with 8–10 pairs of divisions, oblique, oval-oblong, 4–5 lines long, shiny above, reddish beneath: corolla smooth, about 3 times as long as the calyx: pod straight or slightly incurved. Guiana and intro. into Fla.

S. floribúndum, Benth. (Acacia pulcherrima, Willd.). Spineless: pinnæ 13 pairs; lfts. many pairs, oblong-linear, obtuse, pubescent beneath; petiole pubescent and with 2 convex glands at base: spikes twin, axillary, filiform: fls. 5-parted, pilose. Brazil.

STUÁRTIA: *Stewartia.*

STYLÍDIUM (*stylos*, a column, referring to the body formed by the union of the stamens and style). *Candolleàceæ* or *Stylidiàceæ.* Herbaceous or somewhat woody perennials of many perplexing species mostly in Australia, seldom grown under glass or in the open in mild climates.

Confusion has arisen in the name of this group, and recent authorities adopt the name Candollea, but Candollea is itself confused. In 1805, La Billardière founded the genus Candollea for the plants which a few months earlier were named Stylidium, Swartz, by Willdenow (Sp. Pl. iv. 146). As the first application of the name Candollea was thus invalidated, La Billardière, in 1806, used Candollea for a genus belonging to Dilleniaceæ; this is the group described on page 653, Vol. II, now included in Hibbertia by Gilg in Engler & Prantl's Pflanzenfamilien, although kept separate by Bentham in Flora Australiensis and by Bentham & Hooker in Genera Plantarum. Although the name Stylidium, Swartz, is antedated by Stylidium, Loureiro, founded in 1790 on a plant of the Cornaceæ, Swartz's name stands, since Loureiro's Stylidium belongs as a synonym to the earlier genus Alangium (see page 243, Vol. I). According to the International Rules, as well as on the principle of fifty years of accepted usage, it is correct to retain Candollea for the Dilleniaceous plants (page 653) and to use Stylidium for the genus we are now considering, as is done by Bentham & Hooker. Schönland, however, in Engler & Prantl, and, earlier, F. von Mueller, revive the Candollea of 1805 and make Stylidium a synonym, and in this case the Candollea of 1806 would become Eeldea of Durand if it is retained as a genus distinct from Hibbertia. According to the Philadelphia or American Code, however, the existence of earlier homonyms, no matter whether valid names or synonyms, prevents the use of Stylidium, Swartz, and of Candollea of 1806, and Forsteropsis would apparently be the name to be used for the Stylidium of Swartz, while Eeldea would replace Candollea. The latest monographer, Mildbraed, in Engler's Pflanzenreich, hft. 35 (iv. 278. 1908), adopts Stylidium, Swartz. It may be said in passing that the generic name Candollea has also been used for plants distinct from either of the groups we are here considering, but these applications are of later origin.

The stylidiums are of very minor importance horticulturally and scarcely appear in the American trade, although *S. adnatum* has been listed in southern California. The species are difficult of determination in Australia; Mildbraed describes 103. Most of the species "form a rosette or spreading tuft of radical leaves from the midst of which springs the scape. Sometimes the following year the new leaves and scape are close to the old ones, forming a dense, tufted stock, the bases of the leaves sometimes assuming a bulbous appearance; in others, one or two short stems are formed above the old tuft, each crowned by a new rosette and scape, and sometimes several successive tufts of leaves, separated by short stems or branches, may be observed." The plants are more or less lobelia-like, with pink, purplish, yellow, or white fls. in racemes, panicles, or cymes; corolla irregular, five-lobed of which four lobes ascend in pairs and the other (the lip) much smaller and deflexed or sometimes nearly as large as

the others and curved upward; calyx five-lobed, more or less two-lipped; stamens two, united with the style: fruit a capsule, two-valved from the top downward: leaves all radical, or scattered in whorl-like tufts, as described above.

S. adnàtum, R. Br. (Candollea adnata, Muell.), has mostly very narrow or linear lvs. scattered along the st., the upper ones crowded in a terminal tuft: fls. pink, nearly sessile in compound racemes or spike-like panicles: sts. 12 in. or less long.—*S. Brunoniànum*, Benth. (Candollea Brunoniana, Muell.). Tufted or rarely proliferous, the radical lvs. linear to oblanceolate: scapes 12–18 in. high, with whorls of narrow lvs., and bearing many small pink fls., the corolla-throat appendaged, B.R. 28:15. H.U. 4:72.—*S. ciliàtum*, Lindl. (S. saxifragoides, Lindl. Candollea ciliata, Muell.).=S. piliferum.—*S. dichótomum*, DC. (S. mucronifolium, Hook. Candollea dichotoma, Muell.). Low, the scapes 2–4 in. high and glandular-pubescent: lvs. narrowly linear, acute, scattered between tufts at base and top: fls. yellow in a glandular-hairy compound raceme or panicle. B.M. 4538. F.S. 6:606 (as S. Hookeri). J.F. 1:59.—*S. graminifòlium*, Swartz (S. Armeria, Labill. Candollea graminifolia, Muell.). Tufted or somewhat proliferous, the scapes 6–18 in. high: lvs. rather rigid, linear, sometimes denticulate: fls. pink, nearly sessile in a raceme or interrupted spike. B.R. 90. B.M. 1918. J.F. 3:286.—*S. piliferum*, R. Br. Tufted, lvs. linear and hair-pointed, the plant with yellow glandular hairs: scape 6–12 in. high, bearing a raceme or panicle of yellow or whitish or pinkish fls., the corolla-throat not appendaged. B.M. 3883 (as S. ciliatum); 4529 (as S. saxifragoides). J.F. 1:34.

L. H. B.

STYLÒMA (name refers "to the large indurated styles"). *Palmàceæ*. A genus very recently proposed by O. F. Cook for the Pacific island palms heretofore referred to Pritchardia (Journ. Wash. Acad. Sci., 1915, p. 241). *Pritchardia pacifica* under this disposition becomes *Styloma pacifica*, Cook; and the other species on page 2810, Vol. V, become *S. Gaudichaudii*, *S. Martii*, *S. pericularum*, and *S. Thurstonii*, Cook. He keeps *Pritchardia Wrightii* distinct under Colpothrinax.

3741. Stylophorum diphyllum. (×¼)

STYLÓPHORUM (Greek, *style* and *bearing*, in reference to the persistent style). *Papaveràceæ*. Hardy, perennial herbs, with stout rootstocks and yellow sap: lvs. radical, pinnatifid or none; cauline few, lobed or cut: fls. yellow or red; peduncles elongated, solitary or somewhat fascicled; buds nodding; sepals 2; petals 4; stamens many; ovary 2–4-placentæ: caps. frequently stipitate, ovoid, oblong or linear, dehiscent from the apex to the base.—Three species, according to Fedde, one from N. Amer., the other two from China.

diphýllum, Nutt. (*Papàver Stylóphorum*, Hort.). Celandine Poppy. Fig. 3741. A hardy perennial about 1 ft. high, forming large clumps: st. with 2 lvs. at the summit: lvs. light green, pinnately parted: fls. yellow, 2 in. across, in clusters of 3–5. May, June. Moist shade, W. Pa. to Wis. and Ark. B.B. 2:102. J.H. III. 34:475. Gn. 65, p. 283.—An attractive plant of easy cult. in any rich, rather loose, moist soil in either shade or open, but preferably in partial shade. It is easy to transplant.

F. W. Barclay.

STYLOPHÝLLUM (Greek, *style* or *column* and *leaves*). *Crassulàceæ*. A genus separated from Cotyledon and composed mostly of new species: basal lvs. linear, elongated, base sometimes broad clasping: calyx 5-lobed, the lobes ovate, equal and small; corolla campanulate, not angled, white, red, or yellowish, the lobes broad, thin, and spreading, united below into a tube: carpels 5, united below, generally strongly spreading as in Sedum. —Twelve species all from Calif. **S. Orcuttii,** Rose. Rather stout and very glaucous, woody at base: lvs. linear: calyx-lobes obtusish; corolla-tube shorter than the calyx, the lobes rather broad and somewhat keeled, rose-colored, not at all tinged with yellow. S. Calif. and adjacent islands.—This plant was distributed as *Cotyledon attenuata*, which is probably a different species.

STÝRAX (ancient Greek name of *Styrax officinalis*). *Styracàceæ*. Storax. Ornamental woody plants chiefly grown for their handsome flowers.

Deciduous or evergreen trees or shrubs more or less stellate-pubescent: lvs. short-stalked, exstipulate, more or less covered, like the infl., with stellate hairs: fls. white; calyx campanulate, obscurely 5-toothed or truncate; petals 5, connate only at the base; stamens 10, inserted at the base of the corolla and usually somewhat connate below; ovary superior, often united at the base with the calyx, 3-loculed at the base, 1-loculed at the apex; style slender: fr. a drupe, mostly subglobose, fleshy or oftener dry with dehiscent pericarp, 1–2-seeded, with large, subglobose seeds.—About 100 species in the tropical, subtropical, and warmer temperate regions of Amer., Asia, and Eu. There is a monograph by Miss J. Perkins in Engler, Pflanzenreich (IV. 241), Styracaceæ, pp. 17–88 (1907). *S. Benzoin* yields the benzoin, a balsamic exudation of the wounded tree; storax, a similar gum-resin, was formerly obtained from *S. officinalis*, but the storax of today is a product of Liquidambar.

The storaxes are handsome shrubs of graceful, usually loose and spreading habit with numerous white and mostly fragrant, often pendulous, flowers in racemes or few-flowered clusters, followed by rather insignificant subglobose drupaceous fruits. *S. japonica* and *S. Obassia* are the hardiest and stand the winter in sheltered positions as far north as Massachusetts. *S. americana* is somewhat tenderer; *S. grandifolia* is hardy about Philadelphia and *S. Wilsonii* is probably of the same hardiness; *S. officinalis* is hardy only South. They are well adapted for borders of shrubberies or as single specimens on the lawn, and thrive best in a light, porous soil. Propagation is by seeds which are usually profusely produced in cultivation, sown soon after ripening, and by layers sometimes grafted on *Halesia carolina; S. japonica* and *S. americana* may also be grown from cuttings, but usually only a small percentage will root.

A. *Fls. in many-fld. racemes: lvs. 2–10 in. long.*

B. *Young branchlets, petioles, and racemes grayish-tomentose.*

grandifòlia, Ait. Shrub, 4–12 ft. high: lvs. oval to obovate, shortly acuminate, usually narrowed toward the base, denticulate or almost entire, glabrous above, grayish-tomentose or -pubescent beneath, 2½–6 in. long: fls. fragrant, in loose racemes 3–6 in. long or sometimes in clusters; corolla fully ½in. long, with spreading, oblong petals: fr. subglobose, about ½in. across.

May. S. Va. to Fla. L.B.C. 11:1016 (poor). B.B. (ed. 2) 2:723.

BB. *Young branchlets, petioles, and racemes soon glabrous.*

Obássia, Sieb. & Zucc. Shrub or small tree, 30 ft. high: young branchlets and petioles covered with a quickly disappearing floccose rusty tomentum: lvs. orbicular to broadly obovate or oval, abruptly acuminate, usually rounded at the base, remotely dentate above the middle and sometimes tricuspidate at the apex, glabrous above, pubescent beneath, 6–10 in. long: fls. fragrant, in racemes 5–7 in. long; rachis glabrous; pedicels and calyx finely tomentose; corolla ¾in. long, with slightly spreading obovate-oblong petals: fr. ¾in. long, ovoid, pointed. May. Japan. S.Z. 1:46. B.M. 7039. G.C. III. 4:131 (not correct in regard to habit). A.F. 12:30. M.D.G. 1898:16. S.I.F. 1:80. G. 36:531.

AA. *Fls. in few-fld. clusters or short racemes: lvs. ½–3 in. long.*

B. *Lvs. ½–1 in. long, serrate or denticulate, tomentose beneath.*

Wilsonii, Rehd. Small compact shrub, to 6 ft.: lvs. rhombic-ovate or oval, obtuse or acutish, sparingly toothed or denticulate, sparingly pubescent above, white-tomentose beneath, ½–1 in. long: fls. short-stalked in 3–5-fld. clusters, ⅓–½in. long; calyx stellate-pubescent; corolla-lobes oblong: fr. globose-ovoid, ⅛in. long, finely velvety. May, June. W. China. B.M. 8444. G.M. 56:369. G. 36:161. R.H. 1914, p. 33.—Handsome little shrub, begins to bloom when about two years old and less than a foot high.

BB. *Lvs. 1–3 in. long.*

C. *Petals 5–8: lvs. pubescent beneath, entire, usually obtuse.*

officinàlis, Linn. Shrub or small tree, to 20 ft.: lvs. broadly oval or ovate, obtuse or acutish, entire, stellate-pubescent, at least when young, 1–2½ in. long: fls. in few-fld. tomentose clusters; pedicels about as long as calyx; corolla ¾in. long, with 5–7 oblanceolate petals; stamens 10–16, with the filaments pubescent and connate at the base. April–June. Eu., Asia Minor. L.B.C. 10:928. Var. **califórnica,** Rehd. (*S. califórnica,* Torr.). Shrub, 5–8 ft.: corolla usually 1 in. long, sometimes with 8 petals; stamens connate nearly one-third. Calif.

CC. *Petals 5: lvs. almost glabrous, acute.*

D. *Pedicels about as long as calyx, puberulous.*

americàna, Lam. (*S. glàbrum,* Cav. *S. lævigàtum,* Ait.). Shrub, 4–8 ft. high: lvs. oval to oblong, acute at both ends or acuminate, entire or serrulate, bright green and almost glabrous, 1–3 in. long: fls. nodding, in few-fld. clusters; pedicels about as long as calyx or little longer, puberulous; corolla about ½in. long, almost glabrous, with spreading or reflexed, lanceolate-oblong petals; calyx-teeth minute, acute. April–June. Va. to Fla., west to Ark. and La. B.M. 921. L.B.C. 10:960. B.R. 952 (as *Halesia parviflora*). Var. **pulverulénta,** Perkins (*S. pulverulénta,* Michx.). Lvs. stellate-pubescent, at least when young: fls. on tomentose pedicels. S. Va. to Fla. and Texas. B.B. (ed. 2) 2:723.

DD. *Pedicels ¾–1 in. long, glabrous.*

japónica, Sieb. & Zucc. Fig. 3742. Shrub or small tree, becoming 30 ft. high, with slender spreading branches: young branchlets and lvs. with stellate pubescence, which soon disappears: lvs. broadly elliptic to elliptic-lanceolate, acute at both ends, often acuminate, crenately serrulate, glabrous, 1–3 in. long: fls. pendulous, in 3–6-fld. glabrous racemes; corolla about ½in. long, with slightly spreading, elliptic, tomentulose petals; calyx usually with short and broad, obtuse teeth. June, July. Japan, China. S.Z. 1:23. Gt. 17:583. B.M. 5950 (as *S. serrulatum*). M.D.G. 1899:229, 230. R.H. 1888, p. 320. S.I.F. 1:80. G.W. 3, p. 207. Gn. 76, p. 588. Gn.W. 12:705. G. 32:485; 36:533. G.M. 48:347; 53:143.—The hardiest species and exceedingly handsome in bloom with its profusion of gracefully drooping white fls.

S. Bénzoin, Dry. Small tree, allied to S. japonica: lvs. stellate-tomentose beneath, also pedicels and calyx. Malay Archipelago.—*S. dasyántha,* Perkins. Shrub or small tree, to 25 ft.: lvs. obovate to oblong, acuminate, serrulate, sparingly stellate-pilose, 2½–4 in. long: fls. nearly ½in. long, in many-fld. racemes or panicles. Cent. China. Var. *cineráscens,* Rehd. Lvs. stellate-tomentose beneath.—*S. Hemsleyàna,* Diels. Shrub or tree, to 30 ft.: lvs. broadly ovate, acuminate, serrate, pubescent on the veins beneath, 3–6 in. long: fls. ¾–1 in., in long racemes, sometimes panicled. Cent. and W. China. Gn. 79, p. 205. B.M. 8339.—*S. platanifòlia,* Engelm. Allied to S. californica. Almost glabrous: lvs. undulate or irregularly sinuately lobed. Texas.—*S. serrulàta,* Roxbg. Shrub or tree, 40 ft. high, allied to S. americana: lvs. usually elliptic-oblong, acuminate, distinctly serrulate: fls. short-pedicelled, in 5–10-fld. short racemes; calyx and pedicels tomentose. E. India.—*S. Shiraiàna,* Makino. Small tree: lvs. rhombic to orbicular, coarsely toothed, nearly glabrous, 1½–3 in. long: fls. nearly 1 in. long, in short racemes. Japan.—*S. Veitchiòrum,* Hemsl. & Wilson. Tree, to 30 ft.: lvs. lance-ovate to oblong-ovate, acuminate, denticulate, glabrous, 3–4½ in. long: fls. over ½in. long, in many-fld. racemes or panicles: bears the large galls found on S. Benzoin and other species. Cent. China.

3742. Styrax japonica. (×¼)

ALFRED REHDER.

SUCCÌSA (succise, præmorse; cut off at the lower end, referring to the root). *Dipsàceæ.* Three or 4 herbs, by some authorities incl. in Scabiosa, of the Medit. region to Trop. Afr., marked by the soft or herbaceous scales or palea (involucels) subtending the florets in the head, and by other technical characters. To this genus or group belongs the "teufelsabbiss" of the Germans. The plants are little known in cult., but *S. austràlis,* Mert., is listed abroad among outdoor perennials. Nearly or quite glabrous: lvs. ovate-elongate and acuminate, entire, the lower ones somewhat auriculate: heads ovate, with lilac-violet or ochroleucous fls.; scales of involucre in 2 series. *S. praténsis,* Moench. (*Scabiòsa Succìsa,* Linn.), may be cult.: root præmorse (as if cut off): radical lvs. ovate-lanceolate, acuminate and entire, the cauline ones connate: scales of involucre in 2 or 3 series.

SUCCULENTS: *Planting,* page 2672.

SUGAR-APPLE: *Annona squamosa.* **S.-Cane:** *Saccharum.*

SUKSDÓRFIA (W. N. Suksdorf, botanist of Washington state). *Saxifragàceæ.* One species as recently delimited, a slender perennial, *S. violàcea,* Gray, growing on wet cliffs and rocks, Mont. to Ore. and Wash.: glandular-pubescent, the rootstock bearing bulblets: fls. small, pink, in few-fld. panicles on leafy axial shoots: st. 1 ft. or less high: lvs. reniform, 5–7-round-lobed, the lower ones petioled and the upper ones on the st. sessile: sepals, petals, and stamens 5, the anthers almost sessile.

SULLIVÁNTIA (William S. Sullivant, American bryologist). *Saxifragàceæ.* Slender perennial herbs, useful in wild-gardens and for colonizing, but scarcely in cult. Four species are now recognized, all natives in the U. S., mostly local, allied to Saxifraga: rootstock horizontal, short: fls. perfect, white or whitish, regular, small, in a panicle on a nearly leafless scape-like st.: lvs. mostly basal, reniform to orbicular, shallowly lobed and coarsely toothed, long-petioled: sepals 5; petals 5, clawed; stamens 5, the filaments subulate, shorter than the petals; carpels united below the beaks, forming erect follicles, the seeds winged. *S. Súllivantii,* Brit. (*Saxifraga* [?] *Súllivantii,* Torr. & Gray. *Sullivántia ohiònis,* Torr. & Gray). Fl.-st. 6–16 in. high, growing on limestone cliffs in Ohio and Ind. *S. Hòpemanii,* Coult., differing in 3-nerved rather than 1-nerved sepals and much smaller stature, grows from Wis. and Minn. to Colo.

SUMACH: *Rhus.*

SUNDEW: *Drosera.* **S.-drop:** *Primula;* also *Œnothera fruticosa* and allies. **S. Rose:** *Helianthemum.*

SUNFLOWER: *Helianthus.* Since the publication of Volume III some progress has been made in the study and breeding of sunflowers, and a brief account of the principal results follows: The investigations of A. H. Church, of Oxford, have shown that the typical unbranched monocephalous sunflower (*Helianthus annuus,* Linn.), which is not known in the wild state, has come down to us unchanged from ancient times, and existed in cultivation in pre-Columbian America. It was grown at Madrid and described by Dodonæus as early as 1567. (American Naturalist, XLIX (1915), page 609). It is found that "marking factors" exist in rays of annual sunflowers, which give rise to different patterns when the anthocyan colors are introduced. The system of markings in *H. annuus* and varieties is quite different from that in *H. cucumerifolius* (or *H. debilis* var.) and varieties; thus the red varieties of *H. cucumerifolius* produced by Herb, of Naples, have rays reddened at the end, or have a red stripe down the middle of the ray, or may have the whole upper surface of ray deep brownish pink, and the under side entirely clear light sulfur-yellow. (Journal of Heredity, VI (1915), page 542). In a culture of red sunflowers (*H. annuus,* variety) at Boulder, Colorado, a collarette form has been obtained in some numbers, both in the chestnut and wine-red colors. The ray-florets have extra lobes, which are small and directed inward, the structure being like that of the collarette dahlia, though less regular. The type will doubtless be improved in course of time. (Gardeners' Chronicle, November 6, 1915, page 295.) Varieties are now obtained, but have not yet been sufficiently selected and isolated, with two or more rows of rays, in the manner of the star dahlias. It is hoped that some very good forms of the red sunflower will be developed along these lines. A new form of the wine-red sunflower has the bicolor pattern, with the background pale (dilute) orange instead of primrose. This gives, in certain cases, an exceedingly rich and bright color. By crossing the silky-haired *H. argophyllus* with vinous *H. annuus,* and again crossing the resulting plants with vinous *H. annuus,* a very pretty new hybrid has been obtained, the rays very pale yellow, tinted with vinous or with a broad ring of color at the base. It has the *H. argophyllus* foliage.

As early as 1896 (Bulletin Torrey Botanical Club, vol. 23, page 357) hybrids between annual and perennial sunflowers were recorded, but without details. The hybrid *H. annuus* × *H. scaberrimus* (*rigidus*) was listed by Thellung in 1913. In 1913 Leonard Sutton in England used the pollen of *H. rigidus* (*H. scaberrimus*) on the red variety of *H. annuus,* and obtained fertile seed. The F_1 had the characters of the perennial parent, but Sutton reports that an F_2 plant has been obtained with small streaks and splashes of red. In 1914 Mrs. Cockerell used the pollen of the perennial *H. pumilus* on vinous *H. annuus,* and obtained seeds which produced plants in 1915. These resembled the perennial parent, and formed rosettes only during the first season. An attempt to force these into flower in the greenhouse in the winter of 1915–1916 totally failed; but three seeds of the original lot placed in a coldframe early in 1916 produced plants, one of which is a rosette, while the other two have formed no rosette, and have flowered the first season, like an annual. The largest of the first lot of plants from the *H. pumilus* × *H. annuus* cross flowered about the middle of July, 1916, and in its mature form showed a curious combination of characters. The rays, however, were entirely without red, and as is usual with perennials, gave a red color with caustic potash. (Since this was written, one of the hybrids has flowered showing the collarette character, and the lobes forming the collarette are largely red.) This hybrid plant has a curiously close resemblance to the horticultural form known as Daniel Dewar. The broad leaves with well-developed petioles are, however, like those of *H. pumilus* and *H. annuus,* not Daniel Dewar. The strongly serrate margins resemble *H. annuus.* At the present time the hybrids between annual and perennial sunflowers present many problems, and are exceedingly puzzling. It seems probable that results of considerable botanical and horticultural interest will eventually be obtained.

S. Alexander of Michigan has made an elaborate study of the forms of perennial sunflowers growing in his region. He finds that only part of the species are perennial in the strictest sense, the others reproducing by underground branches, having no permanent budding crowns. He also finds that the forms are extremely diverse and has recognized over 600 minor species, differing in a variety of characters. This great diversity of character should afford the basis for many interesting horticultural forms. The nature of these lesser types, from the standpoint of genetics, has not been ascertained. If crossing has taken place, the various combinations arising may have been perpetuated and increased by the system of vegetative reproduction by "earth-branches," which would give us areas covered with plants of the same composition, constituting apparently fixed and constant "species." Alexander finds, however, that the true stationary perennials present a great diversity of forms, though they appear to be far less numerous than are the migrators. T. D. A. Cockerell.

SURINAM CHERRY (Fig. 3743), *Eugenia uniflora* (*E. Michelii*) of the family Myrtaceæ, is a large shrub, sometimes becoming a small tree, but commonly branching close to the ground and forming a broad compact bush 6 to 12 feet high. It is indigenous to Brazil, where it is called pitanga. In Cuba it is cultivated under the name of cerezo de Cayena, or Cayenne cherry; in Florida it is a common garden plant, and is hardy as far north as Putnam County, according to Reasoner. In recent years the fruit has begun to appear in the markets. In California the plant does not seem to fruit very freely, and has never become generally cultivated, though it is sufficiently hardy to be grown in the open ground throughout the southern part of the state.

The branchlets are rather thin and wiry: the leaves

subsessile, opposite, entire, ovate, subacuminate at the apex and rounded to subcordate at the base, 1 to 2 inches long, glabrous, reddish when young but when mature of a deep glossy green color. When crushed they emit a pungent odor which is rather agreeable; in Brazil they are often gathered and scattered over the floors of the houses, the odor which they give off when trampled upon being appreciated and considered efficacious in driving away flies. The white slightly fragrant flowers are about ½ inch in diameter, solitary in the axils of the leaves on slender peduncles up to 1 inch long; the sepals are four, oblong, concave, ciliate; the petals four, oblong-obovate, cupped, ciliate. The stamens are numerous, erect in a large cluster, the filaments filiform and the anthers oval, laterally dehiscent. The style is slightly longer than the stamens, filiform, the stigma simple; ovary bilocular. See page 1162.

The fruits are produced in great abundance during the early spring in south Florida, with frequently a second crop later in the summer; they are subglobose, about 1

3743. Surinam cherry. (×¾)

inch in diameter or somewhat less, prominently eight-ribbed longitudinally, deep crimson in color when fully ripe, each containing one large spherical seed or two hemispherical ones. The flesh is soft and melting, very juicy, of the same color as the thin skin and of an aromatic, subacid flavor. The fruit is a great favorite in parts of Brazil, where it is commonly eaten out of hand or made into jellies, preserves, and sherbets.

The plant is of very simple culture. It is usually propagated by seeds, which will germinate upon the ground beneath the bush if the fruits are allowed to fall. They can be sown in flats of light sandy loam, and covered to the depth of about an inch. Germination usually takes place within a few weeks. When a foot high, the plants may be set out in the open ground, where they require very little attention. They succeed remarkably well on the shallow sandy soils of southeast Florida, but in their native home are found upon clay or clay loam. Their behavior in California indicates that they are reasonably drought-resistant. Because of their attractive appearance and close, compact growth they are often used in Brazil for hedges, for which purpose they are excellent. F. W. Popenoe.

SUTHERLÁNDIA (named for James Sutherland). *Leguminòsæ.* Tender canescent shrubs, hardy in the extreme S., otherwise grown in the greenhouse: lvs. unevenly pinnate; lfts. many, very entire, without stipels; stipules small, narrow: fls. showy, scarlet, few in short axillary racemes; calyx-teeth subequal; standard erect, spreading at the top; wings small, oblong; keel erect, incurved, rather acute, exceeding the standard; stamens 1, free from the standard, the others connate in a sheath; ovary stipitate: legume ovoid, membranaceous, much inflated, rather indehiscent.—One species, S. Afr. Prop. by seeds and said to be easily raised from cuttings. The seeds are generally sown in June or July and the plants wintered in the greenhouse, where they should have very moderate watering and as much air and light as possible. Grown for the bloom.

frutéscens, R. Br. Shrub, about 3 ft. high: lvs. with 9–11 pairs of lfts. and an odd one: fls. drooping and in the best variety 1 in. or more long, not pea-shaped: pod sometimes 2¼ x 1¼ in., bladder-like. S. Afr. G.W. 14, p. 383. Var. **commùnis,** Harv., has lfts. glabrous above, elliptical or oblong: ovaries and pods glabrous. B.M. 181 (as *Colutea frutescens*). R.H. 1896, p. 206. Var. **tomentôsa,** Harv. Lfts. shorter and broader, obovate or obcordate, silvery white on both sides: ovaries and pods hispid. Var. **grandiflòra,** Hort. (*S. floribúnda,* Carr., not Vilm.), has large red fls. and does not bloom until the second year. R.H. 1871:610. Var. **álba,** Hort. (*S. floribúnda,* Vilm., not Carr.), has white fls. F. Tracy Hubbard.†

SWAINSÒNA (named for Isaac Swainson, an English horticulturist of the latter part of the eighteenth century). Often incorrectly spelled *Swainsonia. Leguminòsæ.* Glabrous or subappressed-pilose herbs or subshrubs, adapted to greenhouse culture or out-of-doors in the extreme South.

Leaves odd-pinnate; lfts. many without stipels; stipules frequently herbaceous, base broad, rarely bristle-like: fls. blue-violet, purple, red, rarely white or yellowish, in axillary, usually peduncled racemes; calyx-teeth subequal or the 2 upper shorter; standard orbicular or reniform, spreading or reflexed; wings oblong, falcate or somewhat twisted; keel broad, incurved, obtuse; stamens 9 and 1; ovary sessile or stipitate, many-ovuled: legume ovoid or oblong, turgid or inflated, coriaceous or membranaceous.—About 30 species, Austral. Differs from Colutea chiefly in smaller stature and the large lateral stigma. By far the most popular kind is *S. galegifolia* var. *albiflora.*

A. *Standard with prominent oblique or longitudinal calli: pod stipitate, thin, inflated.* (*S. Maccullochiana probably has no calli; cf. under* AA.)

B. *Calyx densely white-tomentose.*

Greyàna, Lindl. (*S. grandiflòra,* R. Br.). Perennial or subshrub, 2–3 ft. high: sts. erect or ascending, young shoots and lvs. white-tomentose, becoming glabrous: lfts. 11–21, oblong, obtuse or retuse, ¾–1½ in. long: fls. large, pink, in long, erect, pedunculate racemes; calyx dense white-tomentose, teeth short; standard ¾in. diam., with 2 prominent, erect, plate-like calli, wings shorter, keel incurved, obtuse: pod stipitate, inflated up to 1½–2 in. long. Austral. B.M. 4416. B.R. 32:66. H.F. 3:72.

BB. *Calyx glabrous or nearly so.*

galegifòlia, R. Br. (*Vícia galegifòlia,* Andr. *Colùtea galegifòlia,* Sims. *S. Osbornii,* Moore). Small gla-

brous attractive shrub, with long flexuose or half-climbing branches: lfts. 5–10 pairs and an odd terminal one, small, oblong and obtuse or somewhat emarginate: racemes axillary and mostly exceeding the foliage, bearing rather large deep red fls.: pod 1–2 in. long, much inflated, stipitate. Austral. B.M. 792. H.F. II. 4:276. J.F. 3:304. J.H. III. 49.547.—An old-time garden plant, blooming freely in a cool- or intermediate house along with carnations and roses. It thrives well either as a pot-plant or in beds. It is hardy at San Francisco. It is a nearly continuous bloomer. Cuttings taken in late winter bloom in summer; these plants may then be transferred to the house for winter bloom, although maiden plants are to be preferred. By cutting back old plants, new bloom may be secured. Cuttings grow readily. The plant is easy to manage. The original form of swainsona is little known in cult., but the advent of the white form has brought the species to the fore.

Var. **albiflòra,** Lindl. (var. *álba,* Hort. *S. albiflòra,* Don). Fig. 3744. Fls. pure white. B.R. 994. L.B.C. 17:1642. A.F. 8:1173; 10:611; 11:1180. Gng. 5:185.—In N. America this is one of the most popular of florists' white fls. for use in winter decorations. It has been called the "winter sweet pea" because of the shape of the fls., but it has no fragrance. The delicate bright green foliage affords an excellent contrast with the pure white fls. This variety is often grown at the end of a rose- or carnation-house, or trained on a trellis. It likes abundant sunlight, rich soil, and liquid manure. When allowed too much root-room, the plants become very large and are slow to bloom, wherefore a large pot or tub is preferable to the border.

Var. **violàcea,** Hort., has rose-violet fls., and is somewhat dwarf. *S. coronillæfòlia,* Salisb., probably represents this form or something very like it. B.M. 1725. *S. coronillæfolia* is an older name than *S. galegifolia,* and if the two names are considered to represent the same species the former should be used.

Var. **ròsea,** Hort., has pink fls.

AA. *Standard without callosities: pod various. (S. Maccullochiana may have calli.)*

B. *Lfts. glabrous above, puberulent beneath.*

Maccullochiàna, F. Muell. Shrub, erect, up to 8 ft. high, pubescent: lvs. pinnately compound, 8–10 pairs of lfts., which are elliptic or obovate, mucronate, rather glabrous above, puberulent beneath; stipules obliquely deltoid: raceme many-fld.: fls. reddish purple; standard ovate-orbicular; wings oblong, rounded, base auriculate; keel slightly curved, obtuse: pod 2 in. long, stipitate. N. W. Austral. B.M. 7995.

BB. *Lfts. more or less pubescent on both surfaces.*

C. *Fls. violet-purple: lfts. 9–15 pairs.*

lessertiæfòlia, DC. (*S. Froèbelii,* Regel). Perennial, 1–1½ ft. high: sts. diffuse or ascending, glabrous except the young shoots and foliage which are more or less gray-appressed-pubescent: lfts. 9–15 or rarely more, oblong, obtuse, mucronate or almost acute, ⅓–⅔, rarely 1 in. long; stipules rather broad: fls. rather small, violet-purple, in short racemes, sometimes reduced to umbels or heads; calyx more or less pubescent with black appressed hairs; standard nearly ½in. broad without callosities, wings shorter, keel very obtuse, almost hood-shaped: pod sessile, inflated, ¾–1 in. long. Austral. Gt. 3:89.

CC. *Fls. lilac-rose: lfts. 6–10 pairs.*

ecallòsa, Sprague. Herb, erect, about 2 ft. high, pubescent: lvs. 3–5 in. long; lfts. 6–10 pairs, elliptic-oblong, obtuse or retuse, sometimes mucronate, ½–¾in. long, pubescent on both surfaces; stipules deltoid at base, apex subulate: racemes axillary, 4–5-fld.: fls. lilac-rose; standard without calli, 7–8 lines diam., much longer than the wings; keel broad, obtuse; ovary silky. W. Austral.

S. álba, Hort., is mentioned in the horticultural journals as a form with snow-white fls.; possibly only a variation of S. galegifolia. G.W. 3, pp. 353, 354; 11, p. 13. Var. *grandiflòra,* Hort., is offered in the trade.—*S. atrococcínea,* Carr. Similar to S. Ferrandii but with larger lvs.: infl. large; peduncle slightly purplish: fls. purplish red, standard broad-spread, 2-lobed, slightly convex, with a white spot at base, keel brilliant red-violet. A horticultural form.—*S. Ferrándii,* Hort. Perennial, 12–20 in. high, much branched: lvs. compound, unevenly so; lfts. numerous, elliptic, apex rounded, glabrous: fls. in axillary racemes; peduncle short and arched; standard broadly expanded; wings much reduced; keel small. Probably of garden origin. Var. *álba,* Hort., has pure white fls. Var. *carmínea,* Hort., has carmine-pink fls.—*S. grandiflòra* var. *álba,* Hort., is offered in the trade, very probably is a form of S. galegifolia.—*S. ròsea* var. *grandiflòra,* Hort., is offered in the trade.—*S. spléndens,* Hort., appears in the trade. F. Tracy Hubbard.†

3744. Swainsona galegifolia var. albiflora. (×¼)

SWEET ALYSSUM: *Alyssum maritimum.* **S. Bay** of general literature is *Laurus nobilis;* in America, *Magnolia glauca.* **S.-brier:** *Rosa rubiginosa.*

SWEET CICELY, or SWEET-SCENTED CHERVIL (*Myrrhis odorata,* Scop., which see), indigenous to Europe on the banks of streams, is a graceful hardy perennial 3 feet tall, with very large downy grayish green, much-divided leaves, hairy stems and leaf-stalks, small, fragrant white flowers, and large brown seeds of transient vitality. The leaves, which have an aromatic, anise-like, sweetish flavor and odor, characteristic of the whole plant, are still occasionally employed in flavoring soups and salads, though their use as a culinary adjunct, even in Europe, is steadily declining. In American cookery, the plant is almost confined to the unassimilated distinctly foreign population. Though easily propagated by division, best results are obtained from seed sown in the autumn either spontaneously or artificially; the seedlings, which appear in the following spring, are set 2 feet apart each way in

almost any ordinary garden soil. Spring-sown seed frequently fails to germinate. When once established common care will be sufficient. M. G. KAINS.

SWEET CLOVER: *Melilotus alba.* **S. Fern:** *Comptonia.* **S. Flag:** *Acorus Calamus.* **S. Gale:** *Myrica Gale.* **S. Gum:** *Liquidambar.*

SWEET HERBS. The term "sweet herbs" has long been applied to the fragrant and aromatic plants used in cookery to add zest to various culinary preparations, principal among which are dressings, soups, stews, and salads. At the commencement of the nineteenth century many were to be found in gardens and kitchens that now have been dropped entirely or have but very limited use. Perhaps no group of garden plants during this time has been marked by so little improvement. Except in parsley, very few distinctly new or valuable varieties have been produced or disseminated. This is mainly due to the prevailing ignorance of their good qualities, to which ignorance may be charged the improper handling, not only by the grower, but by the seller and often by the final purchaser. With the public duly awakened to the uses of herbs, improvements in growing, handling, and in the plants themselves will naturally follow, to the pleasure and profit of all.

In this country the herbs best known and appreciated are parsley, sage, thyme, savory, marjoram, spearmint, dill, fennel, tarragon, balm, and basil, arranged approximately in their order of importance. Since parsley is more extensively used as a garnish than any other garden plant, it is grown upon a larger scale than all other herbs combined. Hence some seedsmen do not rank parsley with sweet herbs. Sage is the universal flavoring for sausage and the seasoning *par excellence* for rich meats such as pork, goose, and duck. It is more widely cultivated than thyme, savory, and marjoram, which have more delicate flavors and are more popular for seasoning mild meats, such as turkey, chicken, and veal. With the exception of spearmint, without which spring lamb is deemed insipid and the famous mint julep a thing of little worth, the remaining herbs mentioned above are scarcely seen outside the large city markets, and even there they have only a very limited sale, being restricted mainly to the foreign population and to such restaurants and hotels as have an epicurean patronage.

In many market-gardens especially near to the large cities, sweet herbs form no small source of profit, since most of them, when properly packed, can be shipped in the green state even a considerable distance, and when the market is over-supplied they can be dried by the grower and sold during the winter. Probably more than one-half the quantities used throughout the country are disposed of in the latter manner.

As a rule, the herbs are grown as annuals and are propagated from seed sown in early spring, though cuttage, layerage, and division of the perennials are in favor for home practice and to a certain extent also in the market-garden. Commercially they are most commonly grown as secondary crops to follow early cabbage, peas, beets, and the like. In the home-garden they are frequently confined to a corner easily accessible to the kitchen, where they remain from year to year. In general, herbs should be planted on good light garden soil of fine texture, kept clean by frequent cultivation, gathered on a dry day after the dew is off, dried in a current of warm, not hot air, rubbed fine and stored in air-tight vessels.

For specific information, see articles on the following: *Anise, Angelica, Balm, Basil, Caraway, Coriander, Dill, Fennel, Hyssopus, Mentha, Origanum* (Marjoram), *Parsley, Sage, Samphire, Savory, Tarragon.* Also book on "Culinary Herbs," M. G. Kains.

M. G. KAINS.

SWEET MARJORAM: *Origanum.*

SWEET PEA. The popular name of *Lathyrus odoratus*, one of the Leguminosæ, grown for its handsome and fragrant flowers. See *Lathyrus* for botanical account; for structure of the flower, see *Legume;* see also *Orobus.*

Because of its range of color, beauty of form, fragrance, and value as cut-flowers, the sweet pea is not only the queen of the large genus to which it belongs, but now ranks first among annual flowers. It has been long cultivated in gardens, and in recent years in America it has risen to a place among the five leading commercial cut-flowers.

The sweet pea is a native of the island of Sicily and was first described by Father Franciscus Cupani, a devout Italian monk and an enthusiastic botanist, in a small work published at Panormi in 1695. Cupani sent seeds in 1699 to Dr. Uvedale at Enfield, England, and to Caspar Commelin at Amsterdam, Holland. The latter published a figure and description of the plant in his "Horti-Medici Amstelodamensis" (1697–1701). From this description it is learned that the flowers had purple standards and sky-blue wings, were fragrant, and that the plants were climbing in habit, as they grew to a height of 6 or 7 feet. A white-flowered variety of the sweet pea appears to have been known in 1718, and in 1737 Burmann called attention to the pink-and-white-flowered form. Although he admitted that his plant differed only in the color of the flowers from that described by Cupani, and which, he says, occurred frequently in gardens, Burmann proceeded to make a new species, *Lathyrus zeylanicus*, because he received the seeds among a collection of plants from Ceylon. Later botanists have not found the sweet pea growing wild in Ceylon, from which the authorities conclude that a mistake was made. This form was named Painted Lady and was grown until about 1900, when it gave way to its improved form, Blanche Ferry.

Sweet pea seeds were offered for sale as early as 1724. The three colors mentioned appear to have been the only cultivated varieties until 1793, when the black and scarlet varieties were catalogued. In 1837 the first striped variety, in 1860 a yellow-flowered and also the Blue Edged varieties, were offered. The latter was white with a distinct blue edge. Later this form was known as Butterfly, and it was the forerunner of the Picotee section. In 1865 Invincible Scarlet won the first certificate awarded a new sweet pea. Crown Princess of Prussia, the first of light pink varieties, was offered in Germany in 1868. Adonis (1882) was the first of the rose-pink varieties. Until 1880 (a period of 185 years) little improvement had been made in the sweet pea, and it had not been given the attention that had been bestowed upon the dahlia, verbena, hollyhock, or the rose. There were nine distinct varieties in 1860, and although many new names appeared during the next twenty years, these mainly represented supposed improved strains of the existing colors. It is very probable that not more than fifteen distinct varieties of sweet peas existed when Henry Eckford, the great specialist, began his remarkable work.

No one can understand the improvement in sweet peas within the last forty years unless one considers the form of the flowers as well as the limited number of colors which then existed. The oldest illustrations of the sweet pea show the wings to be more prominent than the standard, and although there appears to have been some improvement in the size of the standard before 1875, nevertheless the flower was lacking in many respects. The standards of most of the varieties had a tendency to reflex at the edges, and the apical notch was very prominent. Often there were side notches which caused the standard to droop forward. The natural line of improvement, aside from securing better colors or color combinations, was to round out the outline of the standard and to give it a more expanded form and greater substance.

CIX. Sweet peas of the Spencer or Waved type.

Eckford, after long experience and signal success as a breeder of florists' flowers, began his work on the sweet pea about 1876. Beginning with a few varieties, he patiently crossed and selected for several years before he began to secure results. His first notable variety, Bronze Prince, was awarded a first-class certificate by the Royal Horticultural Society in 1882. Soon he began to secure new colors and sent out the deep bronze-blue Indigo King (1885), Orange Prince (1886) and the dark maroon Boreatton (1887). These were followed each year by new colors and improved forms of the flowers. The hooded varieties appeared and gave a new interest to sweet pea improvement. Although many of the hooded varieties that were introduced had flowers in which the standards were hooded so much as to appear triangular in outline, nevertheless many were very beautiful. The perfection of this form was reached in the variety Dorothy Eckford (1903). The increased size of many of Eckford's varieties led to the name Grandiflora sweet peas, but this name is now used to designate all varieties which do not have flowers of the waved or "Spencer" form.

At the time of the great bicentenary conference on the sweet pea held in London in 1900, Eckford had introduced 115 out of the 264 varieties catalogued up to that time. Even in America the Eckford varieties constituted at least 60 per cent of all lists of selected varieties; and in 1916 of the Grandiflora varieties remaining in the trade, as shown by the catalogue of the leading American dealer, more than one-half originated in Eckford's garden at Wem, in Shropshire.

Improvement in America.

The real interest in sweet peas in America began soon after the first introduction of the Eckford varieties by Breck and by Henderson in 1886. Added impetus was given by the introduction of Blanche Ferry in 1889, and by Emily Henderson in 1893. As early as 1890 the sweet pea had become a popular flower in this country, and soon local sweet pea shows were held. The demand for seed greatly increased and the competition in the shows was keen enough to bring about a desire for new and better varieties. The growers looked forward with anticipation for Eckford's annual set of novelties. Meanwhile in England there was not yet the keen interest in sweet pea that had taken hold of America. The popularity of the sweet pea in America was Eckford's constant inspiration to better things, but gradually England came more generally to appreciate this flower with the result that since the waved form appeared the sweet pea has surpassed the popularity it attained in America. The demand for seed was satisfied when it was found that California had superior advantages for seed production. When the Eckford novelties were grown in California they sometimes proved to be unfixed, and some of these variations, together with the results of some artificial crossing, gave the growers some new varieties. Many of the best striped, as well as marbled varieties, are of American introduction.

The most striking novelty in sweet peas, the dwarf or cupid race, was found in California in 1893 and was offered to the seed trade under the name Cupid in 1895. The first variety was white-flowered. This was followed by other varieties, and soon all the colors then known in sweet peas were to be found in the dwarf type. The Cupid sweet pea grows only a few inches high, forming a dense mass. The dwarfing is the result of the extreme reduction in the length of the internodes of stems. The flowers were of the open and hooded form, borne upon short stems, and characterized by little or no fragrance. They appear to thrive under more drought and heat than the ordinary type. They have not succeeded very well outside of California, for in a season of normal rainfall in the East the plants are injured by lying on the moist ground. The appearance of the dwarf sweet pea offers perhaps the best example of synchronous variation on record. This remarkable variation appeared in California, Germany, England, and France within the period of two years prior to its announcement here by Burpee.

The Cupids were followed by the bush varieties which were considered to be intermediate in growth. This class did not gain much favor and soon disappeared. The snapdragon varieties, which had the standard reduced in size and in contact with the wings, giving the blossom the general effect of a snapdragon, were offered in 1897 but attracted little attention.

The winter-flowering type is the most important of all those originating in America. This type has been perfected in this country and has tremendously enhanced the financial value of the sweet pea as a cut-flower. No other country can begin to approximate the extent of the industry of sweet pea growing under glass.

Development of the waved varieties. (Fig. 3745.)

At the time of the bicentenary of the sweet pea, it seemed as if the future improvement of the sweet pea would be along the line of an increase in the number of flowers to a spike or the securing of new colors or color combinations in the existing open and hooded forms of the flower. No one seemed to realize that the sweet pea was on the eve of the most remarkable improvement in the form of flower and that along with it would come increased size and a greater average number of flowers to a spike. This was the introduction of the waved or, as it is called in America, the Spencer type, in 1904. The first variety was raised by Silas Cole who named it Countess Spencer in honor of the wife of his employer. The parentage of this variety, although doubted by some, has been given as (Lovely × Triumph, 1898) × Prima Donna, 1899. It was shown at various English shows for three years prior to its introduction. Countess Spencer was such an improvement in size, and the form so distinctly new, that it created a sensation. The very large standard and wings were beautifully frilled and waved. The clear pink color was also especially pleasing. This variety was not entirely fixed when it was sent out and soon numerous sports were offered. Among the first of these were the orange-pink Helen Lewis and the carmine-rose John Ingman. Especial difficulty was experienced when the seed of new waved varieties was grown in California, but from this tendency to sport have been secured many of the finest varieties.

3745. Waved type of sweet pea. (×1)

About the time that the Countess Spencer appeared, W. J. Unwin found a sport in the variety Prima Donna which he named Gladys Unwin. It was also of the waved type of about the same shade of pink as Countess Spencer, but the flowers were not so large. Soon other

varieties appeared, and for a few years this group vied with the Spencer varieties for popular favor.

The introduction of the waved form aroused great interest and soon large numbers were growing sweet peas for exhibition. Many took up the production of new varieties, and soon new forms were offered in large numbers. In some cases the same sport had been found and given different names. It was seen that hopeless confusion would result if some means were not found to eliminate the synonyms. The English Sweet Pea Society established trial grounds, and when the American Sweet Pea Society was organized in 1909 it established trial grounds in coöperation with the Department of Floriculture of the New York State College of Agriculture at Cornell University, Ithaca, New York. These two national societies hold annual exhibitions, and the American Sweet Pea Society holds exhibitions of winter-flowering varieties at the National Flower Shows held each spring.

Classification.

More than 1,000 varieties of sweet peas have been introduced, but some of these represent strains of existing varieties or were applied to seedlings which did not present any improvement.

3746. Forms of sweet pea flowers: *1*, hooded; *2*, waved; *3*, open. (×1)

The modern sweet pea may be classified as follows: Climbing and dwarf types, the former being subdivided into garden and winter-flowering types. The varieties may be classified as to the form of the flower into open, hooded and waved forms (Fig. 3746).

Garden type	*Winter-flowering type*	*Dwarf type* (*Cupid*)
Open form	Open form	Open form
Hooded form	Hooded form	Hooded form
Waved form	Waved form	

The open form may be further separated into notched and rounded standards; the hooded varieties according to the degree of hooding, the most extreme case being the snapdragon varieties; and the waved varieties may be classified according to the degree of waviness as it appeared to be less or greater than Countess Spencer. This latter classification would require that the flowers be taken from plants under uniform conditions of growth. The National Sweet Pea Society of England classifies sweet peas according to form of the flower into grandiflora or waved, and into thirty-seven color sections as follows: Bicolor; Bicolor (Dark); Light Blue; Dark Blue; Blush-Pink; Lilac-Blush; Carmine; Cerise (Pale); Cerise (Dark); Cream, Buff, and Ivory; Cream-Pink (Pale); Cream-Pink (Deep); Crimson; Fancy; Lavender; Lavender (Pale); Lilac; Magenta; Marbled and Watered; Maroon; Maroon-Red; Mauve (Pale); Mauve (Dark); Orange-Pink; Orange-Scarlet; Picotee-edged (Cream Ground); Picotee-edged (White Ground); Pink (Pale); Pink (Deep); Rose; Salmon; Salmon (Pink); Scarlet; Striped and Flaked (Purple and Blue); Striped and Flaked (Chocolate on Gray Ground); Striped and Flaked (Red and Rose); White.

The bright sunshine and summer heat of America tends to destroy some of these fine distinctions of color, and the varieties can be grouped in about twenty-five color sections.

Garden culture.

One of the first essentials in sweet pea culture is the choice of an open sunny location, thus providing plenty of light and air. Plants grown in too much shade are weak and spindling in growth, producing few flowers. Any ordinary garden soil is suitable for sweet peas, provided it is sufficiently drained so that in periods of excessive rains the water will not lie on the surface, causing the plants to become yellow and the roots to decay. A heavy soil usually gives better results than a light one as it holds moisture better.

A preparation of the soil as is usually made for the growing of vegetables will give fairly good results; but extra care in the selection and preparation of the soil will be repaid in larger flowers, longer stems, better colors, and a longer blooming-period.

The sweet pea is a deep-rooting plant, and in order to provide suitable conditions so that the effects of drought are overcome, the preparation must be deep and thorough. Deep preparation not only promotes available fertility, but also increases the area in which moisture and nourishment may be found, and the plant responds by sending feeding-roots in all directions.

The preparation of the soil should be made in autumn by trenching at least 2 feet in depth. Since this is an expensive operation, it is advisable instead to dig a trench 16 inches wide and 2 feet deep for each row of peas. If the subsoil is poor or of unsuitable character, it should be removed and replaced with good soil. If the subsoil is very heavy, coarse stable-manure should be mixed with it. A good dusting of air-slaked lime, applied while working the soil in the autumn, is very beneficial. Many soils that have been cultivated for a long time are acid, so that leguminous plants, such as clover or sweet peas, will not grow, or at least do not thrive. Lime corrects this acid condition and, furthermore, it releases plant-food that would not otherwise be available in soils which are not acid. Clay soils are made more open and porous by the use of lime. Half-decayed stable-manure should be mixed with the top soil. Bone-meal applied at the rate of one-quarter to one-half pound to a lineal yard of trench will prove beneficial. The trenches should be filled more than level full, and left rough. During the winter the soil settles, but if in spring the ridges can yet be seen, it will be found that these dry rapidly and thus favor early planting.

Sweet peas for the garden are either sown where the plants are to be grown or are sown in pots and transplanted. Sowing in the open ground may be done either in autumn or spring. South of the latitude of New York, sweet peas may be successfully grown from fall sowings. North of this line the practice is not always successful unless they are planted in a well-drained situation in a sandy loam. The general conditions requisite to success are to plant late so that the seed does not germinate and appear above the surface. If any top growth is made, the plants will be killed in sections where the ground freezes. The rows should be slightly ridged up to prevent water standing over the row. After the ground freezes, a mulch of manure is

applied. Fall-sown sweet peas bloom ten days to two weeks earlier than the spring-sown, and usually produce better flowers.

Sweet peas planted in the spring should be sown early. As soon as the soil is dry enough, the rows should be sown over the trenches prepared in the fall. If the ridges remain, they will dry earlier than level soil. These may be raked level and a drill opened so that the seed may be sown 2 inches deep and 2 inches apart. After the plants have started, but before they begin to stool, they should be thinned so that the plants stand 3 to 4 inches apart. As soon as the tendrils appear, small twigs should be thrust in the ground to support the plants and prevent their injury by the wind.

3747. Sweet peas started in pots, with supports.

Sweet peas may be sown in 3- to 4-inch pots (Fig. 3747). A suitable potting-soil made of well-rotted sod, with a little leaf-mold and sand, is best. Four or five seeds are sown in each pot and covered with an inch of clean sand. The sowing should be made six to eight weeks prior to the usual time sweet peas can be sown. The pots are placed in a cool greenhouse or a well-protected coldframe and given plenty of light and air so as to keep the plants short and sturdy. When the plants begin to produce tendrils, insert some small twigs in the pots to support the plants. The plants are gradually "hardened off" so that they may be set out in the open ground. One great advantage of this system is that the grower is independent, to a certain extent, of weather conditions as he can wait until the soil is in the best possible condition before planting. The pots may be set 12 to 18 inches apart, using care to keep the ball of earth intact and without interfering with the supports. Good twiggy brush will make the best supports for sweet peas, but when not obtainable, wire netting makes an excellent support. The latter is durable and looks neater when not covered with vines.

The soil should be frequently stirred, and in hot weather a mulch of straw or lawn-clippings will serve to conserve moisture. If waterings are given in dry weather, they should be copious. The quality of the flowers may be improved by watering with weak manure water, but other liquid fertilizers are seldom used. The prompt removal of all withered flowers and pods is essential in preserving a long period of bloom.

Sweet peas in greenhouses (Figs. 3748, 3749).

The winter-flowering varieties are the most important type yet developed from the garden form, and this type has attained its greatest perfection in the United States. This range of sweet peas is distinct in habit of growth and early-flowering character. Unlike the garden type which apparently ceases growing for a time when the plants are a few inches high while the side shoots develop, the winter-flowering sweet peas grow rapidly until they attain a height of 2 to 4 feet. Then they begin to flower freely, after which time side branches are developed. Winter-flowering varieties planted in September begin to flower between Thanksgiving and Christmas, while varieties of the garden type planted at the same time do not flower until April or May. A knowledge of these characteristics of the early stage of growth will enable a grower to guard against considerable loss from getting the wrong seed.

Soon after the introduction of Blanche Ferry, florists began to grow that variety in boxes placed across the ends of the greenhouse where the plants were near the glass, or small clumps were grown on carnation benches and trained round the purlin posts. With such methods of culture, and with the varieties then available, the flowers were not received on the market in sufficient quantity to be quoted until March or April.

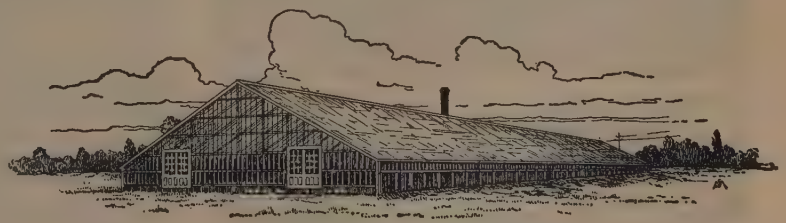
Anton C. Zvolanek, in 1892, found a chance seedling among the variety Lottie Eckford which was much earlier and dwarfer in habit. This was later crossed with Blanche Ferry, and the result of this line of crossing was the variety Christmas Pink, sent out in 1899. Miss Florence E. Denzer, a white variety, was introduced in 1902. Since the latter date many varieties have been sent out. The first varieties had flowers of the open or hooded form, but as soon as the waved sweet peas were introduced, Zvolanek made crosses with the winter-flowering varieties. It was not until 1912 that this class was ready to introduce to the trade, but in 1913 twelve varieties were offered. At present waved varieties of all the colors known among winter-flowering sweet peas are grown, and the older varieties are rapidly disappearing in the competition.

Another group of the early-flowering sweet peas is the Telemly, originated in Algeria in 1900. These varieties are an adaptation of the climate of northern Africa where the varieties of the garden type planted in the latter part of September do not flower until May. An exception to this was Blanche Ferry which flowered about the first of April. An early sport was found flowering in February, and from this have been developed a number of varieties which flower from Christmas until after the garden varieties come into bloom. Recently waved-flowered varieties have been developed by Arkwright, the originator of this strain. This group is better known in Australia or England, and in the latter country these varieties are grown to some extent in winter under glass.

The culture of sweet peas under glass has increased rapidly since 1902, when William Sim began to grow this flower extensively and has developed the modern methods. Today large greenhouses are specially constructed for the purpose of growing this flower, and the amount thus invested represents considerable capital.

Low or dark greenhouses are not suitable for raising sweet peas. Large, wide houses with side walls at least 6 feet high and with good top and side ventilation, are now built for sweet-pea growing. No beds or benches are required. If the soil in the greenhouse is not naturally good, it is removed to a depth of 2 or 3 feet and replaced with better earth. The soil is trenched 2 feet deep or deep trenches are dug in which to place composted soil in preparing to sow sweet peas. The soil should be made sweet by the addition of lime, and enriched by liberal applications of bone-meal. Each year the soil should be deeply prepared and manure worked into it before sowing.

The colors most in demand on the market are pink and white, pink, lavender and white. The reds and orange colors are usually grown in less quantity. The



3748. A sweet pea house at Detroit, Michigan.

varieties chosen should be those possessing good, clear, well-defined colors. The Grandiflora varieties are more productive, but do not bring so good a price in the larger cities as the waved varieties.

The early crop is sown about August 15, and the later crop during the latter half of September. The seeds are sown in drills where the plants are to stand, except the white-seeded varieties which are sown in sand and transplanted. The latter do not germinate well in soil, as a rule, but when treated in this way a good stand is secured. When the rows run east and west they should be 5 feet apart, and if they run north and south they may be placed as close as 3 feet.

The plants should be thinned to four plants to a lineal foot of row whether grown in single or double drills, and in planting from pots this rule should be observed.

Sweet peas are often grown after chrysanthemums, and for this purpose the plants should be started in 2½-inch pots. Two seeds may be planted in deep rose pots or in paper pots. The soil should be fibrous loam with the addition of fine old manure and sharp sand. The seeds are covered 1 inch deep, and the pots placed in a temperature of 55° to 60° F. for germination, after which the plants must be placed in a lower temperature to prevent them from becoming drawn.

The plants must soon have supports, and the best material to use under glass is string. If the rows are in line with the purlin posts, binder twine can be stretched from post to post on either side of the row thus inclosing the plants. These tiers of string will need to be as close as 6 to 8 inches at the bottom, but later as the vines grow may be as much as a foot apart. When the purlin posts are not in the row, temporary posts of iron pipe or 2- by 2-inch strips may be used. Wire netting is generally condemned by commercial growers, owing to the labor and expense connected with its erection and removal, and also because they think more crooked-stemmed flowers result. The vines supported by string can be easily removed at a minimum expense and the house quickly made ready for another crop.

3749. Interior of sweet pea house.

The temperature in the autumn is often too high for sweet peas, and under such conditions the plants often show a tendency to flower when only 2 feet high; but, as a rule, it is usually better to remove all such flowers until the plants gain more strength. As far as possible, the night temperature should be from 40° to 45°, for if a higher temperature is given, the plants flower too soon and before they have made a good root-system. When the plants are from 30 inches to 4 feet high and showing buds, the temperature should be gradually raised to 52°. This is the highest temperature required for the Grandiflora varieties. When in bloom, the temperature should be 60° on cloudy days, and 68° on bright ones. The waved, or orchid-flowering, varieties require the same treatment previous to flowering, after which the night temperature should be 55°, 60° to 65° on cloudy, and 70° to 72° on sunny days.

Picking and packing.

Sweet pea flowers should be picked when the top flower is at least half open, unless the flowers are to be shipped a long distance, when they may be cut in a less fully developed state. The proper time to cut the flowers is in the morning, although this will depend upon the time the shipments can be made. The flowers should be kept two to three hours in water before packing, and this will govern the hour of picking for the florist. The flowers must be packed dry, and if the outdoor flowers must be picked wet, they should be placed while in water in a warm current of air to dry the blooms. The flowers are made into bunches of nineteen to twenty-six spikes, according to quality. These are tied near the base of the stems, which are wrapped with waxed paper. The bunches are packed in shallow boxes with one, or at most two, layers of bunches packed in each box thus preventing the bruising of the flowers. The boxes often employed are 4 by 10 by 12 or 5 by 12 by 24 inches in depth, width, and length. The amount of wrapping on the boxes will depend on the temperature and other conditions at the time of shipment.

Exhibiting.

Exhibitors should keep the flowers off their vines until four or five days before the exhibition, and three days before this event a shade of cheese-cloth should be erected over the orange-, scarlet-, and blue-flowered varieties to prevent the scorching of the blooms. This shading must be removed after the exhibition flowers are cut. The spikes are cut so that all the flowers are fully open when they are judged. The ideal spike has a stem 12 to 18 inches long with four flowers. Twenty spikes loosely arranged so that each may be easily seen, is the proper number for a vase. The stems may be kept in the proper position by placing in the vases some 2-inch pieces of stiff reeds or grass stems. Some gypsophila may be used in the vases if permitted by the rules of the competition. Arrange the vases of a collection of varieties so that colors do not clash and so as best to exhibit the merit of the blooms. The educational value of the exhibit is enhanced if each vase is neatly labeled with the name of the variety.

Insects and other pests.

Snails sometimes destroy sweet pea seedlings in frames or greenhouses, but can be prevented by scattering lime under the pots. The red-spider is sometimes troublesome in the greenhouse and outdoors, and can be controlled by the usual methods. The green aphis or "green-fly" attacks sweet peas under glass, but is easily controlled by regular fumigations of tobacco preparations. In the garden a larger green aphis, the clover aphis, is not infrequently found, but spraying with tobacco extract, nicotine, or kerosene emulsion

will usually destroy them. Plants that are frequently syringed with cold water are seldom infested with insects.

Fungous pests.

The most prevalent fungous pest affecting sweet peas under glass appears to be *Thielavia basicola*, or root-rot. Infected plants have little or no root-system, due to the fact that new roots are constantly destroyed. The leaflets often turn yellow with white edges, finally dying and falling to the ground. Sometimes one portion of the plant may be dry and dead while the remainder is green, although it does not grow or produce flowers. In fact, it is sometimes a mystery how a diseased plant can continue to live with its very limited root-system. There are some other root-rot organisms, but their action is similar and the method of control is the same for all—the removal of infected soil or sterilizing it.

The powdery mildew attacks greenhouse sweet peas at any stage of growth if the proper temperature is not maintained. The application of sulfur to the heating-pipes will check this disease. Care must be taken not to use the sulfur too strong or the flowers will be injured. Outdoor mildew usually does not appear until late in the season when the plants are failing.

Sweet peas grown in the open garden may be attacked by the root-rots above mentioned or by anthracnose and mosaic diseases, which may be serious. The former attacks the leaves, stems, flowers, and pods, but is most frequently found on the latter which are attacked at any stage of development. The affected parts wilt and die. The disease can be carried over winter upon the seeds. The prompt destruction of infected plants, as well as the burning of all old vines in the fall and the use of clean seed or treating the seed before sowing, will do much to lessen the danger from this disease. The mosaic disease, which may be allied to or identical with the trouble known as streak in England, is a rather baffling disease to the growers. It is distinguished by a yellow mottling of the leaves and stems of the plant. This is often accompanied by a curling of the leaves. The plants become stunted in growth and cease flowering if they have reached the flowering stage. It is a disputed point whether it is a bacterial disease or not, but it seems certain that the trouble is transmissible by the feeding of aphides. No remedy is known except the obvious one of keeping insects in check and destroying affected plants by fire.

The dropping of the young flower-buds either in the open or under glass is usually due to physiological conditions. Low temperature, lack or excess of plant-food, too much nitrogenous fertilizer, lack or excess of water are among the causes of this trouble. A. C. Beal.

Growing sweet pea seed in California.

Up to about the year 1885, most of the sweet pea seed was grown in England, France, and Germany, and imported to this country; at that time the first attempt was made to grow the seed in California. This resulted in almost immediate success, and in 1900 more than 600 acres were devoted to the growing of the crop. Most of the sweet peas grown at this time were of the Grandiflora type and yielded an average of 1,100 pounds to the acre, sometimes in a good year even as much as 2,200 pounds. With the introduction of the Countess Spencer type of sweet pea, about 1904, however, the waved forms supplanted the Grandiflora type, the larger part of the acreage being now devoted to the Spencer type. Approximately 2,500 acres are now planted to the sweet pea.

The original Countess Spencer sweet pea was of a shell-pink color, but it was not fixed and many color sports were produced. At present there are about 150 distinct varieties of the Spencer type under about 460 different names, resulting from different growers finding the same sports, or from varieties which were not improvements on existing varieties of the same colors. The yield of seed to the acre of the Spencer type is much less than from the Grandiflora type, only about 250 pounds to the acre being obtained. This difference in yield is due to the structure of the flowers: in the Grandiflora type the keel is closed, not allowing the pollen to escape so that each variety must pollinate itself, and the varieties can be grown close together and yet remain true to color and type; in the Spencer type, however, the keel is open, allowing the pollen to be blown out, and, as a consequence, about 75 per cent of the flowers do not set seed; also the plants must be set far apart in order to keep them true to color and type.

A cross was made between the Spencer sweet pea and the winter-flowering sweet pea, resulting in the winter orchid-flowering sweet pea. This is a shyer seeder than the Spencer, yielding only about seventy-five pounds to the acre. The flowers resemble the summer Spencer except that the growth is dwarf and the foliage more pointed. If sown in August under glass in the eastern states, they will bloom from November until late in spring. If sown outdoors, they will bloom three to four weeks earlier than the summer type, just before the extreme hot weather.

There are four types of sweet pea now grown in California: the summer Grandiflora, the winter Grandiflora, both of these being grown only on a small scale; the summer Spencer, and the winter orchid-flowering. In addition, the Cupid, which grows 5 to 6 inches high, is occasionally grown, only about 30 acres a season being devoted to it.

The raising of the sweet pea seed is usually on a large scale. Large tracts of land are plowed in autumn about 10 inches deep, either by horse-power or large tractors, before the beginning of the rainy season. The field is then carefully disced and pulverized and left to settle. If the rainy season begins as early as October, the fields should be harrowed again after the rain and the seeds planted. However, if the rains do not come until late, the seed must be sown in the dry soil, although they will not germinate so evenly. The most successful seeding is done between November and January. The seed is sown mostly by four- or two- row horse planters, being planted 30 inches apart and 3 inches apart in the rows, and 2 inches deep. Between each named variety, at least 10 feet must be left to prevent crossing.

After the seed is planted, the field must be kept in good condition by hoeing. After each rain the ground between the rows must be broken up. As soon as the plants are up, a horse cultivator may be used which breaks the crust 2 or 3 inches deep and 3 to 4 inches from the plants; but hand labor must be used to cultivate nearer the plants. This must be done after each heavy rain, sometimes five times being necessary. Irrigation is seldom practised, as 10 inches rainfall is sufficient for a good crop of sweet peas.

By the latter part of March and April the winter or early sweet pea will be in flower, and the summer or late sweet pea begins to bloom in May. Now must begin the process of thinning. No matter how carefully the seeds have been selected, there will be some "rogues" and these must all be removed. The best among these may be tagged and kept for stock seed to grow later on. All novelties and the stock seed for the next year are usually planted and taken care of by hand.

After the thinning has been done, the plants are left to themselves, no supports being given them, until the seed is ripe. These seeds are not evenly ripened and the cutting must be done when the larger part of the seed is ready to be harvested. The cutting is performed by a specially constructed ripper drawn by two horses and cutting two rows at once. As soon as cut,

the plants are piled in small heaps and left for several days to dry. They are then put in large piles to cure which takes from three to four weeks. As soon as all the seed is perfectly cured and sufficiently dry, the thrashing begins. This is usually performed by gasoline power, and the clean seed is run directly from the thrasher into the sacks. ANT. C. ZVOLANEK.

SWEET POTATO. The plant *Ipomœa Batatas*, grown for its large edible root-tubers (Fig. 3750). The origin is not definitely known (see page 1662, Vol. III), but it is probably tropical American. It is a widely variable plant in foliage, as shown by the leaf-forms in Fig. 3751. The top is herbaceous, form a running vine. Flowers and fruits are rarely seen.

Neither the acreage, production, nor the money value of the sweet potato crop give an adequate idea of its economic importance. In those parts of the earth's surface where it thrives, it forms an important food staple for the inhabitants, and thus occupies a position not accorded crops which, though of great money worth, do not contribute directly to the food-supply of the territory in which they are grown.

The sweet potato, being native to tropical and subtropical regions, is restricted in its range of cultivation

3750. A good hill of sweet potatoes.

more by climatic than by soil conditions, although its commercial cultivation is confined almost exclusively to sandy or loamy soils. It is, in fact, one of the staples of the southern states which thrives well on lands that have been considerably depleted by cropping with other plants, and one which can be made to produce a profitable return on light sandy soils carrying little humus, provided an adequate supply of plant-food in the form of commercial fertilizer is available. The ability of this plant to thrive and produce under such conditions, together with its great food value, which is considerably higher than that of the Irish potato, has served to advance it to the position of second place among the truck crops grown in the South and to seventh place among the standard agricultural crops of the nation.

Botanically the sweet potato belongs to the Convolvulus or morning-glory family. The edible part is the thickened root. It does not possess eyes or scars as do some other roots and tubers, but it possesses the ability to develop adventitious buds, which character is taken advantage of in reproducing the crop by vegetative means.

Roots to be used for seed purposes, selected at the time of harvest, are usually small, from 1 to 1¼ inches in diameter, of uniform shape, and characteristic of the variety. These roots are cured and stored under conditions most certain to insure an adequate supply of seed material, which, at the northern limit of the cultivation of the crop, is needed for bedding in April to insure a supply of "draws" for planting during the second and third weeks in May.

The seed-supply should not only be selected as above stated but it should be chosen from healthy plants and, in addition, should be carefully examined for disease. All specimens showing the slightest trace of decay or rot of any kind should be discarded.

The soil for the plant-bed, whether it be in the open or a manure- or fire-hotbed, should be free from contamination—preferably sterilized. If such precautions are observed, the first step in the insurance of the crop against loss from rot either in the field or in the storage house has been taken. Young sprouts which grow from the bedded seed roots are known as "draws" or "sets." These are chiefly used for planting in the field, but roots, or pieces of roots, may be and sometimes are used. In the warmer sections where seasons are long, it is a common practice to grow enough early draws or sets to plant an area large enough to give a sufficient quantity of vine cuttings to plant the commercial area. This is a good system as it insures disease-free plants, so far as the root-rots are concerned, for setting the field. An even closer approach to a let-alone system is followed in some sections. Instead of harvesting and storing seed and propagating sets, a portion of last season's crop is allowed to remain unharvested over winter and it is from the volunteer plants of such an area that a supply of vine cuttings for the commercial plantation are secured.

Sweet potatoes are for the most part long-stemmed, creeping, or viny plants. They can be planted in hills but are more often set on parallel ridges thrown up 30 to 36 inches apart. The ridges are often made by throwing two furrows together over a trench in which well-rotted stable-manure has been scattered, or in which commercial fertilizer containing a liberal percentage of potash has been placed. On such ridges the draws are usually planted, either by the use of a hand dibble, tongs, or transplanting machine, 14 to 16 inches apart.

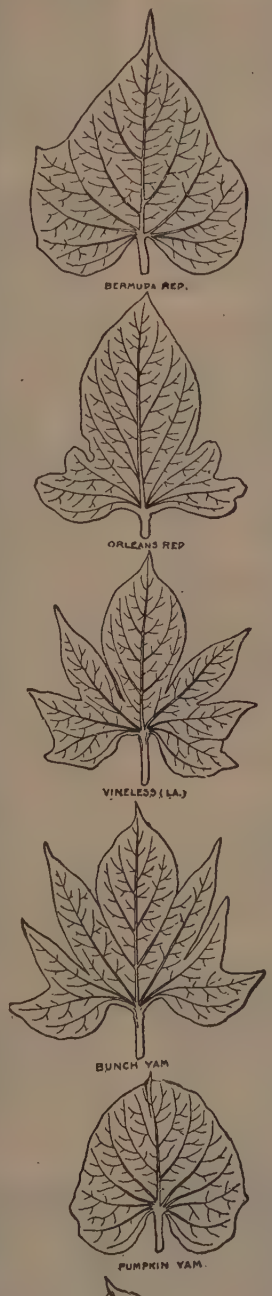
The subsequent culture consists in keeping the area free of weeds with horse-drawn implements as long as the growth of the plants will permit even by the use of a vine-lifter, after which all large weeds are removed by hand.

The signal which summons all hands to the sweet potato harvest is the first frost which causes the leaves to blacken. The home-garden plantation will be harvested with potato forks or with a turning plow after the vines have been cut away with a hoe, but the commercial area will be entered with a special digging-plow with rods in place of a moldboard and two rolling coulters so arranged on a cross-piece fastened to the beam of the digger that they cut the vines on either side of the ridge, thus preventing their interference with the operation of digging. As soon as the roots have been turned out and have dried in the sun, they should be carefully gathered, so as to avoid breaking or bruising, into one-half- or five-eighths-bushel hampers and hauled on spring wagons to the curing and storage house. In placing the roots in the house, care should be exercised to avoid breaking or bruising them. Some growers spread layers of pine straw between each 12- or 15-inch layer of roots placed in the storage house. This practice is less common at the present time since especially designed storage houses have come into general use.

The storage houses in most general use both North and South are frame structures built entirely above ground, although there are a few houses at the North that possess a basement or semi-basement story used for the storage of sweet potatoes. These frame structures are so built that their contents are exposed in the least possible degree to outside changes of temperature. While the buildings are not insulated, they are provided with paper between the studding and sheeting, between the sheeting and the clapboarding, and on the inside under the sheeting. In the more exposed situations, either back plaster or a strip of paper is used between

the studding in addition to the construction above noted. The floors as well as the ceilings are made as nearly frost-proof as possible and to add still greater safety the roots are not placed on the main floor of the building itself but upon slat floors raised at least 2 inches off the main floor. Besides adding a factor of safety against frost, these slat floors serve another important function, that of facilitating the distribution of heat throughout the heap of roots during the curing process. The partitions between the bins should also be double-slatted partitions in order to act as ventilators or chimneys so that the ventilation of the material in the storage may be insured as well as more rapid and more uniform curing.

The curing of sweet potatoes at harvest-time is of equal importance with a proper storage room, good ventilation, and the maintenance of a proper storage temperature subsequently. As the sweet potatoes come from the field, they should be placed in the bins in layers distributed evenly over the surface, and during the time the house is being filled and for a period of ten days or more thereafter the temperature of the storage house should be maintained at 85° to 90° F. both night and day. After this drying or curing period, the temperature should be gradually reduced, but at no time during the storage period should it fall below 45° F. The temperature which has proved most satisfactory for holding the roots after the curing period is 50° F. While sweet potatoes can be successfully stored in hampers or crates, most commercial storages depend on the use of bins with slat floors separated by hollow slat partitions. A convenient arrangement is so to construct the storage that each bin holds one carload or other unit quantity, depending on marketing facilities. In no case should sweet potatoes once placed in storage be rehandled or disturbed in any way until the contents of that particular receptacle, be it hamper, crate, or bin, is to be prepared for immediate delivery to the market. Sweet potatoes will not tolerate sorting or handling of any kind while in storage. The successful keeping of sweet potatoes in storage, therefore, depends on care in using disease-free seed or sets, careful handling of the roots from field to storage, a frost-proof storage provided with adequate heat for curing and ventilators for insuring rapid change of air during the curing-period as well as at subsequent periods when atmospheric conditions demand it, and the load of the house so placed, at time of storing, that any given unit may be discharged without disturbing the remainder of the material in storage. At harvest-time, and at all subsequent periods, except in severe weather when there is liability of injury from frost, sweet potatoes can be distributed in double-headed or burlap-covered, ventilated barrels. Such containers are economical, are more convenient to handle than crates or hampers, and form a satisfactory market unit. Bags should never be used. In cold weather when perishable freight or express is liable to frost-injury, strong hampers holding one and one-half bushels or one-half barrel are often used as containers for sweet potatoes. Such packages are prepared for shipment by first lining them with a tough grade of paper, and, after the container has been filled and covered, wrapping it with a similar material. One of the great handicaps to the sweet potato industry at the present time is the highly perishable nature of the crop, making it difficult for those who do not have the best of facilities to market the crop during severe weather except to nearby markets.



3751. Leaves of sweet potato.

There are two important types of sweet potatoes grown in the United States, one with a dry mealy flesh and another with a flesh of a soft, moist, sugary consistency when cooked. The northern markets generally prefer the dry mealy varieties with yellow color, while the soft, moist sorts, either light or deep yellow in color, are preferred by the southern markets. The commercial grower will therefore grow the sort or sorts demanded by the markets in which he expects to dispose of his product. His own likes and dislikes should not be given any weight in choosing market sorts.

Among the dry mealy-fleshed sorts may be mentioned Big Stem Jersey, Yellow Jersey, Early Carolina, and Triumph; characteristic representatives of the other class include such sorts as Nancy Hall, Georgia, Pumpkin Yam, Dooley, and Porto Rico.

L. C. CORBETT.

SWEET SCABIOUS: *Scabiosa.* **Sweet-scented Shrub:** *Calycanthus.* **S.-Sop:** *Annona squamosa.* **S. Sultan:** *Centaurea moschata.* **S. Vernal Grass:** *Anthoxanthum.* **S. William:** *Dianthus barbatus.*

SWÉRTIA (named for Emanuel Swert, a bulb-cultivator of Holland and author of "Florilegium," 1612). Also spelled *Sweertia. Gentianàceæ.* Erect, simple or branched, perennial or annual herbs, some of which are hardy, others adapted to the greenhouse; mostly border or rock-garden plants.

Leaves opposite, or radical in the perennial species, long-petioled, some of the cauline lvs. sometimes alternate: fls. blue, rarely yellow, arranged in racemose panicles or laxly corymbose; calyx 4–5-parted, segms. linear or lanceolate; corolla-tube very short, rotate, glandular-pitted, lobes 4–5, overlapping to the right; stamens 4–5; ovary 1-celled: caps. dehiscing by 2 valves at the sutures.—About 85 species, widely scattered about the world but mainly from S. Asia.

A. *Nectariferous pits destitute of a fringe.*

dilùta, Benth. & Hook. (*Ophèlia dilùta,* Ledeb.). A tender perennial about 1 ft. high: st. winged and angled, branching from near the base: lvs. glabrous, ovate-lanceolate, 3-nerved, rather obtuse, rounded at the base, short-petioled: fls. 4-merous, blue, in a dense, fastigiate umbel; corolla-lobes ovate, rounded at the apex and bearing at the base a single ovate, nectariferous pit destitute of a fringe. E. Asia, Japan.

AA. *Nectariferous pits with a fringe.*

B. *Pits oblong.*

punctàta, Baumg. Perennial: sts. ascending from the base, many-fld.: lvs. several, alternate, elliptic-oblong, acutish; lower attenuate to a broad petiole: fls. erect,

greenish yellow, dark-spotted; corolla-segms. membranaceous, lanceolate, rather obtuse, pits in 2's, oblong, crested and fringed. S. E. Eu., Caucasus.

BB. *Pits orbicular.*

connàta, Schrenk. Perennial: st. erect, many-fld.: lvs. oblong, acutish, lower attenuate to the petiole; cauline all connate at base: fls. erect, greenish yellow, dark-spotted; corolla punctate, segms. obtuse, apex denticulate; pits distant, very long-ciliate. Siberia.

perénnis, Linn. A hardy perennial ½–1 ft. high: lower lvs. obong-elliptical, long-petioled; st.-lvs. ovate-oblong, obtuse: fls. mostly 5-merous, blue to white, in a thyrse; corolla-lobes elliptical-oblong, acute, bearing at the base 2 orbicular nectariferous pits crested with a fringe. Colo., Utah, and northward; also in the alpine regions of Eu. and in Asia.—*S. perennis* is an alpine bog-plant and should be given a cool deep moist soil.

F. W. Barclay.
F. Tracy Hubbard.†

SWIETÈNIA (named for Gerard van Swieten, 1700–1772). *Meliàceæ.* Trees, sometimes grown in the warm-house, one of them yielding the mahogany of commerce: lvs. even-pinnate, very glabrous; lfts. opposite, petioled, obliquely ovate, long-acuminate: fls. small, in axillary or subterminal panicles; calyx small, 5-cleft; petals 5, spreading; staminal tube urn-shaped, 10-toothed, anthers 10; disk annular; ovary sessile, ovoid, 5-celled: caps. 5-celled, about 3 in. diam.—Three species, Trop. Amer. Intro. into S. U. S.

Mahágoni, Jacq. Mahogany. A large evergreen tree with hard dark red wood of well-known value: lfts. 6–10: fls. greenish yellow. Tropical regions of N. and S. Amer., W. Indies, and S. Fla. G.C. III. 54:437.—According to Mueller, the degree of endurance is not sufficiently ascertained. In Jamaica it hardly reaches an elevation of 2,000 ft. It requires rich soil. It is said that the tree will bloom at small size when grown in pots.

S. Chloróxylon, Roxbg.=Chloroxylon Swietenia.

F. W. Barclay.

SYÀGRUS: *Cocos.*

SYCAMORE in Europe is *Acer pseudoplatanus;* in America, *Platanus occidentalis,* although this plant should be called plane-tree. The sycamore of the ancients was a kind of fig known as Pharaoh's fig, *Sycomorus antiquorum,* or *Ficus Sycomorus* (for which see pages 1233, 1234, Vol. III).

SYCÓPSIS (Greek, *fig* and *appearance,* alluding to its resemblance to certain figs). *Hamamelidàceæ.* Five species of evergreen shrubs or trees of China and the Himalayas, with generally oblong, entire or denticulate, stipulate lvs. and rather insignificant apetalous monœcious fls. with minute calyx-lobes in heads or short racemes: staminate fls. in heads surrounded by pubescent bracts; stamens 8, with a rudimentary ovary; pistillate fls. with an urceolate calyx inclosing the ovary; styles 2, slender, with decurrent linear stigmas: fr. a dehiscent pubescent caps., with 2 brown lustrous seeds. Only the following species is sometimes cult. for its evergreen foliage; also the staminate fls. with their rather large red anthers are attractive. It stands the winter with some protection or in a sheltered position at the Arnold Arboretum. Prop. is by seeds or by cuttings of nearly mature wood under glass with slight bottom heat. **S. sinénsis,** Oliver. Shrub or small tree, to 20 ft.: lvs. short-petioled, elliptic-ovate to elliptic-lanceolate, acuminate, usually denticulate above the middle, glabrous or sparingly pubescent, 2–4 in. long: pistillate fls. in 6–12-fld. stalked heads; staminate fls. in small heads surrounded by brown pubescent bracts; anthers oblong, red, on slender filaments: caps. densely pubescent. Cent. and W. China. H.I. 20:1931; 29:2834, figs. 1–3.

Alfred Rehder.

SYMBEGÒNIA (name refers to the union of parts of the flower). *Begoniàceæ.* A few small herbs, all natives of New Guinea (Afr.), differing from Begonia in the tubular female fls.; the male fls. have the parts distinct. *S. fúlvo-villòsa,* Warb., for some time the only known member of the genus, appears to be the only species that has appeared in cult., but is apparently not in the trade: erect herb 8 in. or less high, with red-tinged st. and oblique lance-oblong strongly double-serrate green lvs.: female fls. pale yellow, with 5 spreading serrulate lobes and a 3-winged inferior ovary; male fls. of 2 separate sepals, and 12–20 stamens. B.M. 8409.

L. H. B.

SYMBIOSIS is the intimate association of two or more distinct organisms, with benefit to one only, or to both; commensalism; consortism; copartnership. In this association each organism is called a symbiont.

According to the character of the union, several kinds of symbiosis have been recognized: (1) Mutual antagonistic symbiosis (mutual parasitism), when two organisms are foes of each other, as certain bacteria and animals, the latter showing a "natural resistance;" also the syntropism of certain lichens with lichens. (2) Antagonistic symbiosis (true parasitism), when the host is partly or completely killed by the parasite, as the potato and the rot fungus (*Phytophthora infestans*); or galls (hypertrophies) produced on the host, as in the black-knot of plums; and in higher plants, which live at the expense of others, as the mistletoe (green) and the dodder (chlorophylless). (3) Mutual symbiosis, when there is often reciprocal advantage; (*a*) nutricism, when one symbiont nourishes the other without apparently receiving any return, as the mycorrhiza and the roots of forest trees (mycosymbiosis); (*b*) mutualism, when a mutual benefit results from the union of two organisms capable of living separately, as the bacteroid and the roots of the Leguminosæ; (*c*) individualism, when the symbionts are so intimately connected in their growth as to suggest a single individual, as the union of alga and fungus to form a lichen. By some this relationship of alga and fungus in the lichen thallus is regarded as helotism, or slavery, where the alga lives entirely indifferent to the fungus. The views of Bruce Fink, who considers the lichen to be a fungus with an alga associated with it, are widely different from the usually accepted views on the subject. (4) Prototrophy, the wet-nurse relationship, as in the lichen *Lecidea intumescens,* which eventually gets its nourishment by means of a lodger, a different lichen. (5) Contingent symbiosis, when one symbiont lives in the interior of another for shelter, as Nostoc in the tissues of Hepaticæ, Lemna, Cycas, Gunnera; and Anabaena in Azolla. Green plants live symbiotically with animals such as Spongilla, Hydra, and Convoluta. In Hydra, the green alga, known as Chlorella, is found in the endodermic layer and when the colorless eggs of the fresh-water polyp are almost mature a few of the green cells are found migrating into the protoplasm of the egg-cells.

John W. Harshberger.

SYMPHORICÁRPOS (Greek, *symphorein,* to bear together and *karpos,* fruit, referring to the clustered fruits). Sometimes spelled *Symphoricarpus.* Syn., *Symphòria. Caprifoliàceæ.* Snowberry. Ornamental shrubs grown chiefly for their attractive fruits.

Deciduous upright or rarely prostrate shrubs: lvs. opposite, entire, or on vigorous shoots often sinuately dentate or lobed, exstipulate: fls. short-pedicelled, in terminal or axillary clusters or spikes or sometimes solitary; calyx 4–5-toothed; corolla campanulate or tubular, 4–5-lobed; stamens 4–5, included or somewhat exserted, style slender with capitate stigma; ovary with 2 fertile and 2 sterile cells: fr. a 2-seeded berry.—About 15 species in N. Amer., south to Mex. and 1 in W. China; many of the American species are closely related and difficult to distinguish.

The snowberries are low or medium-sized shrubs with slender upright or decumbent stems, spreading more or less by suckers, with small generally oval or ovate leaves and small clustered, rarely solitary, white or pink flowers followed by attractive usually white, rarely pink, dark red or bluish black berries. The flowers are rather insignificant in most species except in *S. oreophilus*, *S. microphyllus* and allied species which bear larger tubular nodding flowers and are rather attractive when in bloom. The chief ornamental feature is the fruits which are usually white and retained far into the winter; among the handsomest are *S. albus* var. *lævigatus* with heavy clusters of snowy white fruits at the tips of the arching branches, and *S. orbiculatus* with dark red fruits densely clustered along the slender branches and remaining plump and fresh far into the winter, its foliage also remaining unchanged until severe frost sets in. Some species, as *S. albus*, *S. orbiculatus*, and *S. occidentalis*, are quite hardy North, while *S. mollis*, *S. rotundifolius*, and *S. oreophilus* are hardy as far north as Massachusetts; *S. microphyllus* is tender. They are

3752. Symphoricarpos occidentalis. (×⅓)

excellent plants for borders of shrubberies and for covering the ground under trees, spreading more or less by suckers; they will thrive in almost any soil from heavy clay to dry gravelly banks. Propagation is readily effected by hardwood and by greenwood cuttings, by division, and also by seeds.

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A. *Fr. red: fls. campanulate.*

1. orbiculàtus, Moench (*S. vulgàris*, Michx. *S. parviflòrus*, Desf. *S. Symphoricárpos*, MacMillan. *Symphòria conglomeràta*, Pers. *S. glomeràta*, Pursh). Indian Currant. Coral Berry. Shrub, 2–5 ft., with slender upright branches: lvs. oval or ovate, mostly obtuse, usually pubescent beneath, ¾–1½ in. long: fls. in dense and short axillary and terminal clusters or spikes; corolla campanulate, ⅛in. long; stamens and the hairy style included: fr. purplish red, subglobose, ⅛–¼in. across. July: fr. in Oct., Nov., long persistent. N. J. to Ga., Kans., and Texas, west to S. D.; sometimes escaped. Mn. 1, p. 84. Gn. 34, p. 280. G.C. III. 28:413. Var. **variegàtus,** Schneid. (var. *aùreo-reticulàtus*, Zabel). Variegated with yellow.—One of the most desirable species on account of the long-persisting fr. and foliage.

AA. *Fr. white or pinkish.*

B. *Fls. campanulate.*

C. *Style and stamens exserted.*

2. occidentàlis, Hook. Wolfberry. Fig. 3752 Shrub with upright rather stiff branches, 1–4 ft.: lvs. oval or ovate, entire or undulate-crenate, thickish, grayish green and pubescent beneath, 1–3 in. long: fls in axillary clusters or spikes ½–1 in. long; corolla campanulate, pubescent inside, pinkish white, ¼in. long: fr. subglobose, white, about ⅓in. long. June, July; fr. Sept. Ill. and Mich. to Brit. Col. south to Colo. and Kans. G.F. 3:297 (adapted in Fig. 3752). G.C. III. 49:104. Gn. 75, p. 508:—*S. Heÿeri*, Dipp. (*S. occidentàlis* var. *Heÿeri*, Dieck), is very similar and differs chiefly in the thinner lvs. less distinctly veined beneath and more often undulate-dentate and in the somewhat shorter stamens and style; it is possibly a hybrid between this and the following species, found in Colo.

CC. *Style and stamens included.*

3. álbus, Blake (*S. racemòsus*, Michx. *Vaccínium álbum*, Linn.). Snowberry. Waxberry. Shrub with upright slender branches, 1–3 ft. high: lvs. oval to elliptic-oblong, obtuse, pubescent beneath, on shoots often sinuately lobed, 1–2 in. long: fls. in terminal spikes or axillary clusters; corolla campanulate, pinkish, about ¼in. long: fr. globose or ovoid, snow-white, ¼–½in. long. June–Sept.; fr. Sept.–Oct. Nova Scotia to Alaska south to Pa., Idaho, and Calif. Var. **lævigàtus,** Blake (*S. racemòsus* var. *lævigàtus*, Fern.). Taller, to 6 ft., with glabrous usually larger lvs. and larger clusters of frs. Que. to Wash., south to Va., often escaped. L.B.C. 3:230. B.M. 2211. G.W. 8:115. Gn. 77, p. 527. C.L.A. 15:33. G. 29:169; 35:769 and G.M. 56:763 (as *S. mollis*). Var. **ovàtus,** Rehd. (*S. ovàtus*, Spaeth). A form of the preceding with broadly ovate, bluish green lvs. mostly about 2 in. long and 1¾ in. broad, rounded or nearly truncate at the base.—The snowberry generally cult. as *S. racemosus* is the var. *lævigatus*, while typical *S. albus* is sometimes grown as var. *pauciflorus*, but the true var. *pauciflorus*, Blake, is a low shrub with smaller lvs. with grayish white pubescence beneath and only 1–3 fls. at the end of the branchlets; it is found from Lake Superior to Alberta and south to Colo. and Ore., and is apparently not in cult.

4. acùtus, Dipp. (*S. móllis* var. *acùtus*, Gray). Low diffuse or procumbent shrub: branchlets velutinous or puberulous: lvs. elliptic to elliptic-oblong, acute at both ends, soft-pubescent, grayish or whitish beneath, often irregularly dentate, ½–1 in. long: fls. in terminal few-fld. clusters and solitary or in 2's in the axils below; corolla pinkish or white, about ⅛in. long: fr. subglobose, white, ¼–⅓in. long. June, July; fr. Aug., Sept. Wash. to Calif. west to Idaho, Colo., and N. Mex.

BB. *Fls. tubular or funnelform; style and stamens included.*

C. *Anthers reaching about the middle of the corolla-lobes.*

5. rotundifòlius, Gray. Upright shrub, to 3 ft.: lvs. orbicular to elliptic, entire or lobed, usually puberulous above, grayish and pubescent beneath, ½–1 in. long: fls. in 2–5-fld. terminal clusters and axillary; corolla pinkish, ¼–⅓in. long, the tube pubescent within: fr. white, subglobose. June, July. Wash. to Calif. and N. Mex.

6. oreóphilus, Gray. Upright shrub, to 4 ft., with slender spreading branches: lvs. oval to elliptic, usually acutish, slightly puberulous above, grayish or whitish pubescent beneath, ½–1 in. long: fls. in terminal 2–5-fld. clusters and axillary; corolla pinkish, nearly ⅓in. long, the tube almost glabrous within: fr. white, ovoid. June, July. Ore. to Calif. and Ariz. I.T. 3:98.

CC. *Anthers as long as corolla-lobes.*

7. microphýllus, Kunth (*S. montànus*, Kunth) Upright shrub, to 3 ft.: branchlets glabrous or puberu-

lous: lvs. ovate, acute, rounded at the base, pubescent and bluish gray beneath, ⅛–1⅛ in. long: fls. in terminal clusters and axillary; corolla pinkish, ⅛–½in. long, pubescent inside: fr. pink. Aug., Sept. Mex. B.M. 4975.

S. longiflòrus, Gray. Allied to S. oreophilus: lvs. smaller and narrower, acute at both ends: fls. slender, ½in. long; style pubescent. Calif. to Utah and N. Mex.—*S. mòllis*, Gray. Closely allied to S. acutus, but lvs. oval to suborbicular, obtuse. Calif. The plant cult. under this name is usually S. acutus.—*S. sinénsis*, Rehd. Slender glabrous shrub, to 5 ft.: lvs. oval to rhombic-ovate, ½–1 in. long: fls. in terminal peduncled spikes; corolla campanulate, white: fr. bluish black, bloomy. W. China. Has proved hardy at the Arnold Arboretum.—*S. vaccinioides*, Rydb. Allied to S. rotundifolius: lvs. elliptic, acute at both ends, puberulous or glabrescent: fls. small. Wash. to Wyo. and Utah.

ALFRED REHDER.

SYMPHYÁNDRA (Greek, *anthers grown together*). *Campanulàceæ*. Perennial herbs with a thick caudex, most of them hardy.

Leaves broad, usually cordate, dentate, the radical ones long-petioled, the cauline alternate, few or small: fls. usually nodding, rather large, racemose or laxly panicled, white, yellowish or bluish(?); calyx-tube adnate, hemispherical or turbinate, limb deeply 5-lobed or -parted; corolla campanulate, 5-lobed; ovary inferior, 3-celled.—About 8 species from the Caucasus and Asia Minor and one reported from Korea. Its special botanical interest lies in the fact that the anthers are grown together into a tube, which character tends to annul the distinction between the Campanula and Lobelia families. Otherwise the genus is much like Campanula, and used for similar purposes.

A. *Calyx without appendages.*

Hófmannii, Pant. Much branched, 1–2 ft. high, pilose: branches decumbent: lvs. oblanceolate, acute, doubly dentate: fls. white, pendulous, 1½ in. long, 1 in. or more across, borne in a large leafy panicle; calyx-tube hemispherical, without appendages, segms. large, leafy, cordate; corolla campanulate, hairy inside. Bosnia. B.M. 7298. Gn. 57, p. 303. G.C. III. 4:761. R.H. 1910, p. 285.—Under favorable conditions in England this plant has maintained a succession of bloom from July–Dec. In Amer. the plant is said to be liable to exhaust itself in blooming, thus behaving like a biennial. It has large fleshy roots, needs a dry position, and sows itself. A plant of good habit and well worth cultivating.

AA. *Calyx with appendages.*

armèna, A. DC. Perennial, rather pilose: sts. slender, erect and decumbent, about 6–12 in. high, branched above: lvs. coarsely and rather acutely dentate; lower long-petioled, cordate-ovate; upper minute, subsessile: peduncles filiform, 1-branched or somewhat corymbose, 3–5-fld.; calyx hirsute, segms. spreading triangular, acute, appendages very short, acute; corolla velvety narrowly campanulate, lobes short. Caucasus.

ossética, A. DC. Perennial, rather glabrous, about 6 in. or less high: sts. leafy, rather stout, incurved-pendulous: lvs. acutely double-dentate; radical rather long-petioled, subcordate, ovate or oblong-acuminate; intermediate lvs. sessile: peduncles filiform, stoutly or rather simply racemose: fls. pale blue; calyx glabrous, segms. very broadly lanceolate, acuminate, appendages acuminate and short; corolla glabrous, tubular-campanulate. Caucasus.

S. péndula, Bieb. Perennial, pilose: sts. fleshy, 6–12 in. high: lvs. crenate-dentate, lower ovate, cordate, long-petioled; intermediate lvs. oblong, acute, cuneate, short-petioled: fls. simply racemose, yellowish white; calyx canescent-tomentose, appendages acuminate: corolla campanulate, whitish-tomentellous. Caucasus. F.W. 1877 289.—*S. Wánneri*, Heuff. Perennial, hispidulous: sts. 1–3, ascending, 6 in. or more high: lvs. oblong-lanceolate, acutely serrate or somewhat laciniate; radical long-attenuate to the petiole; cauline attenuate to the base, sessile: infl. thyrsoidly branched, branches 1–3-fld.: fls. blue-violet, large, nodding; calyx-tube hemispherical, segms. broadly and elongated-lanceolate, not appendaged; corolla long-campanulate. S. E. Eu. Gn. 65, p. 410.

F. TRACY HUBBARD.

SÝMPHYTUM (Greek, *to grow together*, in reference to the supposed healing virtues). *Boraginàceæ*. COMFREY. Erect often hispid herbs, usually hardy in all but the far North, sometimes grown for the variegated foliage of some species.

Roots sometimes tuberous: lvs. alternate or several radical ones; the cauline sometimes decurrent; the upper sometimes strongly approximate, almost opposite: cymes terminal, usually single or twice bifid or simple unilateral racemes: fls. yellowish, blue, or purplish, pedicelled; calyx 5-cleft or -parted, lobes or segms. linear; corolla broadly tubular, lobes 5, very short; stamens 5; ovary distinctly 4-lobed: nutlets 4, obliquely ovoid, erect, rugose.—About 25 species, Eu., N. Afr., and W. Asia. Monographed by C. Bucknall in Journal of the Linnean Society, vol. 41 (1913). Of easy cult. in any good soil. The shade of overhanging trees is not objectionable. When grown for the beauty of the variegated foliage, the flowering sts. may be removed with advantage. Useful in borders.

A. *St. branched: fls. generally numerous.*

B. *Calyx divided to or below the middle.*

C. *Lvs. decurrent on the st.*

officinàle, Linn. (*S. bohèmicum*, F. W. Schmidt). Perennial, about 3 ft. high: root thick: st. branched, white-pilose: lvs. slightly pilose, basal and lower cauline ovate-lanceolate, upper oblong-lanceolate, all broadly decurrent at base: fls. white, yellowish, purple, or rose, in drooping cymes. Eu., Asia. Var. **argénteum,** Hort., is offered in the trade as growing 2 ft. high, with silver-variegated foliage and drooping blue fls. Var. **aùreum,** Hort., is offered in the trade as a golden variegated form growing 2 ft. high. Var. **coccíneum,** Hort. (*S. coccíneum*, Hort. ex Schlecht.), is offered in the trade as a scarlet-fld. form. Var. **lilácinum,** Hort., is offered in the trade. Var. **purpùreum,** Pers. (*S. officinàle* var. *bohèmicum*, Don), has reddish purple fls. Eu. Var. **variegàtum,** Hort., has lvs. widely margined with creamy white. F.S. 18:1901–1902.

3753. Symphytum asperum. (×⅛)

CC. *Lvs. not decurrent.*

D. *Calyx-segms. obtuse: upper lvs. subpetiolate.*

ásperum, Lepech. (*S. aspérrimum*, Donn). PRICKLY COMFREY. Fig. 3753. Perennial, 2½–5 ft. or even more high: root thick: st. branched, uncinate: lvs. hispid or prickly on both surfaces, ovate or elliptical, acuminate; lower petioled base cordate or rotundate; upper subpetioled, base cuneate: fls. at first rose then blue, smaller than those of *S. officinale*. Russia, Caucasus, Persia. B.M. 929.—Has some forage value. There are horticultural forms with yellow-variegated or -margined lvs. known as *S. aspérrimum aùreo-variegàtum*, and *S. aspérrimum* var. *variegàtum*.

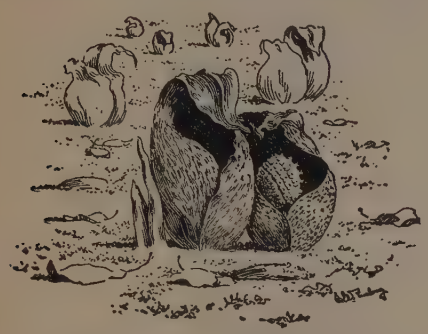
DD. *Calyx-segms. acute: upper lvs. sessile.*

peregrìnum, Ledeb. Perennial, about 3½ ft. high: st. erect, tall, branched, prickly, prickles slightly retrorse: lower lvs. long-petioled, elliptic-lanceolate, acuminate, about 10 x 4½ in.; upper lvs. sessile, all

softly hispid; petioles decurrent: fls. sky-blue; buds pinkish; calyx 5-parted almost to the base, segms. triangular-lanceolate; corolla-tube angled, constricted at the middle, upper part somewhat campanulate, mouth 5-cleft. Caucasus. G.C. III. 50:127.—Closely related to *S. officinale*, may be a hybrid.

BB. *Calyx not divided to the middle.*

caucásicum, Bieb. Perennial, 1–2 ft. high, branched, softly pilose-hirsute, grayish: st. erect: lower lvs.



3754. Skunk cabbage (Symplocarpus fœtidus), as the hoods come up in spring. (×⅓)

oblong, attenuate to the petiole; upper lvs. narrowly and shortly decurrent: fls. paniculate-corymbose, blue; calyx viscidulus and setulose; corolla tubular-funnelform, lobes shortly and broadly ovate. Caucasus.

AA. *St. simple or nearly so: fls. generally few.*

B. *Lvs. nearly glabrous.*

cordàtum, Willd. Perennial: st. simple, glabrous: lvs. rather glabrous, subrotund-cordate, acuminate, radical long-petioled; cauline short-petioled; uppermost sessile, ovate-lanceolate: fls. yellowish white, in short, recurved racemes; calyx somewhat 5-parted, lobes lanceolate; corolla funnelform-tubular. Hungary.

BB. *Lvs. hispid.*

grandiflòrum, DC. Perennial, about 1 ft. high: st. rather simple, base glabrate, otherwise reflex-spreading, hispid: lower lvs. long-petioled, subcordate-ovate, acute, decurrent along the petiole; uppermost lvs. opposite, oval, decurrent on the st.: fls. yellowish white, in a few-fld. raceme; calyx lobed below the middle, lobes linear; corolla-lobes broad and obtuse. Caucasus. G.W. 7, p. 294.

F. Tracy Hubbard.

SYMPLOCÁRPUS (Greek, referring to the aggregate fruit). *Aràceæ. Spathyèma* is the older name, but the other is retained by the "nomina conservanda" list of the Vienna rules. Skunk Cabbage. A hardy swamp-loving perennial herb which pushes up its hooded spathes in very early spring or even before the first of January in favored situations.

Spadix globose or oblong, entirely covered by fls., the ovaries of which are embedded in the spadix; perianth of 4 hooded sepals; anthers 2-celled; style pyramidal, 4-sided; ovary 1-loculed, with a solitary, suspended, anatropous ovule: berries in large heads, 1-seeded.—Only one species. See Krause, in Engler's Pflanzenreich, hft. 37 (IV. 23 B), 1910.

The spathes are 3 to 6 inches high, usually grow in clumps, and the variation in their coloring is a never-failing delight. They are mottled with purplish brown and greenish yellow, the former color sometimes becoming bright red, the latter ranging from dark green to bright yellow. These spathes are produced several weeks before the leaves appear, and they inclose odd flowers which are described below in detail. Just when the skunk cabbage flowers is a matter of some debate; the stamens are generally out in February or March. The hoods retain their beauty for months. In April or May they decay and the strong-growing leaves soon attain a height of 1 to 3 feet and a breadth of 1 foot or more. All parts of the plant give a strong skunk-like odor, but only when bruised. Skunk cabbage is offered by dealers in hardy plants, as also by collectors. Its hardiness and bravery have been celebrated by outdoor writers from Thoreau to the present day. The question of its pollination has been much discussed. It was long supposed to be pollinated by the action of the carrion flies which are attracted by its odor. However, Trelease has shown that the bees are busy with the pollen while the plant is in flower and that the carrion flies mostly come later.

fœtidus, Linn. (*Spathyèma fœtida*, Nutt.). Skunk Cabbage. Fig. 3754. Lvs. numerous, 1–3 ft. long, 1 ft. wide, ovate, strongly nerved: spathe preceding the lvs., colored as described above: fr. ripe Aug., Sept. Nova Scotia to Minn., south to Fla. and Iowa; also in Asia. B.M. 836 (as *Pothos fœtida*); 3224. V. 23:186. A.G. 14:367.

Wilhelm Miller.

SÝMPLOCOS (Greek, *symplocos*, entwined or connected, the stamens being connate at the base). Including *Hopèa* and *Lòdhra*. *Styracàceæ*. Ornamental woody plants grown chiefly for their attractive flowers and fruits.

Deciduous or evergreen trees or shrubs: lvs. alternate, entire or serrate, exstipulate: fls. perfect or sometimes polygamous, in terminal or axillary racemes or panicles, rarely solitary; calyx 5-lobed, imbricate, corolla 5-lobed or 5-parted, often split almost to the base, rarely consisting of 2 whorls; stamens numerous, rarely few, usually connate at the base, and often more or less adnate to the corolla; style filiform; ovary 2–5-loculed, inferior: fr. a drupe with a long 1–5-seeded stone.—About 285 species, widely distributed through the tropical regions except Afr.; only a few outside the tropics. Monograph by Brand in Engler's Pflanzenreich, hft. 30 (IV. 241), 1907. Several species have medicinal properties; *S. tinctoria* yields a yellow dye.

Of the numerous species only *S. paniculata* which is

3755. Symplocos paniculata. (×½)

hardy as far north as Massachusetts, is generally cultivated; it is a shrub or small tree with abundant white flowers in small panicles, appearing in spring, and with bright blue berry-like fruits in autumn. It thrives in well-drained soil and sunny position. The half-evergreen *S. tinctoria*, which seems not hardy north of its natural habitat, prefers moist soil and shady situation. The evergreen species are all tender and little known in cultivation. Propagation is by seeds, which usually do not germinate until the second year, and by greenwood cuttings under glass; also by layers.

3756. Synadenium Grantii. (×⅜)

paniculàta, Wall. (*S. cratægoìdes,* Buch.-Ham. *Lòdhra cratægoìdes,* Decne.). Fig. 3755. Deciduous shrub or sometimes tree, attaining 40 ft., with slender, spreading branches, forming an irregular open head: young branches pubescent: lvs. short-petioled, oval or obovate to oblong-obovate, acute or acuminate, sharply serrate, distinctly veined beneath and more or less pubescent at the veins, rarely glabrous, 1½–3 in. long: fls. white, fragrant, ⅓–½in. across, with spreading, oblong-oval petals in panicles 1½–3 in. long: fr. usually 1-seeded, oval, blue, about ⅓in. high. May, June. Himalayas to China and Japan. G.F. 5:89 (adapted in Fig. 3755). M.D.G. 1901:100, 101. S.I.F. 2:68. G. 33:425.

tinctòria, L'Her. Sweet Leaf. Horse Sugar. Half-evergreen shrub or small tree, occasionally to 30 ft. tall: lvs. elliptic to oblong-oblanceolate, acute to short-acuminate, undulate or obscurely serrate, lustrous above, pubescent beneath, 2–5 in. long: fls. sessile, ½in. across, yellowish, fragrant, in axillary dense clusters: fr. oblong, crowned with the persistent calyx-lobes, ½in. long, orange-brown. Spring. Del. to Fla. and La. S.S. 6:255, 256.

S. coccínea, Humb. & Bonpl. Evergreen tree: lvs. oblong, acuminate, crenulate, 3–5 in. long: fls. solitary, axillary, pink, 1 in. across, with 10 petals. Spring. Mex. R.H. 1846:281. F.S. 2:133. —*S. japónica,* DC. (S. lucida, Sieb. & Zucc.). Evergreen shrub or small tree, 20 ft. high: lvs. elliptic to oblong, acute, remotely serrate, glabrous, 2–3 in. long: fls. yellowish, in short, few-fld. racemes: fr. oblong, red. Spring. Japan. S.Z. 1:24. S.I.F. 2:66. A shrub which has been distributed by several botanic gardens under the name of S. japonica has proved to be Pyracantha crenulata.—*S. sínica,* Ker. Deciduous shrub, closely allied to S. paniculata: lvs. elliptic, acute, serrate, pubescent on both sides, 1½–2 in. long: fls. white, in short panicles; calyx-teeth acute. May, June. China. B.R. 710.—*S. sumíntia,* Buch.-Ham. Small evergreen tree: lvs. oblong-elliptic, acuminate, cuneate at the base, serrulate, glabrous, 3–5 in. long: fls. white, in short racemes: fr. oblong. Himalayas. Gt. 31:1073.

Alfred Rehder.

SYNADÈNIUM (Greek name, indicating the united involucral glands). *Euphorbiàceæ.* Thick-branched tropical shrubs, sometimes cult. in collections of succulents, having the generic characters of Euphorbia, except that the glands of the involucre are united so as to form a ring around the lobes.—About 10 species, chiefly in Trop. Afr. Prop. and treated similarly to the succulent euphorbias.

arboréscens, Boiss. A shrub, up to 4 ft. high, the st. unbranched: lvs. obovate-cuneate, obscurely crenulate; midrib keeled and often denticulate: bracts puberulent: involucre yellow. S. Afr. B.M. 7184.

Grântii, Hook. African Milk Bush. Fig. 3756. A shrub 10 ft. or less high, branched: lvs. obovate-spatulate, 3–4 in. long, obtuse; midrib rounded: cymes dichotomous, with tomentose bracts and red involucres. Trop. Afr. B.M. 5633.

J. B. S. Norton.

SYNÁNDRA (Greek, *together* and *anther,* referring to the connate anthers). *Labiàtæ.* Hardy fibrous-rooted biennial herb, with the habit of Lamium, suitable for border planting: calyx campanulate, inflated; corolla-tube long, much expanded above and at the throat, the upper lip slightly arched, entire, the lower spreading and 3-cleft, with ovate lobes, the middle one broadest and notched; anthers approximate, in pairs under the upper lip, the 2 upper each with 1 fertile and 1 smaller sterile cell, the latter cells cohering together. One species, N. Amer. *S. hispídula,* Brit. (*S. grandiflòra,* Nutt.). Hairy biennial, 1–2 ft. high, lower lvs. long-petioled, broadly ovate, cordate, crenate, thin; the floral lvs. gradually reduced to bracts, each with a single, sessile fl.: corolla 1–1½ in. long, yellowish white. Shady banks of streams, Ohio to Ill., Tenn., and Va.

SYNCÁRPIA (Greek, *together* and *fruit,* referring to the head-like clusters of caps.). *Myrtàceæ.* Trees, one of which is intro. into Calif.: lvs. opposite, ovate, evergreen: fls. gathered in globose heads: peduncles 1-headed, lateral axillary or paniculate at the ends of the branches, rather small, white; calyx-tube adnate at base of ovary, turbinate or campanulate, segms. 4, rarely 5, persistent; petals 4, rarely 5; stamens many, free; ovary inferior, 2–3-celled: caps. adnate to the calyx and inclosed in it.—Two species, Austral.

glomulífera, Niedenzu (*S. laurifòlia,* Ten.). Turpentine Tree. Lvs. broadly ovate to elliptic-oblong, obtuse or obtusely acuminate, 2–3 in. long, often appearing as if in whorls of 4: fls. 6–10 in a head, with 2–4 bracts of variable size under the head; calices connate at the base; petals broadly ovate or orbicular, less than 2 lines long; ovary 3-loculed; ovules several to each locule.—According to Von Mueller's Select Extra-tropical Plants, this tree attains a height of 200 ft., with a trunk often 30 ft. in circumference; it is of quick growth and well adapted for a shade tree. The wood is very durable and almost fireproof and is valuable for piles, railway sleepers, and shipbuilding. It takes a high polish and is used for flooring and cabinetwork. Offered in S. Calif.

F. Tracy Hubbard.†

SYNDÉSMON (Greek, *bound together,* because the plant unites characters of Thalictrum and Anemone). *Ranunculàceæ.* Rue Anemone. Dainty perennial herb grown in wild borders for its carpet of beautiful leaves and attractive spring flowers.

Glabrous, from a cluster of tuberous roots: basal lvs. 2–3-ternately compound: involucre similar but sessile, the lfts. being stalked: fls. white or pink, in an umbel; pedicels slender; sepals thin, 5–10, petal-like; petals none; stigma sessile, truncate: achenes terete, deeply grooved.—A monotypic genus of E. N. Amer. Under the International Rules, Anemonella is the tenable name (*Anemonella thalictroìdes*). Syndesmon was used earlier (1832 as against 1839), but in such a way as not to constitute publication as defined by those Rules, although it is tenable under the American Code. The plant should have been treated under Anemonella in this work.

The plants should be grown in partial shade. The soil should be moist and light or sandy. They should be left undisturbed for years. They will then form a carpet of great beauty. Propagation is by division of roots in spring or fall, but such division greatly weakens them and the plants for propagation should be taken from the edges of the beds.

thalictroìdes, Hoffmg. (*Anemòne thalictroìdes,* Linn. *Thalictrum anemonoìdes,* Michx. *Anemonélla thalictroìdes,* Spach). Fig. 3757. Plant 3–6 in. high: lvs. much like those of thalictrum: fls. resembling those of *Ane-*

CX. Commercial field of sweet potatoes in the Middle South.

mone quinquefolia, appearing before the basal lvs. March–June. Common in woods and open fields. L.B.C. 10:964. Gn. 35:408; 63, p. 277; 76, p. 305. J.H. III. 48:388. B.M. 866. I.H. 6:211. Var. **flòre-plèno,** Hort. Fls. double. Very pretty. L.B.C. 8:770. F.S. 11:1155. R.B. 11:205.

K. C. Davis.

SYNECHÁNTHUS (Greek, *continuous* and *flower*, alluding to the arrangement of the infl.). *Palmàceæ*. Unarmed gregarious palms, grown in the warmhouse: trunk slender, annulate, often stoloniferous: lvs. terminal, equally pinnatisect, segms. broad or narrow, membranaceous, acuminate, plicately nerved: spadices several, long- and slender-peduncled, the floriferous erect; spathes several, tubular, membranaceous, persistent: fls. green or the male purplish, minute, arranged in 1–2 rows in alternate elongated groups, the superior in the groups male, the inferior female: fr. reddish yellow, shining, ellipsoid, 1-seeded. Three species, Cent. Amer. and Colombia. *S. fibròsus*, Wendl.

3757. Syndesmon thalictroides. (×½)

Trunk 4 ft. high, green: lvs. 4 ft. long, erect and spreading; lfts. numerous, 1–1½ ft. long, spreading and rather pendulous, linear-lanceolate: spadices one-third as long as the lvs., the branches many, very slender, forked: fr. orange-red. Cent. Amer. B.M. 6572.

SYNGÒNIUM (Greek name, said to refer to the cohesion of the ovaries). *Aràceæ*. Tropical American woody climbing or creeping plants, with milky juice and sts. rooting and lf.-bearing at the nodes: lvs sagittate, becoming with age pedately 5–9-parted, on long petioles, with a persistent accrescent sheath: peduncles short: spathe yellowish or whitish green; tube small, ovoid, persistent; spadix shorter than the spathe: staminate fls. with 3–4 stamens, pistillate fls. with oblong-ovoid 2- or abortively 1-loculed ovary: seeds solitary in the locules, obovoid or globose, black.—About 10 species, W. Indies and Mex. to Brazil. Monographed in DC. Mon. Phan., vol. 2, 1879.

podophýllum, Schott. A tender creeping plant: lvs. becoming 5–7-pinnatisect, 4–6 in. long; petioles becoming 15–20 in. long: tube of the spathe 1–1½ in. long; blade of the spathe 2½ in. long, greenish outside, white within. Mex. The typical form is probably not in cult.

Var. **albolineàtum,** Engl. (*S. albolineàtum*, Bull.), has whitish costæ and lateral nerves. Offered by John Saul, 1893, presumably as a tender foliage plant.

F. W. Barclay.

SÝNTHYRIS (Greek, *together* and *little door* or *valve*, the valves of the capsule long adhering below to the short placentiferous axis). *Scrophulariàceæ*. Hardy herbaceous perennials, glabrous or pilose: rhizome thick: lvs. radical, petioled, ovate or oblong, crenate or incisely pinnatisect: peduncles scape-like, simple: fls. racemose or spicate, blue or reddish; calyx 4-parted, segms. narrow; corolla-tube very short or almost none, subrotate-campanulate, 4-lobed or none; stamens 2: caps. compressed, obtuse or emarginate, 2-grooved.—About 15 species, natives of W. N. Amer. Synthyris is nearly related to Wulfenia of S. E. Eu. and the Himalayas, but the anther-cells are not confluent and the seeds are discoidal. In their native region they are summer-blooming plants with small purplish or flesh-colored spikes or racemes. Border plants.

renifórmis, Benth. (*Wulfénia cordàta*, Greene). A tufted plant about 1 ft. high: lvs. glabrous, orbicular-reniform, crenately incised, the small lobes sharply toothed, 1–3 in. diam.; petioles 3–6 in. long: infl. a raceme about 5 in. long with about 40 purple-blue fls. which are ⅜in. across; pedicels slender and short; calyx-lobes lanceolate. Ore. and Wash. Gn. 74, p. 165. —In England this plant is considered a winter bloomer; it flowers there in Feb. or March, occasionally Nov.

rotundifòlia, Gray. Nearly or quite stemless: lvs. tufted, cordate-orbicular, 1–2 in. diam., long-petioled, doubly crenate, or crenate-incised, slightly pubescent: scape 4–6 in.: fls. few in a terminal raceme, blue or purple; calyx-lobes ovate, acute. Shady coniferous woods, Ore.

F. Tracy Hubbard.

SYRÍNGA (of doubtful meaning; probably from *syrinx*, pipe, because pipes are made from the straight stems of Philadelphus by removing the pith, and the name Syringa had been originally applied to Philadelphus but was transferred to the lilac. Philadelphus is still popularly called Syringa). *Oleàceæ*. Lilac. Ornamental woody plants grown chiefly for beautiful and showy often fragrant flowers.

Deciduous, rarely evergreen (*S. sempervirens*), shrubs or small trees: lvs. opposite, entire or rarely pinnate, exstipulate: fls. in panicles; calyx small, campanulate, 4-toothed; corolla salverform, with cylindrical tube and 4-lobed limb; stamens 2; ovary 2-loculed: fr. a leathery, oblong or oval caps., loculicidally dehiscent, with 2 winged seeds in each locule. (Fig. 3758.) In *S. sempervirens* the caps. is fleshy, one-seeded, and drupe-like, though dehiscent.—About 30 species from S. E. Eu., to the Himalayas, N. E. Asia, and Japan.

The lilacs are mostly large shrubs with bright green medium-sized foliage and with large showy panicles of lilac, purple, or white flowers followed by brown insignificant capsules. They are among the most popular and ornamental flowering shrubs, and hardly any garden or park is found without them. The fragrance of the common lilac is very sweet, as also of *S. oblata* and *S. pubescens*. The strong odor of *S. chinensis* is not agreeable to everyone. *S. villosa* and *S. Josikæa* are almost scentless. *S. amurensis* and its allies have only a slight odor similar to that of the privet. Almost all species are hardy North, but *S. emodi* is somewhat tender; also, *S. pekinensis* is not quite so hardy as *S. amurensis* and *S. japonica*. The lilacs are very showy in bloom, especially when massed in groups, and groups as a rule are the more effective the fewer different varieties they contain. The mixing of species and varieties differing in habit and blooming season only spoils the effect, and so does too great a variety of colors. *S. japonica* is the only real tree of the genus; it attains a height of 30 feet. *S. vulgaris*, *S. amurensis*, and *S. pekinensis* sometimes grow into small trees or at least large shrubs 10 to 20 feet high. *S. persica* is one of the smallest species and seldom exceeds a few feet. The first in bloom are *S. affinis* and *S. oblata*, followed closely by *S. vulgaris*, *S. chinensis*, *S. pubescens*, *S. Julianæ*, *S. persica*, *S. vil-*

3758. Capsule of Syringa vulgaris. (×3)

losa, *S. emodi*, and *S. Josikæa;* after the middle of June *S. amurensis* and *S. pekinensis* come into bloom, followed by *S. japonica* as the last, blooming in the North in the beginning of July. *S. amurensis* and *S. pekinensis* sometimes bloom sparingly a second time in fall. The foliage is bright green and handsome, but drops comparatively early in fall, especially in *S. japonica*, without assuming any fall coloring as a rule. In *S. oblata* the foliage turns to a deep vinous red and remains until November. In *S. pekinensis* it is retained until late in fall and finally assumes a purplish hue or turns pale yellow.

The foliage is not much attacked by insects, but a fungus, *Microsphæra alni*, late in summer often covers the whole foliage of *S. vulgaris* and also of *S. chinensis* and *S. persica* with a white mealy coat, while *S. oblata* is but rarely troubled with this fungus and the other species never. Much damage is sometimes done by a borer, *Trochilium denudatum*, which lives in the stems and branches of *S. vulgaris*, but is rarely found in any other species.

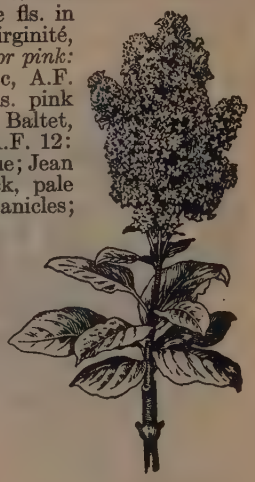
After blooming, the inflorescence should be removed if possible and the pruning be done as far as necessary. Pruning in winter or spring would destroy a large part of the flower-buds for the coming season. Lilacs grow in almost any kind of soil, but a rich and moderately moist one is the most suitable. They are easily transplanted at any time from fall to spring. *S. vulgaris* and its numerous varieties are the most popular of the lilacs on account of their early and profuse blooming, their sweet fragrance, and the variety of colors ranging from dark purple to lilac, pink, and white. The double-flowered varieties keep the blooms longer, but the panicles are less graceful and they usually do not bloom so profusely as the single ones; they also remain mostly dwarfer and have a more compact habit. The faded flowers do not fall off, but remain on the inflorescence; this gives the plant a very unsightly appearance if the faded panicles are not removed. W. J. Stewart suggests a word of warning against lilacs not on their own roots, because of the attacks of borers and the bad habit of suckering in some cases.

Some of the best single-flowered varieties are the following:

Single-flowered Lilacs.—*White:* Alba grandiflora; Alba pyramidalis; Frau Bertha Dammann, A.F. 12: 1078; Madame Moser; Marie Legraye, one of the very best, B.H. 29:135; Princess Marie; Princess Alexandra is a favorite variety of this class in America.—*Blue, lilac, or pink:* Ambroise Verschaffelt, pale pink; Dr. Lindley, pinkish lilac, F.S. 14:1481; Géant des batailles, bluish lilac; Geheimrath Heyder, light lilac; Gigantea, bluish red; Gloire des Moulins, pale pink, G.M. 44:499; Goliath, purplish lilac; Lovaniana, light pink; Macrostachya, light pink; Sibirica, purplish lilac; Trianoniana, bluish lilac.—*Red:* Aline Mocqueris, dark red; Charles X (Caroli), dark lilac-red, A.F. 12:1076. F. 1873, p. 76; Marlyensis, sometimes called Rubra de Marley, lilac-red; Rubra insignis, purplish red.—*Dark purple:* Philemon; Ludwig Spaeth (Andenken an Ludwig Spaeth, Louis Spaeth), very large panicles, the best of the dark varieties; Negro, deep violet-purple; Congo, deep wine red.

3759. Syringa villosa.

Double-flowered Lilacs.—*White:* Madame Abel Châtenay, compact panicles; Madame Casimir-Perier, large graceful panicles, one of the best; Madame Lemoine, large fls. in dense panicles; Obélisque; Virginité, white and pink.—*Blue, lilac, or pink:* Alphonse Lavallé, bluish lilac, A.F. 12:1077; Belle de Nancy, fls. pink with white center; Charles Baltet, lilac-pink; Condorcet, blue, A.F. 12: 1074; Doyen Keteleer, lilac-blue; Jean Bart, pinkish violet; Lamarck, pale lilac, large, rather loose panicles; Lemoinei, lilac-pink, B. H. 28:174; Léon Simon, changing from pinkish to bluish lilac. Gt. 43:1407; Maxime Cornu, pinkish lilac; Michel Buchner, pale lilac, large and very double fls.; President Carnot, pale blue.—*Purple:* Charles Joly, dark purplish red, one of the darkest; Comte Horace de Choiseul, lilac-purple; La Tour d'Auvergne, violet-purple.



3760. Syringa villosa. ×⅛)

The lilacs have been favorite forcing plants in France for more than a century and are nowadays among the most important cut-flowers during the winter season in France as well as in Germany and England. They are on the market from the end of September until they bloom outdoors. Charles X is considered one of the very best for forcing. Marlyensis, Marie Legraye, Alba virginalis, Ludwig Spaeth, and other varieties are also good for forcing. Of the double-flowered varieties the following have proved adapted for forcing: Madame Casimir-Perier, Madame Lemoine, Charles Baltet, Jean Bart, Léon Simon, *S. chinensis duplex*, and others. Either grafted plants or plants on their own roots are used. Both force equally well, but grafted lilacs can be grown into plants well set with flower-buds and suited for forcing in two or three years, while plants grown from cuttings require four to six years. Marlyensis is always used on its own roots and propagated either by seeds, cuttings, or division. Special attention must be given to pruning in order to have well-branched plants of good compact habit (see Fig. 1555, Vol. III, p. 1265). The lilac has nothing like the commercial importance for forcing in America that it has in Europe, but the appreciation of it for winter bloom is on the increase in this country.

Lilacs are generally forced in pots, being potted usually in July or in the fore part of August, that they may fill the pots with new roots before winter. Some growers pot the plants in spring or in the preceding fall. This practice is of especial advantage if the plants are intended for very early forcing. These early potted plants are then plunged into the ground outdoors, mulched, well watered and regularly manured; after June, when the young growth is almost finished, only enough water is given to prevent wilting. When the flower-buds have been formed, more water is given until they have reached their full size. It is essential to keep the plants rather dry in fall, so that the wood may ripen thoroughly and early. When the leaves have fallen off, the plants are stored away in convenient places, where they are sheltered from severe frost. Sometimes the lilac, especially *S. marlyensis*, is forced from balls of earth which are not potted, but this does not always give satisfactory results.

About three to four weeks is required to force the plants into bloom with the temperature recommended below. The first days after bringing the plants into the forcing-room, a temperature of 55° to 60° may be given, gradually rising to 78° to 88° and maintained as equally as possible until the panicles are fully developed and the first flowers begin to expand; then the temperature is lowered to 60° to 66°, and when the panicles are about half open the plants are tranferred to a cool greenhouse. Hardening-off is essential to ensure good keeping qualities of the flowers. The red-flowered varieties are often forced in darkened rooms in order to have the flowers blanched or only slightly colored. The shade of color depends entirely on the time when full light is given and also on the temperature. Show plants in pots

3761. Syringa vulgaris.—The common lilac. (×⅓)

should be grown in full light to have the foliage well developed. When the temperature is higher than 76°, frequent syringing is necessary. It is, of course, possible to force lilacs in a lower temperature, and this will even be advisable if the longer time required does not count. Full advice for commercial lilac-forcing is given by Fr. Harms in "Flieder und Asparagus," a book devoted almost exclusively to lilac-forcing.

Interesting experiments recently conducted have shown that the lilac is more readily forced when the plants are subjected to the influence of ether during forty-eight hours shortly before forcing. An account of these experiments by W. Johannsen is entitled "Das Ætherverfahren beim Frühtreiben mit besonderer Berückrichtigung des Flieders." That the ether has a particular effect on the metamorphosis and regeneration of the albuminoids in the plant has been stated recently by other botanists also.

Lilacs may be propagated by seed, which is sown in spring. This method is usually practised only with the more common typical species. The many varieties and rarer kinds are usually propagated by greenwood cuttings under glass in June (or in early spring from forced plants), by hardwood cuttings, by grafting, and also by suckers and division, especially in the case of *S. chinensis*, *S. persica*, and *S. vulgaris*. As a stock, *S. vulgaris* is mostly used and sometimes ligustrum; *S. japonica* will probably prove to be a good stock. *S. villosa*, though readily growing from seed and of vigorous habit, is not to be recommended. Budding in July and August is the most extensively practised method. Grafting is done either in April or May in the open or in February or March in the greenhouse on potted stock. Almost any kind of grafting may be employed as the lilac unites readily. Crown-grafting is to be preferred in order to avoid the troublesome suckers. Plants intended for forcing but deficient in flower-buds are sometimes grafted in October or early in November with branches well set with flower-buds and forced in January or later.

Forcing lilacs.—Most of the lilacs used by American commercial florists for forcing are imported. Care should always be taken to procure pot-grown plants, that is, plants that have been grown in pots the previous summer. The florist who wishes to grow his own plants should lift them in the field in April or before the growth starts and pot them without losing much root. Plunge them out-of-doors during summer and give them plenty of water. This treatment will insure a good growth and the check the plants receive from lifting will induce them to form new flower-buds. These plants will force with the greatest certainty. It is well to allow five weeks for the earliest forcing. A strong heat is necessary, beginning at 60° for the first few days and increasing to 75° to 80°, with a daily watering and syringing several times. After the flowers begin to open, the syringing can be discontinued and when fully expedient the plants are better removed to a coolhouse, where they will harden off and be much more serviceable when cut. As the season advances, say March and April, less heat is needed. They will then force in any ordinary house where the night temperature is about 60°F. The Persian lilac, on account of its abundance of bloom and delicate truss, is very desirable, but this must be forced almost in the dark to produce white flowers. Marie Legraye is for all purposes the most useful lilac which has been used for forcing. (Wm. Scott.)

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KEY TO THE SPECIES.

A. *Tube of corolla much longer than calyx; anthers sessile, not exserted.*
B. *Panicles on leafy branches, usually terminal: lvs. whitish beneath.*
C. *Infl. upright.*
D. *Anthers not exserted.*
E. *Stamens inserted near the middle of the tube; corolla-lobes nearly upright* ..... 1. **Josikæa**

EE. *Stamens inserted below the mouth of the tube; corolla-lobes spreading*..... 2. **villosa**
DD. *Anthers exserted about one-half above the mouth: lvs. very white and glabrous beneath*.... 3. **emodi**
CC. *Infl. nodding or pendulous: corolla-lobes little spreading*..... 4. **reflexa**
BB. *Panicles from lateral buds, without lvs. at the base; terminal bud suppressed.*
C. *Anthers dark violet, inserted much below the mouth: lvs. more or less pubescent beneath, at least while young.*
D. *Branchlets and lvs. above glabrous*..... 5. **pubescens**
DD. *Branchlets and lvs. above pubescent*..... 6. **Julianæ**
CC. *Anthers pale: lvs. glabrous except in No. 7.*
D. *Base of lvs. truncate or cordate.*
E. *Lvs. roundish or broadly ovate.*
F. *Young lvs. more or less finely pubescent: infl. loose*..... 7. **affinis**
FF. *Young lvs. quite glabrous or minutely glandular: infl. dense*..... 8. **oblata**
EE. *Lvs. ovate*..... 9. **vulgaris**
DD. *Base of lvs. cuneate.*
E. *Shape of lvs. ovate-lanceolate*. 10. **chinensis**
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AA. *Tube short, little longer than calyx; stamens exserted: fls. white.* (*Ligustrina.*)
B. *Base of lvs. narrowed: habit spreading*..... 12. **pekinensis**
BB. *Base of lvs. usually rounded: habit upright.*
C. *Under side of lvs. glabrous: lvs. abruptly acuminate: tall shrub*.... 13. **amurensis**
CC. *Under side of lvs. more or less pubescent; lvs. rather gradually acuminate: tree*..... 14. **japonica**

Section Eusyringa.

Group Villosæ.

1. **Josikæa,** Jacq. Shrub, attaining 12 ft., with upright, stout, terete branches: lvs. broadly elliptic to elliptic-oblong, acute at both ends, finely ciliate, dark green and shining above, glabrous or pubescent on the midrib beneath, 2½–5 in. long: fls. violet, short-pedicelled or almost sessile, clustered, in rather narrow panicles 3–7 in. long; corolla with the half-upright lobes ¾in. long; stamens inserted somewhat above the middle of the tube. June. Hungary. B.M. 3278. B.R. 1730.—Less handsome than most other species, but valuable for its late blooming season. Var. **pállida,** Hort., has pale violet fls.; var. **rùbra,** Hort., reddish violet.

2. **villòsa,** Vahl (*S. Bretschnèideri*, Lemoine. *S. emòdi* var. *ròsea*, Cornu). Figs. 3759, 3760. Bushy shrub, 8 ft. high, with rather stout, upright, terete and warty branches: lvs. broadly elliptic to oblong, acute at both ends, finely ciliate, bright green and dull above, pubescent usually only near the midrib, rarely glabrous beneath, 3–7 in. long: fls. pinkish lilac or whitish, short-pedicelled, in broad or somewhat narrow usually pubescent panicles, 3–7 in. long, rachis terete; lobes spreading, tube about ½in. long; stamens inserted near the mouth. May, June. China to Himalayas. R.H. 1888: 492; 1914, p. 333. G.F. 1:521. Gn. 39, p. 91. Gt. 44, p. 500. G.W. 16, p. 138. G. 13:519. A.F. 24:371. B.M. 8292.—A hybrid between this and the preceding species is **S. Hénryi,** Schneid. (*S. Bretschnèideri hýbrida*, L. Henry). Intermediate between the parents, but more similar to *S. villosa:* lvs. villous along the midrib: infl. large, to 10 in. long, more pyramidal and looser: corolla ¾in. long, pale violet-purple, with the stamens just below the mouth. R.H. 1902:40. J.H.S. 27, p. 800. "Lutèce" is scarcely different. Var. **exímia** (*S. Josikæa exímia*, Froebel) has compact large panicles of reddish rose fls. changing to light pink. G.C. III. 42:280. M.D.G. 1901:561. M.D. 1907, p. 262. "H. Zabel" is similar, but the fls. are reddish lilac.

3. **emòdi,** Wall. (*S. villòsa* var. *emòdi*, Rehd.). Shrub, to 15 ft.: branchlets brownish or dark olive-green, dotted with pale lenticels: lvs. elliptic to oblong, acute at both ends, white and glabrous beneath, 6–8 in. long: infl. narrow, 3–6 in. long, with leafy bracts; rachis angular: corolla pale lilac or whitish, not pleasantly scented, tube ⅜in. long; anthers partly exserted; calyx obscurely lobed. Himalayas. B.R. 31:6. R.H. 1876, p. 368. Gn. 39, p. 106. R.B. 28:193.—Not quite hardy in Mass. There are varieties with yellow lvs., var. **aûrea,** Simon-Louis, and with yellow-variegated lvs., var. **aûreo-variegàta,** Hort.

4. **reflèxa,** Schneid. Shrub, to 12 ft.: branches gray or purplish gray, dotted with lenticels: lvs. ovate-oblong to lance-oblong, sometimes elliptic-obovate, acuminate, cuneate at the base, glabrous above, villous beneath chiefly along the veins, 3–5 in. long: infl. nearly cylindric, nodding or pendulous, 5–7 in. long and 1½–2 in. across; rachis, pedicels, and calyx sparingly villous or calyx nearly glabrous: corolla pinkish, ½–¾in. long with nearly upright lobes: fruiting panicles pendulous with reflexed, slightly warty oblong caps. W. China.—A remarkable species very distinct from all others by the pendulous panicles and particularly handsome before the fls. open because of the carmine color of the buds.

Group Vulgaris.

5. **pubéscens,** Turcz. (*S. villòsa*, Decne., not Vahl. *S. villòsa* var. *ovalifòlia*, DC.). Shrub, 6 ft. high, with slender, somewhat quadrangular glabrous branches: lvs. roundish ovate to rhombic-ovate or ovate, shortly acuminate, ciliate, dark green and glabrous above, 1–3 in. long: fls. pale lilac, fragrant, short-pedicelled, in ovate, not very large, but numerous panicles; tube very slender; anthers violet, inserted much below the mouth. May. N. China. G.F. 1:415; 6:266. B.M. 7064. G.C. III. 38:123 (as *S. villosa* var. *pubescens*).—Free-flowering shrub of graceful habit, with handsome dark foliage.

3762. Winter twig of Syringa vulgaris, showing the absence of a terminal bud and the persistent dehisced pods. (×½)

6. **Juliànæ,** Schneid. Spreading shrub, to 6 ft.: branchlets villous: lvs. elliptic-ovate, acute or acuminate, cuneate at the base, short-pubescent above, pale and more villous-pubescent beneath, particularly on the veins, 1–2 in. long: infl. 2–4 in. long, rather loose; rachis and pedicels slightly hairy and like the glabrous distinctly toothed calyx purplish violet: corolla lilac-purple outside, fragrant, small, the spreading lobes white inside; anthers violet, inserted a little below the mouth. May,

June. W. China. B.M. 8423.—A handsome and distinct species similar to *S. pubescens;* the deeper color of the fls. is heightened by the purplish violet color of the whole infl.

7. **affînis,** L. Henry (*S. oblàta* var. *álba,* Hort.). Slender, loosely branched shrub; lvs. broadly ovate, acuminate, truncate at the base, finely pubescent while young, particularly on vigorous shoots, on flowering branchlets sometimes glabrous or nearly so, 1½–2½ in. long and 1⅓–2⅓ in. broad: infl. slender and rather loose, 4–5½ in. long: calyx distinctly 4-toothed; corolla white, tube ⅛in. long. May. N. China. Var. **Giráldii,** Schneid. (*S. Giráldii,* Lemoine, not *S. Giraldiàna,* Schneid.). Lvs. usually more densely pubescent while young: infl. 5–6 in. long, fls. purplish lilac; rachis, pedicels, and calyx purple-violet. N. W. China. R.H. 1909, p. 335.—The earliest of the lilacs to bloom and the fls. do not suffer from frost as do those of *S. oblata.* Hybrids of var. *Giraldii* with *S. vulgaris* have been raised recently by Lemoine, which flower nearly two weeks before the earliest varieties of *S. vulgaris;* such are "Lamartine" with rose-mauve fls. and "Mirabeau" with rosy lilac fls.

8. **oblàta,** Lindl. Shrub or small tree, 12 ft. high, rather compact: lvs. roundish ovate or reniform, often broader than long, cordate, short-acuminate, bright green, their margins usually reddish while young, 2½–4½ in. across: fls. pale lilac to purple-lilac, in dense subglobose or pyramidal panicles, 3–5 in. long; pedicels about as long as the distinctly toothed calyx. May. N. China. G.F. 1:221. A.G. 22:183. G.W. 5, p. 549. B.M. 7806. G. 36:355.—Next to the preceding species the earliest to bloom and handsome in fall with its vinous or russet-red foliage. A hybrid with the following species is **S. hyacinthiflòra,** Rehd. Intermediate between the parents, with broadly ovate lvs., turning purplish in fall. Only known in the double form, var. **plèna,** Lemoine. Many or perhaps most of the newer double-fld. varieties have originated by recrossing this form with varieties of *S. vulgaris.*

9. **vulgàris,** Linn. Figs. 3758, 3761, 3762. Upright shrub or small tree, 20 ft. high: lvs. ovate, truncate or slightly cordate, acuminate, bright green, 2–4 in. long: fls. lilac, blue, purplish, or white, in large panicles. May. S. E. Eu. to Caucasus and Afghanistan; sometimes escaped from gardens in the eastern states. B.M. 183. Gn. 53, p. 156. M.D.G. 1899:205. F.E. 22:5. R.H. 1903, pp. 126–128.—The most important of the older original varieties are the following: Var. **álba,** Ait., branches yellowish gray: fls. white; buds yellowish green; blooms a week earlier than the other varieties. A.F. 12:1081. Var. **cærùlea,** Ait. Fls. blue, in rather loose panicles. Var. **rùbra,** Loud. Fls. purplish red, in large and rather dense panicles. Here belong also var. **marlyénsis,** Hort., and Charles X. Var. **violàcea,** Ait. Fls. violet-lilac, in rather loose panicles. Var. **plèna,** Hort. With double fls. There are several varieties with variegated lvs., but these are hardly worth cultivating.

10. **chinènsis,** Willd. (*S. persica* × *S. vulgaris. S. dùbia,* Pers. *S. rothomagénsis,* Loud. *S. varìna,* Dum.-Cours.). Shrub, attaining 12 ft., with slender, often arching branches: lvs. ovate-lanceolate, acuminate, 2–4 in. long: fls. purple-lilac, red, or white, in large and broad panicles. May. Originated in 1777 in Rouen, France. R.H. 1883, p. 80. F. 1873, p. 76 (as *S. persica*). G.M. 44:498; 50:431.—Very free-flowering. Var. **álba,** Loud., with white fls. Var. **meténsis,** Simon-Louis, with pale purplish fls. Var. **saugeàna,** Loud. (var. *rùbra,* Lodd.), with deep purplish red fls. Var. **dùplex,** Lemoine, with double purplish lilac fls.

11. **pérsica,** Linn. Fig. 3763. Shrub, attaining 5–10 ft., with slender, arching branches: lvs. lanceolate, acuminate, 1½–3 in. long: fls. pale lilac or whitish, in rather loose, broad panicles, about 3–4 in. long; pedicels as long as or longer than calyx. May. June. Caucasus to Afghanistan. B.M. 486. Var. **álba,** Loud. (*S. Steèncruysii,* Hort.). Fls. white. Var. **rùbra,** Hort. Fls. red. Var. **laciniàta,** Vahl (*S. pteridifòlia, S. filicifòlia,* and *S. pinnàta,* Hort.). With pinnately lobed or pinnatifid lvs., of dwarfer habit and with smaller panicles. R.H. 1878, pp. 452, 453; 1883, p. 80; 1901, pp. 40, 41.

Section LIGUSTRINA.

12. **pekinénsis,** Rupr. (*Ligústrina amurénsis* var. *pekinénsis,* Maxim. *Ligústrina pekinénsis,* Regel). Large shrub, attaining 15 ft., with slender, spreading

3763. Syringa persica, one of the common lilacs. (×⅓)

branches, brownish red when young: lvs. ovate to ovate-lanceolate, usually narrowed at the base, acuminate, rather dark green above, pale or grayish green and glabrous beneath, 2–4 in. long, 1–1½ in. broad: fls. yellowish white in large glabrous panicles, usually in pairs at the ends of branches; stamens about as long as limb. June. N. China. G.F. 3:165; 7:385. M.D.G. 1899:425. —Large shrub, of excellent habit, with handsome foliage retained until late in fall; flowers profusely only when older. Var. **péndula, Hort.** With very slender, pendulous branches.

13. **amurénsis, Rupr.** (*S. ligústrina,* Hort. *Ligústrina amurénsis* var. *mandshùrica,* Maxim. *Ligústrina amurénsis,* Regel). Shrub, attaining 12 ft., with spreading or upright branches: lvs. broadly ovate to ovate, usually rounded at the base, bright green above, pale or grayish green and glabrous beneath, 2–6 in. long, 1½–2½ in. broad: fls. yellowish white, in large, rather loose glabrous panicles; stamens almost twice as long as limb. June. Manchuria. Gt. 12:396; 45, p. 64. G.F. 2:271. Gn. 12, pp. 623, 624. R.H. 1877, pp. 453–455.—Sometimes cult. under the name of *S. sibírica* or *S. sibírica álba.*

14. **japónica,** Decne. (*Ligústrina amurénsis* var. *japónica,* Maxim.). Fig. 3764. Pyramidal tree, attain-

ing 30 ft., with upright branches: lvs. broadly ovate to broadly elliptic, rounded or slightly cordate at the base, shortly acuminate, pale green beneath, and usually pubescent when young, 3–7 in. long: fls. yellowish white, in very large pubescent panicles often 1 ft. or more long; stamens little longer than limb. June, July. Japan. B.M. 7534 and S.I.F 2:33 (as *S. amurensis*). G.C. II. 25:561. Gn. 76, p. 356. G. 29:549. G.F. 2:293, 295. M.D G. 1899:424; 1907:381. Gt. 37:217. Mn. 4, p. 5; 7, p. 167. R.H. 1894, p. 325.—Very desirable free-flowering tree and quite hardy N. Var. **argéntea,** Temple, has the lvs. variegated with silvery white.

S. albo-rósea, N. E. Br. . . S. tomentella.—*S. Koehneàna,* Schneid. (S. velutina, Hort., not Komarov). Allied to S. pubescens. Young branchlets puberulous: lvs. oval to oblong-lanceolate, pubescent on both sides, 2–3 in. long: infl. 3–4 in. long, pubescent: fls. pale lilac. China.—*S. Komaróvii,* Schneid. Allied to S. villosa. Lvs. oblong-ovate, pubescent beneath, 4–6 in. long: infl. narrowly pyramidal, to 6 in. long, pubescent: corolla lilac; anthers partly exserted. W. China. Var. *Sargentiàna,* Schneid. Branchlets slightly pubescent: infl. usually somewhat larger: corolla purple; anthers usually scarcely exserted. W. China.—*S. Meÿeri,* Schneid. Allied to S. pubescens. Small shrub: lvs. elliptic-ovate, sparingly pubescent beneath: infl. rather dense: fls. lilac with very slender tube over ½in. long. N. China. Blooms when scarcely a foot high.—*S. pinnatifòlia,* Hemsl. Allied to S. persica. Lvs. pinnate, 2–3½ in. long with 9–11 sessile and decurrent lfts.: infl. slender, about 2 in. long; fls. whitish pink, the tube ½in. long. W. China. G.C. III. 55:269.—*S. Rehderiàna,* Schneid. Allied to S. villosa. Branchlets tomentose: lvs. elliptic, pubescent on both sides, 3–4 in. long infl. broadly pyramidal, to 7 in. long, villous: fls. white. W. China.—*S. Sargentiàna,* Schneid.=S. Komarovii var. Sargentiana.—*S. sempérvirens,* Franch. Shrub, to 4 ft., glabrous: lvs. persistent, coriaceous, broadly oval, obtuse or acutish, 1–1¾ in. long: fls. white, ¼in. long, in dense panicles 2–3 in. long: fr. fleshy, dehiscent. S. W. China. It looks more like a privet than like a lilac; not hardy N.—*S. Sweginzòwii,* Koehne & Lingelsh. Allied to S. villosa. Lvs. ovate, usually rounded at the base, pubescent beneath only near the veins, 2–4 in. long: infl. to 10 in. long, with purple rachis: fls. yellowish white suffused with pink, fragrant, the tube about ½in. long. E. Asia. G.C. III. 57:345. M.D. 1910, p. 112.—*S. tomentélla,* Bur. & Franch. (S. albo-rosea, N. E. Br.). Allied to S. villosa. Branchlets glabrous or short-pubescent: lvs. elliptic to oblong-lanceolate, more or less pubescent beneath, 1–3½ in. long: infl. dense, to 7 in. long, puberulous; fls. lilac-pink; tube over ½in. long. W. China. M.D. 1910, p. 112.—*S. velùtina,* Hort., not Komarov=S. Koehneana. The true S. velutina, Komarov, is apparently not in cult.; it differs chiefly in its larger lvs. and the glandular petioles and infl.—*S. Wilsonii,* Schneid. Allied to S. villosa. Lvs. elliptic-ovate, to elliptic-lanceolate, pubescent beneath near the veins, 2½–5 in. long: infl. broad, to 6 in. long, glabrous or nearly so; fls. white or lilac, tube about ½in. long. W. China.—*S. Wólfii,* Schneid. Allied to S. villosa. Lvs. elliptic-oblong, nearly glabrous: infl. to 12 in. long: fls. lilac, fragrant, ¾in. long. N. China. Remarkable for its very large panicles.—*S. yunnanénsis,* Franch. Allied to S. villosa. Shrub: lvs. elliptic-oblong to oblong-lanceolate, glaucescent beneath, glabrous, 1½–3½ in. long: infl. slender, 3–6 in. long, puberulous: fls. pinkish, with upright-spreading lobes. S. W. China.

ALFRED REHDER.

SYZÝGIUM (from the Greek, *united,* referring to the calyptrate petals). *Myrtàceæ.* Trees and shrubs of the tropics of the Old World, variously defined and by some authors made a section of Eugenia: from Eugenia proper the group differs in the united petals, the calyx truncate or with a 4–5-lobed limb and no staminal disk: fls. small, in compact clusters: fr. small 1- or 2-seeded berries. As defined by Niedenzu, the genus has about 140 species. One or two names under this genus appear in the trade. For *S. jambolana,* see *Eugenia jambolana,* p. 1163, Vol. II.

operculàtum, Niedz. (*S. nervòsum,* DC. *Eugènia operculàta,* Roxbg.). A large evergreen tree with 4-angled or nearly terete branches: lvs. opposite, broad-ovate or elliptic, rounded or somewhat acuminate at apex and narrowed at base, 3–8 in. long, dark green and glossy, the primary lateral nerves few and separated: fls. in 3's and collected into a more or less thyrsoid infl., greenish: berry ½in. or less diam., juicy, edible. Himalaya.—This name appears recently in Calif.: young plants described as having handsome foliage; said to be an acquisition.

L. H. B.

3764. Syringa japonica. (×¼)

T

TABEBÙIA (Brazilian name). *Bignoniàceæ.* Ornamental trees grown chiefly for their showy flowers.

Evergreen: lvs. opposite, simple or digitate, entire or serrate: fls. in terminal panicles or racemes, rarely solitary; calyx irregularly splitting or unequally 3–5-lobed; corolla funnelform-campanulate; stamens included; disk annular or cupulate; ovary with the ovules in many series: caps. more or less compressed, usually elongated, glabrous or scaly.—About 90 species in Trop. and Sub-trop. Cent. and S. Amer. By Bureau and by Schumann, Tabebuia is limited to the 5 or 6 species with simple lvs., and the species with digitate lvs. are referred to Tecoma, while the Tecoma of this work is called Stenolobium by these authors. See, also, *Bignonia.*

The tabebuias are upright trees with large evergreen foliage simple or digitate and with large pink, white, or yellow flowers in terminal, usually few-flowered panicles or racemes or sometimes solitary. They are suited for cultivation in tropical or subtropical countries only and are sometimes grown in southern California and Florida. They grow luxuriantly in rich or well-manured soil and are easily propagated by cuttings and also by air-layering.

A. *Lvs. simple.*

leucóxyla, DC. (*Bignònia leucóxyla,* Vell. *B. pállida,* Lindl.). Fig. 3765. Evergreen tree or shrub: lvs. elliptic-oblong to obovate-oblong, obtuse or sometimes marginate at the apex, glabrous, dark green, with distinct pale midrib, 4–7 in. long: fls. in few-fld. terminal racemes; corolla funnel-shaped, about 2 in. long, with yellow tube and pale lilac limb. Brazil. B.R. 965.

3765. Tabebuia leucoxyla. (×⅔) C, winged seed.

AA. *Lvs. digitate.*

B. *Fls. pink.*

triphýlla, DC. (*Bignònia leucóxylon,* Linn. *Técoma leucóxylon,* Mart.). Evergreen tree: lvs. long-petioled, digitate; lfts. 3–7, usually 5, stalked, oblong-lanceolate, entire, glabrous, 1–2½ in. long: fls. in usually few-fld., loose panicles or 1 or 2; corolla funnelform, with large, spreading limb, rosy pink or nearly white, suffused with pink, 2 in. long; calyx 2-lipped: caps. linear, 6–8 in. long. W. Indies, Guiana.

rósea, DC. (*Técoma rósea,* Bertol.). Evergreen tree: lvs. digitate; lfts. 5, rarely 3, long-stalked, ovate to oblong, acuminate, entire: fls. in many-fld. terminal panicles; corolla funnelform-campanulate, with short tube and large spreading lobes, rosy pink; calyx campanulate, obscurely 2-lobed, almost truncate. Guatemala.

BB. *Fls. yellow.*

chrysántha, Nichols. (*Técoma chrysántha,* DC.). Evergreen tree: lvs. digitate; lfts. 5, ovate, acuminate, entire, tomentose, 4–7 in. long, long-stalked: fls. in terminal dense racemes, yellow, funnelform, 2 in. long. Caracas.

T. æsculifòlia, Hemsl. (Tecoma æsculifolia, DC. · Bignonia æsculifolia, Humb. & Bonpl.). Evergreen tree, about 20 ft. high: lvs. digitate, with 7 oblong-obovate lfts., pubescent above, tomentose beneath: fls. in terminal panicles, subcampanulate, orange-red, with yellow spots on the 3 lower lobes. Mex.—*T. Dónnell-Smíthii,* Rose. Known in Mex. as "Primavera" and said to be one of the most beautiful trees, sometimes 4 ft. diam., and the wood very valuable: fls. beautiful golden yellow, in great abundance, usually appearing before the palmately compound lvs.: lfts. 7, oblong to ovate, acuminate, rounded or truncate at base, serrate.—*T. Pálmeri,* Rose. Tree, 18–25 ft., bearing paulownia-like fls.: lvs. opposite; lfts. 4, about 2–5 in. long, oblong, somewhat acuminate, obtuse at base: fls. white and purplish, with yellow spots, in close clusters at ends of naked branches; corolla 1½–2 in. long. Mex.—*T. pentaphýlla,* Hemsl. (Tecoma pentaphylla, Juss.). Closely related to T. triphylla. Tree, to 60 ft.: lfts. usually 5, elliptic to oblong-obovate, obtuse or acutish: fls. rosy pink, larger. W. Indies, Cent. Amer., Venezuela. The plant intro. under this name by the Dept. of Agric. under No. 38649 is said to have orange-colored fls. and belongs probably to some other species.—*T. serratifòlia,* Nichols. (Tecoma serratifolia, Don). Evergreen tree: lvs. digitate, with 4–5 oblong-ovate acuminate lfts. serrate at the apex, 3–5 in. long: fls. in terminal panicles, tubular-funnelform, yellow. W. Indies.—*T. spectábilis,* Nichols. (Tecoma spectabilis, Planch. & Lind.). Evergreen tree: lvs. digitate, with 5 stalked ovate to oblong-ovate, crenately serrate lfts.: fls. in terminal panicles, orange-yellow, funnelform-campanulate. Colombia. F.S. 9:948.

ALFRED REHDER.

TABERNÆMONTÀNA (named for J. T. Tabernæmontanus of Heidelberg, physician and botanist; died 1590). *Apocynàceæ.* Evergreen usually glabrous trees or shrubs, grown in the warmhouse.

Leaves opposite, thin or leathery: cymes rather branched, terminal or dichotomously arranged: fls. white or yellowish, small or rather large; calyx usually short, deeply or to the middle 5-lobed or -parted; corolla salver-shaped, tube cylindrical, lobes twisted; disk various; ovary with 2 distinct carpels: berries or follicles 2, globose, oblong, ovoid or recurved-reniform, smooth or 3-ribbed.—About 160 species, widely distributed throughout the tropics. See *Goniomɔ* for distinctions from that genus.

The East Indian rosebay, *T. coronaria,* is one of the

best ornamental shrubs for subtropical gardens. This species and *T. Camassi*, referred in this work to Gonioma, flourish everywhere in Florida from Jacksonville southward. If they receive proper attention, tiny cuttings soon develop into dense, bushy plants 3 to 5 feet high, covered with deliciously scented flowers throughout the summer. Indeed the plants are so densely covered with buds and flowers that it is often difficult to find a sufficient supply of cuttings for propagation. *T. coronaria* has larger leaves than *T. Camassi* and the flowers are much like those of the double white oleander, while *T. Camassi* has solider and smaller blossoms. Both do well under the same treatment. In order to enjoy the beauty of the East Indian rosebay to its fullest extent, it must be planted in rich, sandy soil, not too wet and not too dry, and in places fully exposed to the sun. Only very strong pot-grown plants should be set out in the garden. This should be done during the rainy season. Avoid breaking the ball in transplanting. It is useless to transplant in November, the time when most evergreens and other plants are most successfully set out. The plants at this season have not time to become established before the first sharp frost comes, and a weakened tabernæmontana is usually killed outright by even a slight frost. Just before Christmas all the plants of this nature (bauhinias, cestrums, *Poinciana regia*, *Tristania conferta*, grevilleas, eucalypti, and so on) are banked about 18 inches to 2 feet high with dry sand, and they always come through without much damage. In April or even earlier, the banking is taken away and the plants cut back to sound wood. The tabernæmontanas look best in groups by themselves or in front of other glossy leaved evergreens. (H. Nehrling.)

A. *Fls. white.*

coronària, Willd. Crape Jasmine. Nero's Crown. A tender shrub, 6–8 ft. high: lvs. glossy green, oblong to oblanceolate: fls. white, fragrant, 1–2 in. across, in 1–8-fld. clusters in the forks of the branches; petals crimped on the margin, whence the common name. Cult. in India but native country unknown. Var. **flòre-plèno,** with double, somewhat larger, very sweet-scented fls., seems to be far more common in cult. P.M. 16:354. B.M. 1865 (as *Nerium coronarium*).—Cult. in the more southern states and also in greenhouses. Also known as Adam's apple and East Indian rosebay.

AA. *Fls. yellow.*

grandiflòra, Jacq. A small, tender shrub: lvs. oblong-ovate, sharply acuminate, 2–3 in. long, thick: fls. single, yellow, 1–2 in. long, in few-fld. clusters; corolla-lobes oval, obtuse, entire. Early fall. Carthagena, Guiana. B.M. 5226.—Rarely cult. in the more southern parts of the U. S.

T. Camássi, Regel. See Gonioma Kamassi.—*T. dichótoma*, Roxbg. (Cerbera dichotoma, Lodd.). About 6 ft. high: lvs. oblong, acute at base, obtuse at apex, 2½–5 in. long; cymes terminal, dichotomously branched, many-fld.; fls. slightly odorous, 1 in. long. India. B.R. 27:53. L.B.C.16:1516. H.W. 3, p. 259.—*T. grandiflòlia*, Hort., is listed in the American trade, presumably an error for T. grandiflora.

F. W. Barclay.
F. Tracy Hubbard.†

TACAMAHAC: *Populus balsamifera.*

TÁCCA (Malayan name). Syn., *Atáccia. Taccàceæ*, a family allied to the Dioscorea tribes. Perennial herbs from a tuberous or creeping rhizome, adapted to the warmhouse.

Leaves radical, large, petioled, sometimes undivided and entire, sometimes variously lobed or dissected: fls. at the top of erect leafless scapes in dense umbels, lurid brown or greenish; perianth 6-lobed in 2 rows; stamens 6; ovary inferior, 1-celled: fr. globose, ovoid, turbinate or elongated, usually 3-cornered or 6-ribbed, berry-like and indehiscent, rarely finally 3-valved.—About 13 species in the tropics of both hemispheres. The fl.-cluster is subtended by a few, usually 4, leaf-like or colored bracts, and intermixed with the fls. are more or less numerous, long and conspicuous, sterile, filiform pedicels, which usually droop below the fl.-cluster. Taccaceæ contains only one other genus, Schizocapsa.

A. *Lvs. much lobed.*

pinnatífida, Jack. Tender perennial herb, about 2 ft. high: rootstock globose, becoming 1 ft. through: lvs. large, usually 3-branched, the divisions pinnately cut or divided, the ultimate lobes sometimes irregular and unequal but usually ovate to lanceolate: fls. greenish, 8 lines across, many with the sterile pedicels purplish: berry nearly globular, 1 in. through. Afr., India, and Austral. L.B.C. 7:692. B.M. 7299, 7300.—According to Von Mueller's Select Extra-tropical Plants, the Fiji arrowroot is prepared from the tubers of this species. The plant thrives even on the sand-shores of tropical countries, and it is not unlikely that it will endure a temperate climate.

AA. *Lvs. not lobed.*

cristàta, Jack (*Atáccia cristàta*, Kunth). Rootstock a short conic caudex, marked with lf.-scars: lvs. 1–2 ft. long, oblong, acuminate, dark purplish green: scape longer then the lvs.: fls. dark purple, 1½ in. across, in a somewhat 1-sided umbel, with numerous pale sterile pedicels 8–10 in. long: involucral bracts 4, conspicuous, the 2 inner elliptical, narrowed to a petiole, the 2 outer revolute. Malaya. B.M. 4589. F.S. 9:860–861. Gn. 45, p. 415; 49, p. 423.—According to Gn. 45, p. 415, it requires good, rich, open soil, with ample drainage, plenty of water, and a stove temperature. In the winter season the plant should be kept in a state of partial rest.

Chantrièri, André. Plant stemless, on a fibrous, red-brown caudex: lvs. on petioles attaining a length of 28 in., which are dilated and imbricated at base, channeled and red-brown; blades oval, acute at apex, about 20 x 8–10½ in., brilliant shining green, not symmetrical at base: infl. red-brown, brilliant purple spathes brilliant purple; fls. about 20, almost 2 in. long. Malaya. R.H. 1901, p. 541.—Resembling *T. cristata* but larger in its proportions and having more numerous long-stalked fls.

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TACSÒNIA (from the Peruvian name of one of the species). *Passifloràceæ.* From Passiflora, Tacsonia differs in having a long-tubular calyx, stamens and petals usually 5, the latter never wanting, corona of tubercles or very short threads, and in a short reflexed crown near the base of the fl.-tube. However, the line of demarcation between the two genera is often not well marked and Harms (Engler & Prantl's Pflanzenfamilien) unites Tacsonia with Passiflora. Masters (Trans. Linn. Soc. 27) accepts 25 species of true Tacsonia, relegating the intermediate forms largely to Passiflora. Other species have been discovered subsequently. The Tacsonias are all S. American, inhabiting the Andes. They are tendril-climbing shrubs or herbs, requiring the treatment given passifloras. Tacsonias are cult. freely in the open in Cent. and N. Calif. *T. manicata* (*Passiflora manicata*) is a common and striking red-fld. tall climber in S. Calif.

In this work, following Engler & Prantl and also Hooker, the Tacsonias are described under *Passiflora.*

TÆNÍDIA (Greek, making reference to the very small ribs of the fr.). *Umbellíferæ.* One species, a slender smooth glaucous perennial of E. Canada and U. S., *T. integerrima*, Drude, formerly known as *Pimpinella integerrima*, Gray, and *Zizia integerrima*, DC. It has little value to the horticulturist, although interesting to the collector of native plants for the hardy border. It is erect, 2–3 ft., slender, open-branched, with long-rayed umbels of small yellow fls. in spring and early summer: lvs. ternately 2-compound, the lfts. oval to lanceolate, entire, nearly or quite obtuse.

TAGÈTES (*Tages*, an Etruscan god, or perhaps of other derivation). *Compósitæ*. MARIGOLD. American perennial and annual flower-garden herbs.

Leaves opposite or alternate, pinnately cut or rarely simply serrate: fl.-heads of various sizes, yellow or orange, marked in some species with red: strong-scented plants with opposite or alternate mostly pinnately divided lvs. that bear oil-glands: involucre of united parts forming a cup or tube, naked at base: achene angled or flattened, the pappus of a few entire mostly unequal bristles or scales; rays pistillate; disk-fls. perfect.—Species about 20, from New Mex. and Ariz. to Argentina, mostly annuals. The popular annual species known as "African" and "French" marigolds have been derived respectively from *T. erecta* and *T. patula*, both of which are native to Mex. According to Sweet's Hortus Britannicus, these two species were intro. into cult. in 1596 and 1573.

3766. Single French marigold.—Tagetes patula. (×¼)

For garden purposes Tagetes may be divided into two groups, based upon habit of growth. *T. erecta* and *T. lucida* are of upright and somewhat open growth; while *T. patula* and *T. signata* are spreading and bushy, the lower branches lying close to the ground and often rooting. The French marigolds, *T. patula*, are valuable bedding plants. Good garden forms are of even height and bushy compact growth, with a mass of good foliage and well-colored flowers appearing continuously from June until frost. In raising plants, it is preferable to grow them in pots, as this practice seems to check the plants sufficiently to cause them to bloom at a small size and more plentifully during the early summer months than if they were raised with unlimited root room. They should be planted about 1 foot apart. This species also makes attractive specimens in small pots in a few weeks from seed. Mixed seed of the double sorts will give a large percentage of good double flowers, while the seed of special named double sorts is remarkably good. Some of the single forms are very finely colored. The African marigolds, *T. erecta*, are not well suited to bedding purposes, the growth being too open, but for the mixed border or shrubbery they are excellent late-blooming subjects. This species should be grown with plenty of root room, air, and rich soil from start to finish if the largest and most double flowers are desired. The African marigolds are very useful as cut-flowers except under circumstances where their odor is objectionable.

For pot marigold, see *Calendula*.

A. *Fls. generally marked with red.*

pátula, Linn. FRENCH MARIGOLD. Fig. 3766. A hardy annual, usually about 1 ft. high and much branched from near the base, forming a compact, bushy plant: lvs. darker green than in *T. erecta*, pinnately divided; lobes linear-lanceolate, serrate: fls. smaller than in *T. erecta* and borne on proportionately longer peduncles. Mex. B.M. 150; 3830 (as *T. corymbosa*).—Both the single and double forms are grown. The species is very variable as to the color-markings of the fls. which range from almost pure yellow to nearly pure red. A dwarf variety, **nàna,** Hort., is known. Gn. 63, p. 24; 73, p. 127.

AA. *Fls. not marked with red.*

B. *Lvs. pinnately divided.*

C. *Rays numerous.*

erécta, Linn. AFRICAN MARIGOLD. Fig. 3767. A hardy annual growing about 2 ft. high, erect, branched: lvs. pinnately divided, segms. lanceolate-serrate: fls. 2–4 times as large as in *T. patula* and of one solid color, the typical color, according to DeCandolle, being a lemon-yellow. Mex.—The rays are sometimes rather 2-lipped and in one of the garden forms they are quilled. The color ranges from a light sulfur-yellow to a deep orange, many of the light yellow shades being rare amongst fl. colors. This is the common marigold of old gardens in Amer. Foliage very strong-scented.

CC. *Rays few, usually 5.*

signàta, Bartl. An annual branching species: lvs. pinnately divided into usually 12 oblong, linear, sharply serrate segms., the lower teeth awned: rays 5, yellow, roundish-obovate. Mex. R.H. 1895, p. 505. Var. **pùmila,** Hort., a dwarf, bushy form, usually less than 1 ft. high, seems to be the only form in the trade. The fls. are bright yellow and small but numerous.—The species is suited for massing or for borders.

BB. *Lvs. lanceolate, simply serrate.*

lùcida, Cav. SWEET-SCENTED MARIGOLD. A tender perennial plant, entirely distinct from the foregoing annuals in the sessile, lanceolate lvs. and small, usually 2–3-rayed fls. in dense, terminal corymbs. The fls. have a much more agreeable odor than the other species cult. Mex. B.M. 740. R.H. 1895, p. 505.—Sometimes used as a substitute for tarragon, which see.

T. lácera is a species discovered about 1896 by T. S. Brandegee in Low. Calif. It makes a compact bush 4–5 ft. high, bearing a profusion of yellow fls. in winter. Small plants flower well in pots. See G.F. 9:67. —*T. Lémmonii*, Gray, also a shrubby nearly smooth plant about 2 ft. high, seems to be grown in Calif. It is distinctly woody but rather slender: lvs. all opposite, 3–7-foliolate, the serrulate lfts. about 1 in. long: heads about 1 in. diam., showy. Ariz. G. C. III. 27:21.

F. W. BARCLAY.

TAÌNIA (Greek, *band* or *fillet*, alluding to the shape of the lip). *Orchidàceæ*. Terrestrial warmhouse orchids. Sterile st. from a many-sheathed rhizome finally thickened into a pseudobulb: lf. single, terminal, large, long-petioled: flowering scapes arising from the rhizome, tall, leafless, base few-sheathed, bearing a simple terminal raceme: fls. pedicellate, sparse, rather large or medium-

3767. African marigold.—Tagetes erecta. (×⅛)

sized; sepals about the same length, narrow, acutish to acuminate; petals similar to the rear sepal or narrower; labellum affixed to the foot of the column, erect, gibbous at base, lateral lobes erect and parallel or clasping the column, the middle lobe spreading, short, broad; pollinia 8.—About 14 species, India, S. China, and Malaya.

Fuerstenbergiàna, Schlecht. Tall: pseudobulbs ovoid, about 2 in. long, 1-lvd.: lf. erect, petioled, lanceolate, about 2 ft. long: scape slender, erect, 2½–3 ft. tall, bearing a lax 10–15-fld. raceme: fls. about 2 in. across; sepals and petals oblong-ligulate; lip oblong, 3-lobed. Habitat(?).—Closely allied to *T. penangiana.*

penangiàna, Hook. f. Not pseudobulbous: lf. 8–12 x 1½–2 in., about equaling the slender petiole: scape twice as long: sepals linear-lanceolate, ⅔in. long, acuminate; petals narrow, 5–7-nerved, spur shortly conical, obtuse; lip oblong, side lobes subacute, incurved, overlapping the orbicular, acuminate, crisped midlobe. Penang, Malayan Penins. F. Tracy Hubbard.

TAINIÓPSIS (*like Tainia*). *Orchidàceæ.* Epiphytic plants, probably adapted to the coolhouse. Roots rather stout, with a short decumbent rhizome: pseudobulbs ovoid, slightly 4-angled, finally rugose, at apex 2-lvd.: lvs. elliptic-lanceolate, acuminate, narrowed to the petiole, lightly plicate, 1 ft. or more long: scape lateral from near the base of the pseudobulb, erect, slender, more or less exceeding the lvs.: infl. simple or slightly branched, laxly several- or many-fld.: sepals ringent, ligulate, rather obtuse, minutely puberulent outside, glabrous inside, lateral recurved, falcate, base broadened; petals obliquely linear, obtuse, recurved, glabrous, as long as the sepals; labellum curved, mobile, lanceolate-tongue-shaped, apex hastately dilatate with the margins incurved; column medium-sized, broadened toward the apex; pollinia 8. One species, Khasia Mts. and Burma, *T. barbàta,* Schlecht. O. 1915:11.
F. Tracy Hubbard.

TALAÙMA (S. American name). *Magnoliàceæ.* Evergreen trees, grown occasionally in the warmhouse. Lvs., infl., and seeds as in Magnolia: sepals 3; petals 6 to many, imbricate in 2 rows; stamens numerous; carpels numerous, capitate or spicate, 2-ovuled.—About 30 species in the tropics of E. Asia, S. Amer., and Japan. Talauma is closely allied to Magnolia, but the carpels are indehiscent and deciduous, while those of Magnolia dehisce dorsally and are persistent.

Hŏdgsonii, Hook. & Thom. Tender evergreen tree, 50–60 ft. high, producing lvs. and fls. at the same time: lvs. 8–20 x 4–9 in., obovate-oblong, cuspidate or obtuse, leathery, glabrous: fls. cup-shaped, fully 6 in. across and 4 in. deep, solitary, terminal; sepals 3–5, purple outside; petals about 6: fr. 4–6 in. long. Himalayas. B.M. 7392.—The fls. have a spicy odor, hard thick fleshy texture, and the glaucous purplish blue of the sepals contrasts well with the ivory-white of the petals. Hooker ranks this species second in beauty only to *Magnolia Campbellii* (p. 1969, Vol. IV). *T. Hodgsonii* grows at an elevation of 5,000–6,000 ft. This fine tree has been flowered at Kew and perhaps elsewhere in Eu., but never in Amer., so far as is known. Many times seeds were received at Kew from India, but they never germinated, the reason being the rapid decay of the albumen, involving that of the embryo. The trees now cult. in Eu. have been derived from young plants sent from India in Wardian cases at considerable expense and risk. Wilhelm Miller.

TALÌNUM (possibly a native name in Senegal). *Portulacàceæ.* Fleshy herbs, sometimes becoming woody at the base with age, occasionally cult. in the warmhouse. Lvs. alternate or rather opposite, flat: fls. small, in terminal cymes, racemes, or panicles, rarely solitary, axillary, or lateral; sepals 2; petals 5, hypogynous, ephemeral; stamens 5 to many; ovary many-ovuled: caps. globose or ovoid, chartaceous, 3-valved.—About 15 species, widely scattered in the warmer regions.

The variety of *T. patens* is a handsome greenhouse shrub, with foliage marked white and sometimes also pink. The young stems are pink and succulent, but they become woody with age. The plant is allied to portulaca and will endure much heat and drought, but is very impatient of overwatering and lack of drainage. The plants bloom freely, the flowers being small, light pink, and followed by small yellow capsules filled with an indefinite number of little brown seeds. Some prefer to retain the sprays of blossom, but to make the best show of foliage the flower-shoots should be cut off as soon as they appear. Talinum is a satisfactory houseplant. It should be placed in a window with a northern exposure or in some other shady position. Talinum may also be planted out during the summer. (W. C. Steele.)

pàtens, Willd. Erect subshrub: st. almost simple, 1–2 ft. high, leafy to the middle, where the panicle begins: lvs. mostly opposite, oval, abruptly tapering at the base: panicle terminal, long, leafless, bearing dichotomous cymes: fls. carmine; petals 3 lines long; stamens about 15–20. W. Indies and east coast of S. Amer. to Buenos Ayres. Var. **variegàtum,** Hort. (*"Tolinium variegatum,"* Hort. *Basélla variegàta,* Hort.), is probably the plant described as sweet Malabar vine in Vol. I, page 455, of this work.

triangulàre, Willd. Lvs. alternate, obovate-lanceolate: cymes corymbiferous: pedicels 3-cornered (in *T. patens* they are filiform): fls. red or white. W. Indies, Brazil, Peru. Var. **crassifòlium,** Hort. (*T. crassifòlium,* Hort.), is said to be taller and more branched: lvs. larger, often emarginate and mucronate.
F. Tracy Hubbard.†

TAMARACK: *Larix.*

TAMARÍNDUS (from the Arabic *tamar-Hindi,* meaning "Indian date"). *Leguminòsæ.* A tropical genus containing but one species, the well-known tamarind. It is considered to be indigenous to tropical Africa (the upper Nile region) and possibly southern Asia as well. It has long been cultivated throughout the tropics of both hemispheres, being grown both as an ornamental and for its acid fruits, which have many uses. The tamarind became known in Europe during the Middle Ages, doubtless through the Arabians. Until correctly described by Garcia d'Orta (1563) it was supposed by Europeans to be produced by an Indian palm (Dymock).

Leaves alternate, equally pinnate, the lfts. small, indefinite in number; stipules minute, caducous: fls. irregular, produced in racemes at the ends of the branches; bracts and bracteoles ovate-oblong, colored, caducous; calyx-tube turbinate, narrow, the segms. 4, imbricate, membranaceous, colored; 3 superior petals imbricate, yellowish, veined with red, 2 inferior reduced to bristles hidden at the base of the staminal tube; fertile stamens 3, connate in a sheath, opening above with short, free filaments, anthers oblong, longitudinally dehiscent; ovary many-ovuled, with a stalk adnate to the calyx-tube, the style filiform, stigma terminal, subcapitate: fr. an oblong or linear, compressed, indehiscent pod, with a thick, crustaceous epicarp, pulpy mesocarp, and coriaceous endocarp septate between the obovate-orbicular, compressed seeds; embryo exalbuminous. The genus is distinguished from Schotia, the only ally which seems to be cult. in Amer., by its floral characters.

índica, Linn. Tamarind. Tamarindo. Fig. 3768. A large tree, attaining to 80 ft. in height when grown on deep soils, with a trunk 25 ft. in circum.: bark brownish gray, somewhat shaggy: lvs. abruptly pin-

nate; lfts. 20–40, opposite, oblong, ½–¾in. long, glabrescent, soft, pale green, obtuse: fls. few together in lax racemes, individually about 1 in. broad, pale yellow, the petals veined red; calyx-teeth lanceolate, the lowest 2 connate: pod 3–8 in. long, ¾–1 in. broad, cinnamon-brown, with a brittle epicarp and brown pulp inclosing 1–12 seeds. Flowers in April and May in the northern hemisphere, ripening fr. in late autumn and winter. B.M. 4563 (as *T. officinalis*). J.F. 2:133.—The tamarind is a magnificent evergreen tree, extensively cult. in nearly all tropical countries. It succeeds in S. Fla., and has been grown as far north as Manatee, where a large specimen was killed by the freeze of 1884. It is not sufficiently hardy to be grown in Calif., failure having attended all past efforts to cult. it in that state, so far as known. It delights in a deep alluvial soil and abundant rainfall, the largest specimens being found in tropical regions where the soil is rich and deep. On the shallow soils of S. E. Fla. it does not attain to great size. When small it is very susceptible to frost, but when mature it will probably withstand temperatures as low as 28–30° F. without injury.

3768. The tamarind, Tamarindus indica.—Short-podded or West India form. (×½)

The plump slightly curved pod has a thin brittle shell. It contains a soft brownish pulp transversed by a few strong branched fibers; the large flattened glossy seeds, varying from one to twelve in number, are surrounded by a thin tough membrane. The pulp contains sugar together with acetic, tartaric and citric acids, the acids being combined, for the most part, with potash. In East Indian tamarinds, according to Dymock (Pharm. Ind. pt. II, 532–36) citric acid is present in a small quantity, about 4 per cent, while there is about 9 per cent of tartaric. The pulp is widely used in the Orient as an ingredient in chutnies and curries, and for pickling fish. In medicine, it is valued by the Hindus as a refrigerant, digestive, carminative, laxative, and antiscorbutic, for which latter purpose it is sometimes used in place of lime juice. With the addition of sugar and water, it makes a cooling drink or refresco, especially well known in Latin America. For the preparation of this drink, a sirup is often made from the pulp which can be bottled and used as desired. In some countries tamarinds are an important article of export. In Jamaica the fruit is prepared for shipment by stripping it of its outer shell, and then packing it in casks, with alternate layers of coarse sugar. When the cask is nearly full, boiling sirup is poured over all, after which the cask is headed up. In the Orient, the pulp, containing the seeds, is pressed into large cakes, which are packed for shipment in sacks made from palm leaves. This product is a familiar sight in the bazaars. It seems to be greatly esteemed as an article of diet by the Indians, as also by the Arabs, large quantities being shipped to Arabia from India.

According to Watt, the natives of India have an aversion to sleeping under the shade of the tree because of the supposed acid exhalation from the leaves. Pittier states, however, that he has slept under a tamarind tree for weeks without suffering the least inconvenience. Gamble writes that the leaves corrode the cloth of tents pitched in the shade of the tree. This happens, he says, in wet weather; the leaves fall on the tents, and within a day or two the cloth is decomposed in holes.

The tree is easily propagated by means of seeds, which is the only method commonly used. Seeds can be transported without difficulty, as they retain their viability for a considerable length of time if kept dry. They are best germinated by planting them ½ inch deep in light, sandy loam. The young plants are rather delicate and must be handled carefully to prevent damping-off. In India, the yield of a mature tree is said to be about 350 pounds of fruit per annum. Little is known of the insect pests which attack the tree; Maxwell-Lefroy mentions two, *Caryoborus gonagra*, a large gray-brown chrysomelid beetle found in tamarind seeds, and *Charaxes fabius*, a large black yellow-spotted butterfly whose larvæ feed on the leaves. Both these insects occur in India.

Firminger mentions three varieties of tamarind grown in India, but does not know whether they can be depended on to come true from seed. Masters, in the "Treasury of Botany," states that the East Indian variety has long pods, with six to twelve seeds, while the West Indian variety has shorter pods, containing one to four seeds. Seedlings undoubtedly show considerable variation in the size and quality of their fruit, which accounts for the different varieties which have been noted by many writers. Firminger recommends that seedlings which produce unusually choice fruit be propagated by gootee, or stem-layering, a method which is described under Litchi. More recently (1913) Wester has reported that the tree can be shield-budded successfully the method being similar to that used with avocado.

F. W. Popenoe.

TAMARISK: *Tamarix.*

TÁMARIX (ancient Latin name). *Tamaricàceæ.* Tamarisk. Ornamental woody plants, grown chiefly for their showy panicles or racemes of pink or whitish flowers; and also for their very fine graceful foliage.

Deciduous shrubs or trees: lvs. alternate, sessile, often sheathing, small, and scale-like: fls. small, short-pedicelled or sessile, in rather dense racemes, usually collected into terminal panicles; sepals and petals 4–5; stamens usually 4–5, rarely 8–12, sometimes slightly connate at the base; ovary 1-celled, surrounded at the base by a more or less deeply 5- or 10-lobed disk; styles 2–5, clavate or short and thick: fr. a caps., dehiscent into 3–5 valves; seeds many, minute, with a tuft of hairs at the apex.—About 75 species from the Medit. region to

E. India and Japan. Several species have medicinal properties and yield dye-stuffs. The punctures of an insect, *Coccus manniparus*, cause *T. mannifera* to produce "manna."

The tamarisks are very graceful shrubs or small trees with slender branches clothed with minute scale-like appressed leaves, and with usually light pink small flowers in large and loose terminal panicles or in numerous lateral racemes, followed by small capsular fruits. None of the species is quite hardy North, but *T. pentandra*, *T. odessana*, *T. gallica*, and *T. parviflora* are fairly hardy as far north as Massachusetts. Several of the species bloom late in summer and are a welcome addition to the autumn-flowering shrubs. As they are inhabitants of warmer arid regions, they are adapted for dry-land conditions, and they also grow well in saline and alkaline soil. They are excellent for seaside planting and thrive in the very spray of the salt water. Propagation is by seeds, which are very fine and should be only slightly covered, or usually by cuttings of ripened wood in the open ground or by greenwood cuttings under glass.

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KEY TO THE SPECIES.

A. *Fls. 4-merous: racemes lateral on last year's branches.*
B. *Petals spreading, persistent; styles usually 3* ..... 1. **parviflora**
BB. *Petals erect, deciduous; styles usually 4* ..... 2. **tetrandra**
AA. *Fls. 5-merous.*
B. *Racemes lateral on last year's branches* ..... 3. **juniperina**
BB. *Racemes forming large terminal panicles, rarely lateral on the current year's branchlets.*
C. *Lvs. glabrous.*
D. *Petals persistent.*
E. *Bracts ovate-lanceolate* ..... 4. **pentandra**
EE. *Bracts subulate.*
F. *Infl. nodding: tree with spreading branches* ..... 5. **chinensis**
FF. *Infl. upright: erect shrub.* 6. **odessana**
DD. *Petals deciduous* ..... 7. **gallica**
CC. *Lvs. finely pubescent* ..... 8. **hispida**

1. **parviflòra,** DC. (*T. tetrándra* var. *parviflòra*, Boiss. & Kotschy). Fig. 3769. Shrub or small tree, 15 ft. high, with reddish brown bark and slender spreading branches: lvs. ovate, acuminate, semi-amplexicaul, scarious at the apex when older: fls. pink, very short-pedicelled, in slender racemes about 1 in. long along last year's branches; petals spreading, persistent; calyx very small, sometimes only 3-parted; styles usually 3, much shorter than ovary. April, May. S. Eu. F.S. 9:898. R.H. 1855:401. Gn. 61, p. 273; 71, p. 358. —Often confounded with the *T. tetrandra*, also with *T. africana* and *T. gallica* and cult. under these names. *T. tetrandra* var. *purpurea* probably belongs here.

2. **tetrándra,** Pall. Shrub or small tree, attaining 12 ft., with almost black bark: lvs. ovate-lanceolate, somewhat narrowed at the base, with diaphanous margin: fls. light pink or almost white, in racemes 1–2 in. long along last year's branches; disk purple, deeply 4-lobed; styles usually 4, about as long as ovary. April, May. S. E. Eu., W. Asia.—Doubtful whether in cult. in this country; all plants seen under this name by the writer belong to the preceding species.

3. **juniperina,** Bunge (*T. japónica* and *T. plumòsa*, Hort.). Shrub or small tree, attaining 15 ft., with slender spreading branches: lvs. green, oblong-lanceolate, acuminate, scarious at the apex: fls. pinkish, in lateral racemes 1½–2½ in. long on last year's branches; pedicels slender, shorter than calyx; sepals ovate-lanceolate, little shorter than the persistent petals; disk 5-lobed, with emarginate lobes. Japan, N. China. S.Z. 1:71 (as *T. chinensis*.)

4. **pentándra,** Pall. (*T. Pállasii*, Desv. *T. hispida æstivàlis*, Hort.). Shrub or small tree with usually purple branches: lvs. lanceolate to ovate, acute, glaucous or pale green: fls. pink, in large panicles, the racemes dense, 1–2 in. long; bracts ovate-lanceolate, acute or acuminate, as long or slightly longer than pedicels; petals broadly elliptic-oblong, connivent; disk 5-lobed, with emarginate lobes; styles 3, with obovate, connivent stigmas. Aug., Sept. S. E. Eu. to Cent. Asia. B.M. 8138. Gn. 77, p. 494. Gn. W. 25:121.—*T. amurénsis*, Hort., is a form of this variable species. F.E. 20:344, pl. 105. Also *T. cáspica* probably belongs here.

3769. Tamarix parviflora. (×½)

5. **chinénsis,** Lour. Shrub or small tree, attaining 15 ft., with slender spreading, often drooping branches: lvs. bluish green, lanceolate, acuminate, keeled: fls. pink, in large and loose usually nodding panicles, pedicels as long as calyx; sepals ovate, much shorter than the persistent petals; disk deeply 10-lobed. July–Sept. China.

6. **odessàna,** Stev. Shrub, 4–6 ft. high, with upright, slender branches: lvs. lanceolate, subulate, decurrent: fls. pink; racemes slender, about 1 in. long, on short, naked peduncles, spreading and disposed in ample loose panicles; pedicels about as long as calyx; petals slightly spreading; disk 5-lobed, with rounded lobes. July–Sept. Caspian region.

7. **gállica,** Linn. (*T. arbòrea*, Sieber, not Ehrenb. *T. canariénsis*, Willd.). Shrub, or small tree with slender spreading branches: lvs. dull to bluish green, closely imbricated, rhombic-ovate, acute or acuminate, keeled, semi-amplexicaul, with scarious margin: fls. white or pinkish, globose in bud, almost sessile, in slender, panicled racemes; petals deciduous; filaments somewhat dilated at the base, inserted between the rounded lobes of the 10-lobed disk; styles 3. May–July. W. Eu., Medit. region to Himalayas; naturalized in S. Texas and N. Mex. Gn. 34, p. 329. Var. **índica,** Ehrenb. (*T. índica*, Willd.). With slender, upright branches: lvs. dull green: racemes longer and slenderer: fls. pink, disk obscurely and minutely 10-lobed. Himalayas. Var. **narbonnénsis,** Ehrenb. Racemes short, almost sessile, lateral on the current year's branches. S. W. Eu. Var. **élegans,** Schelle (*T. élegans*, Hort.), is a garden form of slenderer habit and with brighter green foliage; blooms somewhat later.

8. **híspida,** Willd. (*T. kashgárica*, Hort.). Shrub, with slender upright branches: lvs. bluish green, cordate and subauriculate at the base, acuminate, somewhat spreading, finely pubescent: fls. pink, almost sessile, in dense racemes 2–3 in. long, disposed in terminal panicles;

petals deciduous, much longer than sepals; disk 5-lobed. Aug., Sept., R.H. 1894:352.

T. africàna, Poir. Allied to T. juniperina. Racemes 2–3 in. long: fls. very short-pedicelled; styles slenderer. Medit. region. Apparently not in cult.; the plant offered in trade under this name is usually T. parviflora.—*T. algèrica* or *T. algeriénsis*, Hort., is probably T. gallica; no species has been described under these names. The Algerian species are: T. gallica, Linn., T. brachystylis, Gay, T. bounopæa, Gay, T. africana, Poir., T. Balansæ, Gay, T. rubella, Battand., T. pauciovulata, Gay, and T. articulata, Vahl.—*T. ánglica*, Webb. Allied to T. gallica. Shrub, to 10 ft.: lvs. bluish green, somewhat constricted at the base: fls. ovate in bud; filaments filiform at the base, attached to the acute lobes of the 5-angled disk. W. Eu. S.E.B. 2:261.—*T. articulàta*, Vahl. Tree, attaining 30 ft., with slender, jointed branches: lvs. glaucous, minute, sheathing: fls. 5-merous, pink, sessile, in terminal panicles. W. Asia. Not hardy N.—*T. dahùrica*, Willd.=Myricaria dahurica.—*T. germánica*, Linn.=Myricaria germanica.—*T. rubélla*, Battand. Allied to T. parviflora. Tree or shrub with red erect branches: lvs. minute, imbricate: bracts ovate, acute, almost as long as calyx; calyx-segms. 4; petals 4, rose; stamens 4, with long filaments and dark purple anthers. Algeria.

ALFRED REHDER.

TAMÒNEA (native name). *Melastomàceæ*. This name was revived to cover the names Cyanophyllum, Miconia, and others (Krasser, in Engler & Prantl, Die Natürlichen Pflanzenfamilien, III. 7. 1898), but later (Nachtr. 1, p. 267) the name Miconia was restored. Miconia is also retained in the list of "nomina conservanda" of the International (Vienna) Congress. Our cross-reference from Cyanophyllum to Tamonea, therefore (Vol. II, p. 930), should be to Miconia. There is apparently only one plant commonly known in cult. as Cyanophyllum, and this is accounted for as *Miconia magnifica* on p. 2047, Vol. IV; and others are there described. Under these dispositions, therefore, the name Cyanophyllum is dropped.

TÀMUS (the old Latin name used by Pliny). Also spelled *Tamnus*. *Dioscoreàceæ*. Herbaceous perennials from a tuberous root: st. annual, twining: lvs. alternate, cordate, entire or 3-lobed: infl. axillary racemes; male often elongated, lax, with the fls. solitary along the rachis or disposed in lax few-fld. racemelets or cymules; female very short, few-fld., sometimes reduced to a sessile fascicle; fls. dicœcious; male perianth urn-shaped-campanulate, deeply 5-cleft; stamens 6; female perianth-segms. 6, small, narrow, distinct; staminodes minute or none; ovary 3-celled: berry subglobose, succulent, indehiscent. About 2 species, 1 from Canary Isls., the other from Eu., N. Afr., and Temp. Asia. *T. commùnis*, Linn. BLACK BRYONY. Rootstock ovoid, black, fleshy: st. very long, twining, branched: lvs. 2–3 in. long, ovate-cordate, acuminate, obscurely laterally lobed: fls. yellowish green, small: berry red. May, June. Eu., N. Afr., and Temp. Asia.

TANACÈTUM (name of doubtful derivation). *Compósitæ*. Annual or perennial herbs which are odorous: lvs. alternate, variously cut: heads of small to medium-sized yellow fls. disposed in corymbs, or rarely solitary, heterogamous, disk-shaped; female fls. with 3–5-toothed, tubular corollas: achenes 5-ribbed or 3–5-angular, with a broad truncate summit, bearing a coroniform pappus or none.—Thirty-five species scattered about the northern hemisphere, of which about 7 are native to N. Amer. For cult., see *Tansy*.

vulgàre, Linn. (*Chrysánthemum vulgàre*, Bernh.). TANSY. Fig. 3770. St. robust, erect, 2–3 ft., leafy to the summit: lvs. pinnately divided into linear-lanceolate segms. which are serrate or pinnately cut: fl.-heads ¼–½in. across, numerous, in a dense flat-topped cyme. July–Sept. Eu. Adventive in the U. S. Var. **crìspum**, DC., has the lvs. more cut and crisped.

T. adenánthum, Diels. Plant densely tufted, 6–12 in. high: lvs. finely divided, clothed with white silky hairs: fl.-heads about ½in. across. W. China.—*T. quercifòlium*, W. W. Smith. Lower lvs. 4–6 in. long: fl.-heads containing about 20 yellow florets. Yunnan.

F. W. BARCLAY.

TANAKÆA (named in honor of M. Tanaka). *Saxifragàceæ*. Herb probably hardy and perennial: plant dicœcious, perhaps sometimes monœcious, stoloniferous; stolons slender, leafy and rooting: lvs. basal, long-petioled, thick or somewhat fleshy, finally leathery, including the petioles 4–8 in. long; blade oblong-lanceolate or ovate-lanceolate, rounded or somewhat cordate at base, acute, doubly serrate: scapes very slender, branched, pyramidal, 6–8 in. high; fls. very small, greenish white, shortly pedicelled, solitary in the axils of the bracts; sepals 5, almost free, oblong-lanceolate; petals none; stamens 10, alternate ones shorter; ovary glabrous, almost entirely free, 2-celled.—One species, Japan, **T. radìcans**, Franch. & Sav. B.M. 7943. G. 35:373; 36:515.

TANGELO (from tangerine and pummelo; by syncopation: tange[rine] [pumme]lo). A new group of citrous fruits originated in 1897 by the writer by crossing the Dancy tangerine with the Bowen grapefruit.

3770. Tansy.—Tanacetum vulgare. (×⅛)

The resulting hybrid, named Sampson tangelo by H. J. Webber and the writer (United States Department of Agriculture Yearbook, 1904) does not closely resemble either parent in its fruit characters, being a slightly pear-shaped thin-skinned smooth and shining fruit of medium to large size, pale orange in color, and with a rather acid sprightly flavored very soft and juicy orange-colored pulp. It ripens very late, several months after it begins to color, and sometimes becomes partly dry before complete maturity. When properly grown it is a delicious fruit. It is being grown commercially on a small scale, but its delicate skin and liability to dry out before fully ripe probably will preclude its culture except by experts for a special market.

The Thornton is another tangelo, a hybrid of tangerine with a Florida grapefruit. It is a rough thick-skinned round fruit with very pale orange-colored juice and sprightly flavored pulp. It ripens earlier than the Sampson tangelo and is less acid. It is very like a tender good-flavored orange in character. It is beginning to be grown commercially on a small scale.

The success of the first two tangelos produced by artificial hybridization has led to the creation of hun-

dreds of additional hybrids between all the mandarin types of orange (*Citrus nobilis*) such as the tangerine, willow-leaf mandarin, King, Satsuma, and the like, and the better sorts of grapefruit and pummelo (*Citrus grandis*). These fruits in general resemble round oranges (*Citrus sinensis*) more than either of their parents and are exceedingly variable, sister fruits from seeds of a single cross-pollinated fruit often being very unlike. Among the tangelos there are some of much promise because of their superior flavor and juiciness.

The spread of citrus canker (a bacterial disease caused by *Pseudomonas citri*) to many of the hot moist orange-growing regions of the world makes it desirable to breed new types of tangelos by hybridizing the canker-resistant mandarin oranges with canker-resistant pummelos such as can be found in the Orient. Such tangelos, if canker-resistant, could perhaps be grown in place of the more susceptible round oranges, just as limequats can be grown in place of the common lime, which is very susceptible to canker.

WALTER T. SWINGLE.

TANGERINE: *Orange* and *Citrus*.

TANSY (*Tanacetum vulgare*, Linn.). A coarse-growing herbaceous perennial naturalized from middle Europe, and a familiar occupant of old gardens, waste places, and roadsides. Its common name is said to be derived from *athanasia*, immortality, an idea suggested to the ancient Greeks by the characteristic permanent possession it takes of the soil. Its annual upright usually unbranched stems, which rise about 3 feet from the perennial root, bear greatly divided deeply cut compound bitter aromatic leaves and rather dense corymbs of numerous small yellow flowerheads which appear in midsummer. The seed, which is small, is marked by five rather prominent grayish ribs and retains its vitality for about two years. Formerly its leaves were in great favor as a seasoning for various culinary preparations, especially puddings and omelettes, uses now almost obsolete. By the medical profession, its tonic and stimulant properties and its efficacy in hysterical and dropsical disorders are still recognized, although other medicines are more popular. In domestic practice it played an early rôle as an anthelmintic and stomachic and is still somewhat popular as a local agent to relieve the pain of muscular rheumatism, bruises, and chronic ulcers. The wild plants usually satisfy all demands, but when no wild supply is at hand seed may be used to start the half-dozen specimens that a family should need. Easily started, readily transplanted or divided, tansy requires no special care in cultivation except to keep it clear of weeds and to prevent its spreading and thus becoming troublesome. It will thrive in almost all soils and situations that are not too wet. For botanical account, see *Tanacetum*.

M. G. KAINS.

3771. Small-leaved form of dandelion

3772. Large-leaved form of dandelion.

3773. Cut-leaved form of dandelion.

TAPEINÒTES (from the Greek, referring to its low stature). *Gesneriàceæ*. Under this generic name, one species is listed abroad, *T. Carolìnæ*, Wawra. The genus is now included in Sinningia and the current name is *S. Carolìnæ*, Benth. & Hook. (*S. barbàta*, Nichols.). It is a Brazilian plant, adapted to the warmhouse: decumbent or ascending, with oblong to lanceolate crenate-serrate lvs. 1 ft. or less long and red beneath: fls. white, red-marked inside, with a contracted and hairy throat and tube swollen at base. B.M. 5623, which represents a striking plant with lvs. brilliant red-purple beneath and curved hairy deflexed white corollas 1½ in. long: described as a small undershrub.

TAPIOCA: *Manihot*.

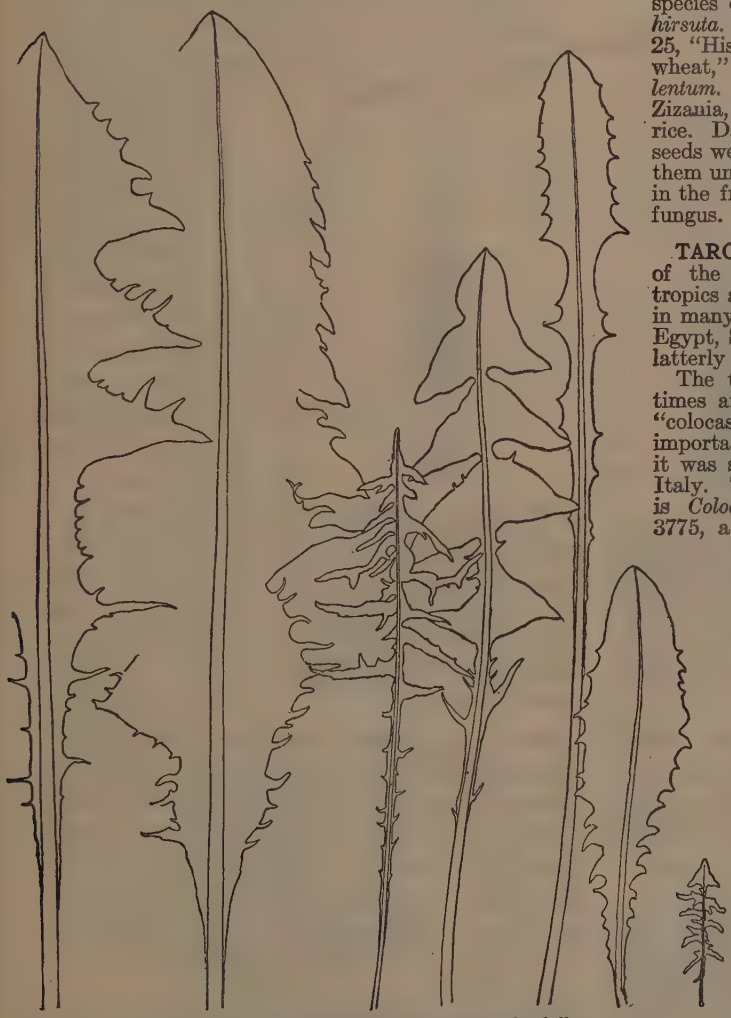
TAPIRÌRA (from a native name in Guiana). Also spelled *Tapìria*. *Anacardiàceæ*. A name of disputed application. The plant likely to interest horticulturists in this relationship is *Cyrtocarpa procera*, from Mex., described on p. 945, Vol. II. Of Tapirira itself, distinguished by 4–5 styles, those in the pistillate fls. short, none is probably regularly in cult. As formerly defined, the species are S. American, with a few in Afr. and Asia, 8 or 10 in number. Later authors restrict the genus to S. Amer., mostly to Brazil. Under any definition, the genus is probably adapted to cult. only on our southernmost borders.

TAPÍSCIA (anagram of Pistacia, to which it bears a strong resemblance, though not closely related).

Staphyleàceæ. An ornamental deciduous tree from China with large alternate odd-pinnate lvs., deciduous stipules and with small yellow fragrant fls. in axillary panicles: calyx tubular-campanulate, 5-lobed; petals 5, spatulate-obovate, little longer than the calyx; stamens 5, exserted; style slender, longer than stamens; ovary superior: fr. a 1-seeded ovoid drupe. It is as yet little known in cult., but probably can be grown successfully in the S. only; it may be recommended chiefly for its bold pinnate foliage and the honey-scented fls. Prop. can probably be effected by cuttings besides by intro. seeds. **T. sinénsis,** Oliver. Small tree, to 30 ft., occasionally to 90 ft.: lfts. 5–7, ovate to ovate-oblong, acuminate, cordate at the base, serrulate, glaucescent and nearly glabrous beneath, 3–5 in. long: panicles broad, 2–3 in. long: fls. $\frac{1}{12}$in. long, yellow, fragrant: fr. ovoid, black, ½in. long. June, July. Cent. and W. China. H.I. 20:1928. ALFRED REHDER.

TARÁXACUM (name probably associated with supposed medicinal properties). *Leontodon* of some authors. *Compósitæ*. DANDELION. Low nearly or quite stemless herbs of cold and temperate regions, mostly of the northern hemisphere. Distinguished by having large many-fld. ligulate yellow heads solitary on naked and hollow scapes; involucre with one inner series of erect narrow bracts and outer calyx-like spreading sometimes reflexed bracts; pappus simple and capillary, borne on a slender beak terminating a fusiform elongated angled achene: fls. opening in sunshine. The plants are exceedingly variable and there are consequently great differences of opinion as to the number of species. Bentham & Hooker would reduce them to about 6, and others would retain 25 or more. The common dandelion is **T. officinàle,** Weber, known also as *T. Dens-leònis*, Desf. It varies immensely in stature and form of lvs., as shown in Figs. 3771–3774. For history, see Sturtevant, Proc. 6th Meeting Soc. Prom. Agr. Sci., and Amer. Nat., Jan., 1886. For an account of the red-seeded dandelion, **T. erythrospérmum,** Andrz., see Fernald, Bot. Gaz., July, 1895:323. From the common dandelion it differs in having smaller sulfur-yellow heads, smaller and very deeply cut lvs., outer involucral scales not reflexed and somewhat glaucous: achenes red or red-brown and shorter beaked: pappus dirty white. It is known to occur in New England, N. Y., Pa. and W.; probably naturalized from Eu. For the cultural directions, see *Dandelion*, Vol. II.

L. H. B.



3774. Variation in foliage of the common dandelion. (All leaves drawn to the same scale.)

TARE, TARES. To the modern English farmer the word "tare" means the common vetch, *Vicia sativa*, although tare is also applied loosely to other species of Vicia and Lathyrus, particularly *Vicia hirsuta*. The celebrated passage in Matthew xiii, 25, "His enemy came and sowed tares among the wheat," refers probably to the darnel, *Lolium temulentum*. The original Greek word in Matthew is Zizania, a name which in botany refers to the wild rice. Darnel belongs to the grass family and its seeds were long thought to stupefy those who ate them unwittingly. The supposed narcotic property in the fruit is said to be due to the presence of a fungus.

TARO. A group of tuberous-rooted edible aroids, of the genus Colocasia, scattered throughout the tropics and subtropics of the world; cultivated also in many warm regions of the temperate zones, as Egypt, Syria, China, Japan, and New Zealand, and latterly in the southern United States.

The taro has been cultivated from very early times and the Egyptian variety, under the name "colocasia," is mentioned by Pliny as being of great importance in Egypt at that time. The culture of it was said to have been already introduced into Italy. The Egyptian variety, now called qolqas, is *Colocasia antiquorum* (*Arum Colocasia*), Fig. 3775, a quite different plant from that of the varieties most commonly grown in southeastern Asia and the islands of the Pacific. The qolqas is of very inferior quality and is said to be eaten in Egypt only by the laboring classes.

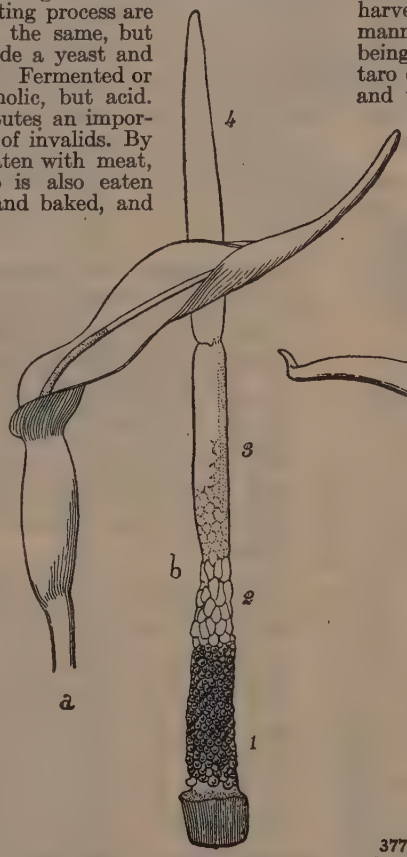
The botany of the taros of the Pacific regions is in an unsatisfactory state, owing largely to the infrequency with which many varieties flower, but most of them evidently belong to *Colocasia esculenta* (by some considered to be a variety of *C. antiquorum* and so treated in Vol. II, page 830). See Fig. 3776.

The culture of taro has probably reached its highest development in the Hawaiian Islands and it is largely through its extensive use there that the plant has become so widely known among travelers and others. The large number of varieties despite the fact that the plants seldom, if ever, set seed, testifies to the antiquity of the culture of this type of taro. MacCaughey and Emerson, in the Hawaiian Forester and Agriculturist

(vols. 10, 11, 1913–1914), record a list of 262 named varieties of taro, or "kalo," which are said to have been grown on the islands. But few of these are of commercial importance, and many are no doubt lost.

In Hawaii, taro is eaten mostly in the form of poi, a sticky paste made by steaming or boiling the taro, then peeling and "pounding" or grinding it with the addition of a little water. It is usually allowed to ferment for a day or two before being eaten, and is considered to be a very easily digested, wholesome, and nutritious food. The organisms involved in the fermenting process are probably not always the same, but they appear to include a yeast and one or more bacteria. Fermented or sour poi is not alcoholic, but acid. Poi frequently constitutes an important part of the diet of invalids. By others it is usually eaten with meat, especially fish. Taro is also eaten boiled, or parboiled and baked, and in many other ways like the potato. Most varieties are acrid in the raw state, however, and these often require longer cooking in order to destroy this property. When properly cooked and served, the better varieties of taro are highly palatable and constitute a most valuable food. The young leaves, before they open, are prized as greens and are called "luau." They are parboiled with baking soda or cooked with fat meat to destroy the acridity.

The cultivation and use of taro in Hawaii appears to be slowly decreasing, although in 1913 it was estimated that the total planting was somewhat greater than 1,500 acres. It is reckoned as fourth in importance among the crops cultivated, sugar-cane, rice, and pine-apple exceeding it.



3775. Taro—Colocasia antiquorum. *a*, Inflorescence, showing wide-open limb of spathe and long sterile appendage of spadix characteristic of this species. *b*, Spadix, showing the following areas, beginning above the base: *1*, pistillate flowers; *2*, abortive flowers which were compressed by the neck of tube of spathe; *3*, staminate flowers; *4*, sterile appendage.

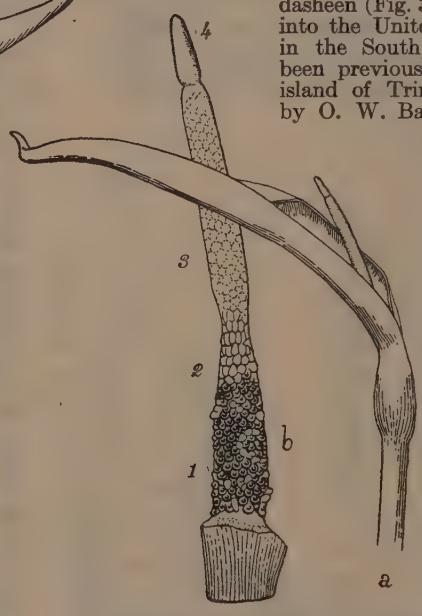
Taro-culture is of two general types, water and upland, and a different set of varieties is grown for each. The length of season required to grow a crop is about one year, although some varieties require longer and some mature in less time. Propagation is by a "huli," which consists of the top of a corm or cormel with 7 or 8 inches of the inner petioles still attached. Planting is undertaken at any time of the year.

In water culture the hulis are placed rather close together, often no more than a square foot being allowed for each plant. The cultural treatment varies greatly and is doubtless influenced by the water-supply, water being often scarce. The soil is puddled in order to prevent too rapid seepage. In some cases the land is rested for several weeks between crops, but more often replanting is made at once. Again, water is sometimes withheld for two to four weeks after planting, while at others the ground is not allowed to dry. At harvest-time the laborers wade into the mud and water and pull up the taro plants by the roots. The roots are then removed from the corms, the outer leaves stripped off, and hulis made from the tops as already described.

The practice in growing upland taro in Hawaii also varies considerably in the spacing of the plants, they being sometimes planted in small groups, at regular intervals, though more commonly in regular rows. The harvesting is performed by hand in much the same manner as described for water taro, a simple tool being used, however, in lifting the plants. Upland taro can be grown only where the rainfall is abundant and well distributed throughout the year, hence its culture is limited to certain localities.

The dasheen.

A variety of this same species of taro, *Colocasia esculenta*, known as the Trinidad dasheen (Fig. 3777), was introduced into the United States for culture in the South, in 1905, it having been previously brought from the island of Trinidad to Porto Rico by O. W. Barrett. This variety, which has come to be known simply as "dasheen," is thought to have come originally from China, as its name, a corruption from "de la Chine" or "da Chine," indicates. Varieties similar in appearance but inferior in quality exist, some of them known to be of Chinese origin.



3776 Taro—Colocasia esculenta (C. antiquorum var. esculenta). *a*, Inflorescence, showing limb of spathe open to trough-shape and short sterile appendage characteristic of this species. *b*, Spadix, showing the following areas, beginning above the base: *1*, pistillate flowers; *2*, abortive flowers which were compressed by the neck of tube of spathe; *3*, staminate flowers; *4*, sterile appendage.

The Trinidad dasheen is considered to be one of the most promising crop plants introduced into the United States in recent years, as it is thoroughly adapted for culture in the moist sandy loams of the South Atlantic and Gulf states and, as grown in such soils, is of excellent quality. The crop from each hill when well grown, consists of one or more large central corms, with a large number of lateral cormels or "tubers" (Fig. 3778). The total yield from one hill in good soil ranges from four pounds to as high as thirty pounds in rare cases. These are cooked for table use like potatoes. They are somewhat drier and have a delicate nutty flavor when they have been grown under suitable conditions and are properly prepared. The color of cooked dasheens varies from white or cream to gray or violet. When grown in heavy or poorly drained lands, however, the quality is usually inferior, in both texture and flavor.

An average of eleven analyses of the dasheen gives 27⅔ per cent of starch and sugars and 3 per cent of protein. The sugar-content is a little higher than in

the white potato, making the dasheen seem slightly sweet by comparison. Like other taros, it is held by many to be easy of digestion as compared with most other starchy foods.

In the United States, the dasheen is at present grown exclusively as an upland crop, that is, not under flooded conditions as other taros are usually grown in Hawaii. The crop requires about seven months of warm frostless weather fully to mature. It has been grown with best results in a moist but well-drained rich sandy loam. Heavy soils produce a low quality of corm and tuber, and often a poor yield. Muck soils, if they contain a moderate amount of moisture, usually produce a heavy crop of dasheens but of poor quality for table use. Dry soils of any kind are useless for dasheens.

Planting should be made in the early spring, just so that the last spring frost will be past before the plants are up. In central Florida, it is made about the middle of March and farther north, up to early April. Cormels, or "tubers," two to four ounces in weight, are generally used for planting, although smaller ones may be used. Larger tubers, small corms, or the upper parts of larger corms may also be planted when available. The character of soil is of greater importance than the size of tuber planted. The tuber is planted about 2 inches below the surface. The plants are spaced 4 by 3 or 3½ by 3½ feet, on level ground except where there is danger from standing water, when planting should be done on ridges. With level planting the soil is gradually drawn toward the plants in cultivating during the latter half of the season. The large leaves shade the ground almost completely by midseason if the soil conditions are good.

The crop matures in late October and early November in the southern United States. Harvesting is performed with a spade or with team and plow. Dasheens keep well when properly handled and stored. The entire subject is treated at length in bulletins of the United States Department of Agriculture.

ROBERT A. YOUNG.

TARRAGON (*Artemisia Dracunculus*, which see) is a close relative of wormwood (*A. Absinthium*). It is a perennial composite herb native of the Caspian Sea region and Siberia, and is cultivated as a culinary herb in western Europe. Its lanceolate entire leaves and small inconspicuous and generally sterile blossoms are borne upon numerous branching stems, 2 to 3 feet tall. Its green parts, which possess a delicate aromatic flavor resembling anise, are widely used for seasoning salads and for flavoring vinegar, pickles, and mustard. The essential oil of tarragon and tarragon vinegar are articles of commerce, the crop being grown extensively in southern France for this purpose. The

3777. Full-grown plant of dasheen, the variety of taro grown in the United States.

3778. A hill of dasheen. The large central corm, with part of leaf-stems still attached, is surrounded by the cormels, or tubers, just as they grow.

former is obtained by distillation of the green parts, the latter by simple infusion in vinegar. The best time to gather the crop for distillation or infusion is when the first flowers begin to open, since the plants have then a larger percentage of oil than before or after. From 300 to 500 pounds of green parts, according to seasonal and other conditions, are needed to produce one pound of oil.

As cultivated tarragon rarely produces viable seed, the plant is propagated by cuttings of both old and green wood and by division of the roots. Cuttings may be taken at any convenient time, but the best time for the division is when the plants have just begun to grow in the spring. Tenacious and wet soils should be avoided and only loams of medium texture and of poor quality in sunny situations chosen. The plants may be set, either in the spring or in the autumn, 1 foot apart and cultivated like sage or mint. The flower-stems should be removed as soon as seen, as this will force greater growth of leaves. The green parts may be gathered at any time, after the plants have become established, and used fresh. Dried tarragon is nearly as useful as green, but there is little market for it, less even than for the leaves. At the approach of winter, especially in cold and snowless climates, the stems should be cut down and the plants covered with litter or leaves. The position of the beds should be changed every three or four years. Tarragon is less cultivated in America than it deserves. Most of our tarragon vinegar comes from France.

A wholly different plant, *Tagetes lucida*, is much like tarragon in flavor and has been used as a substitute for it.

M. G. KAINS.

TASMÂNNIA (named after Abel Jansen Tasman, navigator, for whom the island Tasmania is named). Now considered a synonym of *Drimys*. One species, *Drimys aromática*, Muell. (*Tasmánnia aromática*, R.Br.), is sometimes mentioned in horticultural literature: small tree or a bushy shrub with pinkish fls., elliptic-oblong or oblong-lanceolate lvs. and aromatic pea-size berries. Victoria, Tasmania. B.R. 31:43.

TAVARÈSIA (derivation unexplained). *Asclepiadàceæ.* Succulent stapelia-like perennials, branching at the base: sts. 6–12-angled, angles tuberculate, toothed, each tubercle with 3 bristles: fls. large and showy, in sessile cymes at base of young sts.; calyx 5-parted; corolla large, tubular-funnel-shaped, 5-lobed; crown double, outer shortly tubular at base, then divided into 10 long filiform segms., each terminated by a knob, inner crown of 5 narrow lobes; staminal column arising from base of corolla. Two species, Trop. and S. Afr. *T. Bárklyi,* N. E. Br. Glabrous: sts. 3–4 in. high, thick, fleshy, cylindrical, 10–12-angled, tubercles white-bristled: cymes sessile, few-fld.: corolla smooth, pale greenish or greenish white spotted with purple-red outside, inside papillate, pale yellowish, covered with small purple-red spots, base entirely purple-red; knobs of the filiform outer crown-segms. globular. Trop. and S. Afr. B.M. 6203. G.C. III. 27:210 (both as *Decabelone Barklyi*). G.W. 15, p. 117.

3779. Taxodium distichum.—Bald cypress.

TAXÒDIUM (alluding to the similarity of the foliage to that of Taxus). Syn., *Glyptostròbus, Schubértia. Pinàceæ.* Ornamental woody plants, grown chiefly for their graceful feathery foliage.

Deciduous or evergreen trees or shrubs: lvs. alternate, linear, usually 2-ranked, falling off in autumn or the second year together with the short lateral branchlets: fls. monœcious, small; staminate fls. catkin-like, consisting of spirally arranged anthers, with 4–9 anthercells and forming terminal panicles; pistillate fls. solitary or in pairs at the ends of branchlets of the previous year, composed of imbricated scales bearing 2 ovules inside at the base: cone globose or nearly so, maturing the first year, consisting of spirally arranged woody scales enlarged at the apex into an irregularly 4-sided disk with a mucro in the middle and toward the base narrowed into a slender stalk; 2 triangular, winged seeds under each scale; cotyledons 4–9.—Two species in N. Amer. and 1 in China.

Of the three species, the only one well known in cultivation is the bald cypress, *T. distichum,* a tall pyramidal deciduous tree with small linear two-ranked leaves and small globose cones. It is hardy as far north as New England and is a very desirable tree for park planting. Its light green feathery foliage and the narrow pyramidal habit which it usually retains in cultivation give it a very distinct appearance. In its native habitat it forms in old age a broad round-topped head sometimes 100 feet across and has the trunk much enlarged at the base by huge often hollow buttresses projecting in all directions and terminating in long horizontal roots. From these roots spring the peculiar cypress knees, pyramidal protuberances composed of a very light, soft, spongy wood and spongy bark. These sometimes attain a height of 10 feet and with age usually become hollow. From the under side of the horizontal roots large anchor-roots are sent perpendicularly into the earth and help to anchor the tree firmly in the swampy yielding soil. The knees are thought by some to be formed for the purpose of strengthening this root-system, since they are chiefly found opposite to the anchor-roots, but their main purpose is probably to bring air to the roots during the several weeks or months when the swamps are covered with water. The knees always grow high enough to rise above the surface of the water (see, also, G. F. 3, pp. 2, 21, 22, 57). The bald cypress is one of the most valuable timber trees of North America. The wood is brown, light and soft, close and straight-grained, but not strong; it is easily worked, durable in the soil and much used for construction. The bald cypress thrives best in moist sandy soil, but also does well in drier situations. The habit seems to depend somewhat on the degree of moisture; in drier soil the head is more narrow-pyramidal, in moist soil broader and more spreading. Propagated by seeds sown in spring and the varieties by grafting on seedling stock early in spring in the greenhouse; also by cuttings in sand constantly saturated with water or grown in water alone, under glass.

dístichum, Rich. (*Cupréssus dísticha,* Linn. *Schubértia dísticha,* Mirbel). Bald Cypress. Deciduous Cypress. Fig. 3779. Tall deciduous tree, becoming 150 feet high, with a buttressed trunk usually 4–5, but sometimes attaining 12 ft. or more in diam., usually hollow in old age; bark light cinnamon-brown, flaky: branches erect or spreading, distichously ramified, forming a narrow pyramidal head, becoming at maturity broad and rounded, with slightly pendulous branches: lvs. narrowly linear, acute, thin, light green, ½–¾in. long: panicles of the purplish staminate fls. 4–5 in. long: cone almost globose, rugose, about 1 in. across and destitute of mucros at maturity, seed ¼in. long. March–May. Del. to Fla., west to Mo. and Texas, in swamps, along the larger rivers and over calcareous rocks. S.S. 10:537. G.F. 3:7; 10:125. G.C. II. 11:372; 18:361; III. 7:325, 328; 14:659; 24:320; 54:251. Gn. 76, p. 562. F.S.R. 2, p. 163. Gn.M. 2:11. F.E. 27:71. Gng. 2:225; 5:1. G.M. 39:875. M.D.G. 1896:303. S.H. 2:541. G.W. 14, p. 512.—An interesting natural variety is: Var. **imbricàrium,** Nutt. (*T. adscéndens,* Brongn. *T. microphýllum,* Brongn. *T. dístichum* var. *eréctifrons,* Schelle). Smaller tree with deeply furrowed bark: branches upright: lvs. subulate, ⅛–½in. long, more or less upright and rather appressed. Va. to Fla. and Ala., in lakes, ponds, small rivers, apparently always over a clay subsoil. B.M. 5603. F. 1871, p. 60. Var. **péndulum,** Carr. (*T. distichum sinénse péndulum,* Loud. *Glyptostròbus péndulus,* Endl. *G. sinénsis,* Hort.). A form of the preceding variety with pendulous branches. Var. **pyramidàtum,** Carr. Narrow pyramidal form with short ascending branches. Var. **fastigiàtum,** Knight. With slender, upright, virgate branches sparingly ramified. Var. **nànum,** Carr. Dwarf, shrubby form, with numerous short branches. Var. **nûtans,** Ait. Branches spreading, long and slender, nodding at the tips. F.E. 29:9 (as *T. distichum pendulum*). Var. **microphýllum,** Carr. Shrub, with short spreading branches; the lateral

3780. Old English yews that have reached maturity.—Taxus baccata. Addison's walk, at Glasnevin, Ireland.

branchlets with typical foliage, those of the longer branches gradually passing toward the end into small, scale-like, imbricate lvs.

mucronàtum, Ten. (*T. mexicànum,* Carr. *T. distichum* var. *mexicànum,* Gord. *T. distichum* var. *mucronàtum,* Henry). MONTEZUMA CYPRESS. Similar to the preceding species: taller evergreen tree, occasionally 170 ft. high with a trunk 20 ft. or more in diam.: lvs. shorter, obtusish and mucronulate, falling with the branchlet the second year: staminate fls. and cones larger. Mex. G.F. 3:155. G.C. III. 12:647.—Sometimes planted in S. Calif.

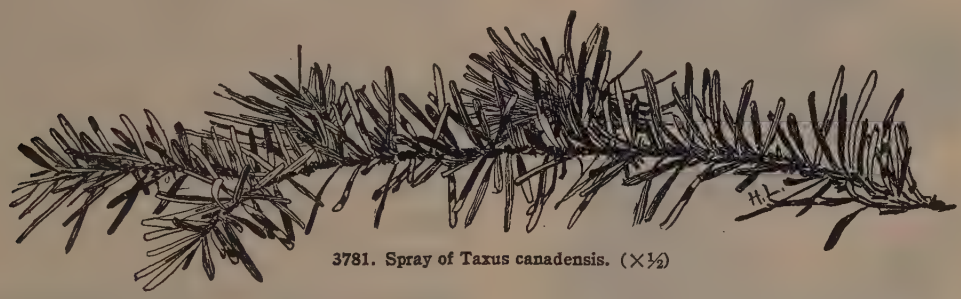
T. heterophýllum, Brongn. (Glyptostrobus heterophyllus, Endl.). Shrub, 10 ft. high: lower branches pendulous: lvs. linear and scale-like on the same plant: cones ovoid, ¾in. long. China. Tender and rarely cult. Often confounded with varieties of T. distichum.

ALFRED REHDER.

TÁXUS (ancient Latin name of the yew). *Taxàceæ,* formerly named in the *Coníferæ.* YEW. Ornamental woody plants, grown for their dark green foliage and the scarlet berry-like fruits.

Evergreen trees or shrubs: lvs. linear, without resin-ducts, pale or yellowish green beneath, usually 2-ranked: fls. usually dicœcious, solitary and axillary, rarely terminal, small, appearing in early spring; staminate globose, composed of 4–8 stamens each, with 3–8 anther-cells attached to the peltate connective; pistillate consisting of a single terminal ovule with several bracts at the base: seed a bony nut surrounded shade well. Large plants may be successfully transplanted if it is possible to secure a sufficient ball of earth with the roots. Propagation is by seeds, which do not germinate until the second year, and by cuttings taken early in autumn and kept during the winter in a cool greenhouse or frame; the varieties also often by grafting on the type in early spring in the greenhouse, or sometimes by layers. Plants raised from cuttings grow more slowly than grafted ones and cuttings of the type rarely grow into trees but usually into low-spreading shrubs (see M.D.G. 1898:565).

baccàta, Linn. Fig. 3780. Tree, attaining 60 ft., with a usually short trunk, occasionally 8 ft. or more in diam.: bark reddish, flaky, deeply fissured in old trees: branches spreading, forming a broad, low head; branchlets somewhat pendulous: lvs. 2-ranked, linear and usually falcate, shortly acuminate, with prominent midrib, dark green above, pale beneath, ¾–1¼ in. long or shorter in some varieties: fr. ⅓–½in. across, with almost globose disk, about a third longer than the broadly ellipsoid brown seed ¼in. long. Eu. and N. Afr. to Himalayas. G.C. II. 23:309; III. 29:262. Gn. 27, p. 578; 35, pp. 36, 37. G.F. 9:265. F.S.R. 3, p. 59. G.W. 10, p. 249; 11, p. 304; 13, pp. 67, 175. Gng. 1:309.—Many garden forms have originated in cult.; the following are the most important: Var. **adprèssa,** Carr. (*T. parvifòlia,* Wender. *T. brevifòlia,* Hort., not Nutt. *T. tardìva,* Laws. *T. baccàta tardìva,* Pilger). Shrub or low tree of irregu-



3781. Spray of Taxus canadensis. (×½)

or almost inclosed by a fleshy cup-shaped scarlet disk; cotyledons 2.—Six species are known. They are distributed throughout the northern hemisphere and in Amer. south to Mex. They are all very closely allied and have been considered geographical varieties of a single species. The wood is heavy, hard, close-grained, strong, elastic, and of reddish color. It is highly valued for cabinet-making and turning, and before the invention of gunpowder was in great request in England for the manufacture of bows. The foliage is poisonous to horses and cattle, but the berries are not.

The yews are evergreen, usually small slow-growing trees or shrubs, with 2-ranked linear dark green leaves, insignificant flowers and showy berry-like red fruits. The best-known species is *T. baccata,* which is hardy as far north as Rhode Island and northwestern New York, and in some forms as far as Massachusetts, while *T. cuspidata* and *T. canadensis* are considerably hardier and thrive as far north as Canada; the other species are little known in cultivation. The yews are very desirable evergreens for park planting; they are densely clothed with dark green foliage and the pistillate plants are particularly beautiful in autumn when loaded with scarlet fruits. They are well suited for hedges and easily trimmed into any desired shape. They were formerly much used for fantastic topiary work (see e. g., G.C. II. 2:264, 265).

That the typical tree-like form of the yew is nowadays not much planted is chiefly due to its slow growth, but the numerous mostly shrubby garden forms are popular plants for small gardens. The yews thrive best in a moderately moist sandy loam and endure

lar habit, with long spreading branches: lvs. oblong, obtusish, mucronulate, ⅓–½in. long: disk of fr. shorter than the seed. R.H. 1886, p. 104. Gn. 35, p. 37. Very distinct form. Var. **adprèssa erécta,** Nichols. (var. *adprèssa stricta,* Beissn.), has the foliage of the preceding, but erect branches forming a columnar bush. Var. **aùrea,** Carr. (var. *elvastonénsis aùrea,* Beissn.). Lvs. golden yellow, more brightly colored at the tips and margin. This form has proved hardier than the type in New England. F.E. 20:703. Var. **argéntea,** Loud. (var. *elegantíssima,* Hort.). Lvs. striped straw-yellow or sometimes whitish. Var. **Dovástonii,** Loud. Branches wide-spreading, nodding at the tips: lvs. dull green, short and abruptly mucronulate. G. 3:89. A very handsome form. Var. **Dovástonii aùreo-variegàta,** Beissn., is a form with the lvs. variegated with yellow. Var. **erécta,** Loud. (var. *stricta,* Hort.). Bushy form, with slender, upright branches and branchlets: lvs. narrower and smaller than in the type. Var. **ericoìdes,** Carr. (var. *microphýlla,* Hort.). Dwarf form, with slender branches and small and very narrow, pointed leaves Var. **fastigiàta,** Loud. (*T. hibérnica,* Hort.). Strictly fastigiate form, with stout crowded upright branches and branchlets: lvs. spirally arranged around the branches, dark glossy green. Gn. 35, p. 36; 40, p. 62. R.H. 1886:105. G. 2:85. F.E. 18:397; 33:315. G.W. 1, p. 349; 8, p. 301; 10, p. 393. One of the most desirable evergreens of columnar habit for formal gardens. Var. **fastigiàta variegàta,** Carr. Less vigorous and more tender: lvs. marked yellowish white. Var. **fastigiàta aùrea,** Standish. Young growth golden yellow. Var. **Fisheri,** Hort. Some of the lvs. deep yellow, others

green. Var. **glaùca,** Carr. Vigorous form, with longer and narrower lvs. dark green above and with a glaucous bluish tint beneath. Var. **Jácksonii,** Gord. (var. *péndula,* Hort.). Branches spreading, pendulous at the tips, with more or less incurved lvs. Var. **lùteo-baccàta,** Pilger (var. *frúctu lùteo,* Loud.). With yellow fr. Gn. 35, p. 37. R.H. 1886, p. 104. Var. **procúmbens,** Loud. Prostrate shrub, with elongated and much ramified branches. Var. **repándens,** Hort. A low form with long wide-spreading branches and dull bluish green lvs. Var. **Wáshingtonii,** Beissn. Vigorous form, with longer lvs., partly colored golden yellow.

cuspidàta, Sieb. & Zucc. (*T. baccàta* var. *cuspidàta,* Carr.). Tree, attaining 50 ft., with a trunk usually 2 ft. diam.: bark bright red: branches ascending: lvs. usually falcate, thickish, distinctly and abruptly mucronate, dark green above, pale fulvous green or pale green beneath, ½–1 in. long: fr. with ovoid seed slightly 3–4-angled and ⅓in. long. Japan. S.I.F. 1:15. Very similar to *T. baccata,* but branches stouter and lvs.

3782. Taxus brevifolia. (×⅙)

darker green above and tinged yellowish beneath, somewhat broader, more abruptly mucronate and thicker in texture. Var. **nàna,** Rehd. (var. *brevifòlia,* Hort. Amer. Var. *compácta,* Bean). Shrubby form with spreading branches densely clothed with short branchlets: lvs. somewhat shorter and duller, ascending and not or scarcely 2-ranked: slow-growing, rather compact while young, but with age becoming more open. C.L.A. 11:308. F.E, 29:409. Gn.M. 2:11. Var. **dénsa,** Rehd. Low form making a dense sometimes almost hemispherical bush with ascending branchlets: lvs. like those of the preceding form. Var. **chinénsis,** Rehd. & Wilson (*T. baccàta* var. *chinénsis,* Pilger). Lvs. more falcate, lighter green, ¾–1¾ in. long, convex above with the midrib very slightly raised: seeds broadly ovoid, slightly compressed, slightly 2-angled. Cent. and W. China.—This variety fruits very profusely. The plant offered as var. *capitata* does not differ from typical *T. cuspidata.*

canadénsis, Marsh. (*T. baccàta* var. *mìnor,* Michx. *T. baccàta* var. *canadénsis,* Gray. *T. mìnor,* Brit.). Fig. 3781. Prostrate shrub, with wide-spreading slender branches, rarely more than 3 ft. high: lvs. shorter and narrower, less crowded and of a lighter, more yellowish green than those of *T. baccata,* assuming in winter usually a reddish tint: fr. ripens about 2 months earlier than that of *T. baccata;* seeds depressed, broader than long: fls. monœcious (at least usually). Newfoundland to Man., south to Va. and Iowa. B.B. (ed. 2) 1:67. V. 14:252. Gn.M. 2:22.—In cult. it becomes usually a more upright and less straggling shrub.

brevifòlia, Nutt. Fig. 3782 (adapted from Pacific R. R. Report). Tree, 40–50 or occasionally 80 ft. high, with slender horizontal or somewhat pendulous branches forming a broad, open, pyramidal head: lvs. distinctly 2-ranked, sharply pointed, dark yellowish green, ½–¾in. long: seeds ovoid, 2–4-angled. Brit. Col. to Calif. S.S. 10:514.—Probably as hardy as *T. baccata.*

T. floridàna, Chapm. Bushy tree, 25 ft. high or sometimes shrubby: lvs. slender, ¾–1 in. long, dark green. Fla. S.S. 10:515. —*T. koraiénsis,* Hort.=Cephalotaxus Harringtonia var. fastigiata. —*T. Wallichiàna,* Zucc. Tree, to 100 ft.: lvs. gradually long-acuminate, 1–1½ in. long. Himalayas, Malay Archipelago, Philippine Isls. Apparently not in cult.

ALFRED REHDER.

TCHIHATCHÈWIA (named for Count Paul Tchihatchef). *Cruciferæ.* Hardy perennial herb (possibly of shorter duration), suitable for the rockery. Plant very hispid: root thick: st. stout, leafy, pilose: fls. purple; sepals erect, the lateral ones saccate at base; petals clawed, blade minute; stamens without teeth: silique pendulous, obovate, compressed, broadly membranaceous-marginate, 1-celled, 2-seeded.—One species, Armenia. Sometimes spelled with another c, Tchichatchewia.

isatídea, Boiss. St. very stout, 6–10 in. high: lvs. 1½–2½ in. long, spreading and recurved, the upper ones gradually larger, sessile, linear, hispidly hairy: fls. bright rosy red, vanilla-scented, disposed in a dense, hemispherical, much-branched corymb, 4 in. across. Armenia. B.M. 7608. G.C. III. 42:324. R.H. 1895, p. 352.

TEA: *Thea.* **T., Oswego:** *Monarda didyma.* **T., Paraguay:** *Ilex paraguariensis.*

TEAK: *Tectona.*

TEASEL: Species of *Dipsacus.*

TÉCOMA (abridged from the Mexican name Tecomaxochitl). Including *Stenolòbium. Bignoniàceæ.* Ornamental shrubs, grown for their showy flowers.

Upright plants with herbaceous shoots: lvs. opposite, odd-pinnate, rarely simple; lfts. serrate, membranous: fls. in terminal panicles or racemes; calyx tubular-campanulate; corolla funnelform or funneliform-campanulate; stamens included, with diverging anther-cells and enlarged foliaceous connective; disk cupulate, crenate: caps. linear, with leathery valves; seeds narrow-elliptic, with 2 large thin wings.—About 5 species from Fla. and Texas to Argentina. The trumpet-vine, commonly referred to Tecoma, will now be found under Campsis.

The tecomas are upright shrubs with pinnate deciduous or subpersistent foliage and large and showy usually yellow flowers in terminal clusters. They stand but little frost and are well suited for cultivation in Florida and southern California. Propagation is by seeds which are usually freely produced and by greenwood cuttings under glass.

The yellow elder, *T. stans,* grows exceedingly well on high pine-land and is perfectly at home in Florida, attaining an immense size if well fertilized and mulched, dense masses 18 to 25 feet high and as much through being not at all rare. This tecoma is the glory of the south Florida gardens in autumn, as is the beautiful *Bauhinia purpurea* in April. No shrub is better adapted for the new settlers in the sandy pine-land gardens. When covered with its large fragrant flowers it is visited by numberless hummingbirds and insects. Owing to its rapid growth and dense foliage from the ground, the yellow elder is highly valued as screen for

unsightly fences and buildings. This tecoma ripens its seed so abundantly that hundreds of seedlings come up around the old plant. The value of this shrub, blooming so late in autumn, cannot be overestimated. *T. mollis*, incorrectly known to the trade as *T. stans* var. *velutina*, also does well, but being a native of Guatemala it is much less hardy than the former. The growth is more upright and stiff, the leaflets are much larger, less serrate, and much darker green and the flowers, which are borne in terminal panicles, are smaller and without fragrance and the color is a much lighter yellow. It also flowers several weeks earlier than *T. stans*. The foliage looks crimped and often blackish, being attacked by a kind of aphis and by several fungi. *T. Smithii* is said to be a hybrid between *T. mollis* and *Tecomaria capensis*, raised near Melbourne, Australia, by Edwin Smith. The plant comes true from seed, and seedlings flower when about a year old, beginning to open their large clusters of yellow and reddish trumpets in April and continuing with short intervals until cut down by frost in December. (H. Nehrling.)

A. *Fls. pure yellow, funnelform-campanulate, abruptly contracted above the base.*

B. *Lvs. glabrous or nearly so.*

stáns, Juss. (*Stenolòbium stáns*, Seem.). YELLOW ELDER. Upright shrub: lvs. odd-pinnate; lfts. 5–11, almost sessile, oblong-ovate to lanceolate, acuminate, serrate, glabrous, 2–5 in. long and ¾–1¼ in. broad: fls. in large, terminal racemes or panicles; corolla funnelform-campanulate, yellow, 1½ in. long; anthers pubescent; calyx with 5 short teeth: caps. linear, 5–7 in. long. Sept.–Dec. S. Fla. to W. Indies and S. Amer. B.M. 3191.—Sometimes called yellow bignonia. Fls. fragrant. Var. **angustàta,** Rehd. (*Stenolòbium incìsum*, Woot. & Standley). Lfts. 7–11, lanceolate to linear-lanceolate, sharply or incisely serrate with flaring teeth, 1–3 in. long and ¼–½in. broad. Texas, Ariz., and Mex. This variety is hardier than the type, which is sometimes cult. as *T. sambucifolia;* the true *T. sambucifolia*, HBK., from Peru, which has glabrous anthers, is probably not in cult.

BB. *Lvs. villous or tomentose beneath.*

móllis, Humb. & Bonpl. (*T. velùtina*, Lindl. *T. stáns* var. *velùtina*, Hort.). Similar to the preceding, but pubescent: lfts. 5–9, oblong-ovate, acuminate, less deeply serrate or almost entire, villous-pubescent on both sides or only beneath, 2–4 in. long: fls. like those of the preceding, but smaller and paler and not fragrant. Mex. to Chile and Peru.—It lasts in bloom much longer and the fls. keep well in water, a rare occurrence in this genus.

AA. *Fls. yellow and red, tubular-funnelform, gradually narrowed toward the base.*

B. *Lfts. obtuse or acutish.*

Smíthii, W. Wats. Fig. 3783 (adapted from The Garden). Upright shrub: lvs. odd-pinnate; lfts. 11–17, oblong, obtuse or acutish, serrate, 1–2 in. long: fls. in large, compound panicles, sometimes 8 in. long and as broad; corolla tubular-funnelform, with 5 reflexed rounded lobes, bright yellow tinged with orange, 1½–2 in. long. Sept.–Jan. Intro. from Austral. and supposed to be a hybrid of *T. mollis* and *Tecomaria capensis*. G.C. III. 14:649. Gn. 48:23. I.H. 43:55, 107. Gt. 44, p. 52. G.M. 36:627. J.H. III. 42:371.—Blooming in the greenhouse in winter and well suited for cult. in pots. It has been said that it comes true from seed, but plants raised by Franceschi from seed received from the originator had mostly pure yellow fls.

BB. *Lfts. acuminate.*

Garrócha, Hieron. Glabrous small shrub: lvs. 3½–5 in. long; rachis narrowly winged; lfts. 7–11, short-stalked, oblong-ovate, acuminate, serrate, 1–2 in. long: fls. in slender racemes forming terminal panicles 4–6 in. long; calyx with long-acuminate teeth; corolla about 2 in. long, yellow with scarlet tube, slender, very gradually narrowed toward the base, limb ¾–1 in. across; anthers slightly exceeding the mouth: caps. 2½–4 in. long. July–Aug. Argentina.—A smaller and more graceful plant than *T. stans*, strikingly handsome with its bright yellow and scarlet fls.

T. æsculifòlia, DC.=Tabebuia æsculifolia.—*T. amboinénsis*, Blume. Evergreen climbing shrub: lvs. odd-pinnate with usually 5 elliptic-obovate lfts. 3–3½ in. long: fls. tubular-funnelform, red, 3–4 in. long, in lateral racemes. Amboina. Once offered by John Saul, but has probably now disappeared from cult. It is not a true Tecoma and belongs possibly to Pandorea.—*T. austrâlis*, R. Br.=Pandorea australis.—*T. Brýcei*, N. E. Br.=Pandorea Brycei.—*T. capénsis*, Lindl.=Tecomaria capensis.—*T. chinénsis*, Koch=Campsis chinensis.—*T. filicifòlia*, Nichols.=Pandorea australis.—*T. fúlva*, Don=Tecomaria fulva.—*T. grandiflòra*, Del.=Campsis chinensis.—*T. hýbrida*, Jouin=Campsis hybrida.—*T. intermèdia*,

3783. Tecoma Smithii. (×¼)

Schelle=Campsis hybrida.—T. *jasminoides*, Lindl.=Pandorea jasminoides.—*T. leucóxylon*, Mart.=Tabebuia triphylla.—*T. Máckenii*, W. Wats.=Pandorea Ricasoliana.—*T. pentántha*, offered by the S. Calif. Acclim. Assoc., is unknown to the writer.—*T. pentaphýlla*, Juss.=Tabebuia pentaphylla.—*T. radicans*, Juss.=Campsis radicans.—*T. Reginæ Sábæ*, Franceschi=Pandorea Brycei.—*T. Ricasoliàna*, Tanfani=Pandorea Ricasoliana.—*T. rósea*, Bertol.=Tabebuia rosea.—*T. serratifòlia*, Don=Tabebuia serratifolia.—*T. shirénsis*, Baker=Tecomaria shirensis.—*T. spectábilis*, Planch.=Tabebuia spectabilis.—*T. Thúnbergii*, Sieb.=Campsis chinensis var. Thunbergii.—*T. valdiviàna*, Phil.=Campsidium chilense.—*T. Whýtei*, C. H. Wright=Tecomaria shirensis.

ALFRED REHDER.

TECOMÀRIA (name derived from Tecoma, alluding to its affinity). *Bignoniàceæ*. Warm-country plants, grown for their showy bloom.

Evergreen shrubs with slender, often sarmentose branches: lvs. opposite, odd-pinnate; lfts. serrate: fls. in terminal panicles or racemes; calyx campanulate, regularly 5-toothed; corolla funnelform, slightly curved; stamens mostly exserted, with pendulous diverging cells; disk cupulate: caps. linear, compressed.—Five species in Cent. and S. Amer. and in S. Afr.

The tecomarias are half-climbing or nearly upright

shrubs with handsome pinnate foliage and yellow, orange, or scarlet flowers in rather dense terminal clusters. They can be grown outdoors only in subtropical regions. Of the several species in cultivation only *T. capensis* seems to be planted in southern California and Florida. Moderate pruning in spring insures a more profuse blooming. Propagation is by seeds and by cuttings under glass in spring or in midsummer.

The cape honeysuckle, *T. capensis*, grows most luxuriantly in Florida gardens and in those all along the Gulf coast. It is usually grown on trellises on verandas

3784. Tectaria cicutaria.

and piazzas with a southern exposure. Of all the species this is the best and most suitable for verandas, being a dense and compact grower, evergreen, almost constantly in flower, easily kept in health and readily trained into shapely specimens. If the long shoots are cut back severely, the plant can be easily trained into shrub form. These long shoots, usually lying flat on the ground, readily strike root and form an excellent material for propagation. *T. capensis* and *Tecoma Smithii* are the only ones which grow and flower fairly well as pot-plants in northern greenhouses. They need good soil and rather large pots to do well. If not well cared for they lose most of their foliage and look poor and unshapely. (H. Nehrling.)

capénsis, Seem. (*Técoma capénsis*, Lindl.). Cape Honeysuckle. Half-climbing or nearly upright shrub: lvs. odd-pinnate; lfts. 7–9, broadly oval to ovate, acute, serrate, glabrous, ½–2 in. long: fls. in peduncled terminal racemes; corolla tubular, curved, with 4-parted spreading limb, the upper lip emarginate, orange-red to scarlet, about 2 in. long; calyx 5-toothed: caps. linear, 1–2 in. long. Aug.–Nov. S. Afr. B.R. 1117. L.B.C. 17:1672. R.H. 1895, p. 108.

T. fúlva, Baill. (Tecoma fulva, Don). Evergreen upright shrub to 15 ft. high.: lvs. odd-pinnate, with 9–13 small, ovate, toothed lfts.: fls. in terminal panicles, tubular-funnelform, slender, yellow, tinged red, 1½ in. long; stamens slightly exserted. Peru. B. M. 4896. F.S. 11:1116.—*T. shirénsis*, Schum. (Tecoma shirensis, Baker. T. Whytei, C. H. Wright). Similar to T. capensis. Shrub, to 10 ft.: lfts. 9–13, ovate, serrate, 1–1½ in. long: corolla about 2 in. long, orange-yellow, the limb marked with red stripes. Nyassaland. B.M. 7970.

Alfred Rehder.

TECOPHILÆA (named for Tecophila Billotti, daughter of a botanist). *Amaryllidàceæ*. Chilean Crocus. Bulbous plants, useful for blooming in pots indoors early in the spring. Lvs. radical, few or 1, inclosed in a long scarious sheath at the base, blade spreading, linear or lanceolate: scape included with the lvs. at base in the sheath, otherwise leafless, 1-fld. or laxly few-fld.: fls. blue; perianth campanulate, 6 segms.; stamens 3 perfect and 3 staminodia; ovary 3-celled: caps. conical toward the top, loculicidally dehiscent.—Two species, Chile. The botanical position of Tecophilæa is open to discussion, but the inferior ovary seems to take it out of the Liliaceæ, with which it has been placed by some writers. The plants are useful for blooming in pots indoors early in spring. *T. violæflora*, Bert., does not appear to be introduced.

cyanocròcus, Leyb. (sometimes written *T. cyanocrocea*). Scapes 1–3, erect, 3–6 in. high, 1-fld.: lvs. 2–3, linear-canaliculate and undulate: fl. azure-blue with white throat, about 1½ in. long, with a narrow tube and obovate segms. G. 37:183. R.H. 1900:70. Var. **Leichtlinii,** Hort., has fls. deep blue with no trace of yellow; said by some to have a white center. Var. **Règelii,** Baker (not known to be in the trade), has longer peduncles, longer and narrower scarcely undulate lvs., and narrow oblong segms. Species hardy at New York City in protected places, but usually the plants do not thrive more than a year or two; they ought to do better farther south. Blooms very early in spring. Fls. violet-scented.

F. Tracy Hubbard.†

TECTÀRIA (Latin for cover, the indusium having shield-shaped coverings). *Polypodiàceæ*. A group of ferns, mostly of large and coarse habit, with superior reniform or heart-shaped indusia fixed by the sinus, as in Dryopteris, but with veins uniting freely to form areoles with free included veinlets.—About 25 species are known, largely from the E. Indies, a few from Trop. Amer. By some included in Polystichum.

decúrrens, Copeland. Lf.-stalks narrowly winged from a creeping rootstock: lvs. 2–4 ft. long, 1 ft. or more wide, cut down to a winged rachis and with 4–8 pairs of pinnæ 6–12 in. long, 1–2 in. wide: sori large, in 2 regular rows between the principal veins. India to Polynesia.

cicutària, Copeland. Fig. 3784. Caudex stout, erect, scaly above: lvs. 6–8 in. to 1½ ft. long; pinnæ horizontal, subsessile from a rather broad truncated base, 2–3 in. long: sori on disk of larger pinnules in 2 rows, oblong, those on terminal narrow segms. solitary, quite marginal. Trop. Amer.

TÉCTONA (derived from *Tekka*, the Malabar name of *T. grandis*). Syn., *Thèka*. *Verbenàceæ*. Tall trees, stellately tomentose, including the well-known teakwood, sometimes grown in the warmhouse as a curiosity. Lvs. opposite or ternately verticillate, large and entire: cymes dichotomous, many-fld., arranged in a large terminal panicle: fls. small, white or bluish, sessile; calyx campanulate, shortly 5–6-cleft, inflated in fr.; corolla-tube short, limb spreading, 5–6-cleft; stamens 5–6; ovary fleshy, 4-celled, cells 1-ovuled: drupe inclosed in the calyx, 4-celled; endocarp bony.—Three species, Asia, India, Burma, Malaya, and Philippines.

grándis, Linn. Teak. Tree, 80–150 ft. high: branchlets quadrangular: lvs. 8–12 in. (of seedlings sometimes 3 ft.), ovate, cuneate at both ends, close tomentose beneath: fls. white or bluish, numerous, but only a few fertile, in panicles 18 in. diam.; calyx stellately white-tomentose, 1 in. diam. in fr. when it is ovoid or subpyramidal; corolla scarcely ¼in. long. India, Malaya. —The timber of this important tree is much used in ship-building because of its durability, great strength, and the ease with which it can be worked. Not planted in this country except experimentally.

F. Tracy Hubbard.

TEÈDIA (named for J. G. Teede, German botanist). *Scrophulariàceæ*. Glabrous or pubescent shrubs, grown in the greenhouse. Lvs. opposite, ovate, entire: peduncles in the upper axils, bearing a few-fld. cymose infl.: fls. rose, rather small; calyx deeply 5-cleft, lobes narrow; corolla-tube cylindrical, limb spreading, 5-lobed, lobes subequal, rotundate; stamens 4: berry subglobose, indehiscent.—Two species, S. Afr. The foliage of both species has an objectionable odor.

lùcida, Rud. Glabrous: st. 4-cornered: lvs. oblong-ovate, acuminate, 2 in. long, decussate; petioles winged

panicles leafy, decussate: fls. rosy pink: seeds many, small. S. Afr. B.R. 209.—This species was intro. into S. Calif. some years ago, but appears to have lost favor. It is said to act like an annual there, but seeds freely and prefers half shade.

T. pubéscens, Burch., grows about 2 ft. high, rusty-pubescent or villous: lvs. ovate or elliptic, often broader than those of T. lucida.

F. Tracy Hubbard.

TELANTHÈRA (name refers to the fact that all ten parts of the staminal cup are equally developed). *Amarantàceæ*. Alternanthera. Small much-used bedding plants, popular in design work because they are compact and stand shearing well.

Apparently all the alternantheras used by gardeners as bedding plants belong to the genus Telanthera, which is distinguished from the true genus Alternanthera by having 5 anther-bearing stamens and 5 elongated antherless staminodia united into a cup or tube. In Alternanthera the tube is short or almost none, the anther-bearing stamens sometimes less than 5, and the staminodia short or none. Of Telantheras there are 40–50 species, mostly herbs, in Trop. Amer. and 1 in W. Afr. The lvs. are entire, ovate to elongated, opposite: fls. small, usually in dense heads in the axils, whitish or sometimes colored, perfect, each subtended by 2 bractlets. In Engler & Prantl, Die Natürlichen Pflanzenfamilien, Schinz retains Telanthera under Alternanthera, not dividing the group.

The alternantheras of gardeners are much used in carpet-bedding and for ribbon-borders, because of their low compact growth, the bright colors of the foliage, which holds its character throughout the season, and the ease with which they withstand shearing. They are usually kept within 6 inches of the ground. The plants are tender to frost, and grow best in warm sunny places. They comprise the stock plants for the foundation work in carpet-bedding. The flowers are inconspicuous and of no account to the gardener.

The plants are propagated by cuttings or division. In either case, they must be carried over winter in the greenhouse or in hotbeds, preferably in the houses at the North. The plants should be kept at 60° or 65° during winter, and rather dry to hold them more or less dormant. Place them where they will receive only enough light to keep them healthy. (1) Cuttings are usually made in August from strong plants growing in the open. The cuttings may be struck in shallow flats and then wintered in these flats without transplanting. The cuttings should be well established before winter sets in, else they will remain weak. In March or April they may be potted off, preparatory to using them in the open. (2) Division is usually preferred by gardeners who have much bedding to do. The plants are lifted after the first frost, cut back to 3 or 4 inches long, and planted in flats. In March or April, the plants are divided and the parts (with the old roots shortened in) potted or transplanted to other flats. However grown, the plants should have four to six weeks in a hotbed if possible, before they are placed in the open ground. Even in the warm greenhouse they usually make slow growth in March and April.

The botanical status of the garden alternantheras is imperfectly understood, and the group needs careful study from living plants. Various garden names cannot be accounted for at present. The common garden alternantheras appear to have issued from the first three following Brazilian species.

A. *Lvs. essentially lanceolate or elliptic.*

amœna, Regel. Fig. 3785. Very dwarf: lvs. long-lanceolate or oblong-lanceolate, sometimes elliptic, acuminate, very short-petioled, the under color mostly green but veined and blotched with red and orange: fl.-heads sessile, single, in pairs or 3's, and terminal. I.H. 12:447; 15:558.—To this apparently belong the garden names *amabilis, spectabilis, sessilis, rosea, Reinhardii.*

AA. *Lvs. essentially spatulate.*

Bettzickiàna, Regel (originally, in 1862, spelled as here, but changed by the author in 1862 to *Bettzichiana*). Fig. 3785. Plant described as suffruticose and erect, the st. branched at base and terete, adpressed-pilose but becoming glabrous: lvs. narrow, spatulate, narrowed into long petiole, apex acuminate and somewhat mucronate: fl.-heads sessile, single, in pairs or 3's, terminal and axillary; bracts ovate-lanceolate, acuminate, nearly or quite entire; staminodia much shorter than stamens, 2–3-cut at apex.—To this variable species appear to belong the garden names *picta, tricolor, aurea, aurea nana compacta, paronychioides, versicolor aurea, magnifica,* and others. Var. **týpica,** Regel (*Alternanthèra paronychioìdes*, Hort.), is low, 2–3 in. tall, with olive-colored lvs. and the upper ones red at apex. Var. **spathulàta,** Regel (*A. spathulàta*, Lem.), is 6–8 in. tall, the st. and lvs. red. I.H. 12:445.

versícolor, Regel. Fig. 3785. Usually becoming taller, much branched, and apparently less used for carpet-bedding than the others: lvs. round-spatulate, narrowed into a short petiole, the colors mostly in shades of copper-red or blood-red, with patches of green between the veins: fl.-heads sessile, single or in pairs. I.H. 12:440.

ficoídea, Moq. St. herbaceous, repent at base and ascending, angled and striate, glabrous, or puberulent above and in the lf.-axils: lvs. spreading or deflexed, short-stalked, broadly lanceolate, attenuate and somewhat acute, mucronulate, the margin undulate-repand: heads ⅓–¼in. long, sessile, solitary or in 2's; bracts

3785. Spray of Telanthera amœna; also leaf-outlines of *a*, T. amœna; *b*, T. Bettzickiana; *c*, T. versicolor. (×1)

acuminate-cuspidate, much longer than outer sepals. Brazil.—The *T. ficoidea*, Hort., may be a form of one of the other species. L. H. B.

TELÈKIA: *Buphthalmum.*

TELÈPHIUM (an old Greek name). *Caryophyllàceæ*, in Engler & Prantl, Die Natürlichen Pflanzenfamilien; *Ficoìdeæ*, in Bentham & Hooker, Genera Plantarum. ORPINE. One species, *T. Imperàti*, Linn., is listed abroad as a hardy perennial but it has little to commend it to the cultivator: it is a low plant with woody base and slender prostrate sts., with erect or ascending branches: lvs. many, ¼in. long, alternate or scattered, oval or elliptic, entire: fls. several and inconspicuous, in small compact clusters. Perhaps valuable on banks or as a carpeter.

The genus Telephium comprises 2 or 3 species in the Medit. region, being diffusely branched and glaucous herbs: lvs. alternate, paired or opposite, without distinct midrib or nerves: fls. small, in compact terminal clusters, the 5 petals white but not showy; sepals 5, persistent; stamens 5; ovary ovoid, 3-angled and usually 3-celled, the styles 3 and short: fr. a dry caps. included in the calyx. L. H. B.

TELFÀIRIA (named after Charles Telfair, 1778–1833). *Cucurbitàceæ*. Climbing shrubs, occasionally grown in the warmhouse, of economic value in the tropics. Lvs. digitately compound; lfts. 3–5, oblong, auriculate at the base on the outside; tendrils lateral and 2-cleft: fls. dicecious, medium or large, male pedicels bracteate, pale purple; male racemose, calyx turbinate, lobes lanceolate; corolla rotate, 5-parted, segms. obovate-cuneate, elongated, fimbriate-tendrilled; stamens 3; female solitary, calyx and corolla like male; stamens rudimentary or none; ovary oblong, 3–5-celled: fr. elongate, base swollen, many-seeded; seeds edible.—Two species, Trop. Afr.

pedàta, Hook. (*Feuillæa pedàta*, Sims). Root stout, fleshy: st. perennial, 50–100 ft. long: lvs. long-petioled; lfts. 3–5 in. long, acuminate, repand-toothed, glabrous except nerves beneath: fls. pale purple, fringed, male 2 in. across; petals obovate-cuneate; female fls. about 4 in. across; ovary obtusely 10-ribbed: fr. fleshy, sometimes weighs 60 lbs., 200–300-seeded; seed 1 in. broad, edible. Zanzibar. B.M. 2681; 2751, 2752.—Intro. into S. Calif. but not successful. The seeds are roundish, about an inch across, and the kernels are sweet to the taste, and are said to be as good as almonds. The negroes of Trop. Afr. boil and eat them. These seeds also yield an abundance of oil which has been said to be equal to olive oil. The fr. becomes 1½–3 ft. long and 8 in. wide. It is oblong in shape, has 10–12 deep furrows, and is always green. Both male and female fls. are 5-lobed, copiously fringed and purple in color, the females somewhat brownish, with a circular green throat, while the males have a 5-pointed star of green in the middle. The male fls. are about 2 in. across, females 4 in. across, with an ovary 2 in. long. The foliage has an unpleasant smell when bruised.

T. occidentàlis, Hook. f., is very similar to T. pedata, but the lfts. are all triple-nerved from near the base (those of T. pedata all at an angle of 45° from the midrib): fls. smaller. Upper Guinea. Said to be cult. for the seeds which the negroes boil and eat.

F. TRACY HUBBARD.†

TÉLLIMA (anagram of Mitella). *Saxifragàceæ*. Erect rather simple hardy herbaceous perennials, the western American representatives of Mitella, well adapted to the wild-garden.

Plants pilose or glandular: lvs. petioled, subrotund-cordate, lobed, dentate; stipules none or adnate to the base of the petioles: fls. pedicelled, nodding, greenish or white, petals rarely reddish; calyx-tube large, dilated or inflated, campanulate, 5-toothed or 5-cleft; petals 5, usually elongate, entire, 3-fid or pinnatifid, sessile or clawed; stamens 10; ovary semi-superior, conical, 1-celled: caps. membranaceous, 1-celled, many-seeded.—About 10–12 species, W. N. Amer. Tellima differs from Mitella mainly in the caps., which is 2-beaked in Tellima, not beaked in Mitella.

A. *Petals pinnately cut into long, thread-like segms.*

B. *Fls. not fragrant.*

grandiflòra, R. Br. FALSE ALUM ROOT. Height 1½–2¼ ft.: lvs. rounded, cordate or angle-lobed and toothed: fls. greenish, becoming pink or red; calyx inflated-bell-shaped, nearly ½in. long; petals laciniate-pinnatifid, sessile. Calif. to Alaska. B.R. 1178. Var. **rùbra,** Hort., grows 1 ft. high, has red foliage and yellow fls.

BB. *Fls. fragrant.*

odoràta, Howell. Height 1–2 ft.: lvs. broadly cordate, obscurely lobed and crenately toothed: fls. red. Wet places near Colombia River.

AA. *Petals palmately 3–7-lobed or -parted.*

B. *Basal lvs. not divided to near the base.*

affìnis, Gray (*Lithophrágma affìnis*, Gray). Sts. stout, 1–2 ft. high: lvs. radical, roundish in outline, crenately lobed, varying into the cauline; cauline mostly parted into 3 broad divisions, which are deeply incised or merely toothed: calyx turbinate; petals 3-lobed at the apex. Ore. to S. Calif.

BB. *Basal lvs. divided to near the base.*

parviflòra, Hook. (*Lithophrágma parviflòra*, Nutt.). Height ¾–1 ft.: radical lvs. mostly 3–5-parted or -divided, the divisions narrowly cuneate and once or twice 3-cleft into narrow lobes: fls. pink or sometimes white; petals with a slender claw, the limb palmately 3–7-parted. Brit. Col. to Utah and Colo.

T. rubrifòlia, Hort., is offered in the trade abroad, as a plant growing 1 ft. high with beautiful foliage and very pretty fls. Probably it is T. grandiflora var. rubra. F. TRACY HUBBARD.†

TELÒPEA (Greek, *seen at a distance*, of fanciful application). *Proteàceæ*. Tall shrubs, occasionally grown in the greenhouse and one species has been experimented with in S. Calif., but so far has not proved very successful. Lvs. alternate, entire or dentate: fls. showy, red, hermaphrodite, twin-pedicelled, densely racemose; racemes terminal, subglobose or ovoid; bracts exterior, membranaceous, colored; perianth-tube elongated, segms. at length more or less separated; disk fleshy, strongly oblique but almost perfectly annulate; ovary long-stipitate, many-ovuled: follicle stipitate, oblique, leathery, recurved.—Three species, 2 Australian, 1 Tasmanian. An earlier name of the genus is Hylogyne, but Telopea is included in the list of "nomina conservanda" accepted by the Vienna Congress.

speciosíssima, R. Br. (*Embòthrium speciosíssimum*, Smith). WARATAH. WARRATAU. Stout glabrous shrub 6–8 ft. high: lvs. cuneate-oblong, 5–10 in. long, mostly toothed in the upper part, coriaceous: fls. crimson, in a dense ovoid or globular head 3 in. across: involucral bracts colored, the inner ones 2–3 in. long. New S. Wales. B.M. 1128. G.C. II. 17:677; III. 55:348. Gn. 22:400. I.H. 34:29.—One of the showiest shrubs of New S. Wales. The heads are 3 in. across and 3–4 in. deep and bear a rough resemblance to a florist's chrysanthemum. The showiest parts, however, are involucral bracts. This plant is known as waratah. It is one of the most distinct members of its family, for a horticultural account of which see *Protea*. Seeds of this species are imported into Calif. frequently, but although they germinate readily, the seedlings damp-off still more readily. Probably if the plant were once established it could be easily prop. by layering or by cuttings. F. TRACY HUBBARD.†

TEMPLETÒNIA (J. Templeton, botanist of Belfast, early part of 19th century). *Leguminòsæ*. Coral Bush. Shrubs or rarely subshrubs, cult. in the greenhouse abroad and hardy outdoors in the extreme S., where they may be used as ornamentals. Lvs. alternate, simple, entire or reduced to minute scales; stipules small or none: fls. red, yellow, or purple, axillary, solitary

3786. Tephrosia macrantha. (×⅓)

or 2 or 3 together; calyx 5-lobed, lobes unequal; standard orbicular or obovate, usually reflexed; wings narrow; keel as long as the standard or shorter; stamens all united in a sheath open on the upper side; ovary sessile or stipitate: pod sessile or stipitate, much flattened, ovate-oblong or linear, completely dehiscent.—About 8 species, Austral. Said to do best in a mixture of sandy loam and peat. Prop. by cuttings.

retùsa, R. Br. (*T. glaùca,* Sims). Coral Bush. Tall glabrous or glaucous shrub: lvs. broadly obovate to narrow-cuneate-oblong, sometimes all under ¾in., sometimes all over 1 in. long, emarginate or mucronate, coriaceous: fls. red (or rarely white); calyx with 4 very short, broad teeth, the lowest longest: pod 1½–2 in. long. B.M. 2088; 2334. B.R. 383; 859. L.B.C. 6:526; 7:644.—Cult. in S. Calif. where it blooms in the winter. F. Tracy Hubbard.†

TEOSINTE: *Euchlæna.*

TEPHRÒSIA (Greek, *tephros,* ash-colored, hoary; referring to the foliage). *Leguminòsæ*. Hardy or half-hardy perennial herbs, subshrubs, or rarely shrubs, of little horticultural value.

Leaves uneven-pinnate; lfts. numerous, rarely 1–3, linear; stipules bristle-like or broader and striate: racemes terminal, opposite the lvs. or in the upper axils: fls. in fascicles of 2–6, red, purple, or white; calyx-lobes subequal or the 2 upper longer; petals clawed, standard suborbiculate, outside more or less silky-villous; wings obliquely obovate or oblong; keel incurved, obtuse or rather acute; ovary sessile, many-ovuled: pod linear, rarely ovate, compressed 2-valved.—About 170 species, natives of the warmer regions of the world.

grandiflòra, Pers. (*Galèga grandiflòra,* Vahl). Rigid shrub 1–2 ft. high, pubescent or nearly glabrous: lvs. short-petioled; lfts. 5–7 pairs, cuneate-oblong or linear-oblong, variably pubescent on both surfaces: fls. fasciculate-corymbose, red, fulvescent on the outside, 8–10 lines long: pod broad, linear, plano-compressed. S. Afr. B.R. 769.

virginiàna, Pers. (*Crácca virginiàna,* Linn.). Goat's Rue. Catgut. Wild Sweet Pea. Hoary Pea. Silky-villous: st. erect, simple, 1–2 ft. high, leafy to the top: lfts. 17–29, linear-oblong: fls. large and numerous, clustered in a terminal, ellipsoid, dense raceme or panicle, yellowish white marked with purple. June, July. Dry sandy soil, southern N. H. to Minn. and southward.

macrántha, Rob. & Greenm. Fig. 3786. Shrub, 6–10 ft. tall: lvs. odd-pinnate; lfts. about 10–12 pairs, oblong-linear, entire, short-acute or cuspidate: fls. in loose terminal panicles 1 ft. long, shaded purple and white, nearly as large as sweet peas; standard very large, erect, oblong-orbicular. Mex. G.F. 7:175 (reduced in Fig. 3786).—A very showy plant, deserving of planting where hardy. Pringle writes that "for weeks it lights up the thickets of hillside ravines with masses of pleasing color." F. Tracy Hubbard.†

TERMINÀLIA (alluding to the leaves being bórne upon the terminus of the shoot). *Combretàceæ*. Only one species, *T. Catappa,* the Indian almond or tropical almond, is well known in American horticulture, but several others are important in the Orient, principally for their fruits, known as myrobalans, which are used in dyeing, tanning, and in medicine.

Leaves alternate, or rarely opposite, often crowded toward the ends of the branchlets, usually petiolate and entire: fls. sessile or nearly so, small, hermaphrodite or polygamo-dicœcious, usually in elongated spikes but sometimes in heads; calyx-tube ovoid or cylindrical, constricted above the ovary, the limb urn-shaped or campanulate, 5-toothed, usually deciduous; petals none; stamens 10, in 2 series, the 5 inferior opposite the calyx-teeth, the 5 superior longer, alternating with the teeth; filaments exserted, subulate or filiform; anthers small, the lobes scarcely connected; ovary unilocular, style subulate, often villous at base, stigma simple; ovules 2, rarely 3: fr. a drupe, ovoid, angular, compressed or 2–5-winged, 1-seeded, the cotyledons convolute.—A genus of about 100 species distributed throughout the tropics, principally in S. Asia, with only a few in Amer.

Catáppa, Linn. Tropical Almond. Indian Almond. Myrobalan. Almendro. Amendoeira. Fig. 3787. A tall, stately tree, up to 80 ft. high, with horizontal branches arising from the primary axis in whorls 3–6 ft. apart: bark smooth, brownish gray: lvs. clustered at the ends of the young branchlets, alternate, entire, obovate, obtuse to subacuminate at the apex, attenuate toward the slightly auricled base, 6–12 in. long, 3–6 in. broad, coriaceous, glabrous above, very finely pubescent below, venation slightly raised on both surfaces but most prominent below; petiole stout, under 1 in. long, flattened above, rusty-pubescent: fls. whitish, upper ones staminate and lower ones perfect, in finely pubescent spikes up to 6 in. long; calyx-segms. acute, slightly concave, valvate in bud, finely pubescent; filaments subulate, inserted upon the hairy disk; anthers cordate: fr. broadly oval in outline, elliptical and 2-

3787. Nut of tropical almond.—Terminalia Catappa. (×⅔)

winged in transverse section, 1½–2 in. long, indehiscent, greenish or reddish, glabrous, with a firm, fleshy exocarp and a hard endocarp inclosing the oblong-elliptical seed; testa membranous, the cotyledons whitish, inrolled spirally. B.M. 3004.—Indigenous to beach forests of the Andaman Isl., but now cult. widely throughout the tropics; Schimper points out that the frs. are adapted for dispersal by ocean currents, the thick husk containing air-cells enabling them to float for a long time. The tropical almond (so-called, but not related to the true almond) is extensively planted in S. Fla., the W. Indies, Cent. and S. Amer., as a street and ornamental tree. Its greatest disadvantage seems to be that it is deciduous during the cold season (shedding its lvs. twice a year in Ceylon, according to Macmillan), but the rich reddish hues assumed by the foliage before falling make it very attractive. There are many fine avenues planted to it throughout the tropics. The nut seems to be much less esteemed in Amer. than in the Orient. Firminger describes it as "of a fine filbert-like flavor, with a crispness like that of a fresh walnut; beyond comparison the most delicious of any kind of nut the country (India) affords." He also states that the kernels, when removed from the husk, are generally served on the table in a plate of water. They yield a valuable oil, resembling almond oil, which is used in India. The tasar silkworm is fed on the lvs., according to Watt. In S. Fla. this is one of the most popular ornamental trees for street and avenue planting. It is not grown in Calif., and is probably too tender for most locations in that state. Prop. seems to be exclusively by seed.

T. Arjùna, Bedd., a large tree indigenous to Cent. and S. India, and cult. in other parts of the country, has recently been intro. to the U. S. and is doing finely in S. Fla. The bark is sometimes used in dyeing and tanning, according to Watt, and also in native medicine. —*T. austràlis*, Cambess., Brazil and Argentina, has been intro. in S. Calif.: described as a medium-sized and very rapid-growing tree of symmetrical shape, suitable for street planting: lvs. small for the genus, lanceolate, acute or obtuse, shining above: fls. in roundish congested long-pedunculed heads: drupe glabrous, ovate-lanceolate, beaked, with plicate margin.—*T. Bellérica*, Roxbg., the beleric myrobalan, a large tree found throughout the forests of India, Burma, and other parts of S. Asia, yields a fr. which is exported from India for use in tanning. The kernels are eaten in India, but are said by Watt to cause intoxication if taken in excess. —*T. Bénzoë*, Pers., properly T. angustifolia, Jacq., has recently been intro. to S. Fla., and promises to succeed. It is a handsome tree with narrow lvs., indigenous to Malaya.—Under the name of *T. edùlis*, Blanco, a plant has recently been intro. to the U. S. from the Philippines which is probably T. Bellerica. It is doing well in S. Fla. and promises to be an unusually handsome ornamental. Barrett says of it "this magnificent large forest tree occurs, not very commonly, in the provinces of Bataan and Cavite (Philippines). In the rainy season abundant crops of cherry-like frs., about 2–3 cm. in diam., are produced. Each fr. contains 1 seed surrounded by sweet pulp somewhat resembling that of the duhat (Eugenia jambolana) in flavor. The pulp with the addition of lemon or some other acid juice makes a beautifully colored jelly." The tree is known as "calompit" in the Philippines.

F. W. Popenoe.

TERNSTRÈMIA (named for Christopher Ternstrœm, Swedish naturalist; died 1745). *Ternstrœmiàceæ*. Evergreen trees or shrubs, adapted to the warm-house. Lvs. leathery, entire or serrate-crenate: peduncles 1-fld., recurved, axillary or lateral, solitary or somewhat fascicled, 2 bracteoles below the fl.: sepals 5; petals 5; stamens numerous; ovary 2–3-celled (sometimes imperfectly so): fr. indehiscent.—About 45 species, warmer Asia, Indian Archipelago and Trop. Amer.

japónica, Thunb. (*Cleyèra japónica*, Thunb., not Sieb. & Zucc. See *Cleyera*.). Small tree or shrub, 10–12 ft.: lvs. alternate, short-stalked, entire, obovate-oblong or oblong, glabrous, feather-veined: fls. clustered: berries about the size of peas. Japan. S.Z. 1:81.

TESTUDINÀRIA (from *testudo* a tortoise, alluding to the supposed resemblance to a tortoise of the above-ground roots). *Dioscoriàceæ*. The Hottentot's Bread, Tortoise Plant, or Elephant's Foot. Perennial plants bearing a slender twining vine from a large hemispherical rhizome or caudex which is above ground and solid-fleshy or woody; sometimes grown in the greenhouse as curiosities or for illustration to students of botany, but not in common cultivation.

Stems twining, slender, herbaceous: lvs. alternate, caudate or somewhat deltoid: fls. dicœcious, small, racemose at the axils; perianth of male fls. broad-campanulate, 6-cleft, stamens 6, styles rudimentary; perianth-segms. of female fls. small, staminodia small; ovary ovoid or oblong, 3-celled: caps. 3-angled, angles prominent, cuneate-wing-like.—Three species from S. Afr.; a fourth has been described from Mex.

elephántipes, Salisb. Rootstock studded with angular woody protuberances, sometimes 1–3 ft. diam.: sts. slender, glabrous, much branched, twining, 8–10 ft. high: lvs. suborbicular, bright green or glaucous, mucronate: fls. small, inconspicuous, the racemes greenish yellow or whitish. S. Afr. B.M. 1347 (as *Tamus*. B.R. 921.—The globular yam-like bulb or rootstock sometimes weighs 100 pounds. The inner part of this "bulb" has been compared to a turnip for texture and color. The Hottentots used to cut it in pieces, bake it in the embers and eat it. Old and grotesque bulbs have been brought from time to time from the Cape as curiosities. The plant is of easy cult. in a cool greenhouse. No method of prop. by the bulb is known.

paniculàta, Duemmer. Rootstock above ground, about 3 in. high, irregularly oblong, woody, flattened above, tessellately lobed, fuscous: sts. twining above, rigid, glabrous, greenish: lvs. 1–3 x 1½–4½ in., broadly reniform or shortly deltoid-subcordate, obsoletely 3-lobed, mucronate, petioled: panicles axillary, many-fld., sparsely or much branched: fls. pedicelled, odorous, rather greenish or pale yellowish. S. Afr.

F. Tracy Hubbard.†

TETRACÉNTRON (Greek, *four* and *spur*, referring to the 4 spur-like appendages of the fr.). *Magnoliàceæ*. A deciduous tree from China with alternate petioled ovate lvs. palmately 5–7-veined, serrate, exstipulate: fls. sessile, small, perfect, in slender pendulous racemes, apetalous; sepals 4, ovate, imbricate; stamens 4, inserted before the sepals, exserted; carpels 4, connate along the ventral suture; styles 4, recurved; ovules pendulous, several in each cell: fr. a 4-celled deeply lobed caps., loculicidally dehiscent; seeds linear-oblong. Next to Cercidiphyllum this is the tallest deciduous tree of China, attaining occasionally to 100 ft., and 20 ft. in girth. In its foliage it bears a strong resemblance to Cercidiphyllum, though not closely related, but it is easily distinguished by the alternate lvs., solitary, not in 2's on the spurs. It has proved hardy at the Arnold Arboretum, at least in sheltered positions, but does not seem to grow so well as Cercidiphyllum, with which it probably shares the same exigencies as to cult. and prop. **T. sinénse**, Oliver. Tall tree with smooth pale or rufous gray bark: lvs. slender-petioled, ovate or elliptic-ovate, acuminate, cordate at the base, bluntly serrate, 3–5 in. long: racemes 2½–4 in. long, short-stalked, slender; fls. yellowish, minute; the exserted stamens about 1 line long: caps. brown, ⅕in. long. June, July. Cent. and W. China. H.I. 19:1892.—The tree needs to be further tested in this country.

Alfred Rehder.

TETRADÝMIA (*four together*, from Greek words, referring to the 4-fld. heads of one species). *Compósitæ*. A genus of low rigid shrubs of the composite family native to the arid regions of W. N. Amer. Herbage covered with dense matted wool: lvs. alternate, often modified into spines. The original species, *T. canescens*, is the best known. Its heads have only 4 fls. They are yellow and about ½–¾in. long. This plant was offered in the E. in 1881 by western collectors but has no horticultural standing and is now probably not in cult. in Amer. There are about a half-dozen species, but not known horticulturally.

TETRAGÒNIA (Greek, *four-angled*, referring to the usually four-angled fruit). *Aizoàceæ*. Here is included a garden vegetable of minor importance.

Herbs or subshrubs from the southern hemisphere and Japan; usually decumbent: lvs. alternate, short-petioled, somewhat fleshy: fls. yellow, green, or reddish, axillary, apetalous; calyx 3–5-lobed.—Only 1 species in cult., but 20 or more species are known in E. Asia and the southern hemisphere.

expánsa, Thunb. New Zealand Spinach. New Zealand Ice-Plant. Fig. 3788. A hardy or half-hardy annual 4–8 in. high, often spreading 4–6 ft.: lvs. triangular, larger ones 4–5 in. long by 2–3 in. broad: fls. small, yellowish green. New Zeal. B.M. 2362.

New Zealand spinach is chiefly useful for furnishing greens during the summer when the common spinach cannot be grown. It tastes something like spinach but is somewhat tougher, as a rule. It is grown to some

3788. Tetragonia expansa. (×½)

extent in California both for man and sheep. It readily self-sows. For an early outdoor crop, fresh seed should be sown in rich soil in a warm room in January or early February. The seed may germinate in a week or ten days but frequently requires a month to start. After growing about two weeks the seedlings should be transplanted to thumb-pots and about a month later to 4-inch pots. Growing vigorously in this condition they will be good-sized plants to move into the garden toward the end of April, where they should be set 3 to 4 feet apart each way, and the plants, when grown, will entirely cover the ground. They should be handled with great care in transplanting, otherwise growth will be so checked that it will require several weeks to recuperate. Again, plants should never be allowed to become pot-bound, as this will immediately bring them into flower and fruit and stunt their further growth, as well as greatly shorten their period of productiveness. Well-grown plants should be ready for use by June 1 and, if vigorous growth continues, nearly a peck of greens can be gathered from each plant once a week until heavy autumn frosts. In gathering, only 4 or 5 inches of the tip ends of the larger plants should be taken. In the South, it is usually dwarf, not generally exceeding 6 to 8 inches. There is another and somewhat easier method of growing the crop, although a given area will be less productive. Inasmuch as the plant is a hardy annual, many seeds which ripen late in autumn will fall to the ground and germinate early in spring, though not early enough for the plants to be injured by spring frosts. These will be large enough for use toward the end of June. Annual crops are thus grown on the same ground several successive seasons with no care except removing old plants and keeping the ground free from weeds.

For the forcing-house crop, seed should be sown during July in seed-beds where the plants remain until the latter part of September, when they should be taken directly to the benches and will be ready for use early in November. It is best to set the plants about 18 inches apart in benches at least 6 inches deep. No further attention is necessary except to give plenty of water, and under good conditions a peck of greens will be produced once a week on 4 square feet from November to May inclusive. A crop may also be grown beneath the benches near the walks, as well as in the grapery borders. Space that cannot be used for other purposes may thus be utilized to very good advantage, although the plants will not produce so abundantly.

This crop may also be grown in houses with portable roofs by starting the plants in summer in houses with the roofs removed, the roofs being replaced on the approach of cold weather. The plants will continue producing the entire winter and following spring, when they should be uncovered and will reproduce themselves in the same way as the summer crop.

H. C. Irish.

TETRAGONÓLOBUS: *Lotus*. The following species now in cult. was not treated in Vol. IV, p. 1917. **Lôtus siliquòsus,** Linn. (*Tetragonólobus siliquòsus,* Roth). Perennial, trailing, hirsute: rhizome slender, branched: sts. ascending: lvs. oblong or obovate; petioles with the stipules shortly adnate: peduncles 1-fld., much longer than the fl.: fls. pale yellow; calyx-segms. lanceolate: pod with straight wings much narrower than the body. Medit. region.

TETRAMÌCRA: *Leptotes*.

TETRANÈMA (Greek, *four* and *filament;* the genus is characterized by having 4 stamens). *Scrophulariàceæ*. Perennial herbs, grown in the greenhouse. St. very short or in cult. slightly elongated, ascending: lvs. nearly radical, opposite, obovate or oblong, slightly crenate-dentate, base angulate, glabrous: peduncles axillary, scape-like, longer than the lvs., bearing an umbel-like cyme at the top: fls. short-pedicelled, nodding, purple-violet, variegated paler; calyx 5-parted; corolla declinate, posterior lip shortly 2-lobed, anterior larger, 3-cleft; stamens 4: caps. rather compressed, loculicidally dehiscent.—Two species, Mex. and Guatemala. **T. mexicànum,** Benth., is the only species cult., known as the "Mexican foxglove" and formerly as *Pentstemon mexicanus*. The pretty fls. are borne in profusion on the summits of slender purple scapes 6–8 in. high. Although essentially a summer bloomer, with good care it may be made to flower most of the year. It is usually regarded as a warmhouse subject, but it makes a good window-plant and is easy to grow. Plants continue to bloom year after year. Prop. by seeds. B.M. 4070. B.R. 29:52. H.U. 6, p. 71.

F. Tracy Hubbard.†

TETRÁPANAX (*four* and *panax*, referring to the four-merous flower structure). *Araliàceæ*. By Bentham & Hooker (Genera Plantarum) this genus is included in Fatsia, and is so treated in Vol. III, page 1204. By others, however, it is kept distinct, and the plant known as *Fatsia papyrifera* then becomes **T. papỳriferum,** Koch, the only species. The reader may take his choice whether to name the plant in one genus or the other;

the preference probably lies with placing it in Tetrapanax. This genus, if accepted, differs from Fatsia in its four-merous rather than mostly five-merous flowers, with two-merous ovary, the tomentose-lanate character, and other features. *T. papyriferum* is an excellent subtropical subject.

Fatsia japonica, Decne. & Planch., remains in that genus, as treated on page 1204.

TETRASTÍGMA (Greek, *four* and *stigma*, in reference to the 4-lobed or 4-parted stigma). *Vitàceæ*. About 40 species in Trop. and Subtrop. Asia of shrubs climbing by tendrils: lvs. alternate, digitate or pedate; lfts. 3–5, sometimes reduced to 1; tendrils with adhesive disks or twining: fls. polygamo-dicœcious, in axillary cymes or umbels, 4-merous; petals spreading; disk adnate to the base of the ovary; stigma sessile, 4-lobed or 4-parted: berry 2–4-seeded; seeds ovoid-globose, sulcate on the inner surface. Allied to Cissus and Parthenocissus but easily distinguished by the sessile 4-lobed stigma and from the latter by the 4-merous fls. Of the numerous species only the following are occasionally cult.; *T. obtectum* and *T. serrulatum* are probably the hardiest, but tender in the N., and are graceful small-lvd. vines which may be used where vines of more delicate character are desired; the first species clings to walls, the second has twining tendrils. *T. Harmandii* is a tall-growing vine with larger lvs. and edible berries, suited only for tropical or subtropical countries. For cult. and prop., see *Cissus* and *Parthenocissus*. **T. obtéctum**, Planch. (*Cissus obtécta*, Wall.). Climbing with disciferous tendrils: branchlets hirsute: lvs. long-stalked, persistent or subpersistent; petioles pubescent; lfts. 5, digitate, sessile, cuneate-obovate to elliptic, acute, remotely crenate-serrate with mucronate teeth, glabrous, or in var. *pilòsum*, Gagnep., pubescent beneath, ½–1½ in. long: fls. greenish, in slender-stalked umbels; pedicels slender: berries ovoid, ¼in. long. Himalayas, Cent. and W. China. **T. serrulàtum**, Planch. (*Cissus serrulàta*, Roxbg. *Vìtis capreolàta*, Don). Climbing with twining tendrils, glabrous: lfts. 5, pedate, sometimes 3, short-stalked, ovate or elliptic to elliptic-lanceolate, acute or acuminate, serrate, ½–2½ in. long: fls. in compound cymes: fr. globose, black, ¼in. thick or slightly larger. Himalayas, W. China. **T. Hármandii**, Planch. High climbing with twining tendrils: lfts. 3–5, short-stalked, narrowly lanceolate, serrate, glabrous, about 2–3 in. long: fls. in axillary short-stalked cymes: fr. globose, 2–3-seeded. Philippine Isls. Recently intro. by the Dept. of Agric.; said to have edible berries similar to those of the Scuppernong grape.

ALFRED REHDER.

TETRATHÈCA (Greek, *four* and *cell;* the anthers are sometimes four-celled). *Tremandràceæ*. Slender glabrous or stellate-pubescent, heath-like little shrubs, grown in the greenhouse and out-of-doors in the far South.

Leaves alternate, verticillate or scattered, heath-like, entire, flat and toothed or reduced to minute scales: fls. 4–5-merous; stamens apparently in a single series; disk inconspicuous: caps. opening only at the edges.—About 20 species, all from Austral. In European greenhouses all the plants of this family are considered difficult of cult. They are treated like many other Australian heath-like plants, being potted in fibrous peat and silver sand and watered carefully at all times. It is said that only soft rain-water should be used.

A. *Sts. terete, leafy.*

B. *Lvs. mostly verticillate.*

thymifòlia, Smith. Lvs. almost all verticillate in 3's or 4's, ovate-elliptical or lanceolate: fls. purple; sepals ovate-lanceolate, acute or acuminate, seldom reflexed; ovary glabrous or more frequently pubescent, with 2 superposed ovules. B.M. 8028.

ericifòlia, Smith. Subshrub 1 ft. or less high, branched, rough-pubescent or nearly glabrous, rarely hirsute: lvs. mostly verticillate, narrow-linear, margins closely revolute, rarely oblong-lanceolate and more open: fls. pink, on slender pedicels; sepals ovate, obtuse, not reflexed; ovary glabrous or rarely pubescent with 2 superposed ovules: caps. obovate-cuneate. R.B. 28:121.

BB. *Lvs. rarely somewhat verticillate.*

pilòsa, Labill. Much branched, glabrous or hispid, about 1–1½ ft. high: lvs. usually linear, margins much revolute, 4–6 lines long: fls. purple, rather small; sepals ovate, obtuse or acute; petals narrow; ovary glabrous or pubescent, 1-ovuled: caps., obovate. F.S. 10:1065 (as *T. ericoides*). Gn.W. 20:361.

AA. *Sts. very angular or flat, almost leafless.*

hirsùta, Lindl. Sts. rather rigid and erect, 6–18 in. high, minutely pubescent and often hispid with few long spreading reddish hairs: lvs. mostly alternate, ovate-lanceolate to oblong-linear, obtuse, all less than ½in. long: fls. rather large, pink, on slender pedicels; sepals lanceolate; petals oblong, ovary glabrous or slightly glandular, with 1 ovule in each cell. B.R. 30:67. J.H. III. 42:461.

F. TRACY HUBBARD.

TEÙCRIUM (Teucer was the first king of Troy). *Labiàtæ*. GERMANDER. Herbs, subshrubs, or shrubs, some of which are greenhouse plants or outdoors in the extreme South, others of them hardy in the North and suitable for the wild-garden or rockwork.

Leaves entire, dentate or incised, sometimes many-cleft; floral lvs. similar or reduced to bracts: floral whorls 2-fld., rarely many-fld., arranged in racemose spikes or terminal heads, rarely with the fls. in a terminal spike or irregularly whorled; calyx tubular or campanulate, rarely inflated, 10-nerved, 5-toothed; corolla-tube included or rarely exserted, limb as if 1-lipped, lower lip large, upper very small or split so as to appear to be wanting; stamens 4, in 2 pairs, exserted through the split notch in the short upper lip: nutlets obovoid, reticulate, rugose.—About 160 species, widely distributed through the warmer and temperate regions of the world. Monographed by Bentham in De Candolle's Prodromus Systematis Naturalis, Vol. 12 (1848). The specific descriptions in the present article are largely based on this work but the sequence of sections and species is according to Briquet in Engler and Prantl, Pflanzenfamilien VI. 3*a*.

The teuciums are little known in cultivation. They probably present no special difficulties to the gardener.

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KEY TO THE SPECIES.

A. *Floral whorls condensed into a terminal subglobose head.*
- B. *Lvs. entire* ..... **1. montanum**
- BB. *Lvs. crenate.*
  - C. *Blades oblong or oblong-linear* .... **2. Polium**
  - CC. *Blades rotundate* ..... **3. pyrenaicum**

AA. *Floral whorls not condensed into a terminal head.*
- B. *Calyx erect.*
  - C. *Lvs. entire or the lower somewhat dentate* ..... **11. fruticans**
  - CC. *Lvs. incise-dentate or dissected.*
    - D. *Pedicels shorter than the floral lvs.* ..... **9. bicolor**
    - DD. *Pedicels much longer than the floral lvs.* ..... **10. orientale**
- BB. *Calyx declinate.*

CXI. Syringa (lilac), Madame Lemoine.

cc. *Fls. not in regular floral whorls, usually in a dense simple spike, sometimes somewhat whorled.*
d. *Calyx with the upper teeth slightly broader than the lower.* 7. canadense
dd. *Calyx with the uppermost tooth much broader.* 8. hircanicum
cc. *Fls. in regular floral whorls.*
d. *Floral whorls 2–6-fld.: small shrubs or subshrubs erect or procumbent at base.*
e. *Lvs. crenate or incised-dentate.* 4. Chamædrys
ee. *Lvs. entire or acutely few-toothed at apex.* 5. Marum
dd. *Floral whorls 2-fld.*
e. *Species perennial herbs.* 6. Scorodonia
ee. *Species hoary shrubs.* 12. betonicum

Section I. Polium.

1. montànum, Linn. Low subshrub, prostrate, hoary or pubescent: sts. much branched at base, summit shortly ascending or rarely suberect and 2–4 in. high: lvs. oblong-linear, entire, base narrowed to a very short petiole, beneath or both surfaces hoary: floral whorls few, condensed into a terminal head, which is hemispherical: fls. white becoming yellow; calyx tubular-campanulate, glabrous or hoary, teeth lanceolate, subulate-acuminate. S. Eu. and Orient.

2. Pòlium, Linn. Low canescent-tomentose, lanate or rarely pilose-hispid shrubs, 2–6, rarely 12 in. high: basal branches procumbent, ascending or rarely suberect: lvs. cuneate-oblong or linear, sessile, crenate, margin revolute, upper surface very short-tomentose, densely lanate or pilose, color, especially above, yellowish hoary, golden or rarely green; floral lvs. similar: floral whorls few, 2–6-fld., condensed in a globose or oblong head, which is solitary or often several corymbosely glomerate: fls. white, yellow, or purple; calyx tubular-campanulate; corolla small. Medit. region and Orient.—A decidedly variable species. Var. **flavéscens,** Benth. (*T. aùreum,* Schreb.), has broader lvs., very hairy heads and yellow tips to the branches.

3. pyrenàicum, Linn. Perennial, repent or diffusely much branched, villous, sterile branches whip-like, fertile short-ascending: lvs. petioled, rotundate, 4–8 lines diam., crenate, base truncate, rounded or cuneate, both surfaces green and hirsute, especially near the margins and nerves; floral lvs. petioled, oblong-linear, entire, acute: floral whorls few, condensed in a small terminal head: fls. yellow (or white); calyx campanulate, teeth acuminate-acute; corolla-lobes often purplish at base. Mountains of S. W. Eu.

Section II. Chamædrys.

4. Chamædrys, Linn. Perennial or shrubby, 1–2 ft. high, base decumbent, branching, pubescent or villous: lvs. short-petioled, ovate or oblong, incised-crenate, base cuneate, both surfaces green or canescent beneath; floral lvs. smaller and dentate: floral whorls 2–6-fld., the upper racemose: fls. red-purple or bright rose, with red and white spots, ¾in. long, rather showy; calyx tubular-campanulate, teeth lanceolate, acuminate. Eu.—A good border plant for late summer bloom.

5. Màrum, Linn. Shrub, low, very much branched, and hoary: lvs. small, ovate, 2–4 lines long, short-petioled, entire or very rarely crenate, hoary beneath; floral lvs. smaller: floral whorls 2–4-fld., racemose, subsecund, raceme 1–2 in. long, whorls approximate: fls. purplish; calyx hirsute, tubular-campanulate; corolla villous outside. Medit. region.—A low greenhouse shrubby plant similar in habit to *Thymus vulgaris.*

Section III. Scorodonia.

6. Scorodònia, Linn. Erect, hispid perennial, 1–2 ft. high, pubescent or subglabrous: lvs. ovate, 1–2 in. long, obtusely crenate, short-petioled, base rounded or cordate, both surfaces green; floral lvs. minute: raceme somewhat branched, rather paniculate above: fls. yellow; calyx rather villous, broadly campanulate; corolla-tube exserted, pubescent outside, the tube twice as long as the calyx. Eu. and adventitious in E. N. Amer.

Section IV. Stachybothys.

7. canadénse, Linn. Erect, perennial herb, 1–3 ft. high, soft-pubescent or canescent: lvs. ovate-lanceolate to oblong-ovate, 2–3 in. long, serrate, base rounded, somewhat canescent beneath, short-petioled; floral lvs. bract-like, sessile, lanceolate: spikes 2–6 in. long, rather lax, simple: fls. purple to cream-color; calyx short-pedicelled, campanulate, hoary and somewhat villous; corolla-lip elongated. Low ground, Maine to Brit. Col., southward to Pa., Ohio, Mo., New Mex., and Calif.—Useful for low grounds and moist borders.

8. hircánicum, Linn.; also spelled *hyrcanicum.* Erect perennial herb 1–2 ft. high, slightly branched, pubescent: lvs. ovate-cordate, 1–3 in. long, obtuse, coarsely crenate, base deeply cordate, scarcely pubescent above, softly somewhat canescent beneath; floral lvs. as subulate bracts: spike simple, 3–8 in. long, dense: fls. purple or red; calyx 2-lipped; corolla villous outside. Caucasus and Persia.

Section V. Teucris.

9. bícolor, Smith. Dwarf, herbaceous, glabrous: lvs. ovate, oblong or lanceolate, about 1 in. long, obtuse, entire or incised, both surfaces green; floral lvs. usually exceeding the fls.: peduncles axillary, 1-fld., short, upper subracemose: fls. blue and white; calyx broadly campanulate, green, teeth broad-lanceolate, acute; corolla-tube included. Peru and Chile.—Offered in Calif. at one time, but apparently not successful.

10. orientàle, Linn. Erect perennial herb, about 1 ft. high, branched at base, green and glabrous or pubescent, canescent: lvs. 1–2-pinnatisect, lower 1½–2 in. long, segms. linear, entire or incised, both surfaces pale or green; upper lvs. smaller; floral lvs. minute: peduncles laxly racemose, irregularly 1–3-fld.; pedicels much longer than floral lvs.: fls. violet or blue; calyx campanulate, teeth lanceolate; corolla 3 times longer than calyx. Caucasus and Asia Minor.

11. frùticans, Linn. Shrub 2–3 ft. high, divaricate branching: lvs. ovate, entire, obtuse, glabrous above, white or reddish brown, tomentose beneath, petioled; floral lvs. similar, smaller: racemes terminal or lateral on short branches, few-fld.; peduncles 1-fld., shorter than the calyx: fls. blue; calyx campanulate, tomentose; corolla-lip twice longer than the calyx. Eu.—Recommended for dry places S. It has a long blooming season.

Section VI. Teucriopsis.

12. betónicum, L'Her. Shrub 2–3 ft. high: branches hoary-tomentose: lvs. ovate-oblong, 1–1½ in. long, rather long-petioled, hoary beneath or on both sides; floral lvs. usually lanceolate: floral whorls 2-fld., secund, laxly racemose, raceme 3–6 in. long: fls. purple; calyx campanulate; corolla-tube somewhat exserted, pubescent outside, upper lobes of limb forming an obsolete upper lip, lateral lobes small, oblong, lowest oblong, concave. Madeira. R.H. 1912, p. 465.

T. frutéscens, Hort., is offered in the trade as a shrub for the rockery, with downy foliage and heads of pale blue fls.; not known botanically; possibly it is an error for T. fruticans.

F. Tracy Hubbard.

TEYSMÁNNIA (named for J. E. Teysmann). *Palmàceæ.* Low unarmed palm, grown in the warmhouse: caudex underground: lvs. erect, elongate-rhomboid obtuse, base acute, margin laciniate, divisions 2-cleft: spadix rather short, branches divided at base, reflexed above; spathes papery-leathery: fls. hermaphrodite,

minute; calyx cup-shaped, 3-toothed; petals thick; stamens 6; ovary of 3 carpels, rarely 1 or 2, free or slightly coherent: fr. globose or depressed-globose, 1-celled, 1-seeded. One species, Sumatra. *T. áltifrons*, Reichb. f. & Zoll. Lvs. 6–7 x 1½ ft., folded; petioles carinate dorsally, obsoletely concave in front, the angles rounded and uncinate-prickly: spathes sheathing the tomentose peduncle: fr. as large as an apple. Sumatra.

THÀLIA (named after Johann Thalius, a German naturalist; died 1588). *Marantàceæ*. Perennial marsh or aquatic herbs, some of them hardy, others suitable for the warm- or greenhouse.

Leaves few, large, long-petioled, often canna-like: panicles terminal; fls. in pairs along the branches forming lax spikes, the pairs in a 2-valved spathe; sepals 3, free, equal, membranaceous; petals 3, free or very shortly connate; lobes of the androecium petaloid, very irregular; lip broad, crested within; anthers 1-celled; ovary 1-celled, 1-ovuled, stigma 2-lipped: caps. oblong-ovoid or globose.—Schumann (Das Pflanzenreich, hft. 11) accepts 7 species, in Trop. and warm Temp. America.

A. *Plant covered with a white powder.*

dealbàta, Fras. Stemless: petioles 1–2 ft. long: lvs. canna-like, cordate, ovate, 6–9 in. long: scape terete, 3–5 ft. high: panicles erect: spikes erect. June–Sept. Ponds and marshes, S. C. and west. B.M. 1690. G.W. 3, p. 620. B.B. 1:455.—A stately aquatic; should be placed in shallow water or in wet soil.

AA. *Plant not powdery.*

geniculàta, Linn. (*T. divaricàta*, Chapm.). Stemless: petioles longer than in *T. dealbata:* lvs. banana-like, 1–3 ft. long, oblong-ovate: scape 5–10 ft. high: panicles 2–4 ft. wide: spikes zigzag, pendulous. Sept., Oct. Ponds, Fla.—This native ornamental-lvd. marsh-plant thrives in garden soil with cannas and like plants. Does well under cultivation in S. Calif.

T. sanguínea, Lem.=Stromanthe sanguinea.

F. Tracy Hubbard.†

THALÍCTRUM (ancient name of doubtful origin; perhaps ultimately from Greek *thallo*, to grow green). *Ranunculàceæ*. Meadow Rue. Interesting plants for the herbaceous border and wild-garden, with fern-like foliage and small flowers in panicles or terminal clusters.

Erect perennial herbs: lvs. ternately compound and decompound; st.-lvs. alternate: fls. dicœcious, polygamous, or perfect in some species, rather small, generally greenish white or sometimes purple or yellow, borne in a panicle or loose raceme; sepals 4 or 5, deciduous; petals wanting; stamens many, showy: carpels usually few, 1-seeded. A monograph of the entire genus was published in 1885, by Lecoyer, in Bull. Soc. Roy. de Bot. de Belge, where he describes 69 species. In 1886 Trelease published a treatment of "North American Species of Thalictrum" in Proc. Soc. Bost. Nat. Hist. 23:293–304, in which he recognized 11 species and 4 varieties north of Mex. His treatment is rather closely followed by Robinson in Gray's Syn. Flora, 1895. All N. American forms were treated by K. C. Davis in Minn. Bot. Studies, Aug., 1900. See also recent studies by E. L. Greene. About 80–90 species are now known, widely distributed in temperate regions, a few in the tropics.

3789. Thalictrum aquilegifolium. (×¼)

Many thalictrums are very hardy, and only the more southern forms of those given below are at all tender. These plants are valued for their feathery heads of flowers, contrasting with their handsome stems and leaves, which are often of a purple cast. They are neat and attractive subjects, often conspicuous in the wild but not so much planted as they deserve. The spring-flowering species are mostly inhabitants of woods and groves, and the summer-flowering of low open grounds and swales, but they do well under garden conditions. The early ones are small and delicate plants, and the late ones are tall and often commanding. The tassel-like staminate inflorescence of some species is very attractive. Thalictrums may be propagated by seed, or by division of roots in early spring just as growth begins. The division of the roots is more popular than the seed method, as it produces strong plants much earlier. Seed is scarce in some species. Any good loamy soil will suit them, if well drained.

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A. *Fr. strongly angled and 2–3-winged, usually stipitate.*

1. aquilegifòlium, Linn. Feathered Columbine. Fig. 3789. Sts. large, hollow, 1–3 ft. high, glaucous: lvs. once or twice 3–5-parted; lfts. stalked or the lateral ones nearly sessile, slightly lobed or obtusely toothed, smooth, suborbicular: fls. in a corymbose panicle, dicœcious; sepals white; stamens purple or white: fr. 3-angled, winged at the angles. May–July. Eu., N. Asia. B.M. 1818; 2025 (as var. *formosum*). Gn. 47, p. 357; 50, p. 117. A.F. 16:1234. J.H. III. 50:203. Gn.W. 23:676 (var. *atropurpureum*). G.L. 23:249 (var. *atropurpureum*). G. 32:623 (var. *album*). G.C. III. 47:211 (var. *album*).—A good garden plant and frequently planted; fls. in early summer. The old name *T. Cornùti*, Linn., may be a synonym of this, and if so it is the older name, being published on a preceding page, but *T. Cornuti* was described as an American plant, while *T. aquilegifolium* is not. As the description and old figure of *T. Cornuti* do not agree with any American plant, the name may well be dropped. Plants advertised as *T. Cornuti* are probably *T. aquilegifolium* or *T. polygamum*.

2. dipterocárpum, Franch. Very smooth, rhizome short: st. simple, 2 ft. or more high, angled above: lower and middle lvs. broadly triangular, 4–6 in. broad, thrice ternately cut; lfts. subrotund, base slightly cordate, pale greenish above, glaucous beneath; cauline lvs. much smaller: panicle narrowly pyramidal: fls. rose, rather large; sepals ovate-lanceolate, long-acuminate: achenes subsessile, compressed, obovate, perceptibly inequilateral, marked on the faces with 3 fuscous nerves, each side rather broadly winged; wings membranaceous, white. Yunnan, China. G.C. III. 45: suppl. Aug. 3. G. 33:111; 36:277. G.M. 51:661. Gn. 72, p. 435. J.H. III. 64:95.—An excellent plant, much noticed abroad.

3. Chélidonii, DC. Dwarf and much branched: lvs. biternate, glaucous beneath and pale green above; lfts. about 1 in. across, orbicular-cordate, crenate or lobed: fls. 1 in. across, lilac or purple, in a rigid-branched panicle, the pedicels deflexing in fr.; sepals elliptic and

obtuse: achenes many, long-stalked, reticulate, with an incurved style. Himalayas, 8,000–12,000 ft. G.C. III. 28:167.—A handsome plant.

4. **Delavàyi,** Franch. Slender, 2–3 ft. high, glabrous: lower lvs. on long, slender petioles, 2–3 times 3–5-parted; lfts. long-stalked, 3–5-lobed, base cuneate, rounded or cordate: fls. pendulous, dicœcious; sepals purple or lilac, ½in. long, equaling the slender stamens; anthers linear: carpels 10–12: fr. winged at the 3 angles, stipitate. Summer. Mountains of E. China. B.M. 7152. G.C. III. 8:125; 38:450. G. 35:793.

AA. *Fr. striate edged or ribbed rather than winged, sessile or essentially so in most species.*

B. *Fls. probably perfect.*

C. *Filaments widened near the anthers, the latter ovate and obtuse.*

D. *Achenes sessile in a head, ovate-oblong.*

5. **petaloídeum,** Linn: St. round, nearly 1 ft. high, almost naked: lvs. 3–5-parted; lfts. smooth, ovate, entire or 3-lobed: fls. corymbose, perfect; sepals white, rotund; filaments pink; anthers yellow: fr. ovate-oblong, striated, sessile. June, July. N. Asia. L.B.C. 9:891. G. 28:625.

DD. *Achenes somewhat stalked, widely spreading, straight on the dorsal margin.*

6. **sparsiflòrum,** Turcz. St. erect, sulcate, 2–4 ft. high, branching, usually glabrous: lvs. triternate, upper ones sessile; lfts. short-stalked, round or ovate, variable in size and shape of base, round-lobed or toothed: fls. in leafy panicles on slender pedicels, perfect; sepals obovate, whitish, soon reflexed; filaments somewhat widened; anthers very short: achenes short-stalked, obliquely obovate, flattened, dorsal margin straight, 8–10-nerved; styles persistent. N. Asia, through Alaska to Hudson Bay, in mountains to Colo. and Calif.

CC. *Filaments filiform or at least very slender; anthers linear, acute or mucronate.*

D. *Stigma hastate or spurred.*

7. **alpìnum,** Linn. Sts. smooth, naked or 1-lvd., only 4–8 in. high, from a scaly rootstock: lvs. tufted at the base, twice 3–5-parted; lfts. coriaceous, orbicular or cuneate at the base, lobed, revolute: fls. in a raceme, perfect; sepals greenish, equaling the yellow stamens; stigma linear: achenes small, obliquely obovoid. Northern and Arctic, and alpine regions of both Old and New Worlds. B.M. 2237.

DD. *Stigma not hastate or spurred.*

8. **mìnus,** Linn. (*T. purpùreum,* Schang. *T. saxátile,* Vill.). Sts. round, sulcate, 1–2 ft. high: lfts. variable, acute or obtusely lobed, often glaucous: fls. drooping, in loose panicles, perfect; sepals yellow or greenish: fr. ovate-oblong, sessile, striated. Summer. Eu., Asia, N. Afr.—A polymorphous species in the variation of the lfts.

Var. **adiantifòlium,** Hort. (*T. adiantoìdes,* Hort. *T. adianthifòlium,* Bess.). Lfts. resembling those of adiantum fern.—A form much used and admired.

9. **Púrdomii,** J. J. Clark. Much like *T. minus,* but fls. larger, sepals acute or acuminate, the pedicels longer and somewhat capillary: glabrous, the branches reddish green: lvs. 2- or 3-pinnate, about 8 in. long, the pinnæ 3–5 pairs; lfts. ovate, 3-lobed, membranaceous: fls. small, greenish, pendulous, in lax panicles; sepals 4, ovate-lanceolate, 3-nerved, acute or acuminate; stamens about 14: carpels 5, sessile, 8-ribbed. N. China; very recently described; cult. abroad.

10. **flàvum,** Linn. Stout, 2–4 ft., with furrowed st. and creeping stoloniferous rootstock: lvs. large, 2–3-compound; lfts. to 1½ in. long, 3-lobed, obovate or obcuneate: infl. compound and compact, the fls. erect and pale yellow (the anthers bright yellow); sepals small: achenes 6–10, small, 8-ribbed. Eu.

11. **glaûcum,** Desf. (*T. speciòsum,* Hort.). Sts. erect, round, glaucous, 2–5 ft. high: lfts. ovate-orbicular, 3-lobed; lobes deeply toothed: fls. in an erect panicle, perfect; sepals and stamens yellow: frs. 4–6, ovate, striated, sessile. June, July. S. Eu.

BB. *Fls. dicœcious or polygamo-dicœcious.*

C. *Achene somewhat inflated, obovoid, and short-stalked.*

12. **polycárpum,** Wats. Aromatic, to 3 ft. high, glabrous throughout: lfts. long-stalked, ovate or roundish, serrate, cut or divided, veined beneath: fls. dicœcious, in rather close panicles; sepals elliptic or ovate; stamens 16–25, with yellowish anthers: achenes larger, in a dense globose head, short-stalked, obovoid, turgid, tapering into reflexed styles. Sandy streams, coast ranges of Calif. to Columbia River.

3790. Thalictrum Fendleri. (×⅓)

CC. *Achene flattened and 2-edged, nearly or quite sessile.*

13. **occidentàle,** Gray. St. to 3½ ft. high, bearing 2 or 3 lvs. which are 2–4-ternate and glandular-pubescent: lfts. thin and glaucescent, with rounded lobes: achenes long, slender, thin-walled, 2-edged, ribbed, not furrowed. Colo., northward and westward.

14. **Féndleri,** Engelm. Fig. 3790. Plant 1–3½ ft. high, rather stout and leafy: lvs. 4–5 times pinnatifid, upper st.-lvs. sessile; lfts. rather firm, ovate to orbicular, usually with many shallow rounded or acuminate lobes; bases variable: fls. dicœcious, in rather compact panicles; stamens many; anthers long: achenes nearly sessile, obliquely ovate, flattened and 1 edge gibbous, 3–4 ribs on each face. July, Aug. S. Colo., westward and southward.

CCC. *Achene ovoid, sessile or nearly so, striate or ribbed.*

D. *Filaments club-shaped or dilated to nearly or quite the width of the anthers.*

15. **polýgamum,** Muhl. (*T. Cornùti,* Auth., not Linn.). Tall Meadow Rue. Erect, 3–8 ft. (or more) high, branching and leafy, smooth or pubescent, not glandular: lvs. 3–4 times ternate or terminally pinnate; lfts. oblong to orbicular, bases variable, 3–5 apical lobes: fls. in a long, leafy panicle, polygamo-dicœcious; sepals white; filaments broadened when young; anthers short: achenes ovoid, stipitate, 6–8-winged or -ribbed, with stigmas as long, which become curled. July, Aug. Low or wet grounds, Newfoundland and Canada to Fla., westward to Ohio.

DD. *Filaments very slender, usually filiform.*

16. **dasycárpum,** Fisch. & Lall. (*T. purpuráscens,* Auth., not Linn.). Stout and erect with purplish st., 3–7 ft. tall, leafy and branching: lvs. 3–4-ternate; lfts. short-oblong and mostly 3-toothed, pubescent beneath but not waxy or glandular: fls. mostly dicœcious but perhaps in some cases polygamous, with purplish

sepals and filaments: achene ovoid, with 6–8 prominent ribs. N. J. to N. D. and Sask. and far southward.—An attractive plant.

17. **venulòsum,** Trel. (*T. confìne,* Fern.). St. simple, erect, 10–20 in. high, glabrous, glaucous, bearing 2–3 long-petioled lvs. above the base: lvs. 3–4 times 3-parted; lfts. short-stalked, rather firm, rounded and lobed at the apex, veiny beneath: fls. in a simple panicle, dicœcious, small; sepals ovate; stamens 10–20, on slender filaments; anthers oblong, slender-pointed: achenes nearly sessile, 2 lines long, ovoid tapering to a straight beak, thick-walled and 2-edged. S. D. westward and southward in the mountains.

18. **dioìcum,** Linn. Rather slender, 1–2 ft. high, glabrous: lvs. 3–4 times 3-parted; lfts. thin, orbicular, several-lobed or revolute, bases variable: fls. in a loose, leafy panicle with slender pedicels, dicœcious; stamens much longer than the greenish sepals; anthers linear, obtuse, exceeding their filaments in length: achenes ovoid, nearly or quite sessile, longer than their styles, with about 10 longitudinal grooves. Early spring. Woods, Lab. to Ala., west to Mo.

For *T. anemonoìdes,* see Syndesmon.—*T. orientàle,* Boiss. Low perennial, st. ½ft. high, flexuose, plant surculose (emitting runners): lvs. triternate; segms. roundish, very obtuse, somewhat 3-lobed: panicle few-fld.; sepals petal-like and persistent, obovate, white, surpassing the stamens; filaments linear: carpels 3–6, linear-oblong, deeply striate, ¼in. long. Asia Minor. Fls. like those of Syndesmon. The plant listed under this name is said to grow 3 ft. high and to have elegant much-divided fern-like glaucous-green lvs. and branching clusters of white fls.—*T. paniculàtum,* Hort., is described as a dwarf (1 ft.) with yellow fls. It probably is not T. paniculatum, Bess.—*T. paniculàtum,* Bess., differs from T. minus in the lfts. being trifid from the ovate base, in the very open panicle and the reddish lf.-segms.: habitat doubtful.—*T. præstans,* Hort., listed abroad, is said to be a graceful plant 4–5 ft. high, with yellow and mauve fls.—*T. sulfùreum,* Hort., is a hybrid.

K. C. Davis.
L. H. B.†

THAMNÓPTERIS (Greek, *bushy fern*). *Polypodiàceæ.* A generic name for a small group of simple-leaved ferns which cannot properly be separated from Asplenium, to which they are here referred (page 414). One species (and a probable variety) is all that is in common cultivation, viz., *A. Nidus,* the bird's-nest fern. Some authors name it under Neottopteris (which see).

THÁSPIUM (name modified from *Thapsia,* another genus of the same family). *Umbellìferæ.* Meadow Parsnip. Glabrous hardy perennials: lvs. ternately divided: umbels terminal, composite; involucre none: fls. yellowish or purple, polygamous; calyx-teeth conspicuous, deciduous; petals acuminate; disk spread out: fr. ovate or ovate-oblong. About 3 species, N. Amer. **T. aûreum,** Nutt. St. branched, 1½ ft. high: root-lvs. mostly cordate; st.-lvs. ternate; lfts. ovate to lanceolate, serrate: fls. yellow. June, July. Var. **trifoliàtum,** Coult. & Rose, with crenate lvs. or lfts., is a common western form. Var. **atropurpûreum,** Coult. & Rose, fls. dark purple. The species is of easy cult. in any ordinary soil. In the wild state the plant grows in at least partial shade. Well-grown plants, especially of var. *atropurpureum,* make attractive specimens. F. W. Barclay.

THÈA (the latinized Chinese name of the tea plant). *Ternstrœmiàceæ.* Tea. Woody plants; one species grown for its leaves which yield the tea, the others grown for their handsome flowers and foliage.

Evergreen shrubs or small trees: lvs. alternate, short-petioled, serrate: fls. axillary or sometimes terminal, usually solitary, stalked, nodding; sepals 5–7, persistent; petals 5–7, rarely 9, stamens numerous, more or less connate below; ovary 3–5-celled; styles 3–5, filiform, connate below: fr. a dehiscent caps. with 1 large globose or ovoid seed in each cell.—About 14 species in Trop. and Subtrop. Asia. Camellia, differing in its sessile upright fls. with many deciduous sepals, is often united with Thea, but from a horticultural point of view it seems desirable to keep the two separate.

The most important member of the genus is *T. sinensis,* cultivated in nearly all subtropical countries and in the mountainous regions of the tropics for its leaves which yield the well-known tea and are an article of great commercial importance. The other members of the genus are ornamental shrubs occasionally grown for their handsome white or pink flowers and the attractive evergreen foliage. They are but little

3791. Thea sinensis.—Tea plant. (×⅓)

known in this country and require about the same treatment as camellia, which see for culture and propagation.

sinénsis, Linn. (*Camèllia Thèa,* Link. *Camèllia theìfera,* Griff.). Tea. Fig. 3791. Shrub, sometimes tree, to 30 ft.: lvs. elliptic-lanceolate or obovate-lanceolate, acuminate, serrate, glabrous, sometimes pubescent beneath, 2–5 in. long: fl. white, fragrant, 1–1½ in. broad; petals usually 5. China, India.—Several varieties have been distinguished, of which the following are the most important: Var. **Bohèa,** Pierre (*T. Bohèa,* Linn.). Lvs. elliptic-oblong, obtuse, flat, dark green, to 3 in. long: fls. usually solitary; sepals pubescent inside or glabrous, ciliate, petals 5–6; styles connate below: branches erect. B.M. 998. L.B.C. 3:226. Var. **víridis,** Pierre (*T. víridis,* Linn.). Lvs. oblong-lanceolate, acutish, often concave, light green, to 5 in. long: fls. 1–4; sepals pubescent, ciliate; petals 5–9; styles free: branches spreading. B.M. 3148. L.B.C. 3:227; 19:1828. Var. **cantoniénsis,** Pierre (*T. cantoniénsis,* Lour.). Lvs. oblong-lanceolate: fls. usually terminal, solitary; sepals pubescent inside; petals 7–9; styles free only near the apex. Var. **assámica,** Pierre (*T. assámica,* Mast.). Lvs. oblong-lanceolate, acuminate: fls. 1–4; sepals glabrous inside; petals 7–9; styles free only at the apex.—The black tea, however, and green tea of commerce are not derived from certain varieties, but are the result of different treatment of the lvs. after gathering. For the cult. of tea in N. Amer., see Vol. II, Cyclo. of Amer. Agric.

T. cuspidàta, Kochs (Camellia cuspidata, Hort.). Shrub, to 6 ft.: lvs. elliptic to lanceolate, thick, long-acuminate, indistinctly denticulate, glabrous, 2–3 in. long: fls. solitary, white, 1½ in. across.; petals 6; ovary glabrous. China. G.C. III. 51:261. J.H.S. 38, p. 62, fig. 38.—*T. drupìfera,* Pierre=Camellia drupifera.—*T. euryoìdes,* Booth (Camellia euryoides, Lindl.). Shrub, to 4 ft.: lvs. ovate-lanceolate, silky beneath: fls. white, nodding, axillary, rather small. B.R. 983. L.B.C. 15:1493.—*T. hongkongénsis,* Pierre=Camellia hongkongensis.—*T. malifl̀ora,* Seem. (Camellia rosæflora, Hook.). Shrub: young branchlets pubescent: lvs. ovate, acuminate, 2–3 in. long: fls. pink; petals, 5, obcordate; ovary glabrous. China. B.M. 5044. Var. *plèna* (Camellia malifiora, Lindl.). Fls. double, pink.

B.R. 547. L.B.C. 12:1134. B.M. 2080.—*T. reticulàta*, Pierre=Camellia reticulata.—*T. roseæflòra*, Kuntze=T. maliflora, Seem.—*T. Sasánqua*, Nois.=Camellia Sasanqua.

ALFRED REHDER.

THECOSTÈLE (Greek, *receptacle* and *column*, in allusion to the shape of the gynostegium, the sheath or covering enveloping the female elements). *Orchidàceæ*. Epiphytic herbs adapted to the warmhouse. Pseudobulbs fleshy, ribbed, 1-lvd.: lvs. oblong, leathery: scape recurved from the side of the pseudobulbs, bearing a simple raceme: fls. medium-sized, short-pedicelled; sepals equal, free, spreading rather broad; petals linear; labellum connate at base with the column in a broad tube, lateral lobes erect, falcate, almost curled, midlobe spreading, elongate, sinuate, undivided; column apex appendiculate with 2 falcate wings at the side of the stigma; pollinia 2: caps. ovoid, beakless.—About 5 species, Malaya.

Zóllingeri, Reichb. f. Pseudobulbs the size of a nutmeg or narrower: lf. 5–9 in. long, oblong or linear-oblong: scape with the raceme 5–8 in. long: fls. ⅔in. diam.; sepals and narrowly linear petals white, blotched with brick-red or crimson; lip yellowish with a pink pubescent front, side lobes subclavate, sigmoid, midlobe broadly obcordate. Lower Burma and Malay Archipelago.

F. TRACY HUBBARD.

THELESPÉRMA (Greek, *wart, seed;* the seeds are often papillose). *Compósitæ*. Glabrous herbs or subshrubs grown in the warmhouse or greenhouse, and sometimes planted out-of-doors.

Leaves opposite or the upper alternate, linear, often filiform, simply or twice pinnately parted or the upper not divided: head medium-sized, long-peduncled, heterogamous; ray-fls. yellow, in 1 row, neutral; disk-fls. purplish, fertile; involucre in 2 rows, the inner row of bracts campanulate and connate to the middle or more: achenes glabrous, smooth or tuberculate.—About 15 species, Mex. and extra-Trop. S. Amer. The genus may be separated from Coreopsis by the form of the involucre, which is in 2 series of bracts with the inner series united to about the middle into a cup, while in Coreopsis the 2 series are distinct and united only at the very base. The seeds, especially the outer ones of the head, in Thelesperma are often tuberculate.

trífidum, Brit. (*T. filifòlium*, Gray). Annual or biennial, 1–2½ ft. high, loosely branching: lvs. twice-pinnate, lobes filiform, outer involucral bracts subulate-linear: rays somewhat spatulate, 3-lobed, disk purple or brown. S. D., Mo., and Neb. to Colo., Texas, New Mex., and N. Mex. B.B. (ed. 2) 3:500.—Probably rare in cult.

hýbridum, Voss (*Cosmídium Burridgeànum*, Hort.). Fig. 3792. A hardy annual, 1½ ft. high, a hybrid of *T. trífidum* and *Coreopsis tinctoria*, from the latter of which it acquires the brown-purple color of its rays: lvs. bipinnately divided into filiform lobes not wider than the st. This is probably *Coreopsis atropurpurea*, Hort.

F. TRACY HUBBARD.†

THELYMÌTRA (Greek, *woman* and *cap*, alluding to the hood-shaped column). *Orchidàceæ*. Terrestrial herbs with ovoid tubers, occasionally grown in the greenhouse. Lf. solitary, usually with a rather long sheath, linear, lanceolate or rarely nearly ovate: fls. usually several in a terminal raceme, sometimes reduced to 1 or 2, blue, purple, red, or yellow, occasionally with white varieties; sepals and petals nearly equal, spreading; labellum similar; column erect, broadly winged, the wings variable, sometimes extended into a broad lobed hood over the anther, lateral lobes often penicillate or crested: caps. erect, obovoid or oblong, beakless. About 30 species, Austral., New Zeal., New Caledonia, and Malaya. Cult. similar to that of bletia. None of the species is in common cult., but a number of them are of interest to orchid fanciers.

T. cárnea, R. Br. St. slender, often flexuous, 6–12 in. high: lvs. narrow-linear: fls. 1–3, pink, sepals and petals oval-elliptic, oblong or obtuse, about 4 lines long. Austral.—*T. ixioides*, Sw. St. usually more than 1 ft. high: lvs. long-linear or linear-lanceolate, flat or channeled, with 1 or 2 shorter ones: fls. blue, pedicellate, usually forming a raceme 4–6 in. long; sepals, petals, and lip elliptic-oblong, 9–10 lines long. Austral.—*T. longifòlia*, Forst. (T. Forsteri, Sw., T. graminea, Lindl. T. pauciflora, R. Br.). Usually about 1 ft. high: lvs. long and narrow: fls. blue, lilac, or pink, rather large, several to a raceme, column produced into a broad hood, usually conspicuous from its dark color. Austral.—*T. variegàta*, Lindl. St. not very stout, 1 ft. or more high: lvs. with a villous sheath, blade linear, glabrous, with a much dilated base: fls. 2–4, purple, large; sepals and petals lanceolate, shortly acuminate or acute, ¾–1 in. long, variegated. Austral.—*T. venòsa*, R. Br. St. 1–2 ft. high: lvs. long and narrow: fls. blue, 6–10; sepals and petals ½–¾in. long; column broadly winged. Austral.

F. TRACY HUBBARD.

THEOBRÒMA (Greek, *food of the gods*). *Sterculiàceæ*. Here belong the trees that produce the seed from which chocolate and cocoa are derived.

About a score of small trees in Trop. Amer., with large simple thick and strongly nerved entire lvs., and small fls. which in at least some species are borne laterally on the branches rather than in axils: calyx deeply

3792. Thelesperma hybridum. (Flower. ×¾)

5-parted or -lobed; petals 5, mostly clawed or narrowed below; fertile stamens 5, opposite the sepals; ovary sessile and 5-celled, many-ovuled, the style filiform: fr. a large woody drupe or pod, with seeds imbedded in the pulp. The species of prime economic importance is *T. Cacao*, but other species are probably concerned in the production of cocoa, and the natural history of the group is yet confused. The word "cacao" (pronounced *ka-kow'*) is the name of the plant and the unmanufactured product of it; "cocoa" is the manufactured product, produced from the bean-like seeds, chocolate being the chief commercial commodity. (Coco is a

very different plant: see *Erythroxylon.*) The beans are washed or fermented, or both, to remove the mucilaginous substance with which they are surrounded or coated with clay to make them moisture-proof, to prevent decay, and preserve the aroma.

The common cacao is *T. Cacao*, Linn., native apparently in Cent. and S. Amer. It is a wide-branching evergreen tree, reaching 20–25 ft. in height (or somewhat more in the wild), with pubescent twigs and alternate oblong-oval or elliptic-oblong entire short-petioled lvs., the blade 6 in. long more or less, rounded at base and abruptly acuminate at apex, with strong midrib and paired or somewhat alternate arching side veins: fls. small, in fascicles directly on the bark of the trunk and main branches, about ¾in. across when expanded, on slender pedicels ½in. or more long; calyx rose-colored, with acuminate segms.; corolla yellowish, the long petals with a stalk-like claw and expanded blade: fr. or "pod" 1 ft. or less long and mostly 4 in. or less in diam., about 10-ribbed, red,

3793. Theobroma Cacao, chief source of chocolate. *a*, *b*, flowers, enlarged; *c*, fruit, much reduced.

yellow, purplish, or brown, elliptic-ovoid in form, the rind thick, hard, and leathery; cells 5, each with 5–12 "beans" in a row imbedded in a white or pinkish acid pulp; the pods will average about 20–40 good beans; these flat brown or purple beans or seeds, each an inch or more across, constitute the commercial cacao, from which the products are manufactured. For an account of the cult. of cacao, see Cyclo. Amer. Agric., Vol. II, pp. 224–6. There is a large literature on the subject.

The estates devoted to the culture of the plant are usually known as "cacao plantations" and are largely on the increase in all suitable climates, owing to the increased demand for the manufactured article in the different forms in which it is now prepared for consumption. The larger proportion of commercial cacao is produced by *Theobroma Cacao* (Fig. 3793). Other species native to Central America and the West Indies are *T. pentagona*, *T. speciosa*, *T. angustifolia*, and the closely related *Tribroma bicolor*.

In vigor of growth and productive capacity, *Theobroma pentagona* resembles to a very large degree the generally cultivated varieties of *T. Cacao*, but it differs in the flowers, in the size of the beans, and especially in the shape of the pods. The beans are larger in size than those of *T. Cacao*, fully equal if not superior in flavor, and are capable of being worked up in the same way as the commoner species. This kind is known on the mainland as "Alligator" cacao, from the fancied resemblance of its skin to the hide of an alligator. The outside of the pod is soft and easily broken, and does not afford such good protection to the interior as the harder shell possessed by *T. Cacao*. In Nicaragua, *T. Cacao* and *T. pentagona* are grown together, and the produce is mostly a mixture of the two species. From the presence of *T. pentagona*, it is possible that hybridization has taken place between two species. It has been noted that the pods of *T. Cacao* produce much larger seeds or beans in Nicaragua than in countries where this species is not grown in company with *T. pentagona:* and the beans of the two species are almost impossible to distinguish when cured together. The product of Nicaraguan plantations also requires much less time for fermentation than the produce of Grenada, Trinidad, or Venezuela, some forty-eight hours being the usual period, while more than four times that number of hours will be required for the proper fermentation of the produce of the last-mentioned countries.

The "Monkey cacao" of the mainland is produced by *Theobroma speciosa*. This is never made into market cacao, as it is very inferior in quality and has a disagreeable flavor. The pods are hard, much corrugated, warted, and of a dirty brown color when ripe.

Many names have arisen for the varieties of *Theobroma Cacao* which are in cultivation, as many as forty having been listed by a Trinidad cultivator of large experience. Looking at the matter from a practical point of view, all these are merely strains of the one species, produced by natural cross-fertilization of the older types. According to Hart's "Cacao," Trinidad, 1900, there are but three major strains or classes of *T. Cacao*, respectively, "Criollo," "Forastero," and "Calabacillo." The type of the first is found indigenous in Trinidad and various places on the mainland, its distinctive character being its bottle-necked pod, with a thin skin and finely ribbed exterior, together with its white or whitish seeds or beans, which are mild in flavor and somewhat rounded in form.

The characters of "Forastero" are its roughly corrugated or verrucose pod, containing large flattish seeds of a purplish color. It is a tree having greater vitality than "Criollo," and gives a much larger crop. "Forastero" means foreign, and this type is said to have been found on the mainland of South America, whence it was imported to Trinidad by Arragonese Capuchin Fathers about 1757. (De Verteuil, "History of Trinidad," 1884.)

"Calabacillo" is the third form, its chief characteristics being the vigor of its growth and its small flat and strongly flavored bean. By some it is considered as a degraded form of Forastero.

While the above gives a brief sketch of the chief characters of the principal types, it must be understood that there are varieties intermediate between the forms; in fact, on the larger number of estates it is impossible to find any two trees exactly alike in all their botanical characters, occurring, without doubt, from the uninterrupted cross-fertilization which has taken place. Still, each country appears to maintain certain characters more permanent than others, and thus secures for itself a name upon the markets of the world. It is probable that this is due, in a measure, to the unconscious preference taken by some to distinctive features of the produce by the continuous cultivation of a fairly

fixed strain which has arisen. It may also be due in some measure to the influence of climate and environment. Certain it is, however, that there are today strains of cacao which are possessed of distinctive characters, not readily produced by any process of preparation in places other than that in which they are grown. A fine set of illustrations of varieties common to different countries has been published in a work by Paul Preuss, who traveled in cacao-producing countries on behalf of the German government.

These different brands are bought by manufacturers and blended to suit their particular market, but there are certain kinds possessing special flavor which are readily sold at high prices. The value of the commercial product fluctuates and the price has marked variations due to many causes. Whether this results from increased production or from a deterioration in the quality cannot be ascertained. It is clear that if cultivators grow cacao for seed without regard to the best rules of selection, the quality must deteriorate. What mitigates this fact is that all the cacao world has, up to a recent date, followed the same practice. The process of grafting, to which the cacao tree readily submits, as has been proved in Trinidad, will enable operators to make large fields of the choicer varieties, and it may confidently be expected that in a few years a great improvement will be shown in the various grades placed upon the market. (For a recent account of budding, see Wester, Philippine Agric. Rev., 1914, p. 27.) But little cacao is manufactured in the countries where it is grown.

Chocolate is the term used for sweetened and hardened preparations of the roasted and ground cacao bean, with the larger proportion of the original fat retained, while the so-called "cocoa" preparations are the same material in fine powder, sweetened or unsweetened, but with the greater proportion of the cacao fat extracted. This fat, when clarified, is a pure white substance, almost as hard as beeswax, and is used in many pharmaceutical preparations. Chocolate and cocoa are both made from the beans or seeds of *Theobroma Cacao* and *T. pentagona*, and differ only in the method of preparation.

The word "cocoa" is a market corruption of the original Spanish "Cacao," which was adopted by Tournefort as a generic name but has since been displaced by the Linnæan Theobroma.

The plant known as *Theobroma bicolor* has recently been made the type of a new genus (*Tribroma bicolor*, Cook) on account of distinctly different habits of fruiting and flowering and structural differences in the flower (O. F. Cook, Journ. Wash. Acad. 5:287–289, 1915). The leaves are large, and in the juvenile stages of growth are broadly cordate in form, and assume the mature or oblong form only on reaching the third or fourth year's growth. The pods are oval, ribbed and netted, hard and woody, with an outer shell ½ inch in thickness which can be cut only with a saw. The seeds are oval, much flattened, with a dark, hard, and smooth exterior. The interior is white, and has a somewhat nutty flavor. They are used in sweetmeats in the same way as almonds, but cannot be made into commercial cacao, suitable for the manufacture of chocolates. This species is very widely distinct from any of the varieties of *T. Cacao* which produce commercial cacao. The produce of *T. bicolor* is known in some parts of Central America by the names of "Wariba," "Tiger," and "Patashte" cacao. See also Cont. Nat. Herb., vol. 17, pt. 8, for branching and flowering habits of cacao and patashte.

J. H. Hart.
L. H. B.†

THEODÒREA (probably a personal name). *Orchidàceæ*. One Brazilian orchid, *T. gomezoòides*, Rodr., of botanical interest but very little known in cult. By some it is referred to Gomezia. Rolfe describes it as having "the general habit of some small slender oncidium, about 5–6 in. high, but the fls. are borne in slender arching racemes of about 6–12 each. The sepals and petals are subconnivent, lanceolate, acute, 4–5 lines long, and light green in color, with a broad dark brown line toward the base. The lip is oblong-ovate, acute, somewhat reflexed at the apex, and white, with an orange-buff blotch in the center. It appears to be a free-growing little plant, and its appearance in cult. is interesting."

THEOPHRÁSTA (named for Theophrastus, a Greek naturalist and philosopher, 370–285 B.C.). *Myrsinàceæ;* by Mez separated in the family *Theophrastàceæ*. Glabrous shrubs, adapted to the warmhouse.

Stem stout, erect, rather simple: lvs. somewhat terminally clustered, spreading, very short-petioled, linear-oblong, spinose-dentate, netted-veined: fls. hermaphrodite, rather large, in short many-fld. racemes, white; calyx 5-parted, segms. ovate; corolla cylindrical-campanulate, 5-lobed at the top, lobes rotundate; stamens 5, staminodes 5; ovary ovoid: fr. globular, apple-shaped, fleshy, many-seeded.—Two species according to Mez, Pflanzenreich, hft. 15 (IV. 236*a*). W. Indies. The chief technical differences between Theophrasta and Clavija are in the fls. and frs. In Theophrasta the corolla is cylindrical and shallowly 5-lobed; staminodia attached on the base of the corolla: fr. large and many-seeded. In Clavija the corolla is subrotate and deeply 5-cleft; staminodia attached on the tube of the corolla; fr. 1- to many-seeded. See *Clavija*.

Jussièui, Lindl. (*T. densiflòra*, Decne.). Small slender tree, 4–8 ft. high, trunk spiny, 1 in. thick: lvs. large, elongate, linear-lanceolate, gradually narrowed toward the base, about 1½ ft. long, margin sinuate-serrulate, serrulations spinulose, both surfaces lepidote-punctate: infl. many-fld., tomentose with chestnut-brown hairs: fls. white; sepals narrowly rotundate or acutish at apex; corolla fleshy; staminodes dark brown, papillose. Haiti and Santo Domingo. B.M. 4239.

americàna, Linn. (*T. fúsca*, Decne.). Subshrub 1–3 ft. high: st. simple, with ash-gray bark: lvs. elongate, linear-lanceolate, gradually narrowed toward the base, 18–20 in. long, about 2 in. wide, margin with small teeth: infl. many-fld., very densely cylindrical raceme, fuscous-tomentose: fls. dull brown, becoming black; sepals rotundate at apex; corolla urceolate; staminodes slightly emarginate, pulvinate-fleshy. Haiti and Santo Domingo.—Probably rare in cult.

T. imperiàlis, Lind.=Martiusella imperialis.—*T. latifòlia*, Willd.=Clavija latifolia.—*T. longifòlia*, Jacq.=Clavija longifolia,—*T. macrophýlla*, Lind., not Link=Clavija grandis.—*T. minor*, Lind., is offered in the trade; it is some species of Clavija.

F. Tracy Hubbard.†

THERMÓPSIS (Greek, *lupin* and *like*). *Leguminòsæ*. Hardy perennial herbs.

Rhizome usually repent, sending up annual, erect, simple or branched sts., sheathed at their base: lvs. alternate, digitately 3-leafleted; stipules free, lf.-like: fls. rather large, yellow, rarely purple, in terminal racemes or disposed opposite the lvs.; pedicels solitary; calyx narrowly campanulate, teeth or lobes subequal; standard suborbicular; wings oblong; keel equaling or scarcely longer than the wings; stamens free: pod subsessile or short-stipitate, linear-oblong or ovate-inflated, straight or curved.—About 18 species, N. Amer. and N. and E. Asia. They are not particular as to land or position, but do best in a deep light well-drained soil. They are generally deep-rooted plants and endure drought very well. Prop. may be effected by division, especially in *T. montana*, *T. fabacea*, and *T. rhombifolia*, which spread extensively by the root, but in general the better way is by seed, although the seed is rather slow to germinate and should be sown as soon as ripe or in the spring with some heat.

A. *Pod strongly recurved.*

rhombifòlia, Richards. Plant about 1 ft. high, branched: lfts. usually oval or obovate, ½–1 in. long:

fls. in a compact spike: pod glabrous. June, July. Western states. B.B. 2:265.

lanceolàta, R. Br. (*Podalýria lupinoìdes*, Willd.). Sts. 6–12 in. high: lvs. nearly sessile, the lower and uppermost ones often simple; lfts. oblong-lanceolate, silky-puberulent on both surfaces; stipules lanceolate, half as long as lfts.: fls. geminate or somewhat verticillate, bright yellow. Siberia and Alaska. B.M. 1389.

AA. *Pod straight or only slightly curved at the apex.*

B. *Plant 3–5 ft. high.*

caroliniàna, Curtis. St. stout, smooth, simple: lvs. long-petioled; lfts. obovate-oblong, silky beneath; stipules large, clasping: racemes 6–12 in. long, erect, rigid, many-fld.: pod 2 in. long, erect, villous, and hoary. June, July. Mountains of N. C.

BB. *Plant 1–3 ft. high.*

C. *Stipules longer than the petiole.*

montàna, Nutt. Plant 1½ ft. high, somewhat silky-pubescent: lfts. oblong-obovate to oblong, 1–3 in. long: fls. in long spikes: pod straight, erect, pubescent. May, June. Western states. B.M. 3611. B.R. 1272 (both erroneously as *T. fabacea*).—Sometimes called "buffalo pen" in the West.

CC. *Stipules shorter than the petiole.*

D. *Racemes axillary.*

fabàcea, DC. Resembles *T. montana* and has possibly been confounded with it in the trade. It differs in having more spreading pods and larger and more compressed seeds. May, June. Siberia.

DD. *Racemes terminal.*

mòllis, Curtis. St. erect, branched, 2–3 ft. high, pubescent: lfts. obovate-oblong, 1–2 in. long: racemes 6–10 in. long: pod slightly curved at the end, 2–4 in. long. May–July. Va. and N. C.

fraxinifòlia, Curtis. Sts. 1–3 ft. high: lfts. 3, oblanceolate to elliptic, oval or lanceolate, glabrous or nearly so; stipules linear to linear-lanceolate: fls. in a loose raceme 4–12 in. long: pod falcate, linear, pubescent, 2–4 in. long. Mountains of N. C. and Ga.

F. W. Barclay.
F. Tracy Hubbard.†

THESPÈSIA (Greek, *divine;* application doubtful). *Malvàceæ.* Trees or tall herbs, grown in the warm-house, and planted in warm regions.

Leaves entire or angulate-lobed: fls. usually yellow, showy; calyx truncate, minutely or bristle-toothed, rarely 5-cleft; ovary 5-celled: caps. woody-coriaceous, loculicidally 5-valved.—About 10 species, Trop. Afr., Asia and the islands of the Pacific, and 1 from Porto Rico. They have the aspect of hibiscus and may be distinguished by the confluent stigmas, more woody caps., and the obovoid compressed seeds.

popúlnea, Soland. A small tree with the younger portions covered with peltate scales: lvs. long-petioled, ovate, cordate, acuminate, 3 in. across: fls. axillary, 2–3 in. across, yellow. Trop. Asia, Afr., and the islands of the Pacific.—Cult. in S. Calif., where it is said to succeed only in warm and moist locations. The fls. are described as varying from yellow to purple. A common tree on tropical seacoasts, reaching 30–40 or even 50 ft., with dense top, blooming all the year; the inner bark yields a fiber, and the wood is durable and useful.

T. grandiflòra, DC. Tree, 30–45 ft. high: lvs. ovate, subcordate, apex subacuminate: fls. purple or red, 4–5 in. diam. Porto Rico. The wood is used in Porto Rico for furniture and other purposes and it is recommended for ornamental uses.

F. Tracy Hubbard.†

THEVÈTIA (named for André Thevet, a French monk, 1502–1590). *Apocynàceæ.* Glabrous small trees or shrubs which are grown in the warmhouse, or out-of-doors in the extreme South.

Leaves alternate, 1-nerved or lightly feather-veined: fls. large, yellow, in terminal, few-fld. cymes; calyx 5-parted, many-glanded inside at the base, segms. acute, spreading; corolla funnelform; lobes broad, twisted; disk none; ovary shortly or deeply 2-lobed, 2-celled: drupe broader than long, 2-celled.—About 10 species, Trop. Mex. southward to Paraguay.

The yellow oleander of Florida gardens, *T. nereifolia*, is a very ornamental small evergreen shrub, growing luxuriantly in rich sandy soil, not too moist and not too dry, ultimately attaining a height of 6 to 8 feet and almost as much in diameter. The foliage is abundant, light glossy green, and reminds one of the oleander, but the leaves are narrower. The pale yellow flowers are abundantly produced. The fruit, which is of the size and somewhat of the form of a hickory-nut, is regarded as poisonous by the negroes. Thevetia can stand a few degrees of frost. If banked with dry sand in fall it does not suffer to any great extent, although the top may be killed. (H. Nehrling.)

A. *Lvs. 8–10 in. long, about 2 in. wide.*

nítida, DC. A tender shrub: lvs. oblong-lanceolate, acuminate, margins revolute: fls. rather large; corolla white, with a yellow throat. W. Indies; cult. in S. Calif.

AA. *Lvs. 3–6 in. long, less than ½in. wide.*

nereifòlia, Juss. Known locally in Fla. as "trumpet-flower" and incorrectly as "yellow oleander." A tender shrub: lvs. linear, shining, margins revolute: fls. about 3 in. long, yellow, fragrant. W. Indies, Mex. B.M. 2309 (as *Cerbera Thevetia*).—Cult. in S. Fla. and S. Calif.

F. Tracy Hubbard.†

THIBAÙDIA (named for Thiebaud de Berneaud, a French botanist). *Ericàceæ.* Shrubs with the st. sometimes tall-climbing: lvs. alternate, persistent and leathery: fls. in numerous many-fld. axillary racemes, scarlet; calyx 5-lobed or 5-toothed; corolla tubular, contracted at the mouth, 5-lobed; stamens 10; ovary 5-celled: berry small, globose, 5-celled. About 20 species, Trop. Amer. Probably none of the true Thibaudias is common in cult., although the two following species have been grown. *T. floribúnda*, HBK., with grayish branches, oblong-lanceolate lvs. and glabrous fls. in solitary raceme. Peru. *T. pichinchénsis*, Benth., growing 6–12 ft. high, with lvs. 3–4 in. long and oval-oblong or sublanceolate and the calyx scurfy-tomentose. Ecuador. *T. acuminàta*, Wall., is correctly *Corallobòtrys acuminàta*, Hook. f. (*Epigýnium acuminàtum*, Klotzsch). Shrub 2–4 ft. high: branches thick: lvs. alternate, petioled, 5 x 1½ in., sometimes 10 x 2¾ in., lanceolate, base cuneate, glabrous: fls. red, in axillary corymbs; calyx-tube cinereous pubescent or glabrous, 5-lobed; corolla glabrous or glandular-puberulent outside, small, 5-toothed. India. B.M. 5010.

T. glàbra, Griff.=Agapetes glabra.—*T. macrántha*, Hook.=Agapetes macrantha. J.F. 1:95. R.B. 26:181.—*T. púlchra*, Hort., is offered in the trade as an orange-red-fld. form. This may be the same as T. pulcherrima, Wall., which equals Agapetes variegata.—*T. setígera*, Wall.=Agapetes setigera. F. Tracy Hubbard.

THISTLE: *Carduus, Cirsium.* **Blessed T.:** *Cnicus.* **Cotton T.:** *Onopordon.* **Globe T.:** *Echinops.* **Golden T.:** *Scolymus.* **Scotch T.:** *Onopordon.* **Sow T.:** *Sonchus.*

THLADIÁNTHA (Greek, *to crush* and *flower;* the author of the genus is said to have named it from pressed specimens). *Cucurbitàceæ.* Herbaceous softly pubescent vines with tuberous roots, some of which are hardy, others adapted to the greenhouse.

Leaves ovate-cordate, denticulate, sinus deep; tendrils simple: fls. dicœcious, rather large, golden yellow; male fls. solitary or racemose, calyx-tube short-campanulate, 5-lobed, corolla rather irregularly campanulate, 5-parted, stamens 5, ovary rudimentary; female fls. solitary, calyx and corolla as in the male, stamens rudimentary or none; ovary oblong, pubescent, with 3 placentæ: fr. oblong, fleshy, indehiscent, many-seeded.—About 13 species, China, Java, and Himalayas.

dùbia, Bunge. A tall climber: lvs. light green, oval, base cordate, apex acute: fls. numerous, yellow, bell-shaped; male fls. solitary in the axils without bracts: fr. ovoid-oblong, about 2 in. long, red; seeds black, smooth. Summer. N. China. G.C. III. 28:279; 54:54. B.M. 5469 (male fl. only). G.M. 43:657.—According to R. I. Lynch, in Gn. 56, p. 518, the plants are of easy cult. and by planting both sexes and artificial pollination the fr. may be grown. He further states that the root-tubers are without buds but form buds just before growth commences, as does a root-cutting. According to Danske Dandridge, the plant is hardy in W. Va., increasing rapidly by tubers and becoming a pest when planted with choicer plants.

Óliveri, Cogn. More vigorous than the former: annual sts. attaining a height of 30 ft. or more, glabrescent, tubers absent: lvs. larger, cordate, acute, about 8 in. long: fls. more numerous, golden yellow. Cent. China. R.H. 1903, p. 473.—There is also a hybrid between these two species which is offered in the trade.

F. Tracy Hubbard.†

THLÁSPI (Greek, *crushed*, referring to the strongly flattened pods and seeds). *Cruciferæ.* Annual or perennial herbs which are glabrous or glaucous, rarely pilose, some of which are cultivated now and then.

Leaves basal, rosulate, entire or dentate; cauline oblong, hastate-auriculate: fls. racemose, without bracts, white, rose, or pale purple; sepals erect, equal at base; petals obovate; stamens free, without appendages: silique short, laterally compressed, oblong, obcordate or obcuneate.—About 90 species, widely distributed in the temperate, alpine, and arctic regions, mostly in the northern hemisphere, but also in S. Amer., S. Afr., and Austral.

alpéstre, Linn. Perennial, 2–12 in. high but usually low, glabrous, somewhat glaucous, habit tufted, forming rather thick mats: basal lvs. in a rosette, petioled, obovate; cauline lvs. elongated-lanceolate, base cordate, entire or dentate: peduncle unbranched, terete: fls. white, sometimes somewhat reddish; sepals purplish. Alpine Eu.—Has been offered as a neat little rock-plant. It should be given shade and a cool moist soil. The material growing in Colo. and formerly called *T. alpestre* is now considered a distinct species, **T. coloradénse,** Rydb. Perennial, cespitose: basal lvs. rosulate, broadly spatulate, sinuately crenate or subentire; cauline lvs. oblong or obovate, obtuse: infl. short and dense; fls. white; sepals with a white margin. Mountains of Wyo. and Colo. The fls. are larger than those of *T. alpestre* and the pod differs. It is uncertain whether the material in cult. in Amer. is this plant or *T. alpestre.*

arvénse, Linn. Penny Cress. Annual or biennial, 6–18 in. high, glabrous, yellow-green: basal lvs. obovate or spatulate, petioled; upper lvs. oblong, remotely and irregularly dentate: fl.-st. mostly branched above: fls. small, white; sepals greenish. Eu.—A weed in most countries, including Amer.

T. bellidifòlium, Griseb. Perennial, dwarf, cespitose: basal lvs. oblong-spatulate; cauline lvs. few, oblong, very short auriculate: fls. violet. Mountains of S. E. Eu. and Caucasus.—*T. rotundifòlium,* Gaudin. Perennial, 2–6 in. high: sts. numerous, ascending: basal lvs. rotundate-ovate, petioled; cauline lvs. clasping, auricled: fls. violet, rarely white. Switzerland. G.C. III. 49:116.

F. Tracy Hubbard.

THORN: *Cratægus.* **Christ's T.:** *Paliurus Spina-Christi.* **Jerusalem T.:** *Paliurus Spina-Christi;* also *Parkinsonia aculeata.* **Swallow T.:** *Hippophaë rhamnoides.*

THORN-APPLE: *Datura Stramonium;* also *Cratægus.*

THRIFT: *Armeria, Statice.*

THRÌNAX (Greek, *fan*). *Palmàceæ,* tribe *Córypheæ.* Thatch Palm. Fan palms well adapted for pot culture.

Spineless palms: trunks low or medium, solitary or cespitose, ringed below, clothed above by the fringed lf.-sheaths: lvs. terminal, orbicular or truncate at the base, flabellately plicate, multifid; segms. induplicate, bifid; rachis short or none; ligule free, erect, concave; petiole slender, biconvex, smooth on the margins; sheath usually beautifully fringed: spadices long; axis clothed with tubular sheaths, papery-coriaceous, split: fls. perfect, the calyx and corolla united into a lobed or entire cup, on rather long, slender pedicels, the pedicel with a caducous bract at the base; stamens 6, their filaments united below; ovary 1-celled: fr. the size of a pea.—About 17 species, native to W. Indies and Fla., and not much known in cult. For the new Porto Rican species, see Cook, Bull. Torr. Bot. Club, Oct., 1901 (vol. 28). Upon a technical embryo character some of the species below and many other wild species are segregated to constitute the genus Coccothrinax, Sargent. As that genus does not differ horticulturally, these species are here treated with Thrinax. See *Coccothrinax.*

The species are of slow growth, but succeed with indifferent care. They are mostly of elegant form and habit. A good specimen is shown in Fig. 3794.

3794. A good specimen of Thrinax.

A. *Under surface of lvs. green.*

B. *Ligule with a blunt appendage at the middle.*

radiàta, Lodd. (*Coccothrìnax radiàta,* Schum. *T. élegans,* Hort.). Caudex short: lvs. green, glabrous or slightly puberulent beneath; segms. united to or beyond one-third; ligule broadly rounded, with a short, blunt appendage at the middle: spadix large, 2–2½ ft. long, paniculate. Cuba to Trinidad.—Said to have been known in cult. as *T. elegans* and *T. gracilis.*

BB. *Ligule bluntly deltoid.*

parviflòra, Swartz. Caudex 10–20 ft. tall: lvs. 10–25 in. long, minutely pubescent, becoming glabrous, green beneath; segms. united one-fourth or one-sixth their length; ligule bluntly deltoid, 1½ lines long. Jamaica. —The plant of Fla. heretofore known as *T. parviflora* seems to be *T. floridàna,* Sarg., a plant not in the trade. S.S. 10:510.

BBB. *Ligule obsolete, truncate.*

barbadénsis, Lodd. (*Coccothrìnax barbadénsis,* Becc.). Trunk middle-sized: lvs. green, glabrous; segms. united at the base; ligule obsolete, truncate: spadix paniculate: berry polished, ⅓in. thick. Barbados.

AA. *Under surface of lvs. silvery or glaucous.*

B. *Lf.-segms. connivent at base.*

argéntea, Lodd. (*Coccothrinax argéntea*, Schum.). Caudex 12–15 ft. high, 2–3 in. thick: lvs. shorter than the petiole, silvery gray beneath, making one of the most beautiful effects in all the palms; segms. united at the base; ligule concave, semi-lunar, erose. W. Indies.

BB. *Lf.-segms. connivent for one-third their length.*

excélsa, Lodd. Lvs. pale green above, hoary-glaucous beneath; segms. united one-third; ligule bluntly deltoid; sheath densely buff-lanate. Jamaica, British Guiana.—Held by some to be a form of the preceding.

BBB. *Lf.-segms. connivent for one-half their length.*

multiflòra, Mart. (*T. graminifòlia*, Hort.). St. medium, 6–8 ft. high: sheaths ragged, fibrous, irregularly reticulate, tomentose: young lvs. white woolly-tomentose; blade equaling the petiole, laciniate; segms. united one-half their length, ensiform-acuminate, rather strict, glaucous beneath; ligule transversely oblong, sinuate, 3-lobed. Haiti. I.H. 31:542.

Other species of Thrinax are in cult. in private collections (see p. 2446), but it is doubtful whether they are in the trade. Some of them may be listed as Coccothrinax. *T. altíssima*, Hort. Lvs. large, 4½ ft. diam., nearly orbicular, the upper lobe of the base folding over the lower one some 7 or 8 segms., rich glossy green above, brilliant silvery beneath, with about 58 segms. which reach over one-third of the way to the base; ligule deep buff-orange, subreniform, open at base; a small basal area of the lf. orange-tinted; petioles 4½ ft. long, biconvex, slightly channeled above, bases included in a closely woven network of strong fiber, greenish yellow, the fiber ashy brown. Grows with vigor in Fla., on ordinary pineland. The botanical position of this palm is undetermined. —*T. argéntea*, Chapm.=Coccothrinax.—*T. Chùco*=Acanthorrhiza Chuco.—*T. crinita*, Griseb. & Wendl. Cuban. A moderate-sized palm with lvs. about 3 ft. diam., and with a short, stiff ligule. Probably belongs, according to Beccari, somewhere near Coccothrinax argentea. This palm was lost to science for 60 years and has recently been rediscovered. A specimen growing in the Brooklyn Botanic Garden has the trunk covered with a fibrous hair-like growth, unlike any W. Indian palms known.—*T. elegantíssima*, Hort., seems to be unknown to botanists. It may be T. elegans which probably belongs to T. radiata.—*T. floridàna*, Sarg. A slender tree, to 30 ft.: lf.-blades 3–4 ft. across, yellowish green, shining above: spadix 3–4 ft. long: fls. slender-pedicelled, the sepals and petals united; filaments subulate: fr. small, ½in. diam. or less. Fla. and Keys.—*T. Gárberi*, Chapm.=Coccothrinax.—*T. keyénsis*, Sarg. Rather stout, 25 ft., the trunk on a base of matted roots: lf.-blades 3–4 ft. across, yellowish green above: spadix 6 ft. or so long: fls. on short disk-like pedicels, and sepals and petals only partly united; filaments triangular: fr. ¼in. or less thick. Lower Keys.—*T. microcárpa*, Sarg. Tree, 30 ft. or more: lf.-blades 3–4 ft. broad, pale green above and silvery white beneath: spadix 1–2 ft. long: fls. on disk-like pedicels, the sepals and petals only partially united; filaments triangular: fr. very small, only ⅛in. or less thick. Keys of Fla.—*T. Mórrisii*, Wendl. One to 2½ ft. high: lvs. glaucescent beneath; segms. free for about two-thirds or three-fourths their length. G.C. III. 11:113; 30:353. Anguilla.—*T. Wendlandiàna*, Becc. Lvs. fiabellate-orbicular, paler beneath; segms. linear-oblong: spadix elongated: fls. long-pedicelled. Cuba and Honduras.

N. Taylor.†

THRIXSPÉRMUM (Greek, *hair* and *seed*, referring to the hair-shaped seeds). Syn., *Sarcochìlus*. *Orchidàceæ*. Epiphytic non-pseudobulbous orchids, grown for their bloom in the warmhouse.

Stems short, either covered with prominent persistent truncate bases of the lvs. or leafless: lvs. flat and often falcate, or narrow-linear, or none: racemes axillary; bracts small; sepals and petals nearly equal, free, spreading, the lateral sepals often more or less dilated at the base; labellum articulate at the end of the basal projection of the column, 3-lobed; column short, erect, produced at the base; pollen-masses 4; caps. usually linear or narrow-oblong.—Species 30, Old World.

Cecíliæ, Reichb. f. (*Sarcochìlus Cecíliæ*, F. Muell.). Sts. short, sometimes elongated to 2–3 in.: lvs. linear or narrowly linear-lanceolate, thick, 2–3 in. long: racemes up to 6–8 in. long, erect, bearing above the middle several small short-pedicelled pink fls.; lateral sepals almost ovate, dorsal sepal narrower; petals still narrower; labellum shorter than the sepals. Austral.

Hártmannii, Reichb. f. (*Sarcochìlus Hártmannii*, F. Muell.). Sts. short: lvs. fleshy, 3–5 in. long: scapes erect: fls. rather small; sepals and petals white, spotted basally with red; labellum shorter, saccate, white, streaked with red-purple. Queensland. G. 32:337.

lilácinum, Reichb. f. (*Sarcochìlus lilácinus*, Griff.). Climbing: sts. slender, 2–3 ft. high: lvs. alternate, ovate, pale green, 1½–2 in. long, cordate and amplexicaul at the base: raceme 1–8 in. long; rachis very stout, compressed, few- to many-fld.: fls. pale rose, white-lilac or bluish, very short-pedicelled; sepals and petals broadly ovate; labellum saccate, white, yellowish and pubescent within: caps. 4–6 in. long, linear. Malaya. B.M. 7754.

F. Tracy Hubbard.

THRYÁLLIS (old Greek name, transferred to these plants). *Malpighiàceæ*. Confusion in practice has arisen in the application of this name and Galphimia. As expressed by J. N. Rose, "the genus Thryallis was published by Linnæus in the second edition of his Species Plantarum, basing it upon a single species, *T. brasiliensis*. In 1829 Martius described two additional species, *T. longifolia* and *T. latifolia*. These two species, however, were soon found not to be congeneric with the original species, but instead of being taken out as a new generic type, were allowed to remain as Thryallis, while the true type of that genus was transferred to Galphimia." Kuntze gave the name Hemsleyna to the two plants of Martius. If Thryallis is restored to its original application, with its legitimate extension, then the plants described under Galphimia, page 1312, become *T. brasiliensis*, Linn. (*G. brasiliensis*, Juss.); *T. hirsuta*, Kuntze (*G. hirsuta*, Cav.); *T. glauca*, Kuntze (*G. glauca*, Cav.). There is a native species, *T. angustifolia*, Kuntze (*G. angustifolia*, Benth.), in Texas and adjacent Mexico, 1 to 2½ feet tall, more or less woody at base, with linear to lanceolate leaves and petals yellow turning reddish.

THRYPTÓMENE (Greek word said to refer to the low heath-like appearance of the plant). *Myrtàceæ*. Glabrous heath-like shrubs, which were at one time popular greenhouse plants, now apparently not so commonly in cult. Lvs. opposite, small, entire: fls. small, sessile or pedicelled, solitary at the axils or rarely fasciculate; bracteoles 2; calyx-tube hemispherical, turbinate or short-campanulate limb with 5 petaloid or scarious, entire, spreading segms.; petals 5, persistent, usually connivent above the genital organs; stamens 10; ovary inferior, 1-celled: fr. sometimes 1-seeded, indehiscent, sometimes 2-seeded and spuriously 2-berried. —About 25 species, Austral.

Mitchelliàna, F. Muell. A compact, bushy shrub with slender branches: lvs. oblong, flat, ¼–½in. long: fls. in the upper axils solitary or in clusters of 2 or 3, white. Offered in S. Calif.—Intro. by Mrs. T. B. Shepherd, who says the plant rarely exceeds 4 ft. in height, blooms in midwinter and is good for cut-fls.

F. Tracy Hubbard.†

THÙJA (*Thya* or *Thyia*, an ancient Greek name for a resinous tree or shrub). Also spelled *Thuya* or *Thuia*. Including *Biòta*. *Pinàceæ*. Arbor-Vitæ. Ornamental woody plants, grown for their handsome evergreen foliage and formal habit.

Resiniferous trees with short horizontal much ramified branches; the flattened branchlets arranged frond-like: lvs. decussate, scale-like, appressed, usually glandular on the back: fls. monœcious, globose, small, terminal on short branchlets, staminate yellow and consisting of usually 6 opposite stamens each with 2–4 anther-cells; pistillate consisting of 8–12 scales in opposite pairs, of which only the middle ones, or in the section Biota the lower ones, are fertile, each scale with 2 ovules inside at the base: strobiles globose-ovate to oval-oblong, with 2 seeds under the fertile scales.—Five species occur in N. Amer., E. and Cent. Asia. The wood is light and soft, brittle and rather coarse-

grained, durable in the soil; it is much used for construction, cabinet-making, and in cooperage. *T. occidentalis* contains a volatile oil, and thujin and is sometimes used medicinally.

The thujas are trees of narrow pyramidal habit, but low and bushy in many of the numerous garden forms, with much ramified branches, the branchlets arranged frond-like, flattened and clothed with small scale-like leaves; the fruit is a small strobile or cone not exceeding

3795. Typical form of Thuja occidentalis. (×⅜)

1 inch in length. The well-known *T. occidentalis* is hardy North; and also *T. Standishii*, *T. plicata*, and several forms of *T. orientalis* are hardy as far north as Massachusetts. Thujas are favorites for formal gardens. They are all of regular symmetrical habit. Their numerous garden forms vary greatly in habit and in color of foliage. For planting as single specimens in parks they are mostly too stiff and formal, but they are well suited for massing on borders of streams or lakes. The most beautiful and the most rapidly growing species is *T. plicata*. Thujas are well adapted for hedges and windbreaks (see Gn.M. 2:15). They bear pruning well and soon form a dense hedge. They thrive best in somewhat moist, loamy soil and are easily transplanted. Propagation is by seeds sown in spring. The varieties, especially those of *T. occidentalis*, are usually propagated by cuttings taken late in summer and kept during the winter in a cool greenhouse or frame; also by grafting on seedling stock in summer or early in spring in the greenhouse. The varieties of *T. plicata* and *T. orientalis* are usually grafted, since they do not grow readily from cuttings, except the juvenile forms of the latter, as var. *decussata* and var. *meldensis*. Consult *Retinispora*.

A. *Cones pendulous, with thin scales apiculate below the apex; seeds winged, compressed: branchlets ramified more or less horizontally, with a distinct upper and under side.*

B. *Lvs. yellowish or bluish green beneath, glandular: leading shoots compressed.*

occidentàlis, Linn. Common Arbor-vitæ. Erroneously but commonly called White Cedar (which is properly Chamæcyparis). Figs. 3795–3797. Tree, attaining 60 ft. and more, with short horizontal branches ascending at the end and forming a narrow pyramidal rather compact head: lvs. ovate, acute, usually glandular, bright green above, yellowish green beneath, changing in winter usually to dull brownish green: cones oval to oval-oblong, about ½in. long, brownish yellow with usually 2 pairs of fertile scales; seeds ⅛in. long. New Bruns. to Man., south to N. C. and Ill. S.S. 10:532. Gn.M. 4:19. F.E. 25:495.—Much used for telegraph poles. A great number of garden forms, about 50, are in cult. The best known are the following: Var. **álba,** Nichols. (var. *álbo-spìca*, Beissn. Var. Queen Victoria, Hort.). Tips of young branchlets white. Var. **argéntea,** Carr. (var. *álbo-variegàta*, Beissn.). Branchlets variegated silvery white. Var. **aùrea,** Nichols. Broad bushy form, with deep yellow foliage (F.E. 22: 797); also var. **Búrrowii,** Douglas' Golden and Meehan's Golden are forms with yellow foliage. See also var. *lutea*. Var. **aùreovariegàta,** Beissn. (var. *aùrea maculàta*, Hort.). Foliage variegated with golden yellow. Var. **Beterámsii,** Schwerin. Copper-colored, gradually changing to green. Var. **cónica dénsa,** Hort. "Dense conical form." Var. **Colúmbia,** Hort. "Strong habit; foliage broad, with a beautiful silvery variegation." Var. **compácta,** Beissn. (var. *Froèbeli*, Hort. Var. *globulàris*, Hort.). Globose, light green form with rather thin branchlets. Var. **cristàta,** Carr. Irregular dwarf, pyramidal form with stout, crowded, often recurved branchlets. Var. **Doúglasii pyramidàlis,** Spaeth. Dense pyramidal form with short densely branched fern-like branches often cristate at the ends. Var. **dumòsa,** Hort. (var. *plicàta dumòsa*, Gord.). Dwarf and dense form of somewhat irregular habit; in foliage similar to var. *plicata*. G.M. 54:223. Var. **Ellwangeriàna,** Beissn. (var. Tom Thumb). Fig. 3798. A low broad pyramid, with slender branches clothed with two kinds of foliage, adult lvs. and primordial, acicular spreading lvs.; it is an intermediate form between the var. *ericoìdes* and the type. R.H. 1869, p. 350; 1880, p. 93. Var. **Ellwangeriàna aùrea,** Spaeth. Like the preceding but with yellow foliage. Var. **ericoìdes,** Beissn. & Hochst. (*Retinispora dùbia*, Carr. *R. ericoìdes*, Hort., not Zucc.). Fig. 3799. Dwarf, globose or broadly pyramidal form, with slender branchlets clothed with needle-shaped soft spreading lvs., dull green above, grayish green beneath and assuming a brownish tint in winter. R.H. 1880, pp. 93, 94. A juvenile form. See, also, *Retinispora*. Var. **globòsa,** Beissn. (Var. *compácta globòsa*, Hort.). Dwarf globose form, similar to var. *compacta*, but lower and smaller. Var. **fastigiàta,** Beissn. (var. *pyramidàlis*, Hort. Var. *columnàris*, Hort.). Columnar form with short branches. Var. **filifórmis,** Beissn. (var. *Doúglasii*, Rehd.). Bushy

3796. Seedling of Thuja occidentalis. (×⅓)

3797. The arbor-vitæ.—Thuja occidentalis. (Nearly full size)

form, with long and slender sparingly ramified branches nodding at the tips, partly 4-angled and clothed with sharply pointed lvs. A very distinct form, somewhat similar to *Chamæcyparis pisifera* var. *filifera*. M.D.G. 1901:357. Var. **Hárrisonii,** Hort. "A neat little tree with the entire foliage tipped almost pure white." Var. **Hôveyi,** Veitch. Dwarf, dense, ovate-globose form with bright green foliage. Var. **intermèdia,** Hort. "Of dwarf,

3798. Thuja occidentalis var. Ellwangeriana. (×⅓)

compact habit." Var. **Little Gem,** Hort. Very dwarf dark green form, growing broader than high. Var. **lûtea,** Veitch (var. *elegantíssima*, Hort. Var. George Peabody Golden). Pyramidal form, with bright yellow foliage. F.E. 27:7. Var. **nàna,** Carr. (*T. plicàta* var. *compácta*, Beissn.). Dwarf compact globose form; foliage similar to var. *plicata*. Var. **péndula,** Gord. With the branches bending downward and the branchlets more tufted. M.D.G. 1901:169. Var. **plicàta,** Mast. (*T. plicàta*, Parl., not Don. *T. Wareàna*, Booth). Pyramidal tree, darker and denser than the type: branchlets short, rigid, much flattened: foliage distinctly glandular, brownish dark green above, bluish green beneath. G.C. III. 21:258. Said to have been intro. from N. W. Amer., but not found wild there. Var. **pûmila,** Beissn. Dwarf dense form with dark green foliage. Var. **pygmæa,** Hort. (*T. plicàta* var. *pygmæa*, Beissn.). Similar to var. *dumosa*, but still dwarfer, with bluish green foliage. Var. **Rèidii,** Hort. "Broad, dwarf form with small lvs., well retaining its color during the winter." Var. **Spaèthii,** P. Smith. Peculiar form with two kinds of foliage; the younger and lower branchlets with spreading acicular lvs. like those of var. *ericoides*, but thicker in texture; the upper branchlets slender and sparingly ramified much like those of var. *filiformis*. Gt. 42, p. 539. Var. **Vervæneàna,** Henk. & Hochst. Of smaller and denser habit than the type: branchlets slenderer, with yellowish foliage, bronzy in winter. F.E. 30:1117. G.W. 1, p. 296; 6, p. 474. Var. **Wagneriàna,** Beissn. (var. *Vérsmannii*, Hort.). Globose form, retaining its bright green color during the winter. M.D.G. 1895:123. Var. **Wareàna,** Beissn. (var. *robústa*, Carr. *T. caucásica*, *T. tatárica*, and *T. sibírica*, Hort.). Pyramidal tree, lower and denser than the type, with stouter branchlets; foliage bright green. Very desirable form. Gn.M. 2:11. R.H. 1908, p. 79. G.W. 1, p. 295. Var. **Woòdwardii,** Hort. "Dense, globose form, with deep green foliage."

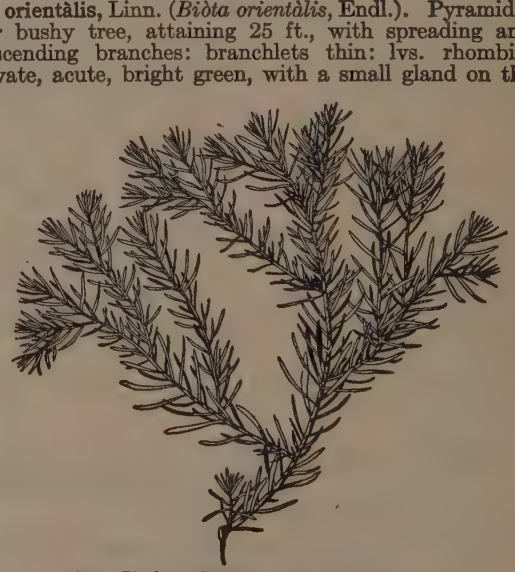
BB. *Lvs. with whitish markings beneath, without or with indistinct gland.*

plicàta, Don (*T. gigantèa*, Nutt. *T. Ménziesii*, Douglas. *T. Lóbbii*, Hort.). Fig. 3800. Tall tree, attaining 200 ft., with short horizontal branches often pendulous at the ends, forming a narrow pyramid: trunk with a much-buttressed base and clothed with cinnamon-red bark: branchlets slender, regularly and closely set: lvs. bright green and glossy above, dark green beneath and with whitish triangular spots: lvs. of vigorous shoots widely spaced, ending in long points parallel to axis, of the lateral branchlets acute and scarcely glandular: cones cylindric-ovoid, little over ½in. long; scales 8–10, elliptic-oblong, usually the 3 middle pairs fertile; seeds winged, notched at the apex. Alaska to N. Calif. and Mont. S.S. 10:533. G.C. III. 21:215, 258 (adapted in Fig. 3800). G.F. 4:116. Gn. 74, p. 65. G. 9:305. M.D.G. 1909:42. Var. **atróvirens,** Sudw. (*T. gigantèa atróvirens*, Beissn.). Foliage dark green. Var. **fastigiàta,** Schneid. (*T. gigantèa fastigiàta*, Beissn. *T. gigantèa pyramidàlis*, Bean). Columnar form. G.C. III. 41:200. Var. **grácilis,** Rehd. (*T. gigantèa* var. *grácilis*, Beissn.). Smaller tree, with more slender branches and smaller foliage of paler green. Var. **péndula,** Schneid. (*T. gigantèa péndula*, Beissn.). Form with slender pendulous branches.

Stândishii, Carr. (*T. japónica*, Maxim. *T. gigantèa* var. *japónica*, Franch. & Sav. *Thujópsis Stándishii*, Gord.). Fig. 3801. Similar to the preceding but lower, usually only 20–30 ft. high: branchlets more irregularly set, thicker and less compressed: lvs. of vigorous shoots closely placed together, ending in short rigid points spreading outward, of the lateral branchlets ovate, obtusish, thickish, lighter green above, darker beneath and with whitish, triangular spots, without gland: cones oval, little over ⅓in. long; scales 8, oval, usually the 2 middle pairs fertile. Japan. G.C. III. 21:258 (adapted in Fig. 3801). R.H. 1896:160. C.L.A. 11:311. S.I.F. 1:11.

AA. *Cones upright, the thickened scales with a prominent horn-like process below the apex; seeds wingless: branchlets ramified in a vertical plane with both sides nearly alike.* (*Biota.*)

orientàlis, Linn. (*Biòta orientàlis*, Endl.). Pyramidal or bushy tree, attaining 25 ft., with spreading and ascending branches: branchlets thin: lvs. rhombic-ovate, acute, bright green, with a small gland on the



3799. Thuja occidentalis var. ericoides. (×⅓)

back: cones globose-ovate, ½–1 in. long; usually 6 ovate scales, each with a horn-like process, the uppermost pair sterile. From Persia to E. Asia, in Japan probably only cult. There are many garden forms, of which the following are the best known: Var. **athrotaxoìdes,** Carr. Dwarf, irregularly and not frond-like branching; branchlets nearly quadrangular, slender, dark green. R.H. 1861, p. 230. Var. **aùrea,** Hort. Low,

compact, globose shrub, golden yellow in spring, changing to bright green. G.W. 1, p. 299. Var. **aùrea conspícua,** Hort. More erect, the intense golden foliage partially suffused with green. Var. **aùrea nàna,** Hort. Golden yellow foliage and very dwarf and compact habit. Var. **aùreo-variegàta,** Hort. Of pyramidal habit: branchlets variegated with yellow. Var. **beverleyénsis** (*Thùja beverleyénsis,* Hort.). A columnar form with the tips of the branchlets golden yellow. Var. **decussàta,** Beissn. & Hochst. (*Retinispora juniperoìdes,* Carr. *Chamæcýparis decussàta,* Hort.). Fig. 3369. Dwarf globose form: lvs. linear-lanceolate, spreading, stiff, acute, bluish green. A juvenile form; see, also, *Retinispora.* Var. **elegantíssima,** Gord. Of low columnar habit, bright yellow in spring, yellowish green afterward. Var. **falcàta,** Lindl. Of dense pyramidal growth, deep green, the horns of the strobiles curved backward. Var. **filifórmis stricta,** Hort. Round-headed dwarf bush, with upright, thread-like branches. Var. **grácilis,** Carr. Of pyramidal somewhat loose and slender habit, with bright green foliage. Var. *frenelòides* and var. *nepalénsis* are hardly different from this. Var. **meldénsis,** Veitch. Of columnar pyramidal somewhat irregular growth: lvs. acicular, bluish green, sometimes passing into the normal form. Intermediate between the var. *decussata* and the type. Var. **péndula,** Parl. (var. *filifórmis,* Henk. & Hochst. *T. péndula,* Lamb. *T. filifórmis,* Lindl.). Branches pendulous, thread-like, sparingly ramified, and with the lvs. wide apart and acuminate. Var. *funiculàta,* Hort., and var. *intermèdia,* Carr., are intermediate forms between this variety and the type. H. U. 4:70. Var. **pyramidàlis,** Endl. Of pyramidal habit, with bright green foliage; one of the tallest and hardiest varieties. Var. **semperauréscens,** Veitch. Dwarf, globose; the golden hue of the foliage remains throughout the whole year. Var. **Sièboldii,** Endl. (var. *japónica,* Sieb. Var. *nàna,* Carr. Var. *Zuccariniàna,* Veitch. Var. *compácta,* Beissn.). Globose compact low form, bright green.

3800. Thuja plicata. (×⅔)

T. dolobràta, Linn.=Thujopsis dolobrata.

ALFRED REHDER.

THUJÓPSIS (Greek, *Thuja-like*). Also spelled *Thuyopsis. Pinàceæ.* Ornamental tree or shrub grown chiefly for its handsome evergreen foliage and the formal habit.

A tree closely related to Thuja and chiefly distinguished by the broader much flattened branchlets and by its conelets having 3–5 winged seeds under each scale.—Only one Japanese species. Its yellowish white close and straight-grained wood is very durable and is used in Japan in boat- and bridge-building.

Thujopsis is one of the most beautiful Japanese conifers and forms a pyramidal tree, in cultivation sometimes shrubby, with spreading branches, the branchlets arranged in a frond-like fashion, much flattened and clothed with scale-like glossy green foliage. It is well adapted for planting as a single specimen on the lawn wherever it can be grown successfully. It is hardy as far north as Massachusetts, but usually suffers from summer drought. It thrives best in a sheltered and shaded position and in moist loamy soil, and seems to grow to perfection only in cool and moist climates. Propagation is by seeds, also by cuttings and by grafting like thuja. Plants raised from cuttings usually grow into bushy round-headed plants. Plants grafted on thuja are said to be short-lived. Seedlings are therefore to be preferred.

dolobràta, Sieb. & Zucc. (*Thùja dolobràta,* Linn.). Pyramidal tree, attaining 50 ft., or sometimes shrubby: branchlets irregularly whorled or scattered, horizontally spreading and often nodding at the ends; branchlets ⅛–¼ in. broad: lvs. glossy green above, marked with a broad white band beneath, those of the upper and under side obovate-oblong, obtuse, adnate except at the apex, the lateral ones spreading, ovate-lanceolate and curved (hatchet-shaped), obtusish: cone globose-ovoid, about ¾in. long; scales 6–10, much thickened at the obtusely pointed apex, the middle ones fertile and with 3–5-winged seeds under each scale. Japan. S.Z. 2:119, 120. G.C. II. 18:556. Gn. M. 2:23. G.Z. 25, p. 49. F.E. 16:517. C.L.A. 7:364. S.I.F. 1:11. Var. **altíssima,** Ansorge. Vigorous and of almost columnar habit. Var. **cristàta,** Ansorge. Branches compact, very full and somewhat crisped. Var. **nàna,** Sieb. & Zucc. (*T. lætèvirens,* Lindl.). Dwarf form, with more slender and narrower branchlets of a lighter green. Var. **plicàta,** Ansorge. Very vigorous with heavy branches which hang over and appear folded. Var. **variegàta,** Fortune. Tips of branchlets creamy white. Var. **Hóndai,** Makino (*T. Hóndai,* Henry). Tall tree, to 100 ft.: branches more densely ramified: lvs. smaller and whiter beneath: cone subglobose, with the scales not thickened at the apex. This is the more northern form and probably hardier than the type which has been called var. *austràlis* by Henry. Recently intro. and now growing at the Arnold Arboretum.

3801. Thuja Standishii. (×⅔)

T. boreàlis, Hort.=Chamæcyparis nootkatensis.—*T. Stándishii,* Gord.=Thuja Standishii.

ALFRED REHDER.

THUNBÉRGIA (after Karl Peter Thunberg, professor of botany at Upsala and successor to Rudbeck and Linnæus; died 1828). *Acanthàceæ.* Mostly tall perennial climbers producing flowers in great profusion; greenhouse, and in the open far South.

Leaves opposite: fls. blue, yellow, purple, or white, solitary and axillary or in racemes; calyx annular and scarcely lobed or toothed or 10–15-toothed, surrounded by 2 large bracts which often inclose also the corolla-tube; corolla trumpet-shaped, with a spreading limb, tube curved or oblique, often compressed, enlarged toward the mouth; stamens 4, didynamous, fixed near the base of the tube, filaments thickened at the base, separate; anther-cells parallel, equal, mostly mucronate at the base: ovary seated on a fleshy disk, 2-loculed, each cell with 2 ovules (rarely only 1). The Thunbergieæ are distinguished by the contorted corolla, the 4-seeded caps., and the globose seeds.—About 75 species, in the tropics of the world, particularly in Afr.

The thunbergias are nearly all vigorous greenhouse climbers resembling allamandas in habit. In large conservatories where they are not cramped for room they flower freely and display their flowers to the best advantage. Severe pruning, which is necessary in small greenhouses, prevents the production of flowers. The larger species, *T. laurifolia*, *T. affinis*, *T. grandiflora*, *T. mysorensis*, and *T. coccinea* are rapid growers, requiring plenty of feeding and root-room. All do better in open beds than in pots. They may be propagated either from seeds or by cuttings which are taken from the young wood which starts into growth after the plants have been cut back during winter. These produce few flowers the following autumn, but bloom freely the second season. As a rule, the plants flower in late summer or autumn, but the time of flowering may be made to vary according to treatment in some species. *T. alata* and its varieties and *T. fragrans* are often treated as annual garden plants, flowering in late summer. *T. erecta* and *T. affinis*, when grown in pots, form rather compact shrubby plants (see Gn. 24, p. 314; 30, p. 292; 47, p. 150). In Porto Rico *T. alata* has escaped and is common. Cook writes that there are two forms, one with corolla-limb cream-yellow and other whitish.

Thunbergias and allamandas are great favorites in central and southern Florida, being used on verandas,

3802. Thunbergia alata. (×⅓)

arbors, small trees, old stumps, trellises and buildings. Of the blue-flowered kinds *T. grandiflora* is hardiest and commonest. It has large heart-shaped leaves which overlap one another in a charming manner. It blooms from September until Christmas, the flowers being light blue and rather dull. The form of *T. laurifolia* known to the trade as *T. Harrisii*, has nearly sky-blue flowers, of a deeper but brighter hue than the preceding. It is a taller-growing and choicer plant, and has ten or more flowers in a raceme, while those of *T. grandiflora* are solitary in the axils. *T. fragrans* is the common white-flowered kind. The form cultivated in Florida is probably var. *vestita*, as the blossoms are not fragrant. *T. alata* is a general favorite. The flowers range from buff and white to orange with a deep purplish brown throat, the last form being the most popular. This species is killed to the ground by sharp frost every winter but sprouts vigorously the following spring. It also comes up from self-sown seed. This species grows only 7 to 8 feet high. All the thunbergias mentioned above are easily raised from cuttings or layers in summer. *T. erecta* is not a climber but has a somewhat straggling habit. It has small dark green leaves and large deep purplish blue gloxinia-like flowers which are white at the base. There is a pure white variety of it. It blooms all summer and autumn. It is readily raised from cuttings during the rainy season. (H. Nehrling.)

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KEY TO THE SPECIES.

A. *Fls. axillary, solitary.*
  B. *Lvs. entire* ..... 1. **affinis**
  BB. *Lvs. angularly toothed.*
    C. *Petioles winged* ..... 2. **alata**
    CC. *Petioles not winged.*
      D. *Color of fls. white: corolla-lobes truncate and sinuately toothed at the apex* ..... 3. **fragrans**
      DD. *Color of fls. blue (white only in varieties).*
        E. *Plant erect or suberect.*
          F. *Lvs. petiolate* ..... 4. **erecta**
          FF. *Lvs. sessile* ..... 5. **natalensis**
        EE. *Plant climbing.*
          F. *Throat of the corolla yellow.* 6. **chrysops**
          FF. *Throat of the corolla white.* 7. **grandiflora**
AA. *Fls. in terminal or axillary racemes (see, also, T. grandiflora).*
  B. *Color of fls. blue* ..... 8. **laurifolia**
  BB. *Color of fls. yellow* ..... 9. **mysorensis**
  BBB. *Color of fls. scarlet* ..... 10. **coccinea**
  11. **elegans**

1. **affĭnis,** S. Moore. A rambling shrub, 10–12 ft. high, smooth: branches 4-angled: lvs. short-petioled, elliptic, acute, entire: fls. 2 in. across, deep purple-blue, with a yellow throat. Summer. Trop. Afr. B.M. 6975. G.C. III. 2:461. G.M. 32:291.—This plant is closely allied to *T. erecta*, from which it differs by its entire lvs. and larger fls., which are about twice the size of those of *T. erecta*. When grown in a pot the plant forms a compact shrub, but when given more room it is a rambling climber.

2. **alàta,** Bojer. Black-eyed Susan. Fig. 3802. St. square, climbing, hairy: lvs. opposite, triangular-ovate, hastate, repand-toothed, rough-pubescent, tomentose beneath; petioles winged, about as long as the lvs.: fls. solitary, on axillary peduncles; calyx very small, surrounded by 2 large inflated bracts; corolla-tube somewhat longer than the involucre, dark purple within; limb rotate, oblique, of 5 rounded segms., buff or cream-colored. S. E. Afr. B.M. 2591. P.M. 2:2. B. 5:238 (not good). L.B.C. 11:1045. J.H. III. 48:11. G.L. 27:38.—A perennial climber which may also be treated as an annual greenhouse plant. Usually prop. by seeds. It is used either as greenhouse climber or to grow on trellises outdoors. Outside it flowers mostly in Aug., but by prop. at various times plants may be had in blossom nearly the whole year in the greenhouse. There are many varieties, some of which have been described as species.

Var. **álba,** Paxt. (*T. alàta* var. *albiflòra,* Hook.). Fls. white, with a blackish center. P.M. 3:28. B.M. 3512. Var. **aurantìaca,** Kuntze (*T. aurantìaca,* Paxt.). Fls. bright orange, with a dark center. The best of the group. P.M. 6:269. H.U. 1, p. 355. Subvar. **Dôddsii** has variegated lvs. P.M. 15:221. F.S. 4:415. Var. **Bàkeri,** Hort. (*T. Bàkeri* or *Bàckerii,* Hort.). Fls. pure white. Var. **Frỳeri,** Hort. (*T. Frỳeri,* Hort. *T. alàta* var. *intus-álba,* Hort.). Pale orange, with a white center. Var. **sulphùrea,** Hort. Fls. sulfur-yellow. Var. **lùtea,** Hort. (*T. alàta* var. *unícolor,* Hort.). Fls. entirely yellow.

3. **frâgrans,** Roxbg. St. slender, climbing: lvs. lanceolate to triangular-ovate, cordate or subcordate, mostly angularly toothed on each side of the base, rough on both sides, petiolate: fls. white, axillary; corolla-tube narrow; limb spreading, 1½ in. across,

lobes truncate and repandly toothed at the end. Summer. India.

Var. **lævis**, Clarke, is glabrous. B.M. 1881. L.R.C. 20:1913. G.C. III. 46:410. Var. **vestita**, Clarke, is more hairy and the fls. are not fragrant.

4. **erécta**, T. Anders. (*Meyènia erécta*, Benth.). Shrub, 2–4 ft. high, with loose spreading branches, half-erect: lvs. opposite, petiolate, ovate or subrhomboid, smooth, entire or sinuate-toothed: fls. solitary on axillary peduncles; calyx cut into 12–14 short teeth, concealed by the large bracts; corolla funnelform; tube curved, deep yellow within; limb purple, 1½–2 in. across, of 5 subrotund obcordate lobes. Trop. W. Afr. B.M. 5013. F.S. 11:1093. R.H. 1863:251. I.H. 3:99. F. 1855:225. J.H. III. 28:35; 49:261; 54:39.—A greenhouse shrub, producing fls. freely at almost any season. Grows in the open in Fla. Not a climber. Var. **álba**, Hort. Fls. white. Var. **cærùlea**, Hort. Fls. large, intense violet, with orange throat.

5. **natalénsis**, Hook. Plants erect, 2 ft. or more high, shrubby at base, green above: sts. quadrangular, mostly glabrous: lvs. somewhat crowded, opposite, sessile, ovate, acute or subacuminate, sinuate-dentate, glabrous above, hairy on the veins beneath: fls. large, pale blue, yellow in the throat, subhorizontal on erect peduncles which are shorter than the lvs.; tube of the corolla yellow, 2 in. long, curved upward, limb of 5 broad spreading obcordate lobes; calyx of 6 teeth. Natal. B.M. 5082. G.C. III. 37:162.—Very near *T. erecta*, which has petiolate lvs. and a greater number of calyx-teeth (if constant?).

6. **chrỳsops**, Hook. St. climbing, slightly hairy: lvs. opposite, petiolate, ovate-cordate, angularly toothed: peduncles axillary, solitary, 1-fld.: corolla funnelform or campanulate; tube yellow, limb purple, bluish around the throat. Sierra Leone. B.M. 4119. F.S. 1:5. P.M. 11:221. F. 1844:193.—Naturally a climber, but said to become somewhat erect if grown in a coolhouse.

7. **grandiflòra**, Roxbg. Fig. 3803. St. tall, climbing: lvs. broadly ovate, angularly cordate and toothed or lobed, somewhat roughened on both sides, petiolate: fls. solitary or in short, stout racemes in the lf.-axils, bright blue, becoming whitish in the throat; corolla-tube bell-shaped; limb 3 in. across, of 5 large, spreading rounded lobes. Bengal. B.M. 2366. P.M. 7:221. L.B.C. 4:324. B. 2:76. B.R. 495. Gn. 47:150. I.H. 42:32. G.C. III. 9:789.—A very large perennial greenhouse climber; flowers during the summer or autumn. There is also a white-fld. variety.

8. **laurifòlia**, Lindl. (*T. Hárrisii*, Hook. *T. grandiflòra*, Wall.). St. terete, smooth except the youngest, twining: lvs. long-petiolate, ovate-oblong to oblong-lanceolate, acuminate, rounded at the base, smooth, entire or slightly toothed: fls. 3 in. across, pale blue, white or yellow in the throat, borne in axillary whorls or in a raceme in which they are clustered or whorled; corolla with a wide, oblique trumpet-shaped tube and a large 5-lobed limb. India. B.M. 4985; 4998. F.S. 12:1275. Gn. 12, p. 420; 30:292 and p. 293. R.H. 1860, p. 342. J.H. III. 28:345; 45:131. Gng. 3:295. G. 3:42, 43. G.W. 3, p. 45; 10, p. 180.—Perennial greenhouse climber, flowering profusely in winter. Prop. by cuttings.

9. **mysorénsis**, T. Anders. (*Hexacéntris mysorénsis*, Wight). Climbing shrub, with long, slender branches: lvs. opposite, petiolate, oblong-lanceolate, acuminate, entire or somewhat distantly toothed: racemes long, pendulous: fls. yellow, 2 in. across, the tube purple, inclosed by the spathe-like bracts; limb 4-lobed, the upper lip erect, concave, with reflexed side lobes, lower lip of 3 subequal, spreading lobes. India. B.M. 4786. F.S. 8:752. S.H. 2, p. 130. G.C. III. 40:356. J.F. 3:285. G.W. 3, p. 187.—A tall greenhouse climber which flowers, according to treatment, at all seasons.

Var. **lùtea**, Hort. (*Hexacéntris lùtea*, Hort., Veitch. G.C. 1854, p. 151, not *T. lùtea*, T. Anders.), has the fls. pure yellow; a variety with a crimson limb and yellow tube is figured in Paxton's Flower Garden, 3:88.

10. **coccínea**, Wall. (*Hexacéntris coccínea*, Nees). A very tall climber: st. much branched, 4-angled: lvs. short-petiolate, variously shaped, the lower broadly ovate, with a hastate or cordate angled base, the upper ovate, cordate, all angularly toothed or the upper entire: fls. in terminal or axillary racemes, 1–3 ft. long; bracts large, inflated, as long as the tube; limb scarlet, of 5 reflexed emarginate lobes; throat orange. Autumn and winter. India. B.M. 5124. L.B.C. 12:1195. F.S. 23:2447–48. R.H. 1890, p. 197. G.W. 3, p. 44.

11. **élegans**, Borzi. Resembles *T. coccinea*. The fls. are said to vary from red to intense yellow. Known only from plants in the Palermo Botanic Garden, to which it is supposed to have been intro. from a nursery in S. France.

3803. Thunbergia grandiflora. (×⅓)

T. Gibsonii, S. Moore. Sts. prostrate: lvs. about 1 in. long, triangular, glossy above: peduncles axillary, erect, 3 in. long: fls. solitary, about 1¼ in. across, yellow, each with a pair of inflated and united crimson-stained bracts. British E. Afr. B.M. 8604.—*T. primulina*, Hemsl. Perennial, silky hairy at first: lvs, rhomboid ovate, 1½–2½ in. long, with 1 small lobe on each side: fls. axillary, solitary, about 1½ in. across, resembling the common primrose in shape and color. E. Trop. Afr. B.M. 7969.—*T. Vogeliàna*, Benth. (Meyenia Vogeliana, Benth.). Erect: lvs. large, ovate or oblong, dark green; fls. about equaling those of T. erecta, deep bluish violet with yellowish throat: handsome summer-flowering species. Fernando Po, Afr. B.M. 5389.

HEINRICH HASSELBRING.

THÙNIA (Count Thun-Tetschen, who had an important collection of orchids about the middle of the nineteenth century). *Orchidàceæ*. Tall plants with annual leafy stems terminating in a raceme of showy flowers.

Formerly united with Phaius, from which it differs by the terminal infl.: sepals and petals similar, spreading; labellum convolute over the column, spurred, ornamented with several crests consisting of lines of fleshy hairs; pollinia 8: fls. subtended by large membranous bracts.—About 6 species in N. India, Burma, and in the S. Himalaya region ascending to a height of 6,000 ft.

The culture of the thunias is very simple. They begin growth naturally at the end of February or early in March. As soon as new growth is visible the plants should be given new material, consisting of fibrous peat or fern-root and sphagnum mixed with loam and some sand and potsherds for drainage. In their native home the plants are said to be epiphytic, and when treated as terrestrial orchids the native habit may be imitated by setting them well above the pot, which should not be too large. For the first four to six weeks until the young roots have made good growth, it is necessary to apply water sparingly. Thunias are very rapid-growing orchids and may be liberally supplied with liquid manure until the end of the flowering season, which occurs about the middle of August. Soon after this the leaves fall. The old stems winter in this condition and serve as food reservoirs for the young growth of the next season, but although they remain on the plant two years they form no leaves the second season. During the resting-period they should be kept in a rather

3804. Thunia alba. (×¼)

dry atmosphere and be given only enough water to prevent the stems (pseudobulbs) from shriveling. This is one of the few orchids which can be profitably propagated by cutting the old stems into lengths of about 6 inches and rooting them in sand or sphagnum. When rooted the young plants may be potted in the usual way. A temperature of 60° to 65° is favorable during the growing season.

álba, Reichb. f. (*Phàius álbus,* Lindl.). Fig. 3804. Suberect, 2–3 ft., clothed with sheathing, oblong-lanceolate, striate lvs. 6 in. long: raceme drooping at the end of the st., 6–12-fld.: fls. white, 3–4 in. across when fully open; sepals and petals oblong-lanceolate, acuminate; labellum shorter than the segms., not manifestly 3-lobed, lateral lobes convolute over the column, apex spreading, wavy and finely crisp; color of labellum white veined with purple in the throat, with 5–9 purple or yellow fringed keels; wings of the column entire. April-Aug. Burma and S. Himalaya region. B.M. 3991. B.R. 24:33. P.M. 5:125. F.C. 3:125. R.H. 1874:450. Gt. 47, p. 233. G. 31:475.—There are several varieties of this species. The throat of the labellum is often yellow.

Bénsoniæ, Hook. f. (*Phàius Bénsoniæ,* Benth.). Sts. fascicled, 1–2 ft. high, leafy: lvs. linear-lanceolate, 8–10 in. long: fls. like those of *T. alba* but of a pale purple color; labellum large, 3-lobed, deep purple in front, with a yellow crested disk, with 6–7 rows of fringe-like golden yellow hairs; spur short, slender. India. July–Sept. B.M. 5694. G.M. 31:557. F.W. 1871:161.—The most showy species of the genus.

Marshalliàna, Reichb. f. (*Phàius Márshalliæ,* Nichols.). Closely related to *T. alba.* Sts. somewhat stronger: segms. pure white, acuminate: labellum evidently 3-lobed, with the lateral lobes surrounding the column, middle lobe wavy and crisp; color of labellum yellowish white, with 5 orange-fringed keels in the throat; wings of the column toothed. May–Aug. India. R.B. 21:229. S.H. 2, p. 335. Var. **ionophlèbia,** Reichb. f., has the center of the labellum bright yellow, paler toward the margin. Var. **álba,** Reichb. f., has white fls. with sulfur-yellow disk to the lip.

T. Veitchiàna=T. Bensoniæ × T. Marshalliana. Sepals and petals white, flushed light mauve at tips; front of lip mauve-purple, the base white, purple-lined. HEINRICH HASSELBRING.

THÙYA: *Thuja.*

THUYÓPSIS: *Thujopsis.*

THYMELÆA (Greek, *thyme* and *olive,* referring to the thyme-like foliage and the small olive-like fruit). *Thymelæàceæ.* Hardy or half-hardy perennial herbs, subshrubs or small shrubs, which are very much branched: lvs. sparse, frequently small or narrow: fls. small, sessile and fascicled or solitary at the axils, hermaphrodite or polygamous by abortion; perianth urn-shaped or rarely, especially in male fls., with a slender cylindrical tube; lobes 4, spreading; stamens 8; ovary subsessile, 1-celled: fr. dry.—About 20 species, Medit. region, chiefly, also in Canary Isls., and in Asia. **T. hirsùta,** Endl. (*Passerìna hirsùta,* Linn.). Decumbent greenhouse or half-hardy shrub, 1–2 ft. high: sts. slender, fastigiate branched: lvs. coriaceous, ovate, nearly round or oblong, obtuse, 2–3 lines long, glabrous above, white-tomentose beneath: fls. white, in axillary or terminal few-fld. fascicles, which equal the lvs. July. Medit region. B.M. 1949. **T. Tartonraìra,** All. (*Dáphne Tartonraìra,* Linn. *Passerìna Tartonraìra,* Schrad.). Small hardy shrub, wholly silky-canescent, whitish or becoming fulvous: lvs. coriaceous, obovate or obovate-oblong, 5–10 lines long: fls. white, numerous, 2–5-glomerate in the upper axils. June. S. Eu.

F. TRACY HUBBARD.

THÝMUS (the old Greek name used by Theophrastus either for this plant or for savory). *Labiàtæ.* THYME. Small shrubs or subshrubs, mostly hardy, and excellent for edging and the rockery.

Leaves small, entire; floral lvs. similar or changing to bracts in the spike: floral whorls usually few-fld., sometimes all distant and axillary, sometimes gathered in terminal short or lax spikes; bractlets minute: calyx ovoid, 10–13-nerved, 2-lipped, 5-toothed; corolla-tube included or exserted, naked inside, limb somewhat 2-lipped; stamens 4, in pairs: nutlets ovoid or oblong, smooth.—About 120 species, broadly dispersed in temperate regions, although the greatest number are natives of the Medit. region.

Thymes are erect or prostrate plants with strong mint-like odor. Most of the species are grown as a ground-cover on banks, in borders, or rockwork. The creeping or prostrate habit, ability to persist in dry places and poor soils, and the colored or woolly foliage of some species make them adaptable to a variety of uses. The common *T. Serpyllum* is evergreen. *T. vulgaris* is the thyme of sweet-herb gardens, being prized in cookery. All thymes are easily propagated by means of division, although seedlings may sometimes be used to renew plantations of some of the species, particularly of *T. vulgaris.* Several names occur in American catalogues, all of which seem to be referable to three species, one of

which is not a true Thymus. See *Sage*, where general culture of such herbs is given.

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KEY TO THE SPECIES.

A. *Floral lvs. similar to the cauline, narrower or scarcely broader, lax.*
B. *Sts. suberect, like a little shrub*..... 1. **vulgaris**
BB. *Sts. procumbent: flowering branches short-ascending.*
C. *Lvs. ovate, oblong, or elliptic.*
D. *Apex of lvs. acute*..... 2. **Herba-[barona**
DD. *Apex of lvs. obtuse (usually broadly so).*
E. *Branches all ascending from the base: upper lip of corolla short and broad*..... 3. **Chamædrys**
EE. *Branches trailing at base, the flowering ones ascending: upper lip of corolla oblong.* 4. **Serpyllum**
CC. *Lvs. linear-subulate to linear-lanceolate.*
D. *Surfaces of lvs. tomentose*..... 5. **hirsutus**
DD. *Surfaces of lvs. glabrous.*
E. *Blades linear-subulate, nearly terete*..... 6. **pectinatus**
EE. *Blades linear-lanceolate, flat.* 7. **heterotrichus**
AA. *Floral lvs. much broader than the cauline, subimbricate.*
B. *Plants diffuse subshrubs with the flowering branches ascending.*
C. *Lvs. subterete*..... 8. **carnosus**
CC. *Lvs. flat.*
D. *Surfaces of lvs. villous: lvs. linear*..... 9. **villosus**
DD. *Surfaces of lvs. glabrous: lvs. usually subspatulate*.....10. **striatus**
BB. *Plants suberect little shrubs with the flowering branches rigid and erect: heads, dense, cone-like*.....11. **capitatus**

1. **vulgàris,** Linn. Common Thyme. Subshrub, erect, 6 in. high: sts. sometimes decumbent at base: branches stiff and woody, usually white-pubescent: lvs. sessile, 3–6 lines long, linear- or ovate-lanceolate, fascicled at the axils; floral lvs. lanceolate, obtuse: floral whorls lax interrupted spikes: fls. small, lilac or purplish, calyx-teeth of upper lip lanceolate, of lower subulate. S. Eu. —An old garden plant, being grown as a sweet-herb. The lvs. and shoots are used for seasoning. It is well to renew the plants from seeds every 2 or 3 years. There are varieties with broad and narrow lvs.

2. **Herba-barŏna,** Loisel. Subshrub, much branched, procumbent, glabrous below: flowering branches shortly ascending, 3–5 in. high: lvs. short-petioled, ovate-lanceolate, acute, base rotundate, viscid-glandular; floral lvs. rather similar: floral whorls approximate and capitate: fls. purplish; calyx white-pilose and red, glandular, upper lip trifid, lower teeth of calyx subulate and ciliate-barbed; corolla-tube slightly exserted. Corsica.

3. **Chamæ̀drys,** Fries. Subshrub, low, forming a tuft: sts. diffuse, ascending: lvs. broad-oblong; petioles ciliate; floral-lvs. similar: fls. whorled or capitate, purple; calyx-teeth of upper lip 3, triangular, of lower lip 2, subulate. N. Eu.—Similar to *T. Serpyllum* and by most considered a form of that species, but said to differ in having the lvs. less narrowed to the petiole and only the petiole ciliate; also the lvs. are less prominently veined.

4. **Serpýllum,** Linn.; also spelled *Serpyllus* (*T. azóricus*, Lodd. *T. hirsùtus*, Auth. not Bieb. *T. micans*, Lowe). Mother of Thyme. Creeping Thyme. Perennial or subshrubby, cespitose or creeping: sts. wiry, prostrate and rooting below, ascending-erect above, slightly puberulent: lvs. elliptic, oblong or ovate, obtuse base more or less attenuate, seldom ½in. long, short-petioled: floral-whorls sessile, congested into a head or the lower more or less distant and racemose: fls. minute, lilac or rose; calyx more or less hairy, 2-lipped to the middle, teeth of upper lip triangular, glabrous or ciliate, of lower lip 2, lanceolate-subulate, ciliate; corolla-tube rather included. Temperate parts of Eu., Asia, and N. Afr. G.M. 57:807. L.B.C. 16:1530.—A common plant in old gardens, prized as an evergreen edging and as cover for rockwork and waste places; also run wild. The lvs. are sometimes used for seasoning, as are those of *T. vulgaris*. The nodes are short, making it a very leafy plant. Variable. Var. **álbus,** Hort., is a white-fld. form. Gt. 45, p. 108. Var. **argénteus,** Hort., is a form with silver variegated lvs. commonly known in the trade as *T. citriodòrus argénteus*, Hort. Var. **aùreus,** Hort., is a form with golden variegated lvs. growing about 8–12 in. high; usually known in the trade as *T. aùreus*, Hort., or *T. citriodòrus aùreus*, Hort.; there is also a minor variation known in the trade as *T. Serpýllum aùreus marginàtus*. Var. **Chaubárdii,** Boiss. & Heldr., see *T. heterotrichus*. Var. **citriodòrus,** Hort., see var. *vulgaris*. Var. **coccíneus,** Hort. (*T. coccíneus*, Hort.), grows about 1½–3 in. high, has dark green lvs. and bright crimson fls. Var. **lanuginòsus,** Hort. (*T. lanuginòsus*, Mill. *T. Chamædrys lanuginòsus*, Hort.), is a low form, about 3 in. high with small roundish lvs. which are gray-pubescent; a good edging plant. Var. **montànus,** Benth. (*T. montànus*, Waldst. & Kit. *T. Chamædrys*, Auth., not Fries), is a form with the branchlets more erect and the lvs. larger than the type. Var. **pulchéllus,** Hort., has the upper part of the calyx and its teeth purple. G.M. 56:83. Var. **spléndens,** Hort., is a form with brilliant red (according to some bright purplish red) fls. Var. **variegàtus,** Hort., has white-variegated lvs., possibly the same as var. *argenteus*. Var. **vulgàris,** Benth. (*T. Serpýllum* var. *citriodòrus*, Hort. *T. citriodòrus*, Schreb.). Lemon Thyme. Lvs. smaller than the type and strongly veined; the plant has a decided lemon odor.

5. **hirsùtus,** Bieb. Perennial or subshrub, cespitose and cushioned or procumbent: flowering branches ascending, hoary-pubescent: lvs. not punctate, sessile or nearly so, linear-subulate, obtuse, both surfaces hoary-tomentose, margin ciliate: fls. closely approximate in an oblong head, rose; calyx reddish, hirsute, 2-lipped below the middle, teeth of upper lip lanceolate, acuminate, of lower subulate; corolla-tube included. S. E. Eu. and Caucasus.

6. **pectinàtus,** Fisch. & Mey. (*T. odoratissimus*, Bieb., not Mill.). Perennial, bush-like: young branches slender, erect, leafy: lvs. glandular-punctate, linear-subulate, obtuse, fascicled at the axils; floral lvs. similar: fls. pale purple, in heads; calyx equally 2-lipped almost to the middle, teeth of upper lip lanceolate, rather acute, of lower subulate; corolla-tube included. S. Russia and Asia Minor. G.M. 56:82. Gn. 78, p. 134.—Very closely related to *T. Serpyllum*. Strongly fragrant.

7. **heterótrichus,** Griseb. Subshrub, 3–6 in. high: branches ascending, puberulent: lvs. 6–8 lines long, linear-lanceolate, rather obtuse, fascicled in the axils, flat, glabrous; floral lvs. similar: floral whorls approximate in a head-like raceme: fls. pale violet; calyx pilose, upper lip trifid to the middle, its segms. lanceolate-acuminate. Greece and Macedonia. G.W. 12, p. 461.—Treated by some authors as *T. Serpyllum* var. *Chaubardii*, Boiss. & Heldr.

8. **carnòsus,** Boiss. Subshrub, about 9 in. high: sts. decumbent at base, otherwise erect, white-pubescent: lvs. minute, fascicled, strongly revolute, fleshy, subterete, oblong, obtuse, glandular-punctate, glabrous,

glaucous; floral lvs. ovate, with revolute margins, hirtellous: heads dense, ovate: fls. white; calyx hirtellous, upper lip 3-toothed to hardly the middle, margin revolute; lower lip with bristle-like teeth. Portugal.

9. **villòsus,** Linn. Subshrub, about 3 in. high: sts. much branched, erect, pubescent: lvs. narrow-linear, acute, ciliate, fascicled at the axils; floral lvs. broadly ovate, acuminate, villous: floral whorls in an ovate-globose spike: fls. purplish crimson; calyx villous, teeth of upper lip short, ovate-lanceolate, of lower subulate. Portugal.—Some of the material offered in the trade under this name may be a form of *T. Serpyllum.*

10. **striàtus,** Vahl (*T. Zygis,* Sibth. & Smith, not Linn.). Subshrub, about 3 in. high: branches woody, procumbent; flowering branchlets erect, somewhat hirsute: lvs. stiff, sessile, linear or subspatulate, glabrous, more or less ciliate beneath; floral lvs. broadly cordate-ovate, striate and pubescent: fls. congested in a dense, ovate head with the uppermost lvs. forming an involucre, white (purple?); calyx-teeth lanceolate; corolla-tube rather included.

11. **capitàtus,** Hoffmgg. & Link (*Coridothymus capitatus,* Reichb. f.). Subshrub, 6 in. to about 1 ft. high: branches stout and erect, sterile branches finally spiny: lvs. stiff, linear, very short, rather 3-sided: head ovate, dense, cone-like: fls. rose; calyx compressed at the margins, teeth ciliate; corolla-tube short-exserted. Medit. region.—Treated as a distinct genus, *Coridothymus capitatus,* by Briquet in Engler & Prantl, Pflanzenfamilien IV. 3*a*.

T. córsicus, Pers.=Satureia corsica.—*T. eréctus,* Hort., is offered in the trade as a small shrubby evergreen about 9–12 in. high, with a rigid habit and clusters of rose or pale pink fls.—*T. ericæfòlius,* Roth=Micromeria varia, Benth. Subshrub, procumbent, pubescent or villous: lvs. sessile, lower ovate, upper lanceolate, somewhat canescent beneath: fls. minute, sessile in a sessile or peduncled fascicle; calyx usually purplish. Canary Isls.

F. Tracy Hubbard.

THYRSACÁNTHUS (Greek, *thyrse* and *flower*). *Acanthàceæ.* Erect, glabrous, pubescent or villous herbs, which are adapted to the warmhouse. Lvs. opposite, entire, usually large: fls. red, fascicled at the bract-axils, pedicelled; fascicles or cymes arranged in a terminal thyrsoid, simple raceme or paniculately branched; calyx short, rather 5-parted, segms. narrow, acute or acuminate; corolla-tube elongate, straight or somewhat incurved, limb somewhat 2-lipped, 4-cleft; stamens 2, staminodia 2; disk rather thick: caps. oblong; seeds 4 or fewer by abortion.—About 23 species, Trop. Amer. The oldest and now accepted name of the genus is **Odontonema.**

3805. Odontonema (Thyrsacanthus) Schomburgkianum. (×½)

O. Schomburgkiànum, Kuntze (*Thyrsacánthus Schomburgkiànus,* Nees. *T. rùtilans,* Planch.). Fig. 3805. A shrubby plant, becoming 6 ft. high: lvs. oblong-lanceolate, nearly sessile: racemes 8–10 in. or even 3 ft. long from the upper axils, slender, drooping: fls. tubular, red, about 1½ in. long, pendulous. Dec.–March. Colombia. B.M. 4851. R.H. 1852:160. Gn. 42, p. 482; 69, p. 209. F.S. 7:732. G. 20:177; 36:177. G.W. 4, p. 352; 11, p. 196.

O. callistàchyum, Kuntze (Thyrsacanthus callistachyus, Nees. T. lilacinus, Lindl. Justicia lilacina, Hort.). Shrub, 2 ft. high: lvs. oblong, petioled, tomentose: fls. red; sepals pubescent, bristly-acuminate; corolla glabrous. Mex. J.F. 2:165.

F. Tracy Hubbard.

THYRSÓPTERIS (Greek, *bunch* or *raceme* and *fern;* the fructification is disposed in racemose bunches). *Polypodiàceæ.* Tree-like fern: lvs. decompound, the fertile portions appearing like bunches of stipitate acorn-cups, the sterile portions twice-pinnate and then deeply pinnatisect. One species, Isl. Juan Fernandez, *T. élegans,* Kunze. Tree fern about 15 ft. high: lvs. decompound, reaching a length of 5–6 ft., one-third of which is naked; sterile portions bipinnate, with lanceolate incised pinnules; fertile parts tripinnate, each pinna becoming a raceme of stalked involucres: sori globose; involucre cup-shaped.

THYRSÓSTACHYS (Greek, *thyrse* and *spike*). *Gramíneæ.* A genus of 2 species of arborescent bamboos native to Upper Burma and Siam, which has been referred to Rottboellia but is probably sufficiently distinct. The st.-sheaths are long, thin and persistent, with a long narrow blade. The lvs. are small or moderate-sized. *T. siaménsis,* Gamble, is a tender, deciduous, "giant bamboo," with very graceful tufted sts. 25–30 ft. high and 1½–3 in. thick: st.-sheaths waved and truncate at the top, 9–11 x 4½–8 in.; auricles short-triangular: blade narrowly triangular: lvs. small, narrow, linear, 3–6 x ⅓–½in. Siam.—Once intro. in S. Calif., but it did not persist. Probably not now in cult. in this country outside test-grounds.

THYSANÒTUS (Greek, *fringed* and *ear,* alluding to the 3 inner perianth-segms. which are fringed). *Liliàceæ.* Perennials, suitable for the greenhouse. Rhizomes sometimes very short, sometimes stout and horizontal: lvs. radical, grass-like, flat or terete: scapes leafless, now erect and simple or paniculate above, now much branched or in one species twining: fls. sometimes densely fascicled, with 1 terminal fascicle or few at the top of the scape, sometimes variously panicled; perianth withering, persistent, segms. distinct, outer narrow, margin entire, inner with a broad colored margin, beautifully fimbriate-ciliate; stamens 6; ovary sessile or short-stipitate, 3-celled: caps. globose or ovoid.—About 21 species, Austral., one of which is also found in the Philippines and China. The difference in the inner and outer stamens and the absence of the latter in some species may not always be as constant as it would appear at first sight. The following species have been occasionally cult. They thrive in sandy loam and may be increased by offsets.

T. dichótomus, R. Br. (T. intricatus, Lindl. T. tenuis, Lindl., not Endl.). Rhizome thick; sts. very variable, sometimes erect, branched, 1–2 ft. high, rarely almost twining: lvs. radical, few, short: fls. 1 or 2, rarely 3, in terminal umbels; perianth-segms. purple; stamens 6. B.R. 24:50; 26:4. J.F. 4:402.—*T. júnceus,* R. Br. Rhizome thick: sts. slender, loosely branched, erect or flexuous, 1–2 ft. high: lvs. radical, few, narrow-linear, short: fls. 1–3, in terminal umbels and sometimes 1 or 2 sessile along the lower branches; perianth-segms. purple, 5–6 lines long; stamens 6. B.M. 2351. B.R. 656.—*T. multiflòrus,* R. Br. Rootstock densely tufted: lvs. all radical, densely tufted, erect, rigid, much shorter than the scape: scapes simple, 6–18 in. high, bearing a single terminal, many-fld. umbel or rarely a second one lower down: perianth-segms. purple, the outer very acute, inner rather shorter; stamens 3. Var. *prolifer,* Hort. (T. proliferus, Lindl.), is a luxuriant form, with a large terminal umbel, frequently a second rather lower down: the lvs. sometimes exceeding the scape. B.R. 24:8. F.S. 18:1911.—*T. tuberòsus,* R. Br. (T. elatior, R. Br. T. isantherus, Lindl., not R. Br.). Roots swollen into tubers: lvs. radical, not numerous, narrow-linear, as long as the scape which is erect, rigid, terete and 6–12 in. (or more) high, branching into a loose, irregularly dichotomous panicle, each branch bearing a terminal 1–4-fld. umbel and sometimes a lateral sessile one: perianth purple, sometimes 6–7 lines long; stamens 6. B.R. 655.

F. Tracy Hubbard.

TIARÉLLA (Latin, *a little tiara* or *turban;* in reference to the form of the pistil). *Saxifragàceæ.* False Mitrewort. Slender erect hardy perennial herbs, useful for the wild-garden or any shaded spot.

3806. Tiarella cordifolia. (×¼)

Leaves several, radical, long-petioled, simple or 3-foliate; stipules small, adnate to the petiole: raceme terminal, somewhat bracteate, simple or compound: fls. white or reddish; calyx-tube short, lobes 5, ovate; petals 5, entire; stamens 10; ovary superior, compressed, 1-celled: caps. membranaceous, 1-celled, 2-valved.—About 8 species, 1 from Japan, 1 from the Himalayas, the remainder from N. Amer. These plants are little grown, but they are useful for colonizing or perhaps for the rock-garden and are particularly attractive in the autumn on account of their brilliant lf.-coloring. Prop. by division.

A. *Lvs. simple.*

B. *Petals oblong.*

cordifòlia, Linn. Foam-Flower. Fig. 3806. A handsome native perennial, forming a tufted mass, 6–12 in. high, of broadly ovate lobed and serrate lvs. and simple erect racemes of white fls. borne well above the foliage in May. Fls. about ¼in. across; petals oblong, clawed, somewhat exceeding the white calyx-lobes. In rich, moist woodland, Nova Scotia to Ont., south to Ga. Gn. 22, p. 21; 32, p. 511; 53, p. 456; 55, p. 40; 66, p. 87. V. 11:35. G.L. 26:153. C.L.A. 4:340. G. 6:27; 10: 144; 12:127; 17:464. Gn.M. 1:188. Gn.W. 21:893. J.H. III. 54:423.—An elegant plant well worthy of general cult. It is a lover of cool shaded places and of rich moist soil. It will do well, however, in ordinary soil and flower freely in a half-shaded place, but the varied lf.-markings of bronzy red and other signs of luxuriance are not brought out to their fullest extent except with moisture, coolness and a fairly rich soil. The plant forces well and easily in a coolhouse for early spring flowering. It is tenacious of life and generally easy to manage. Var. **albiflòra,** Hort., is a fine white-fld. form. Var. **purpùrea,** Hort. (*T. purpùrea,* Hort.), is a purple-fld. form, of which the following variations are also offered in the trade: *purpùrea màjor,* with salmon-rose or wine-red fls.; *purpùrea màjor compácta,* a more compact grower with bronzy chamois-colored fls.; *purpùrea marmoràta,* with very attractive bronze foliage passing to blackish green and marbled with purple: fls. very numerous, maroon.

BB. *Petals filiform, inconspicuous.*

unifoliàta, Hook. Hardy perennial: lvs. thin, rounded or triangular, 3–5-lobed, the lobes crenate-toothed; st.-lvs. usually only 1, rarely 2–3: panicle loose; petals small. W. Amer.—The lobing of the lvs., according to Bot. of Calif., varies so that it may pass into the next species.

AA. *Lvs. 3-foliolate.*

trifoliàta, Linn. Resembling *T. unifoliata* except in having 3-foliolate lvs. Ore. to Alaska, also N. W. Asia.

T. biternàta, Vent.=Astilbe biternata.

F. W. Barclay.
F. Tracy Hubbard.†

TIBOUCHÌNA (native name in Guiana). Including *Pleròma. Melastomàceæ.* Shrubs or subshrubs, rarely herbs, sometimes climbing, usually strigose-pilose or hispid, adapted to the warmhouse or to out-of-doors in the extreme South.

Leaves usually large, leathery, petioled, ovate or oblong, entire, 3–7-nerved: fls. generally in trichotomous terminal panicles, large, violet or purple, rarely 4-merous; calyx hirsute or strigose, tube ovoid, campanulate, urn-shaped or elongated, lobes 5, subulate, lanceolate or oblong; petals 5, obovate; stamens 10; ovary free or adhering toward the base to the 5 calyx-ribs, 5-celled: caps. 5-valved.—About 215 species, Trop. Amer., but chiefly from Brazil.

Tibouchinas are among the handsomest of our intermediate greenhouse plants, and can be readily trained in bush form, probably with the exception of *T. semidecandra,* which is better adapted as a pillar or trellis plant. These plants may be propagated at any time of the year, but early spring is the best season. Small pots should be half filled with sandy loam, the remainder being all sand and the cuttings inserted singly. They should be kept quite close and fairly moist, and they will root in a few weeks. After they are rooted, place them in a greenhouse with a night temperature of about 55°, allowing a rise of 20° in the middle of the day. Pinch the heart out as soon as they begin to grow, and a few days after they have been cut back, move them into a pot about 3 inches larger. A good fibrous loam may now be used for all future pottings, and as the plants get stronger about a third of sheep-manure may be added, also a little sharp sand and charcoal, to keep the soil sweet and porous. Give plenty of light at all times, but avoid strong sunshine. Give plenty of water, and syringe the under side of the foliage to prevent red-spider, which is about the only insect that is trouble-

3807. Tibouchina semidecandra. (×⅛)

some. Never allow the plants to become pot-bound until the size desired for flowering is attained. Give strict attention to keeping the plants in shape, by pinching the strong shoots, and tying them to the outer edge of the plants, allowing the weaker ones to grow, and fill up the middle of the plant. In summer the plants may be placed out-of-doors, and plunged to the rim of the pot, in a bed of ashes; but never allow the sun to strike them directly, as it will disfigure the foliage. These plants are excellent for exhibition purposes and conservatory decoration. The species *T. elegans* and *T. semidecandra* are worthy of general cultivation. (George F. Stewart.)

semidecándra, Cogn. (*Lasiándra macrántha*, Lind. & Seem. *Pleròma macránthum*, Hook.). Fig. 3807. A tender shrub: lvs. ovate or oblong-ovate, 2–6 in. long, round at the base, short-petioled, densely setose above, villous beneath, not foveolate, 5-nerved or 3-nerved: bracts broadly suborbicular, somewhat rounded at the apex and shortly apiculate, margin not translucent: fls. reddish purple to violet, often 5 in. across, solitary and terminal or 1 fl. terminal and 2 in the upper axils on the branchlet; stamens purple; style setulose. Brazil. B.M. 4412 (as *P. Kunthianum*); 5721. F.S. 23:2430. Gn. 44:120. F. 1868:193. I.H. 16:594. G. 29:34. G.W. 7, p. 390. G.Z. 15:1. J.H. III. 42:219. H.F. II. 10:72. Var. **floribúnda** is more suited to pot cult. and flowers more freely than the type when small. *Lasiándra*, or *Pleròma spléndens*, Hort., should be compared with this. The fls. of *T. semidecandra* last but a day or so, but the flowering season lasts for several weeks. Plants may also be used for summer bedding. They are seldom out of bloom. The species is much esteemed in Fla., where it makes a showy shrub 8 ft. high. It endures a few degrees of frost with impunity, and even if cut down it sprouts readily.

élegans, Cogn. (*Pleròma élegans*, Gardn.). Tender shrub, 3–6 ft. high: lvs. rigid, fragile, oblong or ovate-oblong, 3-nerved: fls. purple, 1½ in. across; calyx more or less armed with rigid spreading bristles which are thickened at the base. Brazil. B.M. 4262. P.M. 15:27. F.S. 12:1212 (as *Lasiandra elegans*). H.F. 3:24.

There is a plant offered in the trade under the name of *Pleròma cándidum*, Hort. Bull, described as being a shrub with dark green ovate-lanceolate lvs., densely silky-hairy, the 5 longitudinal veins very prominent beneath: fls. snowy white, about 1½–1¾ in. across, borne in loose terminal heads. Said to have been intro. from S. Austral. As there are no Tibouchinas known outside of S. Amer. it is not likely that this is correctly placed in Pleroma; the proper identification of the plant is at present impossible.—*T. lepidòta*, Baill. (Lasiandra lepidota, Naud.), is a plant which has been much confused and is still uncertain. F.W. 1874:289.—There is a plant at least formerly cult. under the name of *Pleròma sarmentòsum*, Hook. Small villous shrub with the branches and branchlets sarmentose: lvs. short-petioled, ovate or oblong, acute, base rounded or cordate, 7-nerved, pilose: fls. blue, about 2 in. across; calyx-tube obovoid or subglobose, densely tomentose; petals cuneate-obovate. Peru. Its position and name in Tibouchina are uncertain. B.M. 5629. F.W. 1869:225.—*T. stenocárpa*, Cogn. Shrub with acutely 4-angled branches which are sometimes somewhat winged: lvs. short-petioled, usually oblong, base generally short-attenuate, 5-nerved, silky villous: fls. many in a terminal panicle, usually rather large, purple or violet-purple; calyx-tube campanulate; petals narrowly obovate-cuneate. Brazil. F. Tracy Hubbard.†

TIEDEMÁNNIA: *Oxypolis.*

TIGER-FLOWER: *Tigridia.* **T. Lily:** *Lilium tigrinum.*

TIGRÍDIA (*tiger-like*, referring to the peculiarly marked flowers). *Iridàceæ*. Bulbous plants, grown in the greenhouse and also making very showy summer-blooming subjects.

Bulbs tunicated: st. erect, mostly unbranched, 1–2½ ft. tall, with a few narrow plicate lvs. at the base and 2 or 3 smaller ones higher up: spathes 1 or 2, leaf-like, each bearing 1 or few blossoms: fls. in shades of yellow, orange or purplish, variously spotted, often very showy; perianth wide-spreading, with no tube, the segms. 6, in 2 dissimilar series, connivent into a broad cup at the base; stamens 3, the filaments united into a long cylindrical tube including the style; pistil with 3-loculed ovary, long style with 3 2-parted branches.—About 13 species from Mex., Cent. Amer., Peru, and Chile. *T. Pavonia*, from S. Mex., was in cult. in Eu. in the 16th century. L'Obel described it in 1576. The younger Linnæus referred it to the genus Ferraria, and some of the tigridias are yet cult. under that name. Ferraria, however, is a S. African genus, and all the parts of the perianth are nearly equal. *T. Pavonia* is cult. in many forms, and is the only common species in gardens. The fls. of all tigridias are fugitive, lasting only for a day.

Tigridias are tender "bulbs" requiring the treatment given gladiolus. Plant in well-prepared soil when settled weather comes, 2 to 3 inches deep and 4 to 8 inches apart. The principal blooming period is July and August. Allow the corms to remain in the ground until danger of frost approaches, then store in a dry place where dahlias or gladioli will keep. See that the corms are dry before being placed in storage. Propagation is by cormels and seeds. The best colors are secured in warm weather.

3808. Tiger-flower.—Tigridia Pavonia. (×¼)

A. *Fls. large (often 4 in. or more across); the 2 rows of perianth-segms. very dissimilar; stigmas decurrent. (Tigridia proper.)*

Pavònia, Ker-Gawl. Tiger-Flower. Shell-Flower. Fig. 3808. Erect, usually unbranched, 1½–2½ ft. tall, glabrous, with several sword-shaped, strongly plicate long-pointed lvs., the spathe-lvs. 3–5 in. long: fls. produced in succession through the warm season, very large and showy, in some forms 5–6 in. across, oddly marked, with a cup-shaped or saucer-shaped center and wide-spreading limb formed by the obovate outer segms. which are bright red on the limb, and purple, yellow, or red-spotted on the claw; inner segms. panduriform (fiddle-shaped), about half the length of the outer ones, the blade ovate-acute, orange-yellow, and copiously spotted. Mex. and Guatemala. B.M. 532 (as *Ferraria Tigridia*). I.H. 38:142. G.C. III. 55, suppl. Feb. 21. Gn. 64, p. 56. G.W. 11, p. 290; 14, p. 674. R.B. 26:73. Var. **conchiflòra,** Hort. (*T. conchiflòra*, Sweet), has bright yellow fls. Var. **Wátkinsonii,** Hort. (var. *aùrea*, Hort. *T. conchiflòra Wátkinsonii*, Paxt.). Raised from seeds of var. *conchiflora* pollinized by *T. Pavonia*, before 1840, by J. Horsefield, Manchester, England. Horsefield is quoted as follows by Paxton: "In habit and strength this hybrid resembles *T. Pavonia*, the male parent; but in color and the markings of the flower it resembles *T. conchiflora*, the female parent; the large outer sepals, however, are of a very deep yellow, inclining to orange, and sometimes elegantly streaked with red lines; whilst the spotted center equals, if not surpasses, the brilliancy of either of the species. One of its greatest merits is being so free a bloomer, and as easy to cultivate and increase as *T. Pavonia*, whereas *T. conchiflora* is rather delicate, increases slowly, and is easily lost." Dutch bulb-dealers may still offer it. P.M. 14:51. Var. **álba,** Hort., has white fls., with red spots in the throat. G.L.

26:128 (as *T. alba*). Var. **álba immaculàta,** Hort., is a spotless white variety, a sport from var. *alba.* Gn. 49, p. 361. Var. **flàva,** Hort., has pale yellow fls. with red-spotted center. Gn. 50:22. Var. **canariénsis,** Hort., is also a pale yellow-fld. form, but named as if an inhabitant of the Canaries. Var. **lùtea immaculàta,** Hort., has pure yellow spotless fls. Var. **rôsea,** Hort., has rose-colored fls. with yellow variegated center. Var. **lilàcea,** Hort., has lilac fls. with spotted center. Gn. 45:26. Var. **speciôsa,** Hort., is a partially dwarf form with deeper red color, the interior of the cup being similar in color to the limb. Described in 1843. G. 36:359. Var. **grandiflôra,** Hort., has fls. much like those of *T. Pavonia* itself except that they are larger and brighter colored. Gn. 45, p. 263. G. 1:20; 6:263 (as *T. grandiflora*). Identical with this, or subtypes of it, are the forms known as *Wheeleri, coccinea, splendens.* Most of the marked departures in colors of *T. Pavonia* are recent. In catalogues the above names often appear as if they were species names.

3809. Tigridia Pringlei. (×⅕)

Prínglei, Wats. Fig. 3809. Distinguished by Sereno Watson, the author of the species, as follows: "Very closely related to *T. Pavonia,* and if color alone were to decide, it might be considered a variety of it, though differing markedly even in that respect from the old species. The base of the sepals is blotched (rather than spotted) with crimson, with a border of orange, the reflexed blade being of a bright scarlet-red. The petals have the base blotched and coarsely spotted with crimson, with a well-defined, deeper-colored, brownish margin, the blade orange, tinged with scarlet, but not at all spotted as in *T. Pavonia.* The more essential difference is in the form of the petals, which have a broadly cordate or reniform base, with a much narrower small triangular-ovate acute blade. The sepals are also smaller and more oblong in outline." N. Mex. G.F. 1:389 (adapted in Fig. 3809). B.M. 7089.

AA. *Fls. relatively small; the 2 rows of segms. differing less in size; stigmas capitate, or at least not strongly decurrent.* (*Subgenus Beatonia.*)

buccífera, Wats. Fig. 3810. About 1 ft. high, slender, branching, glaucous: lvs. very narrow, strongly plicate: fl. 2 in. across, the cup pale greenish yellow, dotted with purple, the obovate obtuse blade of the outer segms. light purple; inner segms. "folded together in such a manner as to form a sunken longitudinal tube down the center, the dilated sides at the upper end of the tube approaching each other in the form of 2 cheek-like prominences,—these are colored white, purple, and yellow, while the small rounded terminal blade is a deep purple." Mountains of Jolisco, Mex. G.F. 2:413 (adapted in Fig. 3810).—Offered in 1889 by Horsford.

T. aùrea, Hort., is Cypella plumbea.—*T. cælestis,* Hort., is Cypella plumbea.—*T. Houttei,* Roezl, is Hydrotænia Van Houttei.—*T. Meleágris,* Hort., is also a Hydrotænia (H. Meleagris, Lindl.), but is not in the American trade. B.R. 28:39.—*T. violàcea,* Schiede. & Schlecht. One of the Beatonia section: slender, narrow-lvd.: fls. 2 in. across, violet, spotted at the base; inner segms. small, cusp-pointed. Mex. B.M. 7356. H.U. 3, p. 301. Other kinds of Tigrida are likely to appear in cult.

L. H. B.

TÍLIA (the classical Latin name). *Tiliàceæ.* Linden. Lime. Basswood. Whitewood. Ornamental trees, grown for their handsome foliage, good habit, and also for their fragrant flowers.

Deciduous: winter buds large, obtuse, with several imbricate scales, terminal bud wanting: lvs. alternate, petioled, usually cordate, serrate, with caducous stipules: fls. small, in long-peduncled drooping cymes; the peduncle for about half its length adnate to a membranous ligulate bract; sepals 5; petals 5, often with 5 opposite petaloid staminodes; stamens many, with the filaments forked at the apex; ovary superior, 5-celled; style slender, with 5-lobed stigma: fr. globose or ovoid, nut-like, usually with 1–3 seeds.—About 25 species throughout the temperate regions of the northern hemisphere, in N. Amer. south to the highlands of Mex., except W. N. Amer., and in Asia south to Cent. China. The names of the lindens, and particularly of those in cult., have been much confused, owing to the great variability of some species, the rather slight differences between many of the species and to the presence of many hybrids originated spontaneously and in cult. The light-colored soft and light wood is easily worked and much used for the interior finish of houses, for wood-carving, wooden baskets and other small wooden ware. The tough inner bark is used as a tying material and, particularly in Russia, in the manufacture of mats, cords, shoes, and other articles. The fls. yield large quantities of nectar and afford an excellent bee pasture, except *T. tomentosa* and *T. petiolaris,* which are poisonous to bees.

3810. Tigridia buccifera. (×nearly ½)

The lindens are very desirable trees of comparatively rapid growth and regular pyramidal habit while young, with slender-stalked medium-sized or rather large leaves and with small yellowish fragrant flowers in

drooping clusters followed by small inconspicuous nutlets. The species in cultivation are nearly all hardy North and not particular as to the soil, but do not thrive well in dry locations or in dry climates. They are much planted as shade and ornamental trees and, particularly in Europe, are favorite avenue and street trees. The best for avenue planting are *T. tomentosa*, *T. euchlora*, *T. americana*, *T. cordata*; *T. tomentosa* stands heat and drought better than any of the others, while *T. platyphyllos*, although often planted for its rapid growth, is likely to suffer in dry seasons or in dry localities.

Propagation is by seed which must be sown soon after ripening or stratified, as it does not germinate until the second year if kept dry and sown in spring. Also increased by layers; in layering usually the method of

3811. Tilia platyphyllos. (×⅔)

"stooling" is employed; this consists of cutting a younger tree close to the ground and of laying down and covering partly with earth the numerous shoots which will appear. Varieties or rarer species are often grafted in spring or budded in August on common stock. Plants raised from layers or grafts remain often one-sided for many years, as the lateral branches usually employed for propagation have the tendency to grow horizontally instead of strictly upright.

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KEY TO THE SPECIES.

A. *Lvs. green or glaucous beneath, glabrous or pubescent with simple hairs.*
  B. *Under side of lvs. and branchlets pubescent: fls. without staminodes*... 1. **platyphyllos**
  BB. *Under side of lvs. glabrous except axillary tufts of hairs.*
    C. *Axillary tufts present at the base of the lf. and elsewhere.*
      D. *Margin of lvs. finely serrate: fls. without staminodes.*
        E. *Lvs. green beneath; the tertiary veins prominent.*
          F. *Upper surface of lvs. dull green, margin with short-pointed teeth*..... 2. **vulgaris**
          FF. *Upper surface glossy dark green, margin with long-pointed teeth*..... 3. **euchlora**
        EE. *Lvs. glaucous beneath; the tertiary veins not prominent.*
          F. *Cymes 5–11-fld.: fls. without staminodes*..... 4. **cordata**
          FF. *Cymes 8–40-fld.: fls. with staminodes*..... 5. **japonica**
      DD. *Margin of lvs. coarsely serrate, lvs. often 3-lobed: fls. with staminodes*..... 6. **mongolica**
    CC. *Axillary tufts of hairs wanting at the base, present elsewhere: lvs. 4–5-in. long: fls. with staminodes* ..... 7. **americana**
AA. *Lvs. with stellate hairs or stellate tomentum beneath: fls. with staminodes.*
  B. *Branchlets glabrous.*
    C. *Axillary tufts of hairs present on the grayish green or grayish under side of the lvs*..... 8. **neglecta**
    CC. *Axillary tufts of hairs wanting, under side white or whitish.*
      D. *Under side of lvs. densely white-tomentose.*
        E. *Size of the ovate or ovate-oblong lvs. 4–7 in., margin sharply serrate*..... 9. **heterophylla**
        EE. *Size of the orbicular-ovate lvs. 2–4 in., margins sinuately serrate*.....10. **Oliveri**
      DD. *Under side of lvs. thinly grayish tomentose or stellate-pubescent, usually with long hairs on the veins*.....11. **spectabilis**
  BB. *Branchlets pubescent.*
    C. *Without axillary tufts of hairs on the lvs. beneath.*
      D. *Shape of lvs. orbicular-ovate, the white tomentum persisting.*
        E. *Tomentum of branchlets, buds, and petioles grayish or whitish; margin of lvs. finely serrate with short-pointed teeth.*
          F. *Habit upright: petioles shorter than half the blade: fr. slightly 5-angled*.....12. **tomentosa**
          FF. *Habit pendulous: petioles longer than half the blade: fr. 5-furrowed*.....13. **petiolaris**
        EE. *Tomentum of branchlets, buds, and petioles yellowish or brownish: margin of lvs. coarsely serrate with long-pointed teeth*.....14. **mandschurica**
      DD. *Shape of lvs. ovate or triangular-ovate: lvs. irregularly and coarsely serrate with short-pointed teeth, often glabrescent with age*.....15. **Miqueliana**
    CC. *With axillary tufts of hairs; lvs. orbicular-ovate, grayish-tomentose beneath, brownish on midribs and nerves*.....16. **Maximowiczi[ana]**

1. platyphýllos, Scop. (*T. grandifòlia*, Ehrh. *T. europæa*, Linn., in part). LARGE-LEAVED LIME. Fig. 3811. Tree, to 120 ft.: young branchlets pubescent, older glabrous: lvs. orbicular-ovate, abruptly acuminate, obliquely cordate at the base, regularly serrate, dull green and short-pubescent or glabrous above, light green and pubescent beneath, 3–4 in. long; petioles stout, hairy: fls. in usually 3-fld. pendulous cymes; petals oblanceolate, longer than sepals; stamens 30; style glabrous: fr. globose, ovoid or pyriform, 3–5-ribbed, apiculate, tomentose, thick-shelled. June; the earliest species to bloom. Eu. G.F. 2:256 (adapted in Fig. 3811). H.W. 3:42, p. 24, 25. R.F.G. 6:316, 317, 318.—Very variable; some of the most important varie-

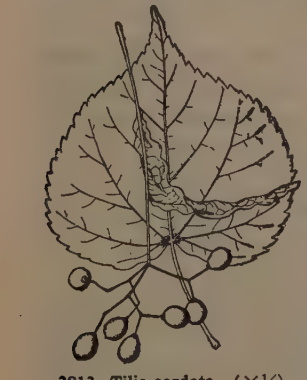
ties are the following: Var. **pyramidàlis,** Kirchn. Of narrow pyramidal habit. M.D.G. 1898:161. Var. **corállina,** Dipp. (var. *rùbra,* Hort.). Young branches red. Var. **aùrea,** Kirchn. Young branches golden yellow. Var. **laciniàta,** Henry (var. *asplenifòlia,* Kirchn. var. *filicifòlia,* Hort. *T. europæa* var. *laciniàta,* Loud.).

3812. Tilia vulgaris. (×½)

Lvs. deeply and irregularly cut. G.W. 15, p. 662. Var. **vitifòlia,** Simonkai. Lvs. slightly 3-lobed or indistinctly lobed.—This species is the strongest grower and in this country often sold as *T. europæa.* It is more impatient of drought than most other species and therefore not to be recommended as a street tree.

2. **vulgàris,** Hayne (*T. intermèdia,* DC. *T. europæa,* Linn., in part). Common Linden. Fig. 3812. Tree, to 120 ft.: young branchlets glabrous: lvs. broadly ovate, abruptly acuminate, obliquely cordate or truncate at the base, serrate with short-pointed teeth, dark green above, light green beneath, glabrous except axillary tufts of hairs, 3–4 in. long; petiole about half as long as the blade: fls. 5–10, similar to those of the preceding species: fr. ovoid or globose, apiculate, tomentose, thick-shelled. June, July; a week or 10 days later than the preceding species. G.F. 2:256 (adapted in Fig. 3812). R.F.G. 6:313. M.D.G. 1904:188, 189.—Supposed to be a spontaneous hybrid of the preceding species and *T. cordata.* This is one of the best species for general planting and fine old trees of it are occasionally seen in this country.

3. **euchlòra,** Koch (*T. dasýstyla,* Kirchn., not Stev. *T. rùbra* var. *euchlòra,* Dipp.). Crimean Linden. Tree, to 50 ft.: young branchlets glabrous, green: lvs. orbicular-ovate, abruptly acuminate, obliquely cordate at the base, regularly serrate, the teeth with slender points, dark glossy green above, paler beneath and glabrous except axillary tufts of brown hairs, 2–3 in. long; petiole slender, more than half as long as the blade: fls. 3–7, in pendulous cymes; style pubescent near the base: fr. ovoid, slightly 5-ribbed, tomentose, thick-shelled. July. M.D.G. 1901:381, 540.—Supposed to be a hybrid of *T. caucasica,* Rupr., and *T. cordata* and seems to occur spontaneously in the Caucasus and Transcaucasia. It is one of the most beautiful lindens on account of its dark green glossy foliage. It is usually prop. by budding.



3813. Tilia cordata. (×½)

4. **cordàta,** Mill. (*T. ulmifòlia,* Scop. *T. parvifòlia,* Ehrh. *T. microphýlla,* Vent. *T. silvéstris,* Desf. *T. europæa,* Linn., in part). Small-leaved Linden. Fig. 3813. Tree, to 100 ft.: young branchlets at first slightly pubescent, soon glabrous: lvs. suborbicular, often broader than long, cuspidate, cordate at the base, regularly serrate with short-pointed teeth, dark green and somewhat lustrous above, glaucous and glabrous beneath with brown axillary tufts, 1½–2½ in. long; petioles about half as long as blade: fls. 5–7 in nearly upright cymes; style glabrous: fr. globose, slightly ribbed, apiculate, tomentose, with thin fragile shell. July. Eu. G.F. 2:257 (adapted in Fig. 3813). H.W. 3:41, pp. 21, 22. R.F.G. 6:311, 312. M.D.G. 1904: 188. Var. **pyramidàlis,** Wittm. Of narrow pyramidal habit.

5. **japónica,** Simonkai (*T. cordàta* var. *japónica,* Miq.). Tree, to 60 ft.: young branchlets slightly pubescent at first: lvs. suborbicular, almost like those of the preceding species, 2–3 in. long; petioles usually longer than half the blade: fls. 7–40, in pendulous cymes; staminodes present: fr. ovoid, not ribbed, tomentose, thin-shelled. July. Japan. S.I.F. 1:72.

6. **mongòlica,** Maxim. Small tree, to 30 ft.: young branchlets glabrous, reddish: lvs. suborbicular, or ovate, acuminate, subcordate or truncate at the base, coarsely serrate and usually 3-lobed, dark green and shining above, glaucescent beneath, glabrous except axillary tufts, 1½–2½ in. long: fls. 6–12 in a cyme; the bract stalked; staminodes present; style glabrous: fr. ovoid, mucronulate, tomentose, thick-walled. July. Mongolia, N. China. R.H. 1902, p. 476. S.T.S. 1:61.

3814. Basswood, or American linden.—Tilia americana. (×½)

—Very distinct with its small coarsely serrate, birch-like lvs. reddish when unfolding; it flowers when only a few feet high.

7. **americàna,** Linn. (*T. glàbra,* Vent.). Fig. 3814. Tree, to 120 ft.: young branchlets glabrous, green: lvs. broadly ovate, abruptly acuminate, cordate or truncate at the base, coarsely serrate, the teeth long-pointed, dark green above, light green beneath with tufts of hairs in the axils of the lateral veins, but wanting at the base, 4–6 in. long, turning yellow in autumn: cymes pendulous, many-fld.: bract stalked, tapering toward the base: staminodes present: fr. ovoid or globose, without ribs, tomentose, thick-shelled. July. Canada, south to Va. and Ala., west to N. Dak., Kans., and E. Texas. S.S. 1:24. Mn. 6:153. Var. **macrophýlla,** Hort. (var. *mississippiénsis,* Hort.). A large-lvd. form. —This species is frequently planted as an avenue tree. Its wood is much used in the manufacture of wooden-

ware, cheap furniture, panels of carriages, and also of paper pulp.

8. **neglécta,** Spach (*T. Michaùxii*, Sarg., not Nutt. *T. pubéscens*, Hort., not Vent.). Tree, to 80 ft.: branchlets glabrous, red: lvs. broadly ovate or ovate, acuminate, obliquely cordate at the base, rarely truncate, coarsely serrate, with long-pointed, usually incurved teeth, dark green and glabrous or sparingly pubescent above, more or less stellate-pubescent and grayish green beneath with conspicuous axillary tufts, 5–6 in. long, turning yellow in autumn: cymes many-fld.; bract decurrent nearly to the base, tomentulose above; peduncle glabrous: fr. subglobose or ovoid, slightly furrowed, tomentose. July. E. Canada to Ga. and Texas west to Ohio. S.M. 673.—This species has often been confused with *T. pubescens* and with *T. heterophylla*.

9. **heterophýlla,** Vent. (*T. álba*, Michx. *T. Michaùxii*, Nutt.). Tree, to 60 ft.: young branchlets glabrous and red: lvs. broadly ovate to oval-ovate, short-acuminate, obliquely truncate or cordate at the base, finely serrate with rather short-pointed teeth, dark green and glabrous above, white-tomentose beneath without axillary tufts, 4–7 in. long: fls. in many-fld. pendulous cymes; bract decurrent often nearly to the base, rather large: fr. subglobose, tomentulose. June. W. N. Y. to Ala. and Ill. S.S. 1:27.—This is a very handsome linden with its large lvs. silvery white below and is sometimes sold as *T. macrophylla*.

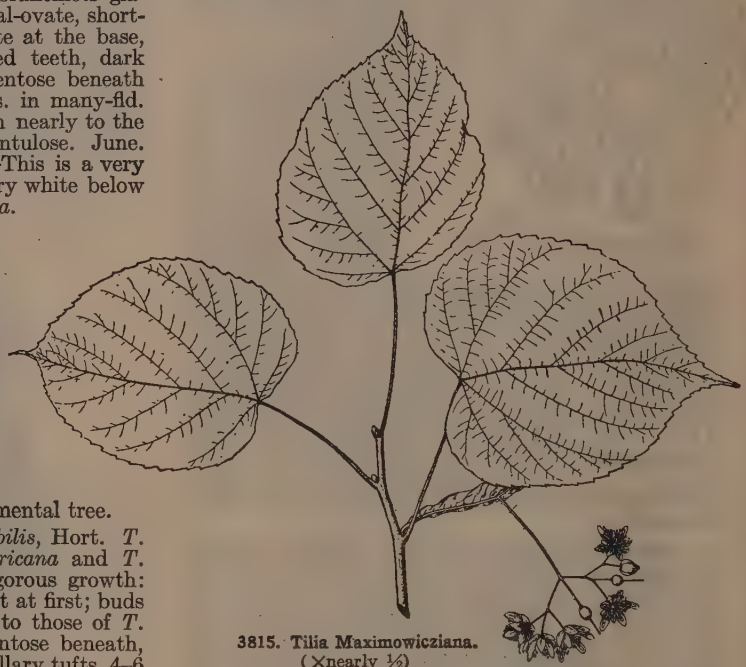
10. **Óliveri,** Szyszylowicz. Tree, to 50 ft.: young branchlets reddish brown, glabrous: lvs. ovate, short-acuminate, cordate or truncate at the base, sinuately denticulate, with short gland-tipped teeth, dark green and glabrous above, white-tomentose beneath, without axillary tufts, 3–5 in. long; petioles glabrous: fls. about 20, in pendulous cymes; bract sessile; pedicels short, thickened: fr. globose, tomentose and tuberculate, apiculate, thick-shelled. Cent. China.—This recently intro. species promises to be a handsome ornamental tree.

11. **spectábilis,** Dipp. (*T. álba spectábilis*, Hort. *T. Blechiàna*, Hort.). Hybrid of *T. americana* and *T. petiolaris* or *T. tomentosa*. Tree of vigorous growth: branchlets glabrous or slightly pubescent at first; buds pubescent toward the top: lvs. similar to those of *T. americana*, ovate, slightly grayish tomentose beneath, with long hairs on the veins, without axillary tufts, 4–6 in. long, 3–5 in. wide: infl. and size of fls. like those of *T. americana*, but tomentose though less densely than *T. tomentosa*. Blooms 2 or 3 weeks earlier than *T. tomentosa*. Of unknown origin; a similar form was raised from seed of *T. petiolaris* at the Arnold Arboretum in 1900. Var. **Móltkei,** Rehd. (*T. Móltkei*, Spaeth). Branchlets and buds quite glabrous: lvs. often without long hairs on the veins, 6–7 in. long. Originated at Spaeth's nursery near Berlin, Germany.

12. **tomentòsa,** Moench (*T. argéntea*, DC. *T. álba*, Ait. *T. álba pyramidàlis*, Hort.). White Linden. Tree, to 100 ft. with upright branches: young branchlets stellate-tomentose: lvs. nearly orbicular, abruptly acuminate, truncate or cordate at the base, serrate or doubly serrate, often lobulate, with short-pointed teeth, sparingly pubescent above, white-tomentose beneath, 3–5 in. across; petiole pubescent, less than half of the length of the blade: fls. 7–10, in pendulous tomentose cymes: fr. ovoid, slightly 5-angled, tomentose; shell woody. July. E. Eu., Asia Minor. R.F.G. 6:324. H.W. 3:43, p. 26. F.E. 14:1154, pl. 39. G.W. 8, p. 617. M.D.G. 1903:190; 1904:189.—This is a very handsome tree of dense habit with upright branches; it stands heat and drought better than any of the other species. Its fls. and those of the following species have proved poisonous to bees.

13. **petiolàris,** Hook. f., not DC. (*T. tomentòsa* var. *petiolàris*, Kirchn. *T. álba*, Koch. *T. americàna péndula*, Hort.). Weeping White Linden. Tree, to 80 ft., with slender pendulous branches: young branchlets tomentose: lvs. similar to those of the preceding species, but more finely and regularly serrate and petioles slenderer, longer than half the blade: fls. also like those of *T. tomentosa:* fr. globose, depressed at the apex, with 5 furrows, tomentose; seeds often imperfect. G.L. 19:257. Gng. 5:210; 15:291. Gn.W. 22:35 (suppl. Jan. 14). G. 34:687. M.D.G. 1901:163. B.M. 6737.—Known only in cult. and probably a variety of the preceding species.

14. **mandshùrica,** Rupr. & Maxim. Tree, to about 60 ft.: young branchlets and buds with brownish tomentum: lvs. orbicular-ovate, short-acuminate, usually cordate at the base, coarsely serrate with long-pointed teeth, sparingly pubescent above, white-tomentose beneath, 4–6 in. long; petiole about half as long as the blade, tomentose: fls. 7–10, in pendulous cymes covered with brownish tomentum: fr. globose, tomentose, with 5 distinct ribs toward the base or without ribs. N. China, Manchuria, Korea.—Similar to *T. tomentosa*, from which it differs in the larger lvs. with long-pointed teeth and in the fr. Like the two following species still rare in cult.



3815. Tilia Maximowicziana. (×nearly ½)

15. **Miqueliàna,** Maxim. Tree, to 40 ft.: young branchlets finely tomentose: lvs. ovate or deltoid-ovate, usually much longer than broad, acute or acuminate, obliquely cordate at the base, coarsely serrate with broad mucronate teeth, dark green and glabrous or nearly so above, grayish tomentose beneath, without axillary tufts of hairs, 2½–5 in. long: fls. 10–20 in pendulous tomentose cymes; stamens 60–75; style shorter than petals, hairy at the base: fr. subglobose, tomentose, 5-ribbed at the base. Cult. in Japan; native habitat unknown. S.I.F. 1:72.

16. **Maximowicziàna,** Shirasawa (*T. Miyàbei*, Jack. *T. Miqueliàna*, Sarg., not Maxim.). Fig. 3815. Tree, to 100 ft.: young branchlets tomentose: lvs. broadly ovate or orbicular-ovate, abruptly acuminate, obliquely cordate at the base, coarsely serrate with broad mucro-

nate teeth, dark green above and pubescent at first, finally glabrous or nearly so, grayish tomentose beneath with brownish axillary tufts of hairs, finally often becoming partly glabrous, 3–6 in. long; petiole stout, less than half the length of the blade: fls. small, 10–18 in pendulous tomentose cymes; style exserted: fr. globose, 5-ribbed, tomentose, thick-walled. Japan. S.I.F. 2:50. G.F. 6:113 (adapted in Fig. 3815).

T. caucásica, Rupr.=T. rubra.—*T. corinthìaca*, Bosc=T. rubra, DC.—*T. Henrydna*, Szyszyl. Tree, to 50 ft.: branchlets pubescent at first: lvs. broadly ovate, obliquely cordate or truncate, with bristly teeth, brownish tomentose beneath, with axillary tufts of hairs, 2–5 in. long: fls. 20 or more in a cyme. Cent. China.—*T. intónsa*, Wilson (T. tonsura, Veitch). Tree, to 60 ft.: young branchlets pubescent: lvs. broadly ovate, cuspidate, serrate, pubescent and grayish green beneath, 3–6 in. long: fls. 1–3: fr. ovoid, 5-angled. W. China.—*T. kiusiana*, Makino & Shiras. Tree, to 50 ft.: lvs. oblong-ovate, acute, obliquely truncate at base, serrate, glabrous, 1½–2 in. long; petiole about ½in. long: cyme 20–35-fld.: fr. globose. Japan. S.I.F. 2:50. Very distinct on account of the small and narrow, short-stalked lvs.—*T. orbiculàris*, Jouin. Very similar to T. petiolaris, but lustrous and glabrous above, grayish tomentose beneath, on shorter petioles. Supposed to be a hybrid between T. petiolaris and T. euchlora, but probably only a variety of the former; originated in the nursery of Simon-Louis near Metz, Germany.—*T. paucicostàta*, Maxim. Small tree; allied to T. cordata: lvs. ovate, usually truncate at base, with long-pointed teeth, green on both sides, about 2½ in. long. W. China.—*T. pubéscens*, Ait. Tree, to 40 ft.: branchlets rusty stellate-pubescent: lvs. ovate, obliquely truncate at the base, coarsely serrate, rusty tomentulose beneath: fr. rusty tomentose. N. C. to Fla. and Texas. S. S. 1:26. Tender and rarely cult.; the plant cult. under this name is usually T. No. 8.—*T. rùbra*, DC. (T. caucasica, Rupr. T. corinthiaca, Bosc). Tall tree with red glabrous branchlets: lvs. similar to those of T. platyphyllos, but glabrous, lustrous above, light green beneath, with long-pointed teeth: cymes 3–7-fld.: fr. ovoid or subglobose, slightly angled. S. E. Eu., Caucasus, W. Asia. Apparently not in cult., often confused with red-branched, slightly pubescent forms of T. platyphyllos.—*T. Spaèthii* =T. americana × T. cordata.—*T. tonsùra*, Veitch=T. intonsa.—*T. Tùan*, Szyszyl. Tree, to 50 ft.: young branchlets glabrous or nearly so: lvs. broadly ovate, truncate or slightly cordate at the base, minutely toothed, entire below the middle, grayish tomentose beneath with axillary tufts, 2½–5½ in. long: cymes 10–20-fld.: fr. subglobose, thick-shelled. Cent. China.

ALFRED REHDER.

TILLÆA (named for M. A. Tilli, 1653–1740). *Crassulàceæ*. Annual herbs, usually very small, aquatic or terrestrial, somewhat succulent, generally very glabrous: lvs. opposite, cylindrical, subulate or flat, very entire: fls. minute, axillary, solitary or cymose or arranged in terminal cymose panicles, white or reddish; calyx 3–5-lobed or parted; petals 3–5, free or connate at the very base; stamens 3–5; carpels 3–5, free: follicles many, rarely 1-seeded. About 25 species, cosmopolitan. *T. muscòsa*, Linn. Minute: sts. branched and decumbent at base, reddish, about 1 in. or more long: lvs. oblong, blunt: fls. axillary, sessile; sepals ovate or lanceolate; petals nearly subulate, white tipped with red. Eu., in moist barren places.

TILLAGE. The working or stirring of the land, with the purpose to improve it for agricultural purposes, is known by the general name of tillage. There is a tendency to use the word cultivation for these operations. Tillage is a specific technical term, and is to be preferred.

In the eager discussions of scientific matters, as applied to agriculture in recent years, there is danger of forgetting that the fundamental practice in all kinds of farming, after all, is the tillage of the land. The knowledge of the importance of tillage has developed late in the world's history. In fact, it was only within the latter part of the last century that the real reasons for tilling came to be popularly understood in this country. Even now there are many persons who think that the object of tillage is to kill weeds.

The modern conceptions of tillage probably date largely from Jethro Tull's book on "Horse-Hoeing Husbandry," which reached the second and full edition in 1733, in England. This book awakened so much discussion that the system of "horse-hoe husbandry" recommended by it was called the "new husbandry." There had been tillage of land before Tull's time, but his writing seems to have been the first technical effort to show that tillage is necessary to make the soil productive rather than to kill weeds or to open the ground to receive the seeds. He contrived various tools whereby grain crops could be sown in rows and afterward tilled. The tillage of the land in early times was confined very largely to that which preceded the planting of the crop. In the vineyards of southern Europe, however, Tull observed that tillage was employed between the vines during the season of growth. Such vineyards prospered. He made experiments and observations on his return to England and came to the conclusion that tillage is of itself a very important means of making plants thrifty and productive wholly aside from its office of killing weeds. He supposed that tillage benefits plants by making the soil so fine that the minute particles can then be taken in by the roots. On the same hypothesis he explained the good effects of burning or "devonshiring" land, and also the benefits that followed the application of ashes: the minute particles of the ashes are so small as to be absorbed by roots. Although this explanation of the benefits of tillage was erroneous, nevertheless Tull showed that tillage is necessary to the best agriculture and that it is not merely a means by which seeds can be put into the land, weeds killed, and the crop taken out.

Tillage improves land in many ways. It divides and pulverizes the soil, gives the roots a wider "pasturage," as Tull puts it, increases the depth of the soil, aërates it, and improves its physical condition with respect to warmth and dryness.

Tillage also saves moisture by deepening the arable soil so that moisture is held, and also by checking evaporation from the surface by means of a thin blanket or mulch of granulated earth that is made by surface-working tools. Water is lost from the soil by underdrainage and by evaporation from the surface. The more finely the soil is granulated, within certain limits, the more water it will hold. Its capillary power is increased. As the water evaporates from the surface, the moisture is drawn up from the under surface so that there is a more or less constant flow into the atmosphere. If any foreign body, as a board or a blanket, is spread on the land, the evaporation is checked. A similar result may follow when the soil is covered with a layer of dry ashes or sand or sawdust. Very similar results are also secured when the surface is made fine and loose by means of frequent shallow tillage. The capillary connection between the surface soil and the under soil is thereby broken, This surface soil itself may be very dry, but it may serve as a blanket or mulch to the soil beneath. In some cases this conservation of moisture by frequent shallow tillage is probably the chief advantage of the tillage of the land in the growing season.

Land that is well tilled has different chemical relations from that which is neglected. Nitrification, decomposition, and other bacterial activities are hastened. The stores of plant-food are rendered available. The soil is made more productive.

The first requisite for the growing of the plant is to have the soil in such condition that the plant can thrive in it. It is only when the land is well tilled and prepared, or when its physical condition is nearly or quite perfect, that the addition of concentrated fertilizers may be expected to produce the best results. Fertilizing, therefore, is a secondary matter; tillage is primary.

The ideal tillage is that which is practised by the gardener when he grows plants in pots. The soil is ordinarily sifted or riddled so that unnecessary parts are removed, and most of it is brought into such condition that the plants can utilize it. The gardener adds leaf-mold or sand or other material, until the soil is brought into the proper physical condition. He also provides drainage in the bottom of his pots or boxes. Often the gardener will produce as much from a handful of soil as a farmer will produce from a bushel.

L. H. B.

TILLÁNDSIA (Elias Tillands was professor of medicine at the University of Abo, Sweden; in 1673 he made a catalogue of plants of the vicinity of Abo). *Bromeliàceæ*. Mostly epiphytes and all natives of America, allied to billbergias, æchmeas, guzmanias, pineapples, and the like; ornamental glasshouse subjects.

Perennial herbs, mostly of upright growth (the common *T. usneoides* being a marked exception), the bases of the narrow entire lvs. often dilated and forming cups that hold water and in which utricularias and other water-plants sometimes grow: fls. usually borne in spikes or heads, singly beneath bracts, perfect, with 3 sepals and 3 petals which are twisted or rolled in the bud, 6 stamens, a superior ovary with filiform style: fr. a 3-valved caps. containing hairy or plumose seeds. Vriesia is distinguished by having 1 or 2 scales or ligules at the base of the petals on the inside, whereas the petals of Tillandsia are eligulate. By some authors the Spanish moss is placed separately, as *Dendropogon usneoides*, Raf., distinguished by the habit and also by characters of flower and seed. Some of the cult. tillandsias belong to still other genera. This is the case with *T. zebrina*, which is properly *Cryptanthus zonatus* (Fig. 1120, Vol. II). This is an odd plant, producing crinkled deflexed saw-edged lvs., which are whitish beneath and brown-barred above, and small clusters of white fls. See p. 902, where other kinds of Cryptanthus in the American trade are described. Many species are described in horticultural literature as having been intro. into cult. but most of these are known only to amateurs and in collections where species of botanical interest are chiefly grown. In the American trade about 30 names appear, many of which are to be referred to other genera. The generic limits of Tillandsia, as of most bromeliaceous genera, are ill defined. By different authors a given species may be placed in any one of a half-dozen genera. Lately, Tillandsia and Vriesia have been merged, but in this book Vriesia is kept distinct, following Mez's monograph. It is useless to attempt a description of all the tillandsias that by chance may occur in collections. Persons who want to know the species other than those regularly in the trade should consult Baker's Handbook of the Bromeliaceæ, 1889, or Mez's Bromeliaceæ in DeCandolle's Monographiæ Phanerogamarum, 1896. The latter work, which regards Vriesia as a separate genus, admits 248 species of Tillandsia. The genus extends northward into the U. S., growing chiefly in Fla., and Texas, although one or two reach S. Ga., and the Spanish moss (which is *Tillandsia usneoides*) reaches Va. and is common throughout the South. The native upright tillandsias are not in the general trade, but they are sometimes offered: of such are *T. recurvata*, *T. tenuifolia*, *T. fasciculata*, *T. utriculata*.

3816. The Spanish moss (Tillandsia usneoides) hanging from the trees. Gulf coast.

Tillandsias are grown both for foliage and for flowers. The foliage is usually scurfy and sometimes blotched. Many of the species are very showy when in bloom, sending up strong central clusters of blue, violet, red, yellow, or white flowers. In nature, the seeds are carried in the wind by means of the soft hairs, and find lodgment on trees, where the plants grow. A few species, however, grow on the ground. In cultivation, most of the species are treated as pot-plants. The growing season is summer. In winter the plants should be kept nearly dormant, although not completely dry. They need a warm temperature and plenty of light while growing. Give a soil rich in peat. In some cases sphagnum may be added to advantage. Propagation is by suckers; also by seeds. For further cultural notes, consult *Billbergia*.

A. *Plant-body slender and hanging: fls. solitary in lf.-axils.*

usneoìdes, Linn. Spanish, Florida, or Long Moss. Figs. 3816, 3817. Whole plant hoary-gray, hanging from trees, the sts. very slender and often several feet long: lvs. scattered, narrow-linear, 1–3 in. long: fls. solitary in the lf.-axils, small and not showy, the petals yellow and reflexed at the end. Trop. Amer. and in the U. S. from Texas to Fla. and E. Va.; extends southward to S. Brazil. B.M. 6309. Gn. 37, p. 221. Gt. 45, p. 267. —This is one of the most characteristic plants of our southern regions. In moist regions it gives a most weird aspect to the forests. It is used as a packing material, and also, when specially prepared, for upholstery. It is rarely cult., although it is not uncommon in greenhouses, being hung on branches and beams; but it must be renewed frequently. The plant is named for its resemblance to the lichen Usnea.

AA. *Plant-body stiff and nearly or quite erect.*

B. *Stamens shorter than the petals.*

C. *Fls. few in the cluster.*

recurvàta, Linn. (*T. Bártramii*, Ell., at least in part). A few inches high, tufted, with scurfy terete or filiform recurved 2-ranked lvs.: fls. 1–5 on spike that is sheathed at the base but naked above, the corolla blue and exceeding the calyx. Fla. to Argentina and Chile.

CC. *Fls. many, distichous.*

ànceps, Lodd. (*Vrièsia ànceps*, Lem.). Erect, the fl.-st. 6–12 in. tall and bearing a spike with large distichous green bracts from which small blue fls. emerge: lvs. stiff, about 1 ft. long, dilated and striped at the base: fls. 2 in. or less long, blue or purplish, the perianth much exceeding the calyx. Costa Rica, Trinidad. L.B.C. 8:771.

Lindeniàna, Regel (*T. Líndenii*, Morr. *Vrièsia Líndenii*, Lem.). Lvs. rosulate, about 1 ft. long, dilated at the base, long recurving: spike large, the showy distichous bracts carmine: fls. large, much exserted beyond the bracts, the large wide-spreading segms. bluish purple. Ecuador, Peru. I.H. 16:610; 27:370 (as var. *Regeliana*). G.C. II. 12:461. R.H. 1872:230; 1898: 206 (as var. *tricolor*). F.M. 1872:44.—A handsome and popular species. This interesting species has also been described as *Phytarrhiza Lindenii*, Morr.

BB. *Stamens longer than the petals.*

C. *St. thickened and bulb-like at the base.*

bulbòsa, Hook. Small scurfy plant a few inches high, the st. swollen at the base: lvs. 3–5 in. long, much dilated and clasping at the base and terete above: fls. few, in racemose short spikes, long and narrow, the much exserted but not spreading petals purple. Var. **pícta,** Hook., has the upper lvs. and bracts scarlet. W. Indies to Venezuela. B.M. 4288. F.S. 3:221.

3817. Spanish moss.—Tillandsia usneoides. (Much reduced)

CC. *St. not prominently swollen.*

D. *Lvs. linear or filiform from the base or abruptly from a dilated base.*

polystàchya, Linn. (*T. angustifòlia,* Swartz. *T. parvispìca,* Baker). Lvs. rosulate, lepidote or scurfy, curved, equaling or exceeding the st.: infl. compound, somewhat paniculate, the lateral spikes shorter than the central ones, the bracts distichous and pointed and little exceeding the calyx: fls. blue. S. Fla. to Brazil.

tenuifòlia, Linn. (*T. cæspitòsa,* Le Conte, not Cham. & Schlecht. *T. Bártramii,* Ell., in part). Plant less than 6 in. tall, reddish, clustered: lvs. awl-shaped and erect, nearly terete, concave at the base, scurfy: fls. few in a simple or somewhat compound spike, the blue petals exceeding the bracts and recurving at the apex. Ga. to Brazil.

DD. *Lvs. gradually narrowed from a broad base.*

fasciculàta, Swartz (*T. bracteàta,* Chapm. *T. glaucophýlla,* Baker. *Vrièsia glaucophýlla,* Hook.). Tall, strong species with st. 2 ft. tall: lvs. 1–1½ ft. long, concave or channeled above, erect or ascending, scurfy and bluish: st. longer than the lvs. and branched, the branches or spikes bearing distichous keeled acute mostly greenish and red-tinged bracts: fls. narrow, exserted, blue. S. Fla., W. Indies, and Cent. Amer. B.M. 4415. F.S. 5:432.—Very variable.

utriculàta, Linn. Plant 2–3 ft. high: lvs. glaucous and scurfy, becoming subulate and recurved at the summit but much dilated and imbricated at the base and forming pockets that hold water: infl. branched, the fls. far apart on the branches: fls pale blue (pale colored forms), narrow, the petals twice longer than the sepals. S. Fla. to S. Amer. B.R. 749 (as *T. flexuosa* var. *pallida*).—For full description of this species, together with plate, see Trelease, 5th Rep. Mo. Bot. Gard. (1894).

T. bivittàta, Lind.=Cryptanthus bivittatus.—*T. Blòkii,* Hort.=Vriesia Blokii.—*T. dianthoides,* Rossi. Scape manifest, bearing a simple infl.: fls. erect; sepals glabrous; petals violet. S. Amer. Gt. 3:138. R.H. 1905:464.—*T. Durángii,* Vis. Infl. bi- or tri-pinnately paniculate: fls. erect; petals blue. S. Amer. Gt. 50, p. 452.—*T. farinòsa,* Hort.=Billbergia pyramidalis.—*T. ionántha,* Planch. Lvs. densely tufted, densely scaly; infl. simple, dense, and short; petals violet. Mex. B.M. 5892.—*T. La Sallèana,* "A new species from S. Amer., with most brilliant fls. It is of free growth and easily cult., thriving best in a moderate temperature and in a light, fibrous soil mixed with sphagnum." (Siebrecht.)—*T. Lindenii*=T. Lindeniana.—*T. musàica*=Guzmania.—*T. muscòsa,* Hort., is probably a Pitcairnia. P. muscosa, Hook., B.M. 4770, is Pitcairnia Beycalema. The name T. muscosa has occurred in the trade, but the plant is unknown to the writer.—*T. polytrichioides,* Mass. Lvs. small, densely clothing an elongated st.: infl. 2–4-fld.: petals pale. S. Amer. R.H. 1912, p. 431.—*T. splèndens*=Vriesia.—*T. Wilsonii,* Wats., has been intro. sparingly to cult., but does not appear to be in the trade. It was discovered in Hernando Co., Fla., in 1887 by W. P. Wilson, of the Univ. of Penna.: "St. simple, very short (about ½in.): lvs. numerous, 1–3 or 4 in. long, gradually narrowed from the clasping base to the long-attenuate apex, channeled above, more or less hoary, with minute appressed, peltate, brown-centered scales: peduncle very slender, recurved, about equaling the lvs., with 2 distinct bracts, probably 1–3-fld.: fls. and caps. not seen." This is Sereno Watson's original description, 1888. See Mn. 2, p. 130, and 6, p. 130, for pictures.—*T. xiphioides,* Ker. Lvs. densely scaly: scape very short or wanting: petals white. Argentina. G.W. 6, p. 291. B.R. 105.—*T. Záhnii,* Hort., is properly Guzmania Zahnii, Mez. Tufted, branching from the base, glabrous throughout: lvs. 1 ft. long, about 1 in. broad, crimson striped and yellow: infl. paniculate, subtended by scarlet bracts: fls. yellow. Costa Rica. B.M. 6059 (as Caraguata Zahnii). In the trade. The following names are accounted for under Vriesia: *carinata, fenestralis, guttata, hieroglyphica, psittacina, Saundersii, tessellata, zebrina* (in part).

L. H. B.

GEORGE V. NASH.†

TIMOTHY: *Phleum pratense.*

TINÁNTIA (named after Tinant, a Belgian botanist). *Commelinàceæ.* Erect herbs, either hardy or grown in the greenhouse: lvs. medium-sized or large: peduncle terminal, rarely with 1–3 extra in the upper axils; cyme terminal, with 1–3 branches floriferous from nearly their base: fls. pedicelled; sepals distinct, green; petals distinct, obovate; stamens 6, all perfect; ovary sessile, 3-celled: caps. 3-celled, loculicidally dehiscent.—About 6 species, Trop. Amer. **T. fùgax,** Scheidw., is a tradescantia-like herb: st. glabrous, 1½ ft. high: lvs. ovate-lanceolate, pilose above, glabrous beneath: peduncle villous, 1–3-branched at apex, branches umbellate: fls. blue, with their pedicels conspicuously bracteolate at base. Known also as *Tradescantia erecta, T. undata, T. latifolia.* B.M. 1340. B.R. 1403. L.B.C. 13:1300.—Sometimes seen in old gardens but not offered in the trade.

TINNÈA (named in honor of Mlle. Tinné). *Labiàtæ.* Tall perennial herbs or subshrubs, pubescent or woolly, adapted to the warmhouse. Lvs. very entire: floral whorls usually laxly 2-fld., axillary or in a terminal raceme: fls. fuscous- or violet-purple, fragrant; calyx ovoid, 2-lipped; corolla-limb somewhat 2-lipped; stamens 4, didynamous; ovary shortly 4-lobed: nutlets obovoid-clavate.—About 23 species, Afr. **T. Sacleùxii,** Sprenger. Dwarf shrub with the branches shortly and densely pubescent: lvs. short-petioled, oblong or ovate, entire, ¾–1 in. long: cymes axillary, 2–5-fld.: calyx membranous, deeply 2-lipped; corolla nearly 1 in. long, lower lip much longer than upper. Trop. Afr. (?).

TIPUÀNA (name apparently Latinized from a Brazilian name). *Leguminòsæ.* Showy unarmed trees, used ornamentally in the extreme southern U. S. Lvs. unevenly pinnately compound, without stipels; lfts. several, alternate; stipules minute, caducous: fls. showy, yellow or pale purplish, in loosely branched terminal panicles; calyx turbinate, teeth short and broad; standard ovate or suborbicular, not appendaged; wings obliquely obovate or oblong; keel-petals obliquely oblong, obtuse, lightly connate; stamens all connate in a sheath which is split above: pod stipitate, indehiscent, 1–3-seeded, samara-like.—About 4 species, S. Amer. Here belongs the plant recently intro. to S. Calif. as *Machærium Tipu,* which is said to yield one of the rosewoods of S. Brazil.

speciòsa, Benth. (*Machærium Tipu,* Benth.). Tender yellow-fld. tree: lfts. 11–21, oblong, emarginate, entire, 1½ in. long; veins somewhat parallel: standard broadly orbicular; wings very broadly half-ovate, much larger than the keel: pod veiny. S. Amer.

F. TRACY HUBBARD.†

TIPULÀRIA (Latin, *Tipula,* a genus of insects, alluding to the form of the flower). *Orchidàceæ.* Small terrestrial orchids in N. Amer. and the Himalaya region. Herbs with solid bulbs, having several generations connected by offsets: lf. solitary, basal, appearing in autumn long after the flowering season: fls. in a long, loose, terminal raceme, green, nodding; sepals and

petals similar, spreading; labellum 3-lobed, produced into a long spur behind; column erect, wingless or narrowly winged.—Two species, one Himalayan.

díscolor, Nutt. (*T. unifòlia,* BSP.). Crane-fly Orchis. Scape 15–20 in. high: lf. ovate, 2–3 in. long, appearing in autumn and often surviving through the winter: raceme 5–10 in. long, loose: fls. green, tinged with purple. July, Aug. Vt. and Mich. to Fla. and La. B.B. 1:480.—Rare. Heinrich Hasselbring.

TITHÒNIA (of mythological derivation; Tithonus was the favorite of Aurora). *Compósitæ.* Robust half-hardy annuals sometimes shrubby at base: lvs. alternate, petioled, entire or 3-lobed: heads large, on a long thickened peduncle, heterogamous; ray-fls. neuter, disk-fls. perfect and fertile; involucre hemispherical or broadly campanulate; receptacle convex; corolla yellow, ray-fls. ligulate, disk-fls. tubular, 5-toothed: achenes somewhat pilose.—About 10 species, Mex., Cent. Amer., and W. Indies.

diversifòlia, Gray (*Mirasòlia diversifòlia,* Hemsl.). Large shrub with rather stout branches, glabrous or nearly so: lvs. petioled, membranaceous, glabrous or puberulent, ovate or almost orbicular, entire or 3–5-lobed, 9x6 in., crenate: heads orange, up to 6 in. diam., terminal or lateral, usually in 3's, on short thickened peduncles: achenes club-shaped. S. Mex. and Guatemala.

speciòsa, Hook. (*Lèighia speciòsa,* DC. *Heliánthus speciòsus,* Hook.). Shrub with erect, terete st.: lvs. petioled, cordate, 3-lobed or entire, crenate: peduncle with a single head, which is scarlet and about 3 in. diam.: achenes obtusely 4-angled. Mex. B.M. 3295. G.C. III. 57, suppl. Mar. 13. F. Tracy Hubbard.

TOCÒCA (tococo is the native name of *T. guianensis*). Including *Sphærógyne. Melastomàcæ.* Glabrous or hispid-pilose shrubs, sometimes bearded with setæ at the axils, grown in the warmhouse for their foliage.

Leaves petioled, large, membranaceous, rarely coriaceous, entire or denticulate, 5-nerved: fls. rather large, arranged in terminal and sometimes also lateral panicles, white or rose; calyx glabrous, pilose or hispid, tube campanulate, terete or ribbed, limb obtusely rarely acutely 5–6-lobed; petals 5–6, obovate or oblong; stamens 10–12; ovary 3–5-celled: berry fleshy; seed obovoid or pyramidal.—About 50 species, natives of Brazil, N. Venezuela, and Guiana.

Tococa requires a warmhouse temperature, with shady and fairly moist place. Use leaf-mold mixed with fibrous loam, and provide ample drainage. It is best propagated from what are called split joints, or eyes with the leaf rolled up, and inserted in thumb-pots in fine sand with chopped moss; then insert pot in sand or cocoa fiber, with bottom heat of 75° to 80°. Cover with bell-glass or other inclosure to exclude air and to keep a fairly moist (but not wet) condition. In about two months the cuttings will have rooted. The wood for propagating should be well ripened. (H. A. Siebrecht.)

imperiàlis, Nichols. (*Sphærógyne imperiàlis,* Lind.). St. simple or little branched, erect, robust: lvs. opposite, decussate, oval, with 5 longitudinal ribs running from base to apex and many parallel transverse veins connecting them. Peru. I.H. 24:284.—Native of Peru, and intro. to Eu. by Linden in 1871. It is said to be easily grown in a warmhouse.

platyphýlla, Benth. (*Sphærógyne latifòlia,* Naud.). Short-stemmed plant with succulent somewhat tortuous st: lvs. broadly ovate, minutely denticulate-ciliate, 7-nerved: fls. rosy or red; ovary 5-loculed. Colombia, Venezuela, Costa Rica.—Cogniaux puts this species in a section characterized by having the lvs. destitute of vesicles and the calyx not winged. In this section it is unique by reason of its herbaceous branches with long bristles, especially at the nodes; the other species of the section have shrubby and glabrous branches. A very beautiful plant, but considered to be difficult to grow. Wilhelm Miller.

TODDÀLIA (*Kaka Toddali,* Malabar name of *T. aculeata*). *Rutàceæ.* Shrubs usually somewhat climbing or sarmentose, unarmed or prickly, adapted to the warmhouse and hardy outdoors in the extreme S. Lvs. alternate, 3-foliate; lfts. sessile, lanceolate, leathery, entire or crenate, pellucid-punctate: cymes or panicles axillary and terminal: fls. rather small, unisexual by abortion; calyx short, 2–5-toothed, -lobed, or -parted; petals 2–5, imbricate or valvate; male fls., stamens 2, 4, 5, or 8, ovary rudimentary; female fls., ovary ovoid, oblong or globose, 2–7- rarely 1-celled: fr. pea-like, hard, coriaceous, globose, permanently syncarpous.—About 20 species (including Vepris), natives to the Old-World tropics and the Cape. In Toddalia proper the petals are valvate, and the stamens as many as the petals; in the subgenus Vepris the petals are imbricate and the stamens twice as many as the petals.

lanceolàta, Lam. (*Vèpris lanceolàta,* A. Juss.). Small tree or large shrub, erect, without prickles, entirely glabrous: petioles 1–2 in. long; lfts. oblong-lanceolate, 2–3 in. long, acute, entire, waved at the edge, ¾–1 in. broad: panicles axillary and terminal, thyrsoid: petals a line long, imbricate; stamens 8, in the male fls. exserted: fr. the size of a pea, 4-lobed, fleshy, gland-dotted. Mauritius, Mozambique, Cape.—Intro. by Reasoner Bros., 1891. Wilhelm Miller.

TODÈA (H. J. Tode, a German botanist, 1733–1797). *Osmundàceæ.* Grape Fern. A group of ferns with fleshy sporangia, as in Osmunda, but having these borne on the backs of ordinary lvs. The last three species, although frequently united with Todea, more properly form a distinct genus Leptopteris, differing widely in habit from the original Todea; they form delicate foliage plants resembling the filmy ferns in habit. For cult., see *Ferns.*

A. *Texture leathery: lvs. bipinnate.*

bárbara, Moore (*T. africàna,* Willd.). St. short, erect: lvs. in a crown, 3–4 ft. long, 9–12 in. wide; pinnæ erect, spreading, sometimes 2 in. wide: sori closely placed, often covering the whole under surface at maturity. S. Afr. to New Zeal. G. 37:265.—A very resistant and useful fern. It deserves wider cult.

AA. *Texture thin: lvs. with linear divisions.*

B. *Lvs. tripinnatifid.*

hymenophylloìdes, Rich. & Less. (*T. pellùcida,* Hook.). Lvs. 1–2 ft. long, 8–12 in. wide, lowest pinnæ about as long as the others; rachises mostly naked. New Zeal.

supérba, Col. St. erect, woody: lvs. 2–4 ft. long, pinnæ often crisped, the lower gradually reduced; rachises densely tomentose. New Zeal.

BB. *Lvs. bipinnate.*

Fràseri, Hook. & Grev. St. erect, woody, 18–24 in. high: lvs. 1–2 ft. long, lowest pinnæ nearly as large as the others; rachis narrowly winged, naked. Austral.

L. M. Underwood.

TOFIÈLDIA (named after Tofield, a Yorkshire botanist). *Liliàceæ.* Perennial herbs, mostly hardy: sts. erect, from a short or repent rhizome: lvs. radical or clustered at the base of the st., short-linear, somewhat distichous; cauline lvs. few or none: fls. small, in a terminal spike, subsessile or short-pedicelled; perianth persistent, segms. oblong or narrow; stamens 6; ovary sessile: caps. 3-lobed.—About 25 species, mostly north temperate and boreal regions but 1 or 2 in the Andes. *T. racemòsa,* BSP. (*T. pùbens,* Michx. *Triántha racemòsa,* Small). Sts. slender, 1–2 ft. high, minute glandular: lvs. narrow-linear, 6–12 in. long: perianth rigid, whitish, 2 lines long. Pine barrens, N. J. to Fla. and Ala. B.M. 3859. Of no special horticultural value.

CXII. A good type of commercial tomato.—Brinton Best

TOLMIÈA (named for Dr. Tolmie, surgeon of Hudson Bay Co.). *Saxifragàceæ.* Herbaceous, glandular pubescent, hardy: rhizome scaly: sts. simple: cauline lvs. alternate, radical petioled, cordate-incised-lobate; stipules membranaceous: racemes terminal, slender, simple: fls. rather secund, nodding, green; calyx-tube elongate, funnelform-campanulate, 5-lobed; petals 5, capillary; stamens 3; ovary narrowly oblong, 1-celled: caps. exserted from the calyx, superior, 2-valved, 2-beaked.—One species. Borders and wild-garden.

Ménziesii, Torr. & Gray (*Leptáxis Ménziesii,* Raf.). Perennial herb, 1–2 ft. high, with slender creeping rootstocks and some summer runners: lvs. round-cordate, more or less lobed and crenately toothed, slender-stalked, all alternate, those of the st. 2–4 in number: raceme ¾–1½ ft. long: fls. and caps. nearly ½in. long, greenish or tinged purple. Forests of Mendocino Co., Calif., to Puget Sound.—Prop. naturally by adventitious buds, produced at the apex of the petioles of the radical lvs. and rooting when these fall to the ground.

WILHELM MILLER.

TÓLPIS (name unexplained). *Compósitæ.* Herbs, annual and perennial, allied to Crepis, with showy yellow heads, suitable for the flower-garden or border, but apparently not offered in this country; species about 15, in the Medit. region, and the Canaries and Azores. St. rarely somewhat woody: lvs. mostly radical or on lower part of st., entire, dentate or pinnatifid, the upper ones few and narrow: heads homogamous, ligulate, the involucre campanulate with narrow bracts in several series; receptacle naked or pitted: achene subterete, 6–8-ribbed, the pappus of 8–10 very slender setæ. *T. barbàta,* Gaertn. (*Crèpis barbàta,* Linn.), from S. Eu., is an erect branched annual with attractive yellow heads, the outer scales of involucre subulate: lvs. lanceolate, dentate, the upper ones near the fl.-heads long-subulate: blooms from midsummer till frost. B.M. 35.

TOLUÍFERA: *Myroxylon.* The following species now planted as a shade tree in S. Fla. was mentioned under Myroxylon. **M. Pereìræ,** Klotzsch (*Toluífera Pereìræ,* Baill.). Tree: lvs. uneven-pinnate; lfts. 6–9, from 2–3 in. long, 14–16 lines broad, oblong, glabrous; petiole 4½ in. long, terete and sparsely puberulent: pod 2½–3 in. long. Cent. Amer.

TOMATO. The plant *Lycopersicum esculentum* (which see, page 1931, Vol. IV), grown extensively for its edible fruit.

The tomato is probably grown more extensively in North America than elsewhere, and the varieties have reached a high degree of perfection. The American standard or ideal is a tomato that is nearly globular, solid and "smooth" (that is, not wrinkled). (Fig. 3818.) The flat angled and wrinkled tomatoes (Fig. 3819) are now little grown in this country. These forms are little adapted to canning, in which use enormous quantities of tomatoes are employed, and they do not satisfy the popular desire. The old-time pear, cherry, and plum forms (Fig. 3820) are still grown for curiosity and also for the making of pickles and preserves, but their field culture is relatively not important. The currant tomato, grown for ornament and curiosity, is considered to be *Lycopersicum pimpinellifolium.* It sometimes hybridizes with the common species (Figs. 2234, 2235, Vol. IV).

The tomato requires a warm soil and climate, a sunny open position, and also a long season. The plants are usually started in hotbeds or glass houses, being transferred to the open as soon as settled weather comes. They are usually set from 4 to 5 feet apart each way and are allowed to grow as they will, finally covering the ground. For home use, however, the plants are often trained, in order to forward their ripening and to secure larger and better-colored fruits. The best method is to train to a single stem, supported by a stake or perpendicular wire or cord (Fig. 3821); or sometimes it is tied to the horizontal strands of a trellis. This single-stem training requires close attention, and if the time cannot be spared for it, the vines may be allowed to lie on an inclined trellis or rack. This rack training keeps the plants from the ground and thereby allows the individual fruits to develop perfectly and also checks the spread of the fruit-rot; but it usually does not give such perfect fruits as the single-stem training, since the number of fruits is limited in the latter. Sometimes a serious difficulty in tomato-growing is a rot of the fruit. This seems to cause most damage following close wet weather when the fruit is ripening. It is thought to be worst on plants that cover the ground thickly with foliage and do not allow it to become dry on the surface. Usually it does not seriously lessen the crop beyond a few pickings; and if the plants are brought into bearing early and are kept in thrifty condition for subsequent bearing, the percentage of total injury is greatly reduced. The tomato is tender to frost. The green fruit remaining when frost kills the plants may be ripened in tight drawers or cupboards, if it is nearly or quite full grown. The tomato is a short-lived perennial, but in cold climates it is grown from seeds as an annual. It may be grown from cuttings.

L. H. B.

General culture of the tomato.

The tomato plant comes from regions in South America where the conditions of temperature and moisture in its growing season are very constantly favorable for its rapid growth and the ripening of a large yield of fruit. Although it cannot be classed as a tropical and hardly as a semi-tropical plant, it thrives best in a day temperature of 65° to 85° F., makes very slow growth in one below 40° F., and, unless hardened by gradual exposure, will be killed by a short exposure to a temperature of 32°. It is a rapid-growing short-lived plant and under favorable conditions will mature its first fruit in ninety to one hundred and twenty days from the sowing of the seed and continue in bearing for fifty to ninety days, when it will generally die of exhaustion, though its life may be prolonged (but with lessened vigor) either by cuttings or layering. It is emphatically a sun-loving plant and unobstructed sunlight is essential for its most vigorous growth and greatest fruitfulness. An attempt to grow tomatoes of superior or even good quality in an orchard or at a season when the sunlight is likely to be dimmed much of the time by clouds or mists is very likely to be disappointing.

The splendid color often seen in Italian-grown fruits is due to cloudless skies rather than to superior varieties or cultural methods. Under favorable conditions the plant is a vigorous and rapid grower and capable of maturing an enormous crop of fruit, but it requires for even a fair yield very constantly favorable conditions, and any check in its growth from cold or cloudy weather or too deep and harsh cultivation, even if the plant seems fully to recover, will surely materially lessen the yield of fruit. Many cases have been seen in which cultures within a few miles of each other and on similar soil have matured crops differing greatly in quantity and quality as a result of such difference in cultural practice as to bring one crop into the fruiting-stage in better condition, or at a time when the weather was more favorable for a full setting of fruit. The plant, however, is very tenacious of life and will often live and produce some fruit under most unfavorable conditions and many who have grown it for years do not know of the amount of fruit a healthy tomato plant is capable of producing. It is doubtful whether the average yield of all the cultures in the United States exceeds 6,000 pounds of marketable fruit to the acre. Yet every

season for the past fifty years many fields have been known where the salable crop was from 30,000 to 40,000 pounds to the acre, with exceptional still larger yields.

Exposure is often an important factor in determining the profit of a crop. Generally a gentle inclination to the southward, with protection of higher land or forest on the side from which cold and damp winds may be expected will give the largest yield of the most marketable fruit, but a sharp inclination to the south, particularly if it be steep or such as to form a hot pocket, rarely produces a maximum crop, although, because of the early ripening of the fruit, it may be a profitable one.

The largest yields recorded were generally grown on red clay loam. Large yields are often secured from soils of very different compositions, from "gumbo" prairie, marsh muck, stiff clay, to a light sand provided the conditions of drainage, fertility, and tilth are favorable, but a maximum crop can never and even a profitable one very seldom be grown on a cold soil, or one which is poorly drained, sodden, sour, or hard and solid from want of cultivation. A good crop of tomatoes very seldom follows one of tomatoes or potatoes.

3818. A contemporaneous American tomato.

Tomatoes are rank feeders and the use of fresh stable manures and those carrying a large proportion of nitrogen is likely to result in a rank growth of vines ripening a small crop of fruit of poor quality. The best yields and quality of fruit will usually be from fields rich from fertilizing in previous years. On unfertile fields where one is obliged to use commercial fertilizers, those comparatively rich in potash will generally prove most profitable. The largest yield and best fruit have generally been from rich clover sods, which were plowed as early as practicable in the spring, rolled, and made friable by repeated surface cultivation.

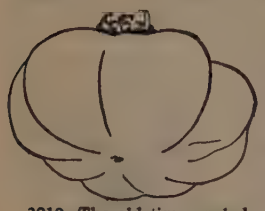
Although in all but the extreme northern part of the United States, in very high altitudes and in some parts of the Puget Sound country, tomatoes will generally ripen a full crop from seed sown in the open ground, from Washington northward plants so grown will rarely ripen their crop until past midsummer and much of it will miss the long days of sunshine, which are essential for the development of the best quality. On this account it is desirable, in most cases, to start the plants under glass, so as to give them fifty to sixty days' growth by the time they can be set in the open ground without danger from killing frosts. It is very easy to grow plants to this age, but the character of the growth and the condition in which they go into the fields are most important factors in determining the quantity and quality of the fruit.

Starting the plants under glass is usually accomplished best by sowing the seed in boxes about 4 inches deep and of convenient size for handling, filled with soil made up of two-fifths potting earth or garden loam, two-fifths old well-rotted cow-manure, and one-fifth coarse sharp-grained sand. Soils used in plant-boxes or -beds should always be sterilized by spreading over steam-pipes perforated on the lower side and filled with live steam until a potato buried about 3 inches in the soil is cooked soft. The seed can be sown rather thickly and covered ¼ to ⅛ inch deep. The boxes should be well watered and set in the shade until the plantlets show above the soil, when they should be set in full sunlight and kept at a constant temperature between 65° and 80°, and given water as needed. The plants should develop large seed-leaves and bud within ten to fifteen days, when they should be transplanted into the frames. The soil of the frames should be 3 to 6 inches deep and freshly made up and sterilized about as recommended for the plant-boxes. The plants may be set twelve to twenty-four to the square foot, according to the time they are expected to remain before setting in the field. The beds should be closely watched and the sash opened as the air in them becomes warmed by the sun to a temperature above 60° and as promptly closed as it cools below 40°. The soil should be watered as necessary to prevent the plants wilting, but this should be done as far as practicable in evening or early morning, rather than during bright sunshine. If necessary the beds may be protected from frost by covering the sash with sacks, old carpets, straw, or even a sprinkling of earth. An inexperienced person will be surprised to see how effective even a slight covering often is. In case frost does creep in, it is best to keep the beds covered until they can warm up without direct sunshine, even if this takes a day or two. Cases have been known in which plants that seemed to be killed were saved by slow warming up. For a few days before the plants are to be set in field, they should be hardened off by scant watering and fuller exposure both to the sun and night air, and the day before they are to be set should be thoroughly sprayed with bordeaux mixture. The field, particularly if it has been a clover sod, should be prepared and cutworms killed by keeping it absolutely free of green vegetation for at least a week before the plants are to be set and the evening before scattering over the surface poisoned bait made by thoroughly mixing one pound of paris green or similar poison with fifty pounds of bran or middlings moistened with sweetened water. The evening after the plants are set, the poison should also be scattered along the rows and the next day the plants should be again sprayed with bordeaux.

Field culture should begin the day after the plants are set and be repeated every four or five days and as soon after every rain as it can be done without puddling the soil. At first the culture should be as close to the plants and as deep as possible, but it should be farther from the plants and shallower each time until it is a mere stirring of the surface in the center of the row, always taking care to disturb the vines as little as possible. The plants should frequently be looked over

carefully for potato bugs, the most effective way of combating them being by hand-picking the beetles and eggs when they first appear.

When quantity and quality of fruit is second to early ripening, the seed may be sown earlier and the growth of the plants checked by crowding and a scarcity of water; so treated they generally will form a crown cluster of well-developed fruit by the time one dares risk them in the open. They are then set close in the row and rather deep, with the stem and root slanting to the south and will ripen the first cluster very early, although the remainder of the crop will be late and poor.



3819. The old-time angled form of tomato.

When quality rather than quantity of fruit is of first importance, staking and pruning is sometimes advantageous, particularly if the season or the soil is inclined to be wet. With many growers stakes 2 inches square and 5 to 6 feet long have given the best satisfaction. As soon as the tomato plant forms its first cluster of bloom it divides, and both branches are allowed to grow and then tied to the stakes while all other branches are cut off just beyond the first cluster of blossoms; during the early part of the season this will require daily attention. Staking has been found profitable and is very generally practised in the southern states.

Even when first discovered by Europeans, the plant or plants now commonly called tomatoes existed in many forms differing so materially in habit of plant and character of foliage and fruit that they were classed by botanists as distinct species, and the number of varieties offered has increased with frequent changes until American seedsmen have catalogued tomatoes under at least 513 distinct names, while many other more or less distinct forms are commonly grown abroad, particularly in Italy.

The following are some of the names used in seedsmen's catalogues, many of them standing for distinct forms of vine or fruit, while others are simply variations in stocks.

Currant or Grape.—Rank-growing, but slender small-leaved vine, very productive of long currant-like stems of bright red fruits not over ½ inch in diameter, of little culinary value.

Cherry, both Red and Yellow.—Strong-growing vine, very productive of cherry-shaped fruits, which are excellent for pickles and preserving.

Pear, both Red and Yellow.—Strong-growing vine, small, long-necked, pear-shaped, two-celled fruits.

Plum, both Red and Yellow.—Long oval-shaped, 2-celled fruits, which are excellent for preserving.

Turk's Turban.—Long oval, bright red fruit, with a peculiar growth on the blossom end.

Potato or Broad-leaved (in a number of variations).—Comparatively small vine, with broad entire leaves.

Dwarf Champion.—Vine very short, compact, leaves thick, crumpled, nearly entire.

Tree.—Vine very short, compact and upright in growth, with distinct thick nearly entire leaves.

Peach, both Red and Yellow.—Fruits covered with down similar to that on a peach or plum.

Diadem.—Fruit bright red, distinctly striped with yellow.

White Apple.—Round smooth yellowish white fruit of delicate flavor and the best of all varieties for eating from the hand.

Golden Queen.—Fruit bright yellow, often with a distinct red blush.

Each of the above is so distinct in habit of plant foliage or fruit that botanists might perhaps classify them as distinct species, while the following are some of the more distinct of the varietal forms listed by seedsmen under different names.

Earliana.—Comparatively small weak-growing vine, but maturing very early a large crop of smooth bright red fruit.

Bonny Best.—Vigorous vine, ripening very early and evenly a large crop of uniformly round bright red fruit.

Matchless.—Large smooth bright red fruit, with red fine-flavored but not very solid flesh.

Red Rock.—A healthy productive vine, with uniformly flattened globular fruit of fine flavor.

Dwarf Giant.—Vine dwarf, but very hardy and productive of large handsome bright red fruit of superior quality.

Sterling Castle.—Vine does particularly well under glass, producing large crop of small uniformly round bright red fruit.

Prince Bourghese.—An Italian sort, wonderfully productive of bright red, long plum-shaped fruit of fine flavor.

Stone.—Very vigorous and productive vine, with oval purplish red fruit.

Ponderosa.—Very large solid-fleshed fruit with small seed cavities, little pulp, and few seeds.

June Pink.—Early-maturing, purplish pink fruit.

Acme.—Large vigorous vines, with round purple-pink fruit.

Beauty.—Strong-growing vine, with a large flattish oval purple fruit.

Honor Bright.—Vine, although apparently unhealthy, is very productive of very firm hard-fleshed fruit, which in ripening changes from white to distinct yellow, then to very bright red.

Many carefully conducted trials have shown that first germination crosses will generally give a larger yield of fruit than either parent. In the experience of breeders, such increased yields have been in proportion to the varietal distinctness and purity of stocks crossed.

No distinct difference in the varietal character of plants from seed of different fruits of an isolated vine of pure stock has been noticed, plants from seed of the first and the last ripe fruit of the same vine showing no difference in earliness. Nor has any consistent difference been detected in size or form of fruit in plants grown from seed of a small smooth and a large rough fruit from the same plant.

Although the flowers are seldom self-fertilized, it is thought that they are with few exceptions pollinated from those of the same plant, generally from those of the same cluster and one should be guided in seed selection by the general character of the plant, rather than by that of single fruit. When plants are grown so that the branches intermingle, there would very likely be crossing and it is wisest to save seed from isolated plants.

One should first form a clear-cut conception of the exact varietal character desired, then carefully select isolated plants which come nearest to ideal and save, separately, seed from a number of fruits. A few seeds from each lot should be grown to fruit maturity under glass during the winter. It is quite possible that this will reveal some lots which do not breed true; such can be rejected and the best and purest lots planted for seed crop.

3820. Two forms of the pear tomato.

Seed is often viable when taken from fruit so green that it shows but little color and plants from such seed sometimes show a little gain in earliness, but they are weaker, less fruitful and do not carry their individuality so well as those from fully ripened seed. Plumper, heavier seed, which will retain its viability much longer, is secured from fruit which is fully ripe. The amount to a bushel of fruit varies greatly from only one to two ounces in sorts like the Ponderosa to as high as twelve to fourteen ounces in the smaller more seedy sorts. When the amount of fruit is less than a bushel and the appearance of the seed is important, the best plan is to spread the fruit in the sun until it is fully ripe. Cut each fruit through the center, and by squeezing the pulp and seed can be pressed out. Let this stand, and in one to three days, depending on the ripeness of the fruit and the temperature, it will separate, the seed falling to the bottom. Pour off the liquid, add to the seed two or three times its bulk of water, stir, let settle and pour off the water and repeat with fresh water until seed is clean. Spread not over three or

four seeds deep and stir every hour or two until seed is thoroughly dry.

Larger quantities can be handled as follows: Separate the pulp and seed from the flesh and skins. Seed-growers usually do this by running the ripe fruit through rollers about ½ inch apart. (In a small way, a hand cider-mill will do this very well.) Then run the pulp and seed through a slowly revolving cylinder of wire netting of about ¼-inch mesh, set at a slight incline so that the seed will fall through the netting, while the flesh, skins, and the like will gradually work out of the lower end. Allow the seed and pulp to stand and ferment until the seed settles and is covered with liquid, which will require from ten to forty-eight hours, according to condition. Care should be taken not to add water or rain while ground fruit is fermenting. Pour off the liquid. Put two or three pails of seed in a barrel, add four to eight pails of water, agitate, and then let seed settle and carefully pour off the water, carrying what pulp and bits of skin it will. Repeat with fresh water till seed is clean. Spread seed not over ¼ inch deep on cloth- or wire-bottom screens. Expose to sun and every few hours stir the seed until it is entirely dry, then bag. Care should be taken to be sure that seed is quite dry before bagging, for it will seem dry to a novice long before it is fit.

W. W. Tracy.

Growing of tomatoes in the South.

The growing of tomatoes on a commercial scale in the southern states began just prior to 1900 and has gradually increased until it is now one of the most important crops grown in that section. Especially is this true of Florida, Mississippi, and Texas.

The crop in Florida begins to move in December and continues at intervals during the winter months. The movement in Mississippi and Texas is more concentrated, beginning the latter part of May and closing the last of June. During the height of the tomato season, solid trainloads of tomatoes are shipped out of the two last-named states daily.

In growing the tomato for the northern markets, earliness is of prime importance. For this purpose, it is necessary to start the crop during the winter months, and, as the tomato is very sensitive to cold, it must be given careful protection for the first six weeks or two months of its growth. This necessarily means extra care and expense, which, in turn, means that the grower, in order to succeed, must exercise a higher degree of intelligence than is shown in the production of the average vegetable crop.

3821. Stake-trained tomato.

It has been clearly demonstrated that it does not pay to grow tomatoes on a large scale, nor does it pay to grow them when most of the help has to be hired. The best results are obtained when a single family plants not over two or three acres and does all the detail work connected with the growing and harvesting of the crop.

Tomatoes for the early market are started in hotbeds. Both manure and flue hotbeds are used for this purpose. The soil of the hotbed should be loose and porous, but not too rich. Especially should an excessive amount of organic matter be avoided. A good average soil, with 1 inch of leaf-mold added gives good results.

The seeds are sown about January 20. They are placed in rows 4 inches apart, ½ inch deep, and from three to four seeds to the inch. Under normal conditions, the seed should begin germinating in six to eight days. The temperature should not be allowed to go over 80° F., during the day, nor below 65° at night. The heat should be so regulated as to produce a slow, steady growth. Too much heat produces rapid, succulent growth, often causing the plants to become weak and spindling, under which conditions they are easily affected by adverse weather and more subject to the attacks of diseases.

3822. A strand of winter tomato, the clusters supported by slings.

As soon as the young plants begin to grow, plenty of ventilation should be given and the soil frequently stirred. The soil should be kept moist, but not wet. By the last week in February, the plants begin to crowd in the row, at which time they should be moved to the coldframe.

The coldframe is usually located in the field where the crop is to be grown. The soil in the coldframe should be richer and should contain more organic matter than that in the hotbed. The rows are laid off about 3 to 4 inches apart, and the plants set 4 inches apart in the row. A board with wooden pegs set 4 inches apart may be used to advantage in opening the holes for the plants. It is advisable to set the plants deeper than they stood in the hotbed, and, as soon as transplanted, they should be given a good watering. Special pains should be taken to protect them from sudden changes in temperature. At first they should be carefully covered at night; and if the weather is very threatening, an extra cover, such as cotton bagging, Sudan grass mats, and the like, should be used. Whenever the weather is clear and bright, the top should be lifted during the warm part of the day. During the latter part of March, when the nights are warm, the cover may be left off entirely, so as gradually to harden the plants. By the first of April, the tomatoes begin to crowd in the row, which is a good indication that they are ready for moving to the open field.

Tomatoes for the early market should be planted on well-drained elevated land, that has some form of windbreak on the north side. The land should be well broken with a turning plow, then disked, harrowed, and laid off in 4-foot rows. A furrow should be run down each row and fertilizer applied and mixed in with the soil. Just before taking the plants from the coldframe, the soil should be given a thorough wetting. Then one end of the coldframe should be knocked out and the soil should be removed to a depth of 2 inches, up to within a few inches of the first row of plants. A sharp spade or mason's trowel is then used and a 4-inch square is cut around each plant, after which the block of soil containing the tomato is carefully lifted and placed in a flat box or on a wide board, which is then

set in a wagon. The wagon should be made to straddle one row and the plants lifted out from the rear and placed from 2 to 3 feet apart in the three adjoining rows. Special pains should be taken when the plants are placed in the furrow to prevent the soil from breaking away from the roots, as they will wilt easily at this stage. Moist soil should be drawn by hand and pressed around each plant. A sweep or small turning plow should then be run around each row so as to fill in the remainder of the furrow.

Tomatoes should receive frequent and thorough cultivation from the time they are set in the open field until the first fruits begin to ripen. A crust should never be allowed to form on the soil, nor should weeds be allowed to grow. A five-tooth cultivator is one of the best implements that can be used in cultivation.

When moved to the open field, the plants are often beginning to show their first cluster of blooms and are also beginning to force out shoots from the axils of the leaves. The plants should be gone over carefully every few days and all lateral shoots and suckers should be removed before they have grown longer than 1 inch. It is a serious mistake to neglect removing shoots and suckers, even for a few days.

When three or four fruit-clusters have set, the terminal bud is pinched out, and thereafter no new growth whatever should be allowed. This severe pruning undoubtedly reduces the amount of fruit to the acre, but it is a considerable aid in the development of quality and earliness.

The staking, like the pruning, should begin soon after the plants are set in the field. A 4-foot stake, 1 by 2 inches, should be driven down within a few inches of the plant, and coarse twine wrapped around the plant and tied to the stake. Two or three tyings should be made during the development of the plant. The staking holds the vines and fruit off the ground, prevents rotting of the fruit in wet weather, and allows the sun and air to strike the fruit, thus inducing earliness, while, at the same time, reducing the danger from diseases.

Tomatoes in the southern states north of Florida begin to ripen about the middle of May. As soon as the ripening period arrives, the tomato patch should be gone over every day during the shipping-season. As soon as the fruit shows a deep creamy white color, with a faint blush of pink, it is ready for harvesting. At the first of the season, the fruit may be allowed to take on a deeper color than later on.

Tomatoes are gathered in one-half-bushel baskets, lined with coarse ducking, and carried to the packing-sheds, which are generally located in the field, and then packed in four-basket crates, averaging twenty pounds, or one-third bushel, each. As a rule, there are two grades: fancy and choice. The fancy are packed with the stem end down and average about twelve to the basket. The choice are packed on the side and average about fifteen to the basket. The six-basket crate is now becoming popular in some sections.

The bulk of the crop is shipped in refrigerator cars, well iced. It is now becoming the custom, when distant markets are to be reached, to harvest the fruit as soon as it is mature, but while still quite green in color. Each tomato is wrapped with soft paper and packed in flats or six-basket carriers and shipped in refrigerator cars, with the ventilators open, but without ice. This is known as the "green-wrapped" pack. It requires 896 four-basket crates to fill a car. A fair average yield is 250 crates to the acre, although a few growers sometimes produce as high as 600. A good average price for a season is 60 cents a crate.

A medium to large tomato, one that is smooth and does not crack easily, is the best for early shipping. The Acme has been the leading variety for many years, while the Earliana, Stone, and Beauty, are grown on a small scale in some sections.

There is no standard fertilizer for tomatoes. Tomato soils of Texas are relatively rich in potash; so, as a rule, it is not necessary to use more than 1 per cent of this ingredient. Most of the Texas growers use a fertilizer containing from 8 to 10 per cent of phosphoric acid, 2 per cent of nitrogen, and 1 per cent of potash. A fertilizer containing from 400 to 600 pounds of equal parts of acid phosphate and cottonseed meal to the acre gives very satisfactory results. In the states east of the Mississippi River, the amount of potash is considerably increased; the total amount of fertilizer used to the acre is also considerably greater. From 800 to 1,000 pounds of fertilizer to the acre, containing 6 per cent phosphoric acid, 7 per cent potash, and 3 per cent of nitrogen, seems to be satisfactory. Fifteen or twenty loads of manure to the acre, applied broadcast, two or

3823. A prolific tomato, the result of training to a single stem.

three months in advance of planting the crop, will always give good results.

The damping-off fungi often attacks the young plants while they are in the hotbed. These fungi work on the stem of the plant, just where it enters the soil, causing it to shrivel and the top to fall over. Wet soil and a damp sultry atmosphere are conditions that favor the development of this disease. Frequent stirring of the soil and thorough ventilation will go a long way toward preventing the appearance of this trouble. A thin coating of tobacco dust or a mixture of three parts of lime to one of sulfur, spread over the soil after the seed is planted, will also help to hold the disease in check.

The blossom-end rot is a very destructive disease. It makes its appearance when the fruit first begins to ripen, thereby destroying the earliest and most profita-

ble part of the crop. The fruit is attacked at the blossom-end. A small black speck first appears, which gradually increases in size until the entire fruit is affected. There is practically no remedy. The best thing to do is to gather and destroy the fruit as soon as it becomes affected.

Tomato-wilt often attacks the plants when the crop is grown on the same land more than one season in succession. Rotation should be practised as a safeguard against this disease.

The nematode is a microscopic worm which attacks the roots of a tomato plant and causes small bead-like knots to form. Ground infested with this pest should be avoided and whenever there is danger of infestation, cowpeas should not be planted on the land preceding tomatoes, as most varieties of peas encourage the development of the nematode.

The boll-worm sometimes causes considerable damage. This is a large green worm that enters the fruit near the stem-end. As soon as the fruit becomes infested, it is entirely worthless and should be removed and fed to hogs or destroyed. The boll-worm can be partially controlled by spraying with arsenate of lead; but, as it seldom makes its appearance before the fruit is full grown, there is danger in using any poison as a sprav

E. J. KYLE.

Tomato-growing under glass.

The tomato ranks next to the cucumber and perhaps next to lettuce in importance as a vegetable forcing crop. It is grown extensively under glass near all of the large cities of the North from the Mississippi River to the Atlantic coast. In some instances houses are devoted wholly to tomatoes, while in the larger number of cases other crops are grown in rotation with tomatoes. A very common practice is to produce lettuce until early spring and then the beds and benches are planted in tomatoes which will ripen during the months of May, June, and July. An early summer crop is considered more profitable than late fall and winter tomatoes, notwithstanding the fact that prices are always much lower. The larger net profits are due to larger yields obtained at much less expense, and there are no fuel bills to pay during the months of June and July and very little artificial heat is required in April and May. These remarks are not intended even to suggest that the forcing of tomatoes should be restricted to late spring and early summer, for many growers realize satisfactory profits on the fall crop and sometimes on midwinter tomatoes.

The tomato is also a popular vegetable in houses which are used solely in providing fresh vegetables at all seasons for the home table. No fruit or vegetable is more appreciated in the winter months than well-grown greenhouse tomatoes which are superior in quality to those grown in the open ground.

Numerous varieties are used for forcing purposes. English varieties have received much attention and some of them, such as Comet, have been grown on a large scale. American sorts, however, are now relied on mainly by the most extensive American growers. Bonny Best is undoubtedly taking the lead among red-fruited varieties. It is very prolific and the round smooth fruits are popular on most markets. Beauty, Globe, and Trucker Favorite are planted most extensively wherever pink or purple fruits are wanted.

In the starting of tomato plants for forcing, there should be uninterrupted growth from germination until the plants have attained full size in the beds. It is customary to sow the seed for the fall crop soon after June 20, and for the spring crop from January 15 to February 1. If a very early spring crop is wanted, the seed should be sown January 1 or even earlier. The seedlings may be planted in beds or flats at the first transplanting and the second shift should be made to pots large enough to care for the plants without crowding. A third shift to 4- to 6-inch pots is often made, and with good management this should result in very fine plants.

Most of the large commercial growers employ solid beds. Raised benches are used in some sections, especially when carnations precede the tomatoes. Solid beds require no expense for construction and maintenance and it is less difficult to maintain uniform soil-moisture conditions. Benches are an advantage when bottom heat is desired and this should be considered if the crop is to be grown at midwinter. If lettuce is grown until the tomatoes are planted early in the spring, solid beds will be found entirely satisfactory. Large pots and boxes are often used in small houses but they are not practicable on a large commercial scale.

Some persons have an idea that the tomato does well in poor soils. This is an erroneous impression, for high yields are obtained only in rich soils. It is true that the proportion of plant-food must be well balanced. An excess of nitrogen, with copious watering and high temperature, causes a rank growth of plants and a low yield. But the soil must be well provided with the mineral elements and enough nitrogen to meet the needs of the plant. If lettuce is grown until March, and enough manure employed to obtain good crops, the soil should be in ideal condition for tomatoes. It must be borne in mind that the greenhouse soil is a kind of manufactured soil, and it is important to give special attention to the supply of fiber or organic matter. The productiveness of greenhouse soils, whatever the crop may be, depends more on their physical properties than upon their chemical composition. Stable manure, used in ample quantity for lettuce, will make the best preparation for tomatoes and no additional manure will need to be applied to the tomatoes, except as a mulch. Special fertilizers have not been found necessary, and seldom an advantage, when stable manure has been used in sufficient amount to keep the soil in proper physical condition. While sandy loams are preferable for growing tomatoes under glass, any of the common soils, clays included, will give good results when properly handled.

There is the greatest diversity of practice among growers concerning planting distances. Some prefer to plant close together in rows with liberal spacing between rows. For example, a highly successful gardener sets the plants 14 inches apart in rows 30 inches apart. Some plant 2 feet apart each way with alleys at convenient distances. In large commercial houses, liberal spacing between rows is a great advantage in training the plants, pollinating the flowers, and picking the fruit.

It is possible to do a little intercropping between the tomato plants. Lettuce and radishes are sometimes grown between the rows, by starting the crops immediately after the tomato plants have been set. The practice is only fairly satisfactory because the tomato plants shade the lettuce and radishes so that the latter crops are seldom very good.

While tomato plants may be trained to two or more stems, the almost universal practice under glass is to grow single stems. (Figs. 3822, 3823.) This is easily accomplished by removing with thumb and finger all lateral branches as fast as they appear. In order that the laterals do not make too much growth, it is best to look over the plants every three or four days. When the plants attain a height of about 5 feet the tops are nipped. The stems may be supported in any convenient way. Various arrangements of wire, or wire and strings, are usually employed. A common practice is to use fairly heavy string or twine for the uprights which are tied to wires running lengthwise in the house.

Tomatoes under glass may be tilled, if it is preferred, but the better practice is to mulch the ground

with 3 or 4 inches of fresh horse-manure which has been aërated in thin layers a few days before being applied. The mulch should be applied after most of the fruit has been set. If applied too soon, an excessive vine growth and sparse setting of fruit may result. A mulch of manure keeps the soil in a loose and friable condition; it conserves moisture more perfectly than the most thorough tillage; it furnishes plant-food every time water is applied; it prevents weed growth and saves labor in rendering tillage unnecessary.

The temperature of the house at night should not fall below 60°. From 10° to 15° higher during the day will provide excellent growing conditions. If there is bright sunshine and the ventilators are open, there need be no fear if the temperature should rise to 100°. Some fresh air should be admitted every day, but good judgment should be exercised in ventilating the houses. Excessive watering must be avoided. High temperatures, over-watering, and poor ventilation are responsible for many failures.

Some attention must be given to the pollination of the flowers. Various methods are followed. Some careful growers use a little camel's-hair brush on each flower that is likely to contain ripe pollen-grains, and the grains of pollen are thus carried from flower to flower just as bees and other insects might perform this work out-of-doors. Jarring the plants daily is usually sufficient to get a good setting of the spring and early summer crops. Whatever the method employed, the work should be done, if possible, when there is bright sunshine and the atmosphere of the house is as dry as possible.

Greenhouse tomatoes have certain enemies which must be controlled if a satisfactory crop of fruit is desired. Steam sterilization of the soil previous to setting the plants is practicable in most large greenhouses. This is by far the most effective means of destroying the nematodes which cause an abnormal development of the roots and interfere with the nutrition of the plants. Steam sterilization also helps to prevent some of the diseases to which the tomato is subject. Blight, mold, and the œdema are among the most serious diseases. Frequent and thorough application of bordeaux mixture is valuable in controlling various diseases. The white-fly is the most destructive insect pest. It may be controlled by fumigating with hydrocyanic gas.

Some of the most successful growers are able to obtain yields of ten pounds to the plant for the spring crop. This, however, is considerably above the average when the entire country is taken into account. Six pounds to the plant, for the spring crop, is a good yield, and four pounds for the winter crop is considered satisfactory. An average of 10 cents a pound for the spring crop makes it a profitable undertaking, and 30 cents a pound is not too much for the winter crop.

The greenhouse tomato should be of the highest quality and special care should be exercised in marketing it. Small packages holding about five pounds are preferable. The tomatoes should be clean and wrapped in paper bearing the name of the grower. The grower should be able to guarantee every specimen which is packed in the number 1 grade. R. L. WATTS.

TOMATO, HUSK: *Physalis.* **Strawberry T.:** *Physalis Alkekengi* and *P. pubescens.* **Tree T.:** *Cyphomandra.*

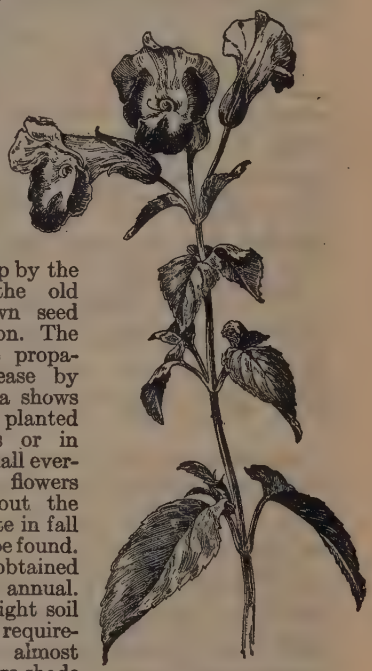
TOMMASÍNIA: *Angelica.* The following species, in the lists under Tommasinia, should be entered with Angelica in Vol. I, p. 287. **Angélica verticillàris,** Linn. (*Tommasínia verticillàris,* Bertol. *Peucédanum verticillàre,* Koch). Advertised in this country as a lawn plant. It is a hardy perennial, about 1 ft. tall, with many small yellow-green fls.: lvs. 3-pinnate, the lfts. ovate, acute-serrate and the lateral ones often 2-lobed and the terminal one 3-lobed, the petiole much dilated at base. Piedmont region, S. Eu.

TOOLS: *Machinery and Implements,* Vol. IV, page 1939.

TORÈNIA (named for Olaf Toren, clergyman; traveled in China 1750–1752 and discovered *T. asiatica*). *Scrophulariàceæ.* Glabrous, pubescent or hirsute annual or perennial herbs, mostly low, branching and somewhat decumbent, grown sometimes in the warmhouse for winter bloom, but mostly grown as garden annuals.

Leaves opposite, entire, crenate or serrate: racemes short, few-fld., terminal or false-axillary; calyx tubular, plicate or 3–5-winged, apex obliquely 3–5-toothed or 2-lipped; corolla-tube cylindrical or often broadened above, 2-lipped; stamens 4, perfect, in pairs of unequal length: caps. oblong.—About 33 species, Trop. and E. extra-Trop. Asia and Trop. Afr.

Torenias are of easy cultivation and are very useful for window-boxes, low borders, or even for large masses. The flowers are not large but the plants are floriferous and keep in good leaf and flowers from spring to frost. *T. Fournieri* has the best habit for a bedding plant, but it may be bordered with *T. flava.* They are easily raised from seed, sown indoors or in the open, but may also be grown from cuttings.



3824. Torenia asiatica. (×⅔)

In Florida *Torenia Fournieri* is an excellent substitute for the pansy, which is cultivated only with difficulty so far south. Young plants come up by the hundreds around the old plants from self-sown seed during the rainy season. The species can also be propagated with great ease by cuttings. The torenia shows its full beauty when planted in beds or borders or in masses in front of small evergreen shrubs. It flowers abundantly throughout the summer, and even late in fall isolated flowers may be found. The best results are obtained by treating it as an annual. Any good and rich light soil seems to meet its requirements. It succeeds almost everywhere but prefers shade and moisture. It even grows luxuriantly in wet places along ditches and water-courses where forget-me-nots grow in the North. If such localities, however, are very shady, the flowers, though much larger, are neither produced so abundantly nor are they colored so brightly as in sunny situations. On the other hand, it is sometimes found in such dry positions, where only cacti and yuccas manage to live, that one can scarcely understand how it is able to succeed. In good soil the torenia attains a height of 8 to 10 inches, and when planted about 8 inches apart soon covers the ground entirely. There is already a great variety in colors, but the typical plant has beautiful light blue and royal purple flowers, with a bright yellow throat, in texture rivaling the most exquisite velvet. (H. Nehrling.)

A. *Fls. mainly yellow.*

flàva, Buch.-Ham. (*T. Baillonii,* Godefr.). Usually decumbent and creeping: lvs. 1–2 in. long, ovate to oblong, coarsely crenate; petiole half as long as the blade or less: fls. axillary and solitary or scattered at the ends of the branches in pairs on an erect rachia; corolla-

tube red-purple above, yellow beneath; corolla-limb bright golden yellow with a purple eye. India and E. Asia. B.M. 6700. F. 1883, p. 55.

AA. *Fls. mainly blue or white.*

B. *Lvs. cordate-lanceolate.*

Fournièri, Lind. (*T. edéntula,* Hort., not Benth.). Low, bushy, usually annual, becoming nearly 1 ft. high: st. 4-angled: lvs. petioled, cordate-lanceolate, 1–1½ in. long, crenate-serrate; petiole ⅛in. long: corolla-tube narrow, yellow; corolla-limb 2-lipped, the posterior lip not cut, pale blue, the anterior 3-lobed; lobes round-obtuse, dark purplish blue, the anterior lobe marked with a yellow blotch. I.H. 23:249. R.H. 1876, p. 465. B.M. 6747. G. 1:58. Var. **álba,** Hort. (var. White Wings), has pure white fls. A.F. 5:401. G.M. 36:87. Var. **compácta,** Hort., is a more compact form than the type and rather larger-fld. G.W. 10, p. 610. Var. **grandiflòra,** Hort., has somewhat larger fls. and is more free-flowering. Var. **speciòsa,** Hort., is a showy form offered in the trade, probably very similar to var. *grandiflora.*

BB. *Lvs. ovate or deltoid-ovate.*

asiática, Linn. Fig. 3824. Annual, erect or diffuse: st. quadrangular: lvs. ovate or ovate-lanceolate, long-acuminate, serrate, obtuse, not cordate at the base, rough to the touch: peduncles axillary, single-fld.; corolla large; tube dark purple; limb 4-lobed, of a delicate pale purple-blue, with a dark blotch on 3 of the lobes, without a yellow eye; stamens 4, the 2 longer with a subulate spur. India. B.M. 4249. Var. **pulchérrima,** Hort., has larger, dark violet-blue fls. with a white spot on the upper lip. G.Z. 4:96.

atropurpùrea, Ridley. Lvs. ovate or ovate-deltoid, ⅔–1½ x ⅓–¾in., short-petioled, serrate: fls. usually solitary on peduncles at the ends of the branches; calyx narrow, wingless; corolla dark purple, 1½ in. long, tube narrow at the base, much exserted, enlarged and curved above, limb about 1 in. across with 4 rounded lobes. Malay Penins. B.M. 8388.

F. Tracy Hubbard.†

TORRÉYA (named for Dr. John Torrey, one of the most distinguished of the earlier American botanists; 1796–1873). Syns., *Tùmion, Caryotáxus. Taxàceæ.* Ornamental evergreens, grown for their handsome foliage and interesting habit.

Strong broad trees: lvs. 2-ranked, linear or linear-lanceolate, with 2 narrow glaucous lines beneath, becoming fulvous with age; when bruised the foliage emits a pungent or fetid odor except in *T. grandis:* fls. dicœcious, rarely moncœcious; staminate fls. ovoid or oblong, composed of 6–8 whorls of stamens, surrounded at the base by bud-scales; pistillate fls. consisting of a solitary ovule surrounded at the base by a fleshy aril and several scales: fr. drupe-like, consisting of a rather large seed, with thick woody shell entirely covered by a thin fleshy aril.—Four species in N. Amer. and E. Asia. The hard, strong, and close-grained wood is much valued in Japan for cabinet-making and building. It is very durable in the ground. In this country it has been used for fence-posts.

The torreyas are handsome evergreen trees, with spreading usually whorled branches, clothed with yew-like two-ranked dark green foliage; the fruits are drupe-like and about 1 inch long. They are but little known in cultivation and rarely seen in a flourishing condition. The Japanese *T. nucifera* is the hardiest and has proved fairly hardy as far north as Massachusetts; also *T. grandis* survives in very sheltered positions in the vicinity of Boston, but the other two species are much tenderer. Torreyas grow best in shaded and sheltered positions and in a somewhat moist loamy soil. Propagation is by seeds; also by cuttings and by grafting on Cephalotaxus. Plants raised from cuttings grow very slowly and usually remain bushy. For cions, terminal shoots should be selected.

A. *Branches, 2 years old, yellowish green or yellowish brown.*

B. *Lvs. linear, emitting a fetid odor when bruised.*

taxifòlia, Arn. (*Tùmion taxifòlium,* Greene). Fig. 3825. Tree, attaining 40 ft., with spreading, slightly pendulous branches, forming a rather open pyramidal head: bark brown, tinged orange: lvs. linear, acuminate, dark or dark yellowish green above, with narrow white lines beneath, ¾–1½ in. long: fr. obovate, dark purple, 1–1¼ in. long. Fla. S.S. 10:512.

BB. *Lvs. linear-lanceolate, without strong odor.*

grándis, Fort. (*T. Fàrgesii,* Franch. *Tùmion gránde,* Greene). Tree, occasionally to 80 ft. high, sometimes shrubby: lvs. linear-lanceolate, ½–1 in. long and ⅛in. broad, bright green and lustrous above, with 2 white lines beneath: fr. ovoid or globose, ¾–1 in. long. China. R.H. 1879, p. 173. G.C. II. 22:681.

AA. *Branches, 2 years old, reddish brown: lvs. emitting a pungent aromatic odor when bruised.*

B. *Length of lvs. 1–3½ in., shape linear.*

califórnica, Torr. (*T. Myrística,* Hook. f. *Tùmion califórnicum,* Greene). California Nutmeg. Tree, attaining 70 or occasionally 100 ft., with spreading, slightly pendulous branches, forming a pyramidal or, in old age, round-topped head: bark grayish brown, tinged with orange: lvs. linear, slightly falcate, acuminate, lustrous and dark green above, 1–3½ in. long: fr. oblong-oval or oval, light green, streaked with purple, 1–1½ in. long. Calif. S.S. 10:513. B.M. 4780. F.S. 9:925. G.C. II. 24:553; III. 5:800, 801. R.H. 1875, pp. 76, 77; 1879, pp. 171, 172.

BB. *Length of lvs. ¾–1¼ in., shape lanceolate.*

nucífera, Sieb. & Zucc. Tree, usually 30 ft., but occasionally 80 ft. high, with spreading branches, forming a compact head, sometimes shrubby: bark bright red: lvs. lanceolate, acuminate, rigid and spiny pointed, very dark green above, with 2 white lines beneath, ¾–1¼ in. long and ⅛–⅙in. broad: fr. obovoid-oblong, green, about 1 in. long. Japan. S.Z. 2:129. R.H. 1873, p. 315. S.I.F. 1:15.

Alfred Rehder.

TOURNEFÒRTIA (Jos. Pitton de Tournefort, 1656–1708; one of the earliest systematic botanists). *Boragináceæ.* A large genus comprising possibly 100 species widely scattered about the warmer parts of the

3825. Torreya taxifolia. (×⅛)

world. Mostly trees and shrubs, rarely subshrubs, with alternate simple lvs. and small fls. in terminal cymes. *T. heliotropioìdes*, Hook.=*Heliotropium anchusæfolium*, which see.

TOWNSÉNDIA (David Townsend, botanical associate of Wm. Darlington, of Pennsylvania). *Compósitæ*. Low many-stemmed herbs, nearly all of which are natives of the Rocky Mountains; sometimes planted.

Leaves linear or spatulate, entire: heads rather large, resembling those of Aster; rays in 1 series, from violet to rose-purple or white and blooming from early spring to summer.—About 17 species. The annual or biennial species have larger heads than most of the perennials. Judging from the literature, the largest-fld. of the perennials are *T. condensata*, *T. Wilcoxiana*, and *T. Rothrockii*, 3 species which seem not to be in cult. as yet. The species mentioned below are presumably among the most desirable of the genus. They are offered by collectors of Colo. wild flowers. As a genus, Townsendia is distinguished mainly by its achene, which is commonly beset with bristly duplex hairs, having a forked or glochidiate-capitellate apex. Townsendia is practically unknown to floriculture. For fuller account, see Gray's Synoptical Flora of North America and Coulter and Nelson's Manual of Rocky Mountain Botany.

grandiflòra, Nutt. Biennial or perennial, 9–18 in. high: sts. spreading from the base, sometimes branching also above: upper lvs. often linear: bracts of involucre conspicuously attenuate-acuminate and scarious-margined: heads large; rays ½in. long, bright blue or violet. Summer. Foothills W. Neb. to Colo. and New Mex.

exscàpa, Porter. Nearly stemless perennial with sessile heads surrounded and surpassed by the linear lvs.: heads ¾in. across; rays white or purplish-tinged; involucral bracts narrowly lanceolate, mostly acute; pappus-bristles very setose. April, May. Dry hills, plains, or mountains, Sask. to Rockies, south to New Mex. and Ariz.—Known as "Easter daisy" in Colo.

T. condensàta, Parry. Very lanuginous: lvs. spatulate-obovate, crowded around the large, broad, sessile heads: rays 100 or more, narrow. Wyo.—*T. Róthrockii*, Gray. Lvs. spatulate, rosulate around the solitary head which is closely sessile at surface of ground, or at length with 1 or 2 additional heads from same crown. Colo.—*T. Wilcoxiàna*, Wood. A small stemless plant: lvs. in rosettes, spatulate, hairy: fl.-heads yellow, on short scapes, ½in. across. Dry plains and hills, Okla. to Colo.

WILHELM MILLER.

TOXICODÉNDRON (Greek, *poison tree*): *Hyænanche*, but by some retained as the tenable name. This Toxicodendron dates from 1796, but the Toxicodendron of Tournefort and Miller is much earlier and is revived by some botanists for the poison sumac and poison ivy (*T. Vernix* and *T. radicans*) and their kin but which in this book are still retained in Rhus. *T. capense*, Thunb., a very different plant and one of the Euphorbiaceæ, is treated under Hyænanche, Vol. III, page 1618.

TOXICOPHLÆA: *Acocanthera.*

TÓXYLON: *Maclura.*

TRACHÈLIUM (Greek, *trachelos*, neck: from its supposed efficacy in diseases of the throat). *Campanulàceæ*. THROATWORT. Perennial herbs or subshrubs, glabrous or hispid, hardy but not much grown: sts. sometimes tall and rather simple, with the fls. numerous, in a much-branched corymbose panicle, sometimes short, many-stemmed or cespitosely much branched, with the fls. rather umbellate at the ends of the branches: fls. blue; calyx-tube adnate, obovoid or subglobose, angulate; limb 5-parted, lobes narrow; corolla narrowly tubular, top shortly 5-lobed; ovary inferior, 3- rarely 2-celled, many-ovuled: caps. subglobose, angulate, membranaceous; seeds small.—About 6 or 7 species, Medit. region. Prop. by seeds or cuttings.

cærùleum, Linn. A half-hardy biennial or perennial, 1–3 ft. high: lvs. ovate, acuminate, unequally serrate: fls. blue or white, in dense terminal cymes, in late summer. Shaded places in S. Eu. B.R. 72. Gn. 28, p. 181; 47, p. 303; 51, p. 84. J.H. III. 50:17.—An attractive late-flowering perennial suited to cult. as an annual. According to Gn. 28, p. 181, the species is fairly hardy in England, but young plants are more floriferous than old ones. Seed may be sown in March. The plant is easily prop. by cuttings. According to Gn. 47, p. 303, plants from cuttings are dwarfer than seedlings.

F. W. BARCLAY.

3826. Trachelospermum jasminoides. (×¾)

TRACHELOSPÉRMUM (Greek, *neck* and *seed*, referring to the fact that the seed has a neck). Syn., *Rhynchospérmum*. *Apocynàceæ*. Glabrous or slightly tomentose-puberulent shrubs, the typical species tall-climbing, grown in the warmhouse and a favorite out-of-doors in the South.

Leaves opposite, distantly feather-veined: cymes lax, terminal or pseudo-axillary: fls. white; calyx small, 5-parted, with 5–10 scales or glands inside at the base; corolla salver-shaped, tube cylindrical, 5-lobed, lobes oblong, twisted to the left, overlapping to the right; disk annulate, truncate or 5-lobed; ovary 2-carpelled: follicles elongate, slender, terete.—About 16 species, E. Asia and Malaya.

Trachelospermum is a most satisfactory greenhouse shrub for a general collection. It requires no special treatment, except that the plants should be kept on the dry side during the winter. It requires several years to work up a good-sized specimen. Young plants should be given warmhouse treatment and encouraged to grow. Large well-established specimens thrive in a coolhouse. In summer the pots may be plunged outdoors in a partially shaded position. The species is propagated by cuttings of half-ripened wood taken with a heel in spring. The star jasmine is one of the many good old standard greenhouse plants that are too little seen nowadays. The specimens require considerable room, and the gardener is sometimes compelled to keep them in a cold pit until the chrysanthemum season is over, although this treatment is not to be advised. It is a tender evergreen shrubby climber from China, with fragrant white five-lobed flowers. It is a favorite in the South, where it is grown out-of-doors and known as the "confederate jessamine." In northern conservatories it is generally known under its synonym, Rhynchospermum. Handsome specimens may be grown in large tubs, making dense bushes 3 to 4 feet high and as much in diameter. (Robert Shore.)

jasminoìdes, Lem. (*Rhynchospérmum jasminoìdes*, Lindl.). STAR JASMINE. Also called "Confederate," "Malayan" or "African" Jessamine. Fig. 3826. Tender, evergreen, climbing shrub: lvs. short-stalked, ovate-lanceolate, acute, glabrous: peduncles much longer than lvs.: calyx-lobes reflexed; corolla-tube contracted

below the middle; several jagged scales at base of corolla; 5 large glands at base of ovary, 2 united, 3 free. S. China. B.M. 4737. Gng. 5:132. Gn. 41, p. 507. J.F. 1:61. R.H. 1902, p. 367. G. 37:191. Var. **variegàtum**, Hort., has lvs. of green and white, tinged red.

T. divaricàtum, Kanitz (T. crocostomum, Stapf). Similar to T. jasminoides in habit, but differs in having slightly smaller buff or pale orange-colored fls. with exserted stamens, pointed in bud, and smaller lvs. Japan, Korea. G.W. 12, p. 415.—It is more hardy than T. jasminoides.

WILHELM MILLER.

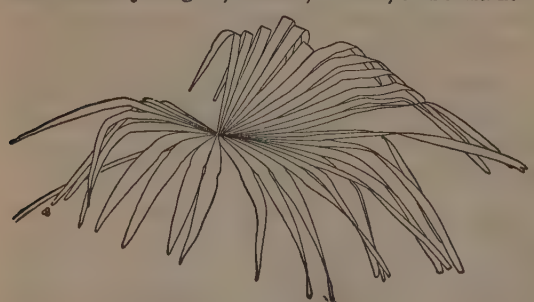
TRACHYCÁRPUS (Greek, *rough* or *harsh* and *fruit*). *Palmàceæ*, tribe *Corỳpheæ*. Indoor and outdoor palms, one of which is widely grown and very hardy.

Tall unarmed palms: lvs. suborbicular or reniform, folded, many-cut; segms. narrow; rachis none: spadices many between the lvs., stout, branched; spathes many, sheathing, coriaceous, tomentose, compressed; bracts minute: fls. small, polygamo-monœcious; sepals 3, ovate; petals 3, broadly ovate, valvate; stamens 6; carpels 3: drupes 1–3, globose or oblong.—About 4 species, Himalayas, China, and Japan. Monographed by Beccari in Webbia 1:41–72 (1905).

Fortune's palm (*T. excelsa* or *T. Fortunei*) is grown both indoors and out in America wherever palms are grown, although it is not one of the most popular species with northern florists. It is grown throughout California and even as far north as Oregon. It is commonly known by the name of Chinese windmill palm in southern California. There are two types of trachycarpus, those which have the trunks covered with old leaf-sheaths—the Himalayan type—and those which have smooth polished trunks—the far-eastern species.

excélsa, H. Wendl. (*T. Fórtunei*, H. Wendl. *Chamærops excélsa*, Thunb. *C. Fórtunei*, Hook. f.). FORTUNE'S PALM. Fig. 3827. Trunk robust, clothed with old lf.-sheaths: lvs. nearly orbicular; segms. numerous, ensiform: fls. clustered 2–4 on a tubercle: fr. transversely globose-reniform, deeply umbilicate. Upper Burma, China, and Japan; will grow in the open in Ga., withstanding 10° F.—This description follows Beccari, who refers *T. Fortunei* to *T. excelsa*. Hooker in founding *T. Fortunei* (B.M. 5221) speaks of it as a more robust tree than *T. excelsa*. The latter (which is from Japan) is said to have smaller and stiffer lvs., less deeply divided (usually only about to middle) with stiff segms., while *T. Fortunei* (China) has lvs. divided much below the middle (as in Fig. 3827), and the segms. more flaccid at least in older lvs. This group needs further study botanically, and also horticulturally in this country.

Martiàna, H. Wendl. (*T. Khasiàna*, H. Wendl. *Chamærops Martiàna*, Wall.). Trunk slender, tall, annulate-scarred, for the most part naked: lvs. nearly orbicular, divided to the middle into numerous segms.: female fls. solitary, sessile: fr. oblong-elliptic, rather compressed, rounded at both ends; seeds deeply sulcate. Himalaya region, Khasia, Burma, and Assam.



3827. Trachycarpus excelsa. The leaves finally become 4 to 5 feet across.

nàna, Becc. Subacaulescent: lvs. deeply many-parted, glaucescent beneath; segms. shortly bidentate at the obtuse apex: female fls. globose-ovate: fr. reniform, umbilicate and superficially sulcate. China.

Tákil, Becc. Trunk robust, strongly clothed with old lf.-sheaths: lvs. persistent, nearly orbicular; segms. numerous, ensiform, shortly bifid or deeply and irregularly 2-parted: female fls. clustered 2–4 together: fr. transversely reniform, deeply umbilicate. Himalayas.

F. TRACY HUBBARD.

3828. Trachymene cærulea.

TRACHYLÒBIUM (Greek, *rough* and *pod;* the upper surface of the pod is tuberculate-roughened). *Leguminòsæ*. Unarmed trees: lvs. with 2 lfts. which are coriaceous; stipules caducous: fls. white, panicled at the ends of the branches; calyx-tube disk-bearing, narrow-turbinate, segms. 4; petals 5, sometimes the 3 upper clawed and suborbicular, the 2 lower minutely scale-like, sometimes all subequal and clawed; stamens 10, free; ovary short-stipitate: pod ovoid-oblong, thick-coriaceous, warty-rugose, indehiscent.—Three species, Trop. Afr., Mascarene Isls., and Trop. Asia. *T. verrucòsum*, Oliver (*T. Hornemanniànum*, Hayne). Tree wholly glabrous excepting the tawny or silky pubescent infl.: lfts. 1-paired, obliquely oblong or elliptical, acuminate or apiculate: panicles overtopping the lvs.; calyx-segms. obovate-elliptical or oblong; petals posterior and lateral subequal, anterior equal or rudimentary: pod 1–2-seeded, oblong or obovoid, 1¼–2 in. long. Mozambique and Madagascar. Gt. 51, p. 633. *T. verrucosum* has the anterior petals nearly equal the rest; *T. Hornemannianum* has them rudimentary.

F. TRACY HUBBARD.

TRACHYMÈNE (Greek, *rough membrane*, alluding to the fr.). *Umbelliferæ*. Hirsute or rarely glabrous annual or perennial herbs, used as garden annuals: lvs. ternately dissected or rarely undivided; stipules none: umbels simple: fls. white or blue; calyx-teeth minute or obsolete, rarely 1–2, subulate; petals entire, obtuse; disk flat: fr. laterally compressed, usually flat.—About 25 species, mostly Australian but a few from Borneo, New Caledonia, and Celebes.

cærùlea, R. Graham (*Didiscus cærùlea*, DC.). Fig. 3828. An erect annual about 2 ft. high, somewhat

hairy: lvs. 1–2-triparted, with linear, acute, 3-cut lobes: peduncles long, bearing an umbel 2–3 in. across of very numerous blue fls.; calyx-teeth obsolete; petals unequal, the external being longer. July–Oct. Austral. B.M. 2875. B.R. 1225. G.C. III. 49:114. G. 29:127. Gn.W. 25:327.

F. W. Barclay.

TRADESCÁNTIA (named for John Tradescant, gardener to Charles I; died about 1638). *Commelinàceæ.* Spiderwort. Perennial hardy herbs, varying greatly in habit from erect and bushy to trailing and rooting at the nodes, grown for their ornamental value both out-of-doors and in the greenhouse.

Stems simple or diffusely branched: lvs. various: cymes simple, sometimes umbellate or densely paniculate: fls. more or less pedicelled, few or numerous, rarely solitary, red, blue, or white; sepals distinct, concave, green or colored; petals distinct, obovate or orbicular; stamens 6, all usually perfect; ovary 3-celled with 2 superposed ovules: caps. loculicidally dehiscent.—About 90 species, all American, ranging from Manitoba to Argentina. The genus was monographed in 1881 by C. B. Clarke (DC. Monogr. Phaner. 3). The genus Zebrina, usually confounded with this by gardeners, differs, among other things, in having a tubular perianth.

To horticulturists, tradescantias are known as hardy herbs, coolhouse plants, and warmhouse plants. *T. virginiana* is the best known of the hardy species, withstanding the climate of the northern states. The wandering Jew of greenhouses and hanging-baskets, usually known as *T. tricolor*, is partly *T. fluminensis* and partly *Zebrina pendula*. *T. Reginæ* is perhaps the best known warmhouse species at present, although various species may be expected in botanic gardens and the collections of amateurs. The glasshouse species are essentially foliage plants. Several species have handsomely striped leaves. All tradescantias are free growers, propagating with ease from cuttings of the growing shoots.

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A. *Plant prostrate, rooting at the joints.*

1. **fluminénsis,** Vell. (*T. mùndula*, Kunth. *T. albiflòra*, Kunth. *T. rèpens*, *T. rèpens vittàta*, *T. víridis*, *T. víridis vittàta*, *T. víridis Goèschkei*, *T. prostràta*, *T. procúmbens*, *T. striàta*, Hort. *T. tricolor*, Hort., in part. *T. myrtiflòra*, Hort.). Wandering Jew in part. Figs. 3829, 3830. Glabrous, with shining sts. and lvs., the nodes conspicuous, trailing, or the ends of the shoots ascending: lvs. ovate-acute, without distinct petiole, ciliate at the very base, the sheaths ¼–⅜in. long: fls. white, hairy inside, the 6 stamens all alike, borne several together in a sessile cluster subtended by 2 unequal lvs. or bracts, the pedicels not all of same age. Cent. Brazil to Argentina. Gt. 16, p. 297. G.W. 13, p. 558.—One of the commonest of greenhouse and basket-plants. In greenhouses, usually grown under the benches. When the plants grow very vigorously and have little light, they are usually green, and this is the form commonly known as *T. viridis*. There are forms with lvs. striped yellow and white, but these colors usually do not hold unless there is abundance of sunlight. In light places, the lvs. become red-purple beneath. Very easily prop. by cuttings or pieces of shoots at any time of the year. The plant needs plenty of moisture in order to grow vigorously. Three plants are known as wandering Jew, and although they belong to 3 genera, it is not easy to tell them apart when not in flower (Fig. 3830). These plants are *Tradescantia fluminensis*, sheaths hairy or ciliate only at the top, fls. white; *Zebrina pendula*, sheaths hairy throughout or at least at base and top, lvs. redder beneath and always colored above, fls. rose-red; *Commelina nudiflora*, sheaths glabrous, fls. blue. The first two are tender to frost; the last is hardy in the open ground in Cent. N. Y. All of them are used for baskets and vases. The first two are best known and are the plants commonly called wandering Jew. All of them may have striped foliage. See *Commelina* and *Zebrina*.

AA. *Plant erect, or ascending from a decumbent base.*

B. *St. none, or scarcely rising above the ground.*

2. **fuscàta,** Lodd. (*Pyrrhèma Lóddigesii*, Hassk.). Stemless, brown-tomentose or hairy: lvs. 6–8 in. long, oblong-ovate, entire, about 7-nerved, short-petioled: fls. blue or blue-purple, 1 in. or more across, borne in the midst of the lvs. on very short pedicels; stamens 6. S. Amer. L.B.C. 4:374. B.R. 482. B.M. 2330.

3829. Wandering Jew.—Tradescantia fluminensis. (Natural size.)

BB. *St. evident, usually branching (often very short in T. brevicaulis).*

C. *Lvs. distichous (in 2 rows).*

3. **Reginæ,** Lind. & Rod. Stiff-growing upright plant: lvs. lanceolate-acuminate, sessile, set closely on opposite sides of the st. and spreading nearly horizontally, about 6 in. long, the center purplish crimson, with feathered border, the space toward the margins silvery, the very edge of the lf. darker, the under side purple. Peru. I.H. 39:147; 40:173 (3); 41, p. 14. G.C. III. 11:699; 13:477. Gn.W. 8:693. R.B. 19:113.—Intro. into Belgium from Peru in 1870. Named for the Queen of the Belgians. It was intro. as *Dichorisandra Reginæ*, which see, p. 1003.

CC. *Lvs. not distichous (in several rows).*

D. *Infl. not peduncled.*

E. *Plants villous.*

4. **brevicaùlis,** Raf. Villous, 1 ft. or less high, sometimes nearly acaulescent: lvs. mostly from near the ground, linear-lanceolate, more or less ciliate: fls. about 1 in. across, blue or rose-purple, in a 4–12-fld. umbel.; pedicel slender, 1–2 in. long; sepals ovate-lanceolate, villous. Ky. to Mo.

EE. *Plants glabrous.*

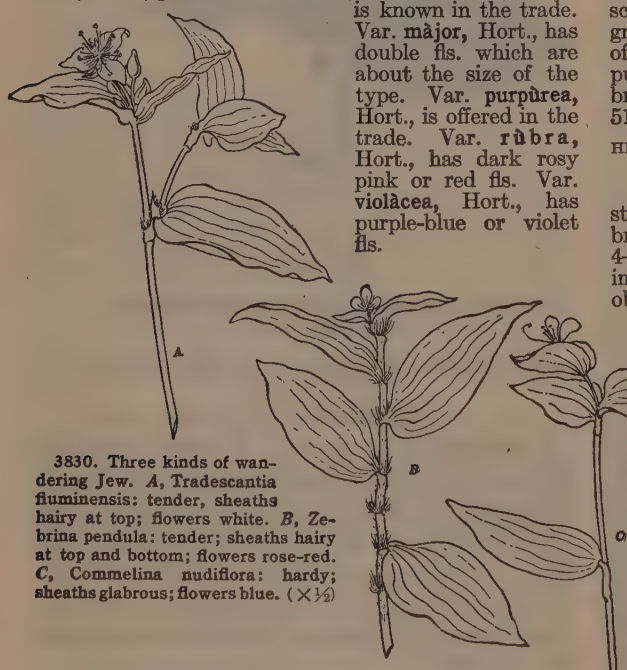
F. *Blades ovate.*

5. **naviculàris,** Ortg. Stoloniferous: st. creeping, geniculate-ascending, glabrous: lvs. sessile, ovate, acute, glabrous: fls. bright rose, in terminal umbels which are sessile; sepals spreading, keeled; petals broadly ovate. Peru. Gt. 26:901.

FF. *Blades linear to lanceolate.*

6. **refléxa,** Raf. Slender, glabrous or nearly so: lvs. narrow, linear-attenuate from a lanceolate base: umbels terminal; bracts soon deflexed: fls. blue; sepals ovate-lanceolate, glabrous or with a tuft of hairs. Wet places, Ohio to Mich., Minn., Kans., Texas, and S. C.

7. **virginiàna,** Linn.; also spelled *virginica* (*T. montàna,* Shuttlw., not Heyne. *T. tùmida,* Lindl.). COMMON SPIDERWORT. Erect, branching, 1–3 ft., glabrous or nearly so: lvs. conduplicate, very long linear-lanceolate (6–15 in. long), clasping: umbels several-fld., terminal, the pedicel recurving when not in bloom: fls. violet-blue, in various shades, 1–2 in. across, produced freely nearly all summer; sepals villous. N. Y. to S. D., Va., and Ark. B.M. 105; 3546 (as *T. caricifolia*). L.B.C. 16:1513 (as *T. elata*). J.H. III. 49:373. B.R. 26:42. H.U. 2, p. 129.—An exceedingly variable plant. Var. **álba,** Hort., is a white-fld. form. B.M. 3501. Var. **álba grandiflòra,** Hort., is offered in the trade. Var. **álba màjor,** Hort., appears in the trade. Var. **atrosanguínea,** Hort., has dark red fls. Var. **cærùlea,** Hort., has bright blue fls. Var. **cærùlea plèna,** Hort., is a double-fld. form. Var. **cârnea,** Hort., is offered in the trade. Var. **coccínea,** Hort., has bright red fls. Var. **congésta,** Hort., has purple fls. Var. **delicàta,** Hort., pale mauve. Var. **grandiflòra álba,** Hort., is known in the trade. Var. **màjor,** Hort., has double fls. which are about the size of the type. Var. **purpùrea,** Hort., is offered in the trade. Var. **rùbra,** Hort., has dark rosy pink or red fls. Var. **violàcea,** Hort., has purple-blue or violet fls.



3830. Three kinds of wandering Jew. *A*, Tradescantia fluminensis: tender, sheaths hairy at top; flowers white. *B*, Zebrina pendula: tender; sheaths hairy at top and bottom; flowers rose-red. *C*, Commelina nudiflora: hardy; sheaths glabrous; flowers blue. (×½)

8. **occidentàlis,** Smythe (*T. virginiàna* var. *occidentàlis,* Brit.). Slender, 1 ft. high: lvs. narrowly linear, involute, base often enlarged and scarious: fls. blue or roseate; sepals glandular-pubescent. Iowa to Neb., Texas, and New Mex.

DD. *Infl. peduncled.*

E. *Fls. white.*

9. **geniculàta,** Jacq. (*T. hypophæa,* Koch & Bouché). Procumbent, sts. geniculate, elongate, pilose: lvs. ovate-oblong, 7–10 x 4–6 lines, pilose, violet-brown beneath: fls. small, white, terminal; sepals ovate-lanceolate, base cuneate. Trop. Amer. G.W. 13, p. 558.

EE. *Fls. rose or purplish.*

F. *Stamens unequal, 3 long and 3 short.*

10. **elongàta,** Meyer. Nearly glabrous, procumbent and rooting at the base, then suberect to the height of 1–2 ft.: lvs. lanceolate or oblong-lanceolate, acuminate, sessile, light glaucous-green above and striped with silver, reddish purple beneath: peduncles 1–5, terminal: fls. rose-colored, the sepals green. Trop. Amer.

3831. Tradescantia Warscewicziana.

FF. *Stamens all equal or nearly so.*

G. *Lvs. narrowly linear: sts. tufted.*

11. **ròsea,** Vent. Slender and nearly or quite simple, glabrous, 12 in. or less tall: lvs. very narrow-linear: bracts short and scale-like: fls. ½–¾in. across, rose-colored. Md. to Mo. and south. Mn. 2, p. 36.

GG. *Lvs. lanceolate to ovate-lanceolate.*

H. *Plant with a stout caudex.*

12. **Warscewicziàna,** Kunth & Bouché (*Dichorisándra Warscewicziàna,* Planch.). Fig. 3831. Dichorisandra-like, having a stout caudex or trunk, marked by lf.-scars and finally branching: lvs. green, stiffish, 1 ft. or less long, clustered at the top of the st., recurving, lanceolate-acuminate: fls. lilac-purple, numerous in small crowded clusters along the branches of a panicle-like cluster. Guatemala. B.M. 5188. R.H. 1860, p. 136.

HH. *Plant without a stout caudex, more or less decumbent at base.*

13. **dracænoìdes,** Greenm. Roots fascicled, tuberous: sts. erect or nearly so, 8–20 in. high, simple or sparingly branched: lvs. lanceolate-attenuate to ovate-attenuate, 4–6 x ¾–1¼ in., villous-pubescent, strongly ciliate: infl. an open, oblong racemose panicle: fls. rose; sepals oblong, apex rounded; petals obovate. Mex.

T. aùreo-striàta, Hort., is offered in the trade as a form with green lvs. striped with yellow.—*T. bengalènsis,* Hort., occurs in the trade, having small, red, fleshy lvs. and blue fls.—*T. crassifòlia,* Cav. (T. iridescens, Lindl.). Something like T. virginiana, but lvs. short and broad, oblong-ovate, ciliate, as also the st.: fls. 1½ in. across, blue-purple, in terminal and axillary sessile umbels, the stamens all equal. Mex. B.M. 1598. G.W. 7, p. 91.—*T. Crássula,* Link & Otto. Somewhat succulent, ascending: lvs. thick, oblong and nearly or quite obtuse, glabrous except on the edges: fls. about ¼–½in. across, white, in terminal and lateral often stalked umbels, the calyx and pedicels hairy. Brazil. B.M. 2935. L.B.C. 16:1560.—*T. decòra,* Bull. Foliage plant: lvs. long-lanceolate, dark olive-green, with a central gray band. Brazil.—*T. discolor* is Rhœo discolor, which see.—*T. dracænæfòlia.* "A noble and rapid-growing plant, with luxuriant and handsome foliage. The lvs. in many respects resemble a dracæna and are a deep green, marked with chocolate or black. . . . When fully grown the plant will send out long runners, bearing out tufts of lvs. at the end." John Lewis Childs, catalogue 1900.—*T. lækenènsis,* Hort., is offered in the trade as a form with green and pink lvs.—*T. lanceolàta,* Hort., is offered in the trade as having large, green, downy lvs.—*T. multícolor,* Hort. See Zebrina.—*T. quadrícolor,* Hort. See Zebrina.—*T. spathàcea,* Swartz., equals Rhœo discolor.—*T. supérba,* Lind. & Rod., has oval-oblong acuminate, sessile lvs., which are dark metallic green with a white band on either side of midrib and are purple beneath. Peru. I.H. 39:155; 40:173, fig 6. Gt. 46, p. 163. Perhaps not a Tradescantia.—*T thuríngia,* Hort., is said to have green-and-white lvs.; offered in the trade.—*T. variegàta,* Hort., is Rhœo discolor var. vittata.—*T. versícolor,* Salisb., is Rhœo discolor.—*T. vulgàris,* Hort., occurs in the trade.—*T. zebrina,* Hort., is Zebrina pendula.

L. H. B.

F. TRACY HUBBARD.†

TRÀGIA (from Hieronymus Bock [or Tragus], a German botanist, 1498–1554). *Euphorbiàceæ*. Herbs, sometimes twining and often with stinging hairs, rarely cult.: lvs. alternate, toothed or lobed: fls. monœcious, racemose, apetalous, inconspicuous; stamens simple, generally 3; styles united above the base, with the apex free: ovules 1 in each of the 3 cells.—About 50 species of tropical and temperate regions; related to Plukenetia and Dalechampia. *T. cannabìna*, Linn., of Trop. Asia, is used for fiber to some extent. *T. volùbilis*, Linn. Twining Cowitch, of the W. Indies, has stinging hairs. Probably not cult. Several species of Tragia are native in the U. S. J. B. S. Norton.

TRAGOPÒGON (Greek for *goat's beard*). *Compósitæ*. Goat's-Beard. Erect biennial or perennial herbs with narrow grass-like leaves and heads of yellow or purple flowers, belonging to the ligulate section of the composite family (tribe *Cichoriaceæ*).

Mostly weedy plants with a tap-root: florets perfect, with slender style-branches and sagittate anthers; pappus composed of bristles in a single series; involucre cylindric or nearly so, with approximately equal-length bracts in a single row.—Between 30 and 40 species, native to S. Eu., N. Afr., and Cent. and S. Asia. One of them is cult. for its edible tap-root (salsify) and another is now a frequent weed in this country. The fls. of these open only in the morning.

3832. Flowers of salsify or oyster plant.—Tragopogon porrifolius. (×⅓)

A. *Fls. purple.*

porrifòlius, Linn. Salsify. Vegetable Oyster. Oyster Plant. Figs. 3532, 3832. Tall strict biennial, sometimes 4 ft. high when in bloom, glabrous: lvs. keeled, tapering from a broad often clasping base: fls. showy, closing at noon or before, the outer rays exceeded by the involucral scales: peduncle thickened and hollow beneath the heads. S. Eu.—Naturalized in many parts of the country, often becoming a persistent weed. See *Salsify*.

AA. *Fls. yellow.*

pratènsis, Linn. Goat's-Beard. More or less branched, 3 ft. or less tall: lvs. as in the preceding: outer rays exceeding the involucral scales; rays yellow, showy, about 2½ in. wide: peduncle scarcely swollen. A weed, from Eu. L. H. B.

TRAGOPYRUM LANCEOLÀTUM var. LATIFÒLIUM: *Atraphaxis Muschketowii.*

TRAILING ARBUTUS: *Epigæa.*

TRAINING: *Pruning.*

TRANSPIRATION is the term applied to the escape of water from leaves and other parts of the plant in the form of vapor.

There is no closed "circulation" of sap in plants comparable to the streaming of blood in animals. Water which generally contains various mineral soil constituents in solution enters the roots, and most of it passes upward through the stems directly to the leaves, where it is evaporated. In plants of a succulent character, the intake often exceeds the loss, and a large amount of surplus liquid may be accumulated in various organs, from whence it may pass to the leaves in times of drought.

The movement of water set up by transpiration carries water and the contained salts to the centers of food formation in the leaves, and the evaporation process facilitates exchange of gases with the air. The evaporation also tends to equalize temperatures. That an enormous amount of work is performed by the plant in transpiration may be seen when it is known that a single sunflower plant will evaporate a pint of water from its leaves in a single day, and about seventy times this much in the course of its development. A birch tree with 200,000 leaves will transpire from 700 to 1,000 pounds of water daily in the summer. A single oak tree will throw 120 or 130 tons of water into the air during the course of a season, and an acre of beech trees containing 400 to 600 specimens will transpire about 2,000,000 pounds in a single summer. It is estimated that 98 per cent of the energy derived from sunlight by leaves is expended in the work of transpiration.

To determine the exact amount of water transpired by a plant, a specimen not more than a yard in height, growing in a pot, may be used. Set the pot on a square of oilcloth, then bring the cloth up around the pot and tie closely to the stem of the plant. This will prevent evaporation except from the shoot. Now set the prepared plant on one pan of a scale, together with a small measuring-glass, and balance. Allow the plant to remain in the warm sunshine for eight hours, then note the amount of water which must be poured into the glass to reach the original level and restore the balance: this will represent the amount of transpiration.

To demonstrate that water actually does come from the leaf, cut off a small leafy shoot of any convenient plant and thrust the base of the stem through a piece of cardboard into a tumbler of water: seal the opening around the stem with wax or gelatine: then cover the exposed part of the shoot with another tumbler and set in a warm light place. Moisture which could have come only from the leaves will soon gather on the glass. Some transpiration occurs over the entire surface of the plant, although only about one-thirtieth as much is given off by the stem as from the same amount of leaf-surface.

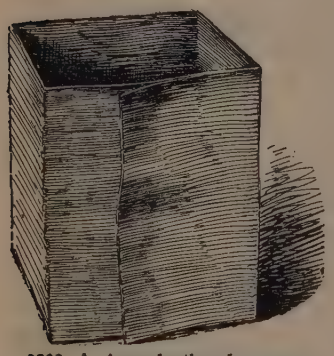
The structure of the leaves is such as to facilitate transpiration. The interior of the leaf is made up of a great number of loosely arranged cells which evaporate water into the air between them. The air in the leaf communicates with the atmosphere through openings called stomata, which are generally placed on the lower side of the leaf. Consequently the watery vapor diffuses out through the stomatal opening. Near the outer end of the stomatal chimneys are guard-cells which undergo alterations in form that change the size of the opening of the guard-cells and modify the rate of water loss. The position and shape of the guard-cells are affected by the age of the leaf, turgidity of the tissues, wind, and sunlight. The rate of transpiration may also be affected by cutinization or other alterations in the cell-walls through which evaporation into the stomatal chambers takes place, or by the presence of colloids retentive of water in the cells.

Species characteristic of arid regions generally have limited waterproofed surfaces with a comparatively small number of stomata. This modification is exemplified by the cacti, which transpire not more than one three-hundredth as much water as a broad-leaved plant of the same volume; and such succulents may lose as little as one forty-thousandth of their total weight by transpiration in a day. D. T. MacDougal.

TRANSPLANTING is a general term to designate the removal of living plants whereby they may become established in new quarters.

Transplanting may be performed when the plant is in a dormant condition, as in winter, or when it is still actively growing. Small herbaceous plants are usually the only ones that are transplanted when in a growing condition, and this only when the plants are living under special garden conditions where they may have the best of attention as to watering and shading. Considered from the standpoint of the plant, transplanting is always a violent operation, for it destroys a considerable part of the root-system, loosens the plant's attachment to the soil, and arrests for the time being a large part of its progressive vital activities. To overcome these dangers, the earth into which the plant is set should be well prepared and moist, so that the plant may quickly reëstablish itself; part of the top usually should be removed to lessen transpiration, and with succulent and growing plants some shade should be provided for a time. The deeper and finer the soil, and the greater the quantity of moisture it holds, the more successful the transplanting operation will be, other things being equal. The operation is also more successful in humid regions, as in the Atlantic states, than it is in dry regions, as on the plains and westward. In the more arid parts of the country transplanting is performed as little as possible, whereas in the eastern part great quantities of annual and other garden plants are transferred from seed-beds to the open ground.

The successful transplanting of any plant depends in part on the condition of the plant itself. The younger the plant, as a rule, the better it withstands the operation. Herbaceous or growing plants that are relatively short and stocky and compact, transplant better than those that are long, "leggy," and weak. The stocky plants are better able to withstand the vicissitudes of inclement weather when they are transferred from a protected place to the open air, and they probably also have more recuperative power to make new roots and to attach themselves again to the earth. Many plants may be "hardened off" or gradually inured to sun and cold before they are transplanted. The more frequently a given plant is transplanted the more readily it endures the removal. The root-system becomes close and compact and there is relatively less injury to the roots at each subsequent removal, providing a long interval does not take place between the operations.



3833. A transplanting-box, specially designed for melons. It is made of a "flat" or splint 14 inches long and 3¾ inches wide, bent at four corners and held in place by a tack. It has no bottom.

The success of transplanting also depends to some extent on the weather at the time the removal is performed. If cool, cloudy, and damp weather follows the transplanting, the plants are much more likely to live. Plants usually establish themselves more quickly in freshly turned soil, because it contains a relatively large amount of moisture. To bring the earth into contact with the roots, it should be firmed closely about the plants. This packing of the soil tends to bring the subterranean moisture upward where it may supply the roots; it also tends to increase evaporation from the surface of the soil and thereby to waste the water, although much of the moisture is utilized by the plant as it passes upward. To prevent the escape of moisture from the surface of the soil, it is customary to cover the ground with a mulch, from 1 to 3 inches in depth, of litter, sawdust, leaves, or coarse manure. When practicable the water may be saved by keeping the surface well tilled, thereby providing a mulch of earth. See *Tillage*.

In dry weather it may be advisable to water newly set plants, particularly if they are green and growing fast, as tomatoes, cabbages, and other annuals. The watering may best be done at nightfall. The water should be applied in a hole or depression about the plant or at one side of it, rather than on the surface; and the following morning the loose fresh earth should be drawn over the roots in order to provide a surface mulch and to prevent the soil from packing. Of course, this particular pains cannot be taken in large field operations.

All kinds of plants can be transplanted, but some of them remove with great difficulty. In these cases the special skill which is born of experience with these particular plants must be invoked for success. The difficulties are of various kinds. In some cases the difficulty may be a tap-root system, as in the case of the black walnut and the hickories. In these instances the plant may be prepared a year or two in advance by severing the tap-root some distance below the ground by means of a spade or other sharp instrument that is thrust underneath the crown. In other cases the difficulty is the inability of the plant to make new feeding roots quickly, as in some of the asiminas or papaws. Such plants often may be treated like the tap-rooted plants; that is, the long cord-like roots may be severed at some distance from the crown a year or two before the plants are to be removed. In other cases the inability to be transplanted is probably due to the excessive rate of transpiration from the foliage. In these cases cutting back the top rather severely and providing shade may contribute to success. In some cases the difficulties are so great as practically to prohibit transplanting.

So-called transplanting machines have been perfected within the last few years for setting small herbaceous stuff, as cabbages, tobacco, and tomatoes. These are really vehicles, drawn by horses, that open a furrow and drop a small quantity of water when the plant is inserted in the furrow by the hands of an operator who rides on the machine. The plants, already prepared for setting, are carried in a tray or hopper, and the operator places these between guards which automatically measure the distance. These machines are particularly valuable in large areas where great quantities of plants are to be set, and also in hard and dry land where it is difficult to make the proper openings with the hand and also otherwise to supply the plant with sufficient water.

For most small plants that are to be reset in small quantity, the dibber is a most useful implement to expedite the operation. (Fig. 3834.)

Plants grown in pots and small shallow boxes transplant more readily than those raised in the open soil. Particularly is this true of pot-grown plants, for the bevel or slope of the pot allows the ball of earth to be "knocked out" readily. See *Potting*. Special transplanting-boxes are on the market, to be used instead of pots, for purposes of economy. These boxes are usually made of thin basket stuff and are thrown away when the plants are taken from them for transplanting. (Fig. 3833.) The seeds are sown directly in these boxes. Melons, cucumbers, and other plants that are difficult to transplant are often grown on pieces of inverted turf, taken from old pastures.

In the case of large trees and shrubs, success often may be attained by transplanting in the winter, when a ball of frozen earth may be removed. It is usually better to give the transplanting of large trees into the hands of an expert than to attempt to perform it with

unskilled help and inefficient appliances. Only a certain proportion of the efforts in transplanting very large trees are really successful. The trees may live for several years and yet never fully recover or make satisfactory subjects. The surest and best results are usually secured only when the trees are nursery-grown and have been transplanted two or three times within a few years of their final removal. There are some species that remove from the wild with relative ease when they are of large size, among which are elms, maples, pin oak, basswood; but the large number of species do not readily recuperate from the operation. See *Arboriculture*, Vol. I, page 362.

3834. A dibber. One of the most useful implements to aid in the transplanting of small plants. The plant is dropped into a hole made by the dibber; this hole is closed by inserting the dibber at the side and moving it against the plant.

It is sometimes said that a plant cannot recover from the transplanting operation, that the severing of the roots inflicts injuries that are not outgrown, and that a new type of root-system develops. These fears appear to be groundless. In many cases the plant does not regain itself, but these instances are probably due to lack of skill in the operation rather than to any inherent difficulty in the transplanting process itself. But even if the transplanting process were found to be theoretically injurious, nevertheless it must be employed in the practice of modern horticulture. L. H. B.

TRANSPORTATION of horticultural products. Commercially, fruits and vegetables are grown primarily for profit. Whether the business of fruit- or vegetable-growing results in profit or in actual loss to the grower depends on a great many factors. Among the more important are quality and quantity of production, distance from markets, cost of transportation, the condition in which the produce reaches the markets, methods of marketing, and the supply and demand.

In present-day fruit-growing, especially when the localities of production are often thousands of miles distant from the larger markets, there is no factor of greater importance than rapid and efficient transportation. Every fruit-grower is, or should be, aware of the necessity of safe and rapid transportation, together with the delivery of perishable produce at the markets in sound attractive condition. Soundness and freedom from decay or deterioration are fundamental to profitable marketing, therefore to successful fruit-growing. All the labor and moneys invested in production are wasted if the products cannot be transported and delivered in good condition.

Transportation is the link that connects the producer with his market, his zone of distribution being determined largely by the cost of transportation and absolutely by the distance over which the produce can be shipped in sound marketable condition. This distance will necessarily vary with the variety of fruit, the localities in which grown, cultural methods, care exercised in handling and preparing it for shipment, the promptness with which it is cooled, and the temperatures maintained in transit. The factors above mentioned are the more fundamental ones governing the condition of horticultural produce in transportation. It is clear, therefore, that successful transportation depends not only on conditions in transit but on the prehandling of the produce prior to shipment. The responsibility for the condition of these products when delivered at the markets is a common one as between producers, shippers, and carriers. The very best refrigeration that is practicable cannot be expected to deliver perishable products in sound merchandizing condition that have been badly handled prior to loading or shipment. Nor can such produce properly handled be delivered in good marketable condition without adequate refrigeration in transit during warm weather or sufficient protection against freezing in the cold weather.

The railways of the United States annually pay out millions of dollars in claims on account of breakage, decay and deterioration, freezing, and other damage in transit of perishable produce. This does not begin to cover losses sustained by the shippers in claims that are not paid, or deterioration for which no claims are made, and the injurious effect on the price received for the produce actually sound. The economic losses to consumers, carriers, shippers, and producers, especially consumers and producers, who finally shoulder the greater part of the burden, are enormous. This great wastage of the nation's food-supply is an important factor in the high cost of living and is very generally one of the main reasons for losses instead of profits to the growers or producers. The most important fact in this connection is that most of these losses are unnecessary and preventable. As the decay and consequent losses occur in transit, it is of the greatest importance that growers, shippers, and carriers have a clear and accurate knowledge of the fundamental factors governing condition of fruits and vegetables in transportation.

Few commodities are more subject to decay and deterioration in transit than are fruit and vegetable crops. In considering the transportation of these products and their behavior in transit, it is absolutely essential that the fact be kept in mind that fruit and vegetables are living organisms with a definite span of life beginning in the orchard or field and ending normally in actual death-decay. It must be remembered, therefore, that, in preparing these products for shipment, in transportation, and through all stages to the ultimate consumer, one is dealing with real organisms, the life-span of which will be lengthened or shortened by methods of handling and conditions in transportation. A correct interpretation of the reasons for the losses from decay and deterioration in transit depends on accurate knowledge of types of troubles that destroy the market value of fruits and vegetables. The prevention of these losses must be based on a clear understanding as regards the relation of the development of these troubles to methods of handling prior to shipment, and to temperature conditions in transit. The types of troubles that may destroy or lessen the value of these products are of two kinds, decay and skin-blemishes. In ordinary transportation the former is by far of the most importance, while in storage skin-blemishes may be very important factors. Decay may result either from attacks by fungous or bacterial organisms, or through physiological breakdown which may be termed natural death decay. The organisms causing decay in transportation may for convenience be divided into two groups, those which are parasitic, or which may cause decay of sound uninjured fruits, and those which are saprophytic or which have not the power to attack the sound unbroken skin of fruits or vegetables. Parasitic fungi causing decay in transit are usually orchard or field diseases that ordinarily can be controlled through proper cultural sanitation practices in the fields or orchards. Saprophytic organisms are responsible for by far the largest proportion of losses due to fungous decay in transportation and can be controlled only through careful and correct handling methods in the harvesting and preparation of the fruit for shipment.

Physiological breakdown or death-decay hinges largely on proper handling methods and temperatures

in transportation. It is plain, therefore, that the fundamental factors influencing, to the greatest extent, the behavior of fruits and vegetables in transportation come under the following heads: (1) Cultural; (2) maturity at time of picking; (3) care exercised in all handling operations; (4) promptness of cooling; precooling; (5) temperatures in transportation.

Cultural history of the crop.

In so far as cultural practices determine the crop's freedom from disease when harvested and its inherent keeping quality, are cultural operations responsible for condition of these crops in transportation. Of especial importance are the methods of orchard or field sanitation. Field or orchard diseases attacking growing fruits or vegetables very often cause serious decay in transit. Peaches from orchards or sections affected with brown-rot (Sclerotinia) or Monilia usually show serious development of brown-rot after shipment. In certain humid sections of the Pacific coast, for example, the prevalence of brown-rot makes long-distance shipment of cherries and fresh prunes an extremely hazardous venture. Certain vegetable crops, such as lettuce, celery, and tomatoes, when transported long distances, sometimes develop serious decay in transit through diseases that attack the growing crops in the fields. Decay in transportation, caused by diseases commonly affecting crops in field or orchards, can be controlled only through proper orchard- and field-sanitation practises. While the rapidity of the development of such decay in transportation can be controlled, to some extent, by quick prompt cooling and the maintenance of very low temperatures, the only real preventive lies in the control of these diseases in fields or orchards.

Maturity at time of harvesting.

The picking-maturity of peaches, muskmelons, and other quick-ripening fruits is governed largely by the distance from market and general experience as regards the carrying quality of such fruits at different stages of maturity under ordinary refrigeration. When they are to be shipped for considerable distances, the usual practice is to pick and pack them while still so green, hard, and immature as to be unfit for immediate consumption. Sometimes they are harvested in such a green state that they do not properly ripen in transit, and while not entirely worthless from a marketing standpoint, their poor eating quality necessarily results in very low prices. Fruits from certain sections have undeservedly gained a reputation for poor quality because the consumers never have had an opportunity to taste any properly matured fruit. There is no questioning the fact that if the quick-ripening fruits entering into long-distance transportation could be harvested at much nearer full maturity, that is, hard-ripe, and transported to the consumer in sound condition, both producer and consumer would benefit greatly, the former in increased returns, the latter in securing a more wholesome and palatable fruit.

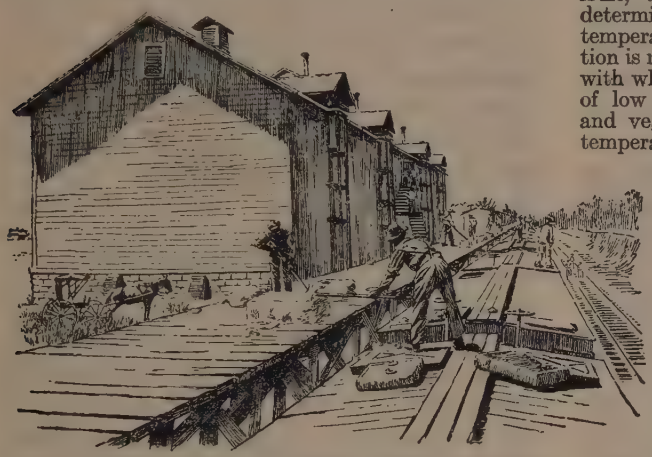
The reason for the present condition is largely found in the notion that such fruits must be picked while still very green and hard to carry in sound condition to the market. To some extent this idea is well founded. Greater care, however, in all handling operations, with prompt cooling, will enable growers and shippers successfully to handle the quick-ripening fruits at more advanced stages of maturity. When precooling facilities are available, it has been demonstrated that it is not only possible but practicable to harvest such fruits as peaches and pineapples at advanced stages of maturity as will give the consumer a product possessing its maximum fine quality and wholesomeness. When such facilities are not available, much can be accomplished toward the same end through proper and careful handling, prompt loading, and the stowing of the load in the car in such a way as to facilitate circulation and consequent quick cooling or refrigeration. The practicability of successfully transporting more nearly tree- or plant-ripened fruits, possessing the maximum fine quality of the variety when delivered to the consumer, will depend both on the grower and the carrier. The grower must exercise, first of all, the greatest care in handling and get his fruit under refrigeration quickly. The carriers must provide refrigeration facilities in which the product can not only be cooled faster but transported at lower temperatures than is ordinarily obtained in the average equipment. What has been said above, relative to the desirability of harvesting certain fruits at much advanced stages of maturity, does not, of course, apply to such fruits as pears, lemons, and fruits or vegetables which should be picked green in order that they may possess their maximum fine quality when finally ripened or cured.

Care in harvesting and handling.

The care exercised in harvesting and preparing horticultural products for shipment determines, to the greatest degree, its shipping or keeping quality. Extensive investigations conducted on a commercial scale by the Bureau of Plant Industry, United States Department of Agriculture, for a number of years, covering a wide range of fruits and vegetables, have clearly and conclusively demonstrated that decay in transit and after arrival at the market is due very largely to rough methods of handling. The fungous organisms causing decay gain entrance through mechanical abrasions of the skin made in picking, hauling, packing, or other handling operations. Every injury or breakage of the cells of the skin offers lodgment for fungous spores which, given proper moisture and temperature conditions, germinate and produce decay. Both high temperatures and moist atmosphere favor rapid development and growth of these organisms. Temperatures are usually fairly high during the harvesting season, as is frequently the humidity. During periods of muggy or rainy weather, the conditions are ideal for the germination and development of fungous spores, and almost every injury is certain to result in decay. The fundamental consideration, therefore, in all handling operations is the preservation of the skin in a sound and unbroken condition.

Nearly all growers and handlers of fruit or vegetables realize that rough handling, resulting in mechanical abrasions of the skin, is more or less responsible for decay occurring in transit. Few, however, have a clear idea of the extent of mechanical injuries made in ordinary commercial handling, nor do they realize fully the importance of the most careful work, or what constitutes proper and careful handling of a perishable product. In a short article it is obviously impossible to go into details as to how injuries are made in handling from field to car. The handling operations involved in the harvesting and preparation of the citrous fruit crop for shipment may serve as a very good example. In the harvesting of citrous fruits the mechanical abrasions may result from cuts made by the clippers used in severing the fruits from the tree, from contact with thorns on the trees, from dropping the fruits into the picking-sack or field-box, rough handling in loading, and jarring in hauling over rough roads or on springless wagons. Additional injury may result as the fruit goes through the washing-machines, brushes and driers, and over the sizers, and into the bins. Long sharp stems also cause much injury as the fruits roll against one another in the picking-sack, field-box, and the various operations of washing, drying, grading, and sizing. The pickers and packers, where gloves are not worn, may cause much injury through finger-nail cuts. The washing of fruit in dirty water, or slow and incomplete drying, both afford ideal or favorable conditions for infection of every injury and the consequent development of decay. The so-called soft fruits require

even more careful handling to avoid bruising and to preserve the skin of the fruit in a sound unbroken condition through all the operations of picking, hauling, and packing. Peaches are very commonly injured through the pickers exerting too great pressure with the thumb or other fingers when removing the fruit from the tree, by rough handling in loading, and bruising in the various operations of grading and packing. While sizers or graders have been used to a considerable extent in the handling of peaches, most of the graders now in use afford too many opportunities for injury to be universally recommended in the handling of such crops. In red raspberries, for example, the most serious decay results from too great pressure on the berry when removing it from the core. The use of three fingers instead of two minimizes the pressure and danger of injury. The inclusion of over-ripe berries in cups or crates intended for long-distance shipment is also a very prolific source of decay. The marketing or distributing zone of such fruits and berries can be extended by several thousand miles by the exercise of a little more care in picking and grading. In grapes the most serious injuries result from the loosening of the berry from the pedicel, and it requires the most careful handling, both in picking and packing, to avoid this type of injury which is chiefly responsible for the frequent excessive decay occurring in transportation.



3835. Icing cars (at the top) at one of the stations of the Fruit Growers' Express, Georgia.

Careful handling involves the exercise of thoughtfulness in the manipulation of the fruit from tree to car in order to preserve the skin of the fruit in an unbroken sound condition. It necessitates the most careful supervision of labor. It means simple and the minimum amount of machinery for washing, drying, sizing or grading, and constant attention to keep it clean and in perfect order. The whole handling problem is an economic one related to systems of both hiring and supervising labor. In citrous states coöperative associations have found it necessary to take over the field handling as well as the packing-house handling to insure uniformity of careful work. Where each grower does his own picking, the bad handling of one nullifies, to a large extent, the good work of the other, especially if the fruit from the different growers is pooled and shipped in the same cars. The success of this method of coöperative handling depends largely on having the right kind of manager and foreman, men who not only know what careful handling is and means, but who can secure such work from every man in the organization having anything to do with the physical handling of the fruit. The system of paying labor is largely responsible for carelessness in handling and decay in transit. Too much emphasis cannot be laid on quality as the tendency is at present decidedly in the direction of attaching too much importance to quantity. Quantity at the expense of quality is poor economy in the handling of any perishable fruit crop.

There is considerable question and argument as regards the best picking-receptacle, particularly as to whether picking-sacks or -bags are preferable to pails or baskets or other similar containers. For citrous fruits, and other hard thick-skinned deciduous fruits, canvas picking-bags are usually preferable. Peaches and other thin-skinned fruits, that are very liable to injury by the rubbing of one fruit against another, ought to be picked in receptacles with rigid sides. In such receptacles the fruits will not be subjected to more or less rubbing against one another as they would be in a picking-bag where every fruit necessarily moves somewhat with the movement of the picker.

Quickness and promptness of cooling.

Next to care exercised in the physical handling of the fruit, temperature is the most important factor in determining the life-span of the fruit. The question of temperature in the handling of fruits for transportation is related primarily to the promptness and rapidity with which the produce is cooled and the maintenance of low temperatures in transit. Most of the fruits and vegetables are harvested during periods of high temperatures. The physiological and chemical changes that constitute ripening proceed very rapidly at high temperatures and but very slowly at temperatures slightly above freezing. High temperatures shorten the life-span of the fruit, both through rapid ripening and the rapid development and growth of decay-producing organisms. The low temperatures retard the ripening processes as well as the germination and growth of fungi causing decay. It is, therefore, of the greatest importance that the produce be cooled as promptly and quickly as possible after removal from the tree or field. Delay of a few hours of the more quick-ripening fruits after harvesting in the field or packing-house during the heat of the day may mean the shortening of the normal life-span of such fruits by days. Prompt cooling is essential, whether this is accomplished by precooling before shipment or slower cooling in a refrigerator car. Advantage also may be taken of cool night temperatures by allowing the fruit to remain unpacked out in the open over night and packed later in the cool of the morning. More cooling can usually be accomplished this way over night than in a whole day in a refrigerator car, especially if the fruit is wrapped and tightly packed.

Precooling.

The prompt quick cooling of produce prior to shipment has been termed "precooling." It is usually accomplished by mechanical means in warehouse plants before loading in cars, or in car-precooling plants after loading. In the latter case the precooling is accomplished by forcing large volumes of cold air through the load in the car. More recently smaller warehouse plants have been built and successfully operated using ice and salt for refrigeration. As to which system is the best is still more or less of an open question and depends largely on local conditions. Warehouse plants have the advantage in so far as the cooling of the produce can be commenced immediately after packing without any delay. The cooling is usually more uniform and very often the plants are used as warehouses to hold fruits and vegetables in good condition for considerable periods when, on account of market conditions, or for any other reason, it is desirable to do so. Mechanically cooled warehouse-precooling

plants are expensive to build and operate, and where the harvesting-season is short, the benefits from precooling must be very marked to justify the expense. The salt and ice plants were designed to meet this objection and have proved very practicable where ice can be obtained at a reasonable cost and where the daily output does not exceed a few cars. The principal objections to car-precooling plants are the delay between loading and precooling and the more or less unequal cooling of the different packages in the car. The delay incidental to finishing the loading of a car, and the switching to a precooling plant is sometimes considerable and, in some instances, the total delay may approximate, to some extent, the slow cooling under regular refrigeration. In a number of instances, where car-precooling plants are in operation, in order to minimize delays, there is too much of a tendency to cut down the actual period of precooling, which results in partial precooling only. Some of the reasons why precooling is not more universally utilized may be found in the rather heavy initial investment necessary to build a plant, and the delay in shipment necessitated by holding over for precooling. Especially is this true with deciduous fruits where, in many sections, the shipping-season is short and where each shipper is desirous of getting his fruit or produce to the market as quickly as possible.

Precooling has been utilized more in connection with the handling and shipment of citrous fruits from California than anywhere else. It has apparently been found to be profitable in the citrous industry largely because of the long orange shipping-season, and for the reason that it is utilized also to reduce the cost of transportation. Precooled fruit from the growers' warehouse plants is shipped with initial icing only during the winter and spring season, the combined cost of precooling and one icing being somewhat less than the regular refrigeration rate. In Florida, precooling of citrous fruits is more in the experimental stage. Owing, however, to the short haul in warm territory in winter, precooled fruit is usually shipped successfully without any icing whatever. Comprehensive experimental precooling investigations on a commercial basis have shown decidedly favorable results from the thorough precooling of lettuce and celery from Florida. The principal berry-growing sections in California and Washington have utilized precooling for several years with the result that they have been able not only to transport berries, such as red raspberries and loganberries, in better and sounder condition, but to widen their marketing territory greatly.

In a number of cases in which precooling has been tried on a commercial basis, the physical handling of the fruit has been too careless to result in any marked advantage from precooling. This serves to illustrate very forcibly that precooling should not be depended on to overcome difficulties arising from improper handling. Another factor of no little importance is the inability of the average refrigerator equipment to maintain sufficiently low temperatures, even under full icing, especially in the upper tiers, in transportation. The good effects of quick and prompt cooling have been nullified to a considerable extent by the rapid rise in temperature of fruits or produce while in transportation. No matter what system is employed, the full value cannot be obtained from precooling unless the produce has been properly and carefully handled in the first place. Used as a means to overcome the effect of rough handling, precooling only retards decay and deterioration and simply transfers the troubles from the first receiver at the market to the retailer or consumer. Precooling must be thorough and as uniform as possible. The refrigerator car used for the shipment of precooled produce should be sufficiently insulated to maintain reasonably low and uniform temperatures in transit.

Temperatures in transit.

The necessity for the maintenance of low temperatures in transit has already been emphasized. The question is often asked: How low ought the temperatures in a refrigerator car to be for best results? The only answer to this question is: As low as possible consistent with safety from freezing. The same principle applies as in storage. The lower the temperature above actual freezing, the more effectively are ripening and the development and growth of decay-producing organisms checked. While most of them continue to grow very slowly at temperatures of 40° F. or below, few germinate at this temperature. If, however, germination has already taken place, the best that can be expected of refrigeration is to check their growth and development sufficiently to allow of sound delivery. The necessity for prompt and quick cooling is therefore very apparent.

The cooling in an ordinary refrigerator car is usually rather slow and very unequal. It requires from six days to a week thoroughly to cool a load of oranges in transit and several days to cool wrapped deciduous fruits. Unwrapped fruits in open containers cool relatively fast because of the opportunity for free air circulation around each individual fruit. The lower tiers cool relatively fast in any load, especially near the ice-bunkers. There are marked differences in temperature between the ends and middle of the car, and between the top and bottom tiers. In the quick-ripening fruits these temperatures are reflected in the condition of the fruit in the various positions in the car. Very often the upper tiers are 15° to 20° higher in temperature than the bottom tiers and have ripened to such an extent as to make it necessary or desirable to sell them separately from the remainder of the fruit in the car.

One of the principal problems in transportation and refrigeration of fruits and vegetables in transit is to secure quicker and more uniform cooling throughout the car. This can be done, to some extent, through methods of loading and stowing and care exercised at time of loading to retain as much as possible of the refrigeration within a pre-iced car. With deciduous fruits and vegetables, cars intended for loading should be pre-iced several hours before loading begins.

The shipper in loading should not only stow the load so as to prevent shifting and breakage in transit but, first of all, so as to facilitate free circulation from both ends to the middle of the car. If crates are used, this can be done by leaving straight uninterrupted aisles between rows from one end to the other. Cleats between each layer from bottom to top will also facilitate quicker cooling. Racks so constructed as to provide a space of 4 inches between rack and floor for free circulation of cold air from each bunker toward the middle of the car underneath the load will greatly facilitate quick cooling of every package in the load. In loading fruit into pre-iced cars, it is very commonly the practice to leave both doors open during the entire period of loading. Much of the refrigeration is lost in this way which could easily be conserved if more care was exercised to open the doors only when absolutely necessary.

In so far as methods of loading and stowing are concerned, the responsibility for the safety of the load and, to some extent, its quick cooling rests on the shipper. The other factors, however, in actual transportation that have to do primarily with quick cooling and the maintenance of low temperatures in transit and freedom from breakage are factors for which the carriers must share responsibility. When properly prehandled produce has been stowed and loaded correctly, both as regards liability to shifting in ordinary freight handling and as to facilitating air circulation and quick cooling, a shipper has largely fulfilled his responsibility so far as products in transportation is concerned. Following this, the responsibility for the safe transportation of properly loaded product rests almost entirely on

the transportation company, both as relates to freedom from breakage and efficient refrigeration. The care exercised in handling freight trains and cars in switching is mainly responsible for the condition of a properly stowed load as regards shifting, breakage, and the like. The efficiency of the refrigerator car is primarily responsible for the quickness of cooling and the maintenance of uniformly low temperatures in transit as well as liability to freezing damage in cold weather. The efficiency of a refrigerator car depends not only on the quantity, quality, and condition of insulation but on the size of the car, the kind of ice-bunkers, and facilities for effecting free circulation and quick refrigeration of all packages in the car.

Salt, as a means of securing lower temperatures in refrigerator cars, is in use extensively in the transportation of meats and similar products requiring temperatures below freezing. It has been used only very sparingly with fruits. Recent tests with somewhat modified equipment indicate that salt can be used to good advantage in securing quick cooling and in maintaining the necessary low temperatures in transit.

The methods of icing and charging for refrigeration in transit vary considerably in different sections of the country. From Pacific coast points to the East, the carriers, under certain blanket rates, assume all responsibility for refrigeration in transit from point of shipment to destination. In the deciduous fruit sections all cars, unless precooled, go out under standard refrigeration, that is, pre-icing before loading and full re-icing enroute at all regular re-icing stations to destination. The refrigeration rate is uniform on all cars to any one point. Under the standard refrigeration rate for citrous fruits, the cars are usually not iced until after loading unless otherwise requested by the shipper who pays a somewhat higher rate for pre-iced cars. With citrous fruits from California, various other rates are in effect permitting one pre-icing and a re-icing before final shipment, or precooling, and one icing with no re-icing in transit. When the growers do their own precooling and initial icing with no re-icing in transit, a charge is made only for the use of the car and freight on the ice hauled in the bunkers. In the shipment of fruits from Florida there is not only the standard refrigeration rate which calls for full re-icing at the designated icing stations enroute, but there is also another rate for half-icing, which means the refilling of the bunkers at the various icing stations to one-half of their capacity, the racks on the floors of the bunkers being raised so as to hold the ice in the upper half of the bunker. In the eastern states the so-called blanket refrigeration rate to various points is not used to any considerable extent in the shipment of fruits and vegetables. The refrigeration charge to the shipper is usually based on the amount of ice consumed in transit as shown by the carriers' records at icing stations. The shipper pays for the ice actually used and the icing is done according to the instructions furnished by him on the bill of lading. If the shipper orders full refrigeration in transit, the cars are re-iced at the regular icing stations. The shipper, however, has the option of giving other instructions if he so desires, namely, either the number of icings enroute or the icing stations at which he wishes the cars to be re-iced. Under the standard refrigeration rates, applying from the Pacific coast territory, the responsibility for refrigeration in transit rests entirely with the carriers. In eastern territory the responsibility is divided between the shipper and the carrier.

Freezing in transit.

The transportation of fruits and vegetables in sound condition in transportation is related not only to efficiency of refrigeration but protection against freezing. During protracted periods of cold weather, such as sometimes occur in the northern and eastern states in the winter, the protection of fruits and vegetables in transit is a real problem. While a number of factors enter into the question of freezing protection in transit, the principal one is insulation. Aside from condition and quantity of insulation, shippers and carriers have both attempted to minimize the danger from freezing by heavy tight loading and lining the inside with heavy paper, sometimes using several thicknesses, by putting in floor-racks and by placing stoves in the bunkers or in the middle of the car.

Both tight and heavy loading are desirable when there is danger from freezing. The tight load tends to hold the heat more effectively and the heavier the load the more heat there is to draw on. Lining with heavy building-paper, or other paper of similar character, gives added protection. Certain roads have found floor-racks of decided value in minimizing the damage from freezing. Results both experimentally and commercially fully justify their use to minimize frost damage as well as an aid to more effective refrigeration. The use of stoves or heaters is hardly to be commended, as frequently the injuries from overheating certain parts of the car result in deterioration as regards quality, condition, and appearance that exceed what the freezing damage would have been. In the transportation of potatoes during the colder months from northern states such as Maine, heater cars are used to a considerable extent. Ordinary freight cars with specially constructed bins so as to provide an air-space between floor and sides of car and the load are used very largely also. A stove is placed in the middle of the car and a messenger accompanies three, four, or more cars to keep the fires going properly. The heat from heaters either outside or inside the cars is depended on more than the insulation to maintain temperatures above freezing.

H. J. Ramsey.

TRÀPA (abbreviated from *calcitrapa*, which is the same as caltrops, an instrument of war used to impede the progress of mounted warriors; it had four spine-like projections, like the fruit of the water caltrops). *Trapàceæ* or *Hydrocaryàceæ;* by some retained in *Onagràceæ*. Floating plants adapted to the aquarium.

Flowers small, axillary, solitary, short-peduncled; calyx 4-parted, the segms. persistent, sometimes spinescent; petals and stamens 4; ovary 2-loculed; ovules solitary, long, pendulous, affixed to the septum: fr. top-shaped, leathery or somewhat bony, 1-loculed, 1-seeded.—Three species, native to the warmer parts of the eastern hemisphere.

Trapa natans is one of the daintiest aquatics in cultivation. It is perfectly hardy and very desirable for aquaria, pools, ponds, or tub-culture. Its beautifully mottled or variegated foliage is very attractive. The flowers are white, small, and inconspicuous. The fruits are very large in comparison with the flowers and leaves, but they are hidden beneath the foliage until they ripen, when they drop off. They are good to eat raw, like chestnuts, and are sweeter and more palatable before the shell becomes hard. The nut is not likely to become of commercial importance in America. The seeds drop from the plant and remain in the pond all winter. Seeds must be kept in water or moist to retain their vitality. (William Tricker.)

nàtans, Linn. Water Chestnut. Water Caltrops. Jesuit's-Nut. Petiole of floating lvs. 2–4 in. long, nearly glabrous; blade rhombic-orbicular, dentate in upper half, slightly villous along the nerves beneath: fr. 4-spined, but the 2 lateral ones shorter. Eu., Orient. Gn. 24, p. 557. G.C. II. 10:213. B.R. 259.—It has two kinds of lvs. The submerged ones are root-like, long, slender, and feathery. The floating lvs. form a loose rosette. The lf.-stalks are swollen and spongy near the apex. The fr. is an inch or two across and has 4 spinescent angles. It is roasted and eaten in some parts of Eu. like the common chestnut. It is sparingly

naturalized in this country. Var. *verbanénsis*, Cesati (*T. verbanénsis*, De Not.), of Lake Maggiore in Italy, has deltoid lvs. and compressed 3-angled fr. with 2 short horns.

bispinòsa, Roxbg. SINGHARA-NUT. Petiole of floating lvs. 4–6 in. long, woolly; blade 2 x 3 in., slightly crenate in the upper half, very villous beneath: fr. ¾in. thick, with 2 of the spines sometimes absent. India, Ceylon.—Said to yield very large and sweet nuts which are sold under the name of Singhara-nut; much used by natives.

T. bicórnis, Linn. f., the Ling of China, is by some referred to T. natans: the fr. has 2 strong opposite long decurved horns like those of a bull's head. WILHELM MILLER.

TRAUTVETTÈRIA (E. R. von Trautvetter, a Russian botanist). *Ranunculàceæ*. Tall erect perennial herbs grown somewhat for their broad leaves and small white flowers borne in clusters.

Leaves broad, palmately lobed: fls. white, small, corymbose-paniculate; sepals 3–5, caducous; petals none: carpels many, forming 1-seeded achenes.—Two species, N. Amer. and E. Asia. Very hardy, thriving in ordinary or rich soil. Easily prop. by division of roots either in late fall or early spring. There is not likely to be much difficulty associated with this operation. Offered by dealers in native plants.

carolinénsis, Vail (*Hydrástis carolinénsis*, Walt. *T. palmàta*, Fisch. & Mey.). Sts. 2–3 ft high: lvs. alternate, reticulated, radical ones very large, with lobes much toothed and cut. July. Pa., south and west. B.M. 1630 (as *Cimicifuga palmata*). G. 29:395.

grándis, Nutt. (*T. palmàta* var. *occidentàlis*, Gray. *Actæa grándis*, Dietr.). Much like the above species: lvs. membranaceous, more deeply lobed, often to the base, thin, sparsely hairy beneath along the ribs; reticulations less distinct: styles longer and somewhat curled. Wash., Idaho, Brit. Col.

The genus Trautvetteria is variously interpreted Many authors regard it as monotypic, the Japanese form (*T. japonica*, Sieb. & Zucc.) being included in one cosmopolitan species (T. carolinensis). E. L. Greene, on the other hand, described 6 new American species at one time in 1912: *T. nervata*, from Ga ; *T. fimbriata*, from Ore.; *T. applanata*, Mo.; *T. rotundata*, Calif.; *T. saniculifolia*, Idaho; and *T. media* from New Mex. K. C. DAVIS.

TRAVELER'S TREE: *Ravenala.*

TREE OF HEAVEN: *Ailanthus.*

TREES: *Arboriculture.*

TREE SURGERY: *Arboriculture*, Vol. I, page 354.

TREFOIL: *Clover*, *Trifolium*; sometimes applied to *Lotus*, *Desmodium* (tick trefoil), and other Leguminosæ.

TRÈMA (Greek, *trema*, hole, alluding to the pitted stone). *Ulmàceæ*. A group of about 30 species of evergreen trees or shrubs in the tropical and subtropical regions of the Old and New Worlds: lvs. alternate, short-petioled, serrate, 3-nerved or penninerved, stipulate: fls. small, in nearly sessile clusters, monœcious or diœcious, apetalous, 5- or rarely 4-merous; sepals of staminate fls. valvate below, imbricate above; stamens 4–5; ovary 1-celled, superior style with 2 linear arms fr. a small ovoid or subglobose drupe; embryo curved or involute. Adapted for cult. in tropical and subtropical regions only and sometimes planted for its evergreen foliage. The first of the two species described below has been offered in Calif., the second in Fla.

bracteolàta, Blume. Small tree, to 30 ft.: lvs. ovate-oblong to ovate-lanceolate, acute, rounded at the base, crenate-serrate, pubescent on both sides, more densely beneath, 3-nerved at the base, 2–4 in. long: fls. in small axillary clusters: fr. globose, black, ⅙in. long, crowned by the remnants of the styles. S. Afr. Wood, Natal Pl. 4:356.—It is said in Calif. that in deep soil it makes a much-branched bushy tree with foliage similar to mulberries, and remarkable for the bright orange color of the old lvs. before dropping down.

orientàlis, Blume (*Céltis orientàlis*, Linn.). Small tree; branchlets pubescent: lvs. rigid, ovate-oblong to ovate-lanceolate, acuminate, cordate and 3–7-nerved at the base, crenate-serrulate, scabrid above, clothed with silvery, appressed pubescence beneath, 3–6 in. long: fr. ovoid, ⅙in. long, black. S. Asia. Wight, Icon. 1971.—A plant offered under this name seen by the writer proved to be a true Celtis, not a Trema.

ALFRED REHDER.

TREMÁNDRA (Greek, *hole* and *anther;* the anthers burst open through a hole). *Tremandràceæ*. More or less stellate-tomentose shrubs, sometimes grown in the greenhouse. Lvs. opposite, ovate, dentate: fls. in 5's; petals not inclosing the stamens, which are rather in 1 row, dehiscing by a single somewhat 2-valved pore; disk glandular, crenate, almost 5-lobed: caps. loculicidally 2-valved.—Two species, Austral. *T. stelligera*. R. Br. Densely stellate-hairy, 2 ft. or more high: lvs. short-petioled, ovate, obtuse, 1–1½ in. long, coarsely and irregularly toothed: fls. on pedicels shorter than the lvs.; sepals villous or tomentose. Austral. Rarely cult.

A plant is mentioned as in cult. under the name of *T. ericoides hirsùta*, Bedingh., but there seems to be some confusion and also doubt as to what it is. The plant in question has brown sts., small, subulate, heath-like lvs. and bright purplish pink drooping blossoms borne on rather long slender pink pedicels. Extra.-Trop. Austral. R.B. 25:133.

TREVÈSIA (after the family Treves di Bonfigli of Padua, patrons of botany). *Araliàceæ*. Showy and rather striking small trees or shrubs from Trop. Asia and the islands in that region: lvs. either palmately cut and simple, or digitately or pinnate compound: fls. rather large for the family and borne in panicled umbels; petals 8–12, valvate, somewhat thick; stamens 8–12; ovary 8–12-loculed: fr. large, ovoid.—About 9 species. Should be grown in a warm moist house, as the plants naturally grow in damp jungles.

palmàta, Vis. (*Gastònia palmàta*, Roxbg.). A small tree frequently 20 ft. in cult., with the ends of the branches sparingly prickly and the young parts tomentose: lvs. crowded at the ends of the branches, 1–1½ ft. across, palmately 5–9-lobed to below the middle; petioles 1–1½ ft. long: panicles long-peduncled, erect: umbels 6 in. through, long-stalked: fls. 1 in. across, yellowish white, showy. Himalayas. B.M. 7008.

T. Sánderi, Hort. Lvs. handsome, deeply cut, borne on long cylindrical petioles; lf.-blade nearly circular in outline, 2 ft. across, digitate, the divisions irregularly pinnatifid and joined at the base. Perhaps a form of what is known in cult. as T. Sundaica. Annam. G.C. III. 53:295.—*T. sundàica*, Regel, is apparently a form of T. palmata; *T. sundàica*, Miq., is a distinct species from Java and Sumatra, with infl. becoming recurved. See Gilibertia.

N. TAYLOR.†

TREVIRÀNA: A section of *Achimenes.*

TREVÒRIA (named for Sir Trevor Lawrence). *Orchidàceæ*. Epiphytic orchids, grown in the warmhouse.

Pseudobulbs elongated-pyriform, not compressed, 1-lvd.: lvs. large, rather leathery, folded, contracted to the petiole: scapes arising from the base of the pseudobulbs, simple, bearing a lax few-fld. raceme: fls large, fleshy, pedicelled; sepals rather thick, free-spreading, lateral ones oblique, very large; petals fleshy, twisted, conspicuously narrower than the sepals; labellum fleshy, concave, erect, not movably jointed with the base of the column, lateral lobes erect, axe-shaped, laxly surrounding the column; midlobe linear-hastate; column rather long, terete, clavate or abruptly truncate at apex; rostellum 2-toothed, membranaceous; pollinia 2: caps. fusiform.—About 3 species, Trop. Amer.

Chlòris, Lehm. Laxly cespitose: pseudobulbs long-pyriform: lf. oblong-lanceolate, acuminate, long-

petioled: spike pendulous, few-fld., commonly 3: fls. fleshy, greenish; dorsal sepals, oblong-lanceolate, acuminate, revolute, lateral ovate, obliquely acuminate; petals ligulate-falcate, cuspidate; lip with the lateral lobes axe-shaped and the midlobe linear-hastate. Colombia. G.C. III. 21, suppl. May 29.

Lèhmannii, Rolfe. Pseudobulbs fascicled, cylindrical or elongate-pyriform, 1-lvd., not ribbed, covered by brown lanceolate sheaths below the middle: lfts. subsessile, oblong-lanceolate, plicate: spike pendulous, few-fld., rachis stout: fls. up to 2½ in. across, green; sepals broad-ovate, subacute, concave, fleshy; petals much narrower than the sepals, oblong-lanceolate, spreading-recurved, paler; lip fleshy, lateral lobes ear-shaped, erect, midlobe 5-grooved, stipitate, swollen, 2-callused. Colombia. B.M. 7805 (as *T. Chloris*).

F. Tracy Hubbard.

TRÈWIA (from C. J. Trew, a German physician, 1695–1769). Also spelled *Trèvia*. *Euphorbiàceæ*. Small tropical softwood trees rarely cult. in greenhouses, but little known to gardeners and apparently not in the American trade: branching from the base: lvs. opposite, entire, 3–5-nerved: fls. dicœcious, in lateral racemes or the pistillate singly, apetalous; stamens simple, 50 or more; styles free above the base. About 5 species, mostly in Trop. Asia. Related to Mallotus. *T. nudiflòra*, Linn., with broadly ovate, acute or acuminate, cordate to subcuneate lvs., has been in cult. in Eu. from S. Asia. It is prop. by cuttings in sand.

J. B. S. Norton.

TRIÀNEA: *Limnobium.*

TRIBRÒMA: *Theobroma*, p, 3331.

TRICALÝSIA (Greek, *triple calyx;* true of some species). Including *Kraùssia*. *Rubiàceæ*. Erect or climbing shrubs, used as ornamentals in extreme South.

Branches opposite, terete or obtusely quadrangular: lvs. opposite, short-petioled; stipules short, broad, apiculate and intra-petiolar: fls. rather small, subsessile, shortly pedicelled, axillary; calyx-tube turbinate or campanulate, 4–6-lobed or shortly dentate; corolla funnel-shaped or shortly salver-shaped, lobes 4–8, oval, ovate, or lanceolate; stamens 4–8; disk annular, fleshy, glabrous; ovary 2- rarely 3-celled: fr. pisiform, berry-like, leathery, 1–2-celled, few-seeded.—About 65 species, Trop. and S. Afr., Madagascar; two intro. in Fla. and S. Calif.

A. *Lvs. lanceolate, acuminate.*

lanceolàta, Hiern (*Kraùssia lanceolàta*, Sond.). Shrub: lvs. lanceolate, acuminate: cymes many-fld.: calyx 5-toothed; throat of corolla densely bearded; stigma deeply 2-lobed, lobes revolute: fr. globose, the size of a pea. Natal.

AA. *Lvs. elliptic, obtuse.*

Sonderiàna, Hiern (*Kraùssia coriàcea*, Sond.). Shrub: lvs. elliptical, obtuse or minutely apiculate, wedge-shaped at the base, coriaceous, 1½–3½ in. long: cymes about 4-fld.: fls. pentamerous; pedicels ⅓–⅜in. long; throat densely bearded; stigmas deeply 2-lobed, lobes revolute. Natal.

T. Kraussiàna, Schinz (Coffea Kraussiana, Hochst. Kraussia floribunda, Harv.). Shrub with reddish brown branches: lvs. ovate-oblong or lanceolate-subacute: cymes axillary, paniculate: corolla 3–4 lines long. Natal.

F. Tracy Hubbard.†

TRICHÍLIA (Greek, *by threes;* the fls. are trimerous). *Meliàceæ*. Trees or shrubs, suitable for the warmhouse or outdoors in the extreme S. as ornamentals. Lvs. with 3 lfts. or uneven-pinnate; lfts. opposite or alternate, usually many-paired, rarely 2-paired: panicles many-fld., axillary: fls. large for the order; calyx short, 4–5-toothed or cleft; petals 4–5, erect or spreading; staminal tube 8–10-cleft or -parted; disk annular, free; ovary sunken in the disk, 2–3-celled: caps subglobose, leathery, 2–3-celled.—About 120 species, Trop. Amer. and Trop. Afr.

spondioìdes, Jacq. Tree, 15–20 ft. high: lvs. pinnately compound; lfts. 7–10-paired, ovate-oblong, oblique and round at base, glabrous: panicles puberulent, divisions 3–11-fld.: fls. greenish yellow; staminal tube cohering one-third its length, anthers 10, hairy: caps. tomentose, rugulose, 5–6 lines diam. Trop. Amer. and intro. into S. Fla.

T. undulatifòlia, Hort., is offered in the foreign trade.

F. Tracy Hubbard.

TRICHÍNIUM (Greek, *hairy*, alluding either to the plant in general or to the fl.-heads). *Amarantàceæ*. Herbs, subshrubs or rarely shrubs glabrous or pubescent, adapted to greenhouse cult.: lvs. alternate, narrow, rarely obovate or spatulate, entire: fls. in dense spikes or globose or oblong heads, white, straw-colored or rose, hermaphrodite; perianth narrow or elongate, 5-parted, segms. equal, linear, rigid, usually plumose; stamens 5; ovary sessile or stipitate, glabrous or lanuginous, ovule 1: fr. an indehiscent utricle.—About 60 species, natives of Austral.

exaltàtum, Benth. (*Ptilòtus exaltàtus*, Nees). A tender perennial, 2–3 ft. high, erect, usually branching above: lower lvs. 2–5 in. long, oblong-lanceolate, rather thick, contracted into a long petiole; upper lvs. smaller: spikes erect, long-peduncled, at first ovoid-conical, becoming longer: perianth ¾in. or less long, yellowish, with dull red tips. B.R. 25:28 (as *T. alopecuroideum*).—Intro. in this country as a greenhouse subject.

T. Mánglesii, Lindl., is perhaps the choicest species. It has violet-purple fls. in large pyramidal heads 3 in. long and 2 in. wide at base. It could probably be grown as a summer annual. B.M. 5443. F.S. 23:2396. R.H. 1866:291. F. 1864:217. I.H. 13:464. G.C. 1864: 555; III. 32:181. G. 25:20. Gn. 68, p. 225.

F. W. Barclay.

TRICHLÒRIS (Greek, for *three*, and *Chloris*, a genus of grasses, referring to the 3 awns which differentiate the two genera). *Gramìneæ*. Perennial grasses that resemble Chloris but differ in having 3-awned lemmas. Species 5, Mex. and S. S. Amer.

mendocìna, Kurtz. (*T. Blanchardiàna*, Hack.). Spikes several, erect, slender, approximate at top of the culms, feathery with the delicate awns. Argentina.—An ornamental grass, readily grown from seed.

A. S. Hitchcock.

TRICHOCAÙLON (Greek, *hair* and *stem;* said to allude to the bristles that tip each tubercle on the st.). *Asclepiadàceæ*. Perennial herbs, suitable probably for the warmhouse. Sts. low, thick, fleshy, many-angled, angles tuberculate; tubercles aculeate: fls. small, between the angles, usually solitary, very short-pedicelled; calyx 5-parted, segms. acute; corolla disk-shaped, deeply 5-cleft, lobes broadly ovate; disk double, short-stipitate, outer deeply 5-lobed, inner 5 ligulate lobes.—About 15 species, Trop. and S. Afr. *T. pictum*, N. E. Br. St. subglobose or cylindrical, oblong, very obtuse, 2–3 by about 2 in., irregularly tessellate-tuberculate, glabrous: fls. fascicled, erect, fascicles 2–4-fld.; sepals broad ovate; corolla not ½in. diam., white marked with purple spots and numerous short lines, lobes broad deltoid-ovate, acute. S. Afr. B.M. 8579. *T. Pillaùsii*, N. E. Br. Plant 5–9 in. high, branching at base: sts. 1¼–2¼ in. diam., cylindrical, with many tuberculate angles, glaucous-green, glabrous, tubercles ending in stiff bristles: fls. in small clusters, between the angles, toward the top of the sts.; sepals ovate, very acuminate; corolla bright creamy yellow, glabrous and smooth outside, densely papillate on the inner face of lobes. S. Afr. Var. *major*, N. E. Br. Plant and fls. larger than the type. S. Afr.

F. Tracy Hubbard.

TRICHOCÉNTRUM (Greek, *hair* and *spur*, alluding to the long slender spur). *Orchidàceæ*. A small group allied to Rodriguezia (Burlingtonia); the plants grow in dense matted tufts.

Pseudobulbs very small, each bearing a broad fleshy

lf.: infl. a few-fld. raceme on which usually only 1 fl. opens at a time: sepals and petals free, spreading; labellum larger, spurred, with 2 lateral lobes and a 2-parted middle lobe; column short; pollinia 2, on a wedge-shaped stipe.—About 20 species. Epiphytes of dwarf stature, growing best on blocks; free-flowering; they suffer from too much water at the root; give them a warmhouse temperature. Prop. by division.

álbo-purpûreum, Reichb. f. Lvs. oblong-lanceolate, 3 in. long, tufted: fls. on short peduncles, 2 in. across; sepals and petals obovate-lanceolate, inside maroon-brown, with greenish tips, outside greenish; labellum subquadrate, white, with a large purple spot on each of the lateral lobes. Brazil. B.M. 5688. A.F. 6:609. J.H. III. 51:382.

tigrînum, Lindl. & Reichb. f. Similar in habit to the preceding: lvs. oblong, obtuse, speckled with red: fls. pendulous, nearly 3 in. across; sepals and petals broadly linear, yellow, speckled with red; labellum cuneate-obovate, emarginate, white, rose toward the disk. May. Cent. Amer. B.M. 7380. I.H. 24:282.

T. panamênse, Rolfe. Fls. light green, with white lip, with red-purple blotch at base; spur yellowish, short, dilated, divided at apex into 4 short lobes. Panama.

HEINRICH HASSELBRING.

TRICHOGLÓTTIS (Greek, *hair* and *tongue*, referring to the fine hairs on the labellum). *Orchidàceæ*. Epiphytic herbs, occasionally grown in the warmhouse. Sts. leafy, elongated, not pseudobulbous: lvs. distichously arranged along the st., narrow: peduncles lateral, very short, 1- to few-fld.: fls. small or medium; sepals spreading, lateral very broad at the base, dorsal oblong; petals like the dorsal sepal; lip adnate with the column-foot, forming a long horizontal spur-like chin, spreading above, lateral lobes erect, short, midlobe rather broad, spreading; column short, wingless; pollinia 2, globose.—About 30 species, Malaya and the Philippines. *T. Solerèderi*, Kränzl. Sts. elongated: lvs. fleshy, somewhat lanceolate, up to 5 in. long, about 1 in. wide: racemes 1-fld.: sepals obovate-oblong, 4–5 lines long, bright green, each with 5 transverse brown-purple bands; petals much smaller, similar in color, but with only 3 bands; lip ½in. long, white, soon becoming yellowish with 2 blood-red spots on the disk. Philippines. *T. Dawsoniàna*, Reichb. f. (*Cleisóstoma Dawsoniàna*, Reichb. f.). Scape 6–10 in. high, stout: lvs. 3–8 in. long, oblanceolate: fls. 2 in. diam., yellow-green barred with brown; sepals oblong-lanceolate; petals shorter; lip subsessile, side lobes oblong, midlobe ovate, acute, with a short falcate wing on each side of the tip. Burma.

3836. Tricholæna rosea.

F. TRACY HUBBARD.

TRICHOLÆNA (Greek for *hair* and *mantle*, referring to the covering of silky hairs on the spikelets). *Gramíneæ*. Allied to Panicum: spikelets loosely paniculate, clothed with long silky hairs; first glume minute, remote from the second; second glume and sterile lemma 2-lobed, a slender awn from between the lobes.—Species 10, all African, 1 extending to the Medit. region and 2 to India.

rósea, Nees (*T. violàcea*, Hort. *T. grandiflòra*, Hochst. *Pánicum tónsum*, Steud.). Fig. 3836. NATAL-GRASS. Annual: culms usually geniculate at base, 1½–3 ft. high: panicle 3–8 in. long, the silky spikelets a rich wine-color when fresh, changing to purplish when dry. S. Afr. R.H. 1897, p. 273.—One of our most beautiful ornamental grasses. Sometimes called ruby-grass. It has become naturalized in parts of Fla. and Calif. A. S. HITCHCOCK.

3837. Fructification of Trichomanes. (Enlarged.)

TRICHÓLEPIS (Greek, *hair* and *scale*, the involucral scales are narrow with long hair-like tips). *Compósitæ*. Annual or perennial herbs, which are branched and unarmed: lvs. alternate, entire, toothed or the lower pinnatifid: heads terminal, solitary, homogamous; involucre ovoid or broader; bracts many-rowed, very narrow, usually with long recurved hair-points: fls. all hermaphrodite, similar and fertile, yellow, red, or purple; tube slender; limb 5-cleft: achenes glabrous, oblong or obovoid, ribbed.—About 7 species, India.

furcàta, DC. Glabrous or puberulous herb, 1½–6 ft. high, branched from the base: lvs. 2–6 x ¾–2½ in., elliptic-lanceolate, acute or acuminate, denticulate, short-petioled: head rather large, yellow; involucral bracts needle-like. Himalaya. Grown for ornament.

TRICHÓMANES (Greek, *soft hair*). *Hymenophyllàceæ*. A group of filmy ferns distinguished by its tubular cup-like indusium and filiform elongate receptacle. (Fig. 3837.) Very delicate in texture and capable of being grown successfully only under shaded glass. Over 100 species are known. Various species may be found in the collections of fanciers, but the following appear to be the only ones regularly in the American trade. For culture, see *Ferns*.

radîcans, Swartz. Lvs. 2–8 in. long, 1–1½ in. wide, bipinnatifid; pinnæ ovate, obtuse; indusia terminal, on short lobes. Tropical regions, extending into the southern states as far as Ky.

Prieûrii, Kunze (*T. ánceps*, Hook.). Lvs. 12–18 in. long, 6–12 in. wide, tri-quadripinnatifid; pinnæ ovate-lanceolate; sori 2–12 to a pinnule, small, in sinuses; indusium with a much dilated lip. Trop. Amer.

L. M. UNDERWOOD.

TRICHONÈMA: *Romulea.*

TRICHOPÌLIA (Greek, *hair* and *cap;* the anther is concealed under a cap surmounted by three tufts of hair). *Orchidàceæ*. Handsome orchids, usually grown in pots, although epiphytal.

Pseudobulbs crowded on the short rhizome, flattened and often elongate, 1-lvd., surrounded with dry scales at the base: lvs. large, solitary, erect, fleshy, keeled: fls. abundantly produced on short, nodding or decumbent scapes; sepals and petals narrow, spreading, often twisted; labellum large, forming the most conspicuous part of the fl., united with the column below, lateral lobes convolute, middle lobe spreading; anther bent over; pollinia on a triangular caudicle; clinandrum fimbriately winged.—About 20 species, ranging from Mex. to S. Amer. The fls. keep fresh a long time, both on the plant and when cut. They need an intermediate or greenhouse temperature. If grown too warm, they suffer. Prop. by division.

Galeottiàna, A. Rich. & Gal. Pseudobulbs narrow, flattened, 5 in. long: lvs. oblong, acute, about 6 in. long: scapes short, mostly 1-fld.: sepals and petals cuneate-lanceolate, yellowish green, sometimes with a band of cinnamon down the middle; labellum trumpet-shaped, whitish with some purple streaks and dots in the center, and yellow in the throat. Aug., Sept. Costa Rica, Mex. I.H. 6:225 (as *T. picta*). B.M. 5550 (as *T. Turialvæ*). C.O. 5.

fràgrans, Reichb. f. (*Pilúmna frágrans,* Lindl. *T. Backhousiàna,* Reichb. f.). Pseudobulbs clustered, flattened, 3–5 in. long, 1-lvd.: lvs. oblong-lanceolate, acute, 6–8 in. long: scape pendent, 1 ft. long, about 6-fld.: fls. on pedicels 3 in. long; sepals and petals spreading, linear-lanceolate, 2½–3 in. long, wavy and twisted, greenish white; labellum folded over the column, spreading in front, and somewhat lobed, white with a yellow stain in the throat. Summer. Colombia. B.M. 5035. C.O. 3. G. 35:411. G.M. 52:421.—Fls. almond-scented.

nóbilis, Reichb. f. (*Pilúmna nóbilis,* Reichb. f. *T. cándida,* Lind.). Pseudobulbs large: lvs. broadly oblong-acute: fls. white; sepals and petals linear-oblong, acute, 2 in. long, scarcely twisted; labellum large, white with a yellow spot in the throat. Venezuela. I.H. **19**:94 (as *T. fragrans* var. *nobilis*). F.M. 1872:21 (as *T. fragrans*). —This has larger stouter pseudobulbs and shorter broader lvs. than *T. fragrans.* The labellum is larger and the petals shorter compared with the size of the fl. Var. **álba,** Hort., has fls. pure white.

tórtilis, Lindl. Pseudobulbs oblong, compressed, somewhat curved, 2–4 in. long: lvs. solitary, oblong, acute, 6 in. long: fls. solitary, on decumbent stalks shorter than the lvs.; sepals and petals linear-lanceolate, 2 in. long, spirally twisted, brown with yellowish margins; labellum forming a tube around the column, upper portion expanded, 4-lobed, white with crimson spots, becoming entirely crimson within. Fls. profusely in summer and sometimes again in winter. Mex. B.M. 3739. B.R. 1863. F.C. 3:101. B. 3:122. C.O. 6. Var. **álba,** Hort., is advertised.

suàvis, Lindl. Fig. 3838. Pseudobulbs thin, compressed, 2 in. long: lvs. broadly oblong, 8 in. long: scape pendent, about 3-fld.: fls. on long, curved stalks, large; sepals and petals lanceolate-acuminate, wavy, nearly straight, 2 in. long, white or cream-colored; labellum large, projecting forward, white or cream-colored, spotted with pale purple, yellow in the throat; limb large-lobed, wavy, and crenate. May, June. Cent. Amer. B.M. 4654. F.S. 8:761. R.H. 1859, pp. 220, 221; 1887, p. 454. Gn. 4, p. 511; 31, p. 452; 38, p. 185; 48, p. 79; 51, p. 371. C.O. 4. R.B. 23:256. G.M. 38: 281. A.G. 24:331. J.F. 3:277. J.H. III. 43:371. Var. **álba,** Warner. Fls. white with a yellow spot in the throat of the labellum. C.O. 4*a*. G. 16:686. G.W. 14, p. 52. Var. **grandiflòra,** Hort. A large-fld. form. G.W. 5, p. 344. Var. **cándida,** Hort. Fls. pure white except yellow blotch at base of lip.

marginàta, Henfr. (*T. coccínea,* Warsc. *T. crísp*a var. *marginàta,* Hort.). Pseudobulbs clustered, oblong, compressed: lvs. broadly lanceolate, suddenly acuminate, subauriculate at the base: scape about 3-fld.: fls. large, whitish outside, reddish purple within; sepals and petals linear-lanceolate, margined with white, the former slightly twisted; labellum trumpet-shaped, with a large, rounded, wavy, 4-lobed blade. May, June. Cent. Amer. B.M. 4857. F.S. 14:1490; 18:1925–26. G.C. III. 20:456. F.M. 1874:98 (as *T. lepida*). J.F. 2:184. C.O. 2.

críspa, Lindl. This plant was described by Lindley in Linden's catalogue. It is closely related to *T. marginata,* which is sometimes classed as a variety of *T. crispa.* The following description is taken from Watson's Orchids: Pseudobulbs ovate, flattened, 2–3 in. long, dark green, 1-lvd.: lvs. leathery, 6 x 2 in., keeled, acute-pointed: fl.-spikes basal, drooping, short, 3-fld.: fls. with pedicels 2 in. long; sepals and petals spreading, 2½ in. long, ½in. wide, wavy-edged, twisted, brownish yellow; lip folded over the column, spreading in front, 1½ in. across, colored deep crimson with a white margin. May, June. Costa Rica. C.O. 2.

T. Goùldii=T. suavis×T. fragrans.—*T. Hennisiàna,* Kränzl. Fls. very fragrant, pure white, with 2 zones of golden yellow on lip. Colombia.

HEINRICH HASSELBRING.

TRICHÓPTERIS (from Greek for *hair,* and *Pteris*). *Cyatheàceæ.* A generic name applied to several American species of Alsophila which, however, probably do not deserve separation. *T. Albertii,* Hort., said to come from the Congo, is not botanically known.

R. C. BENEDICT.

TRICHOSÁNTHES (Greek, *hair* and *flower,* alluding to the fringed edge of the petals). *Cucurbitàceæ.* SNAKE GOURD. Climbing herbs, annual or perennial, sometimes shrubby at base, roots sometimes tuberous, grown both in the greenhouse and outdoors as tender annuals.

Leaves entire or 3–5-lobed, base cordate; tendrils simple or 2–3-cleft: fls. rather large or small, white, monœcious; male fls. racemose, calyx-tube oblong or

3838. Trichopilia suavis. (×¼)

cylindrical, dilated above, 5-lobed, corolla rotate, 5-parted; stamens 3, ovary rudimentary; female fls., calyx and corolla as in male, stamens rudimentary or none; ovary oblong or globose: fr. usually large, fleshy, globose, oblong, ovoid-fusiform, or conical.—About 50 species, Trop. Asia, N. Austral, and Polynesia. Monographed in DC. Monogr. Phaner. 3:351. The fr. is often ornamental and highly colored; in *T. Anguina* it has been noted over 6 ft. in length. The plants flower in July from seed sown in March. They may be treated as tender annuals.

A. *Bracts small or none on the racemes of male fls.*

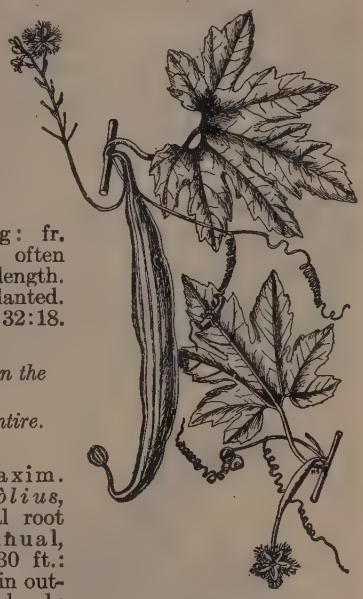
B. *Fr. ovoid.*

cucumeroìdes, Maxim. Root fleshy, tuberous: st. slender, 12–15 ft.: lvs. ovate in outline, 4–6 in. long, more or less palmately 3–5-lobed, margin crenulate: peduncle bearing the male fls. 1–4 in. long and 3–15-fld.:

petals about ½in. long, oblong, acute, longly fringed: fr. oblong, shortly rostrate, nearly 3 in. long, vermilion-colored. Japan.—Offered by importers of Japanese plants.

BB. *Fr. oblong.*

Anguìna, Linn. (*T. colubrìna,* Jacq.). SERPENT or SNAKE GOURD. Fig. 3839. St. slender, tall-growing: lvs. nearly circular in outline, 5–7 in. across, 3–7-lobed; lobes round; margin undulate or wȧvy: peduncle bearing the male fls. 4–10 in. long, 8–15-fld.: body of petals oblong, less than ½in. long, fringes ½in. long: fr. slender, contorted, often exceeding 3 ft. in length. India, but widely planted. B.M. 722. B.R. 32:18. R.H. 1859, p. 595.



3839. Trichosanthes Anguina. (×⅛)

AA. *Bracts large on the male raceme.*

B. *Calyx-segms. entire.*

C. *Lvs. lobed.*

Kirilòwii, Maxim. (*Eopèpon vitifòlius,* Naud.). Perennial root tuber-like: st. annual, high-climbing, 20–30 ft.: lvs. nearly circular in outline, 3–8 in. across, deeply 5–7-lobed, the lobes oblong, acute, coarsely serrate: racemes bearing the male fls. 4–8 in. long, 3–8-, rarely only 1-fld.: petals triangular-wedge-shaped, deeply cut and the segms. much cut and longly fimbriate, ovoid, somewhat acute; base shortly attenuate, yellowish orange, about 4 in. long, 2½ in. thick. Mongolia.

CC. *Lvs. not lobed.*

cordàta, Roxbg. (*T. palmàta,* Wall.). Root tuberous: st. robust, high-climbing: lvs. wide, ovate-cordate, acute or shortly acuminate, 5–8 in. long, rarely somewhat angled or obscurely lobed; margin slightly dentate: peduncle bearing male fls. 5–8 in. long, 4–8-fld.: calyx-segms. finely acute: fr. globose, red, orange-streaked, not acute at the apex. India.

BB. *Calyx-segms. toothed.*

bracteàta, Voigt (*T. palmàta,* Roxbg.). St. stout, climbing to 30 ft.: lvs. broadly ovate, scabrous above, usually deeply 3–7-lobed; lobes acute; margin dentate: peduncle of male fls. 4–8 in. long, 5–10-fld.: fr. globose, red with orange stripes about 2 in. long. India.

F. W. BARCLAY. F. TRACY HUBBARD.†

TRICHÒSMA (Greek, *three* and *ridge,* referring to the 3-lobed labellum). *Orchidàceæ.* A genus of 1 species resembling Cœlogyne. Sepals and petals similar, erect-spreading, the lateral pair forming a distinct mentum with the projecting foot of the column; labellum 3-lobed, the lateral lobes erect, convolute over the column, middle lobe with longitudinal ridges: sts. slender, 2-lvd.: infl. racemose. *T. álbo-marginàta* of the trade is unidentified.

suàvis, Lindl. (*Éria coronària,* Reichb. f.). Lvs. lanceolate, undulate, 3-nerved: fls. few in a terminal raceme, white, yellowish or purplish, fragrant; sepals ovate-lanceolate; petals oblong; labellum ovate-oblong, streaked with purple; disk yellow, middle lobe with several crenate ridges. Himalaya. B.R. 28:21.

HEINRICH HASSELBRING.

TRICHÓSPORUM (Greek, *hair* and *seed;* seeds with 1 or more long hairs at the ends). Syn., *Æschynánthus. Gesneriàceæ.* Subshrubs or shrubs, often climbing over trees, glabrous or rather villous, grown in the warmhouse.

Lvs. opposite, fleshy or leathery: fls. showy, scarlet, greenish or yellow and green mixed, fascicled in the axils or at the ends of the branches, rarely solitary; calyx truncate, 5-cleft or 5-parted; corolla-tube elongated, ventricose or broadened above; limb somewhat 2-lipped, usually strongly oblique; perfect stamens 4; disk annular, usually thick, cup-shaped; ovary superior, oblong or linear: caps. long-linear, 2-valved.—About 55 species, India, Malaya, and E. Trop. Asia.

These beautiful free-flowering plants are propagated by cutting the branches that have been made during the season of growth into lengths of about 2 inches, having two leaves attached and another joint to insert in the sand. They root in about a month in a close frame when the temperature top and bottom is maintained around 70°. Being epiphytal under natural conditions, these plants like a loose open material to grow in, and equal parts of osmunda fiber and sphagnum moss to which plenty of broken charcoal has been added are the best potting material. Shallow pans are best to grow them in, and provision should be made for the water to pass freely through them. The plants should not be allowed to flower the first season, the aim being to secure a good foundation for a future plant, and this is done by pinching the shoots three or four times during the season, growing them in a night temperature of 65°. In winter they may be kept 5° cooler and given enough water to prevent shriveling. The plants should not be stopped the second season, but allowed to run to flower; but after they have finished flowering they may be pruned back to within 6 inches of the base of the plant. Trichosporums should be grown hung from the roof of the house, near the glass, and when the sun gets strong they should have a light shade. When well rooted in the pan they are growing in, manure-water should be given. These plants are not subject to insect pests. (George F. Stewart.)

A. *Calyx deeply 5-parted, the lobes acute.*

grandiflòrum, D. Don (*Æschynánthus grandiflòra,* Spreng.). St. creeping, mostly herbaceous, 4–5 ft.: lvs. lanceolate, acuminate, 4–5 in. long, repand-serrate, fleshy: fls. aggregated; calyx fleshy and short; corolla arched-tubular, 2–3 in. long, downy, orange-scarlet. E. India. B.M. 3843. P.M. 5:241.—Will succeed in an intermediate house.

AA. *Calyx tubular, entire or shortly 5-toothed.*

púlchrum, Blume (*Æschynánthus púlchra,* Don. *Æ. púlcher,* DC.). Fig. 3840. Trailing: lvs. broadly ovate, distantly small-toothed: corolla glabrous, brilliant scarlet, 3 times longer than the glabrous greenish calyx. Java. B.M. 4264. R.B. 18: 13. R.H. 1883:204. P.M. 16:161.

3840. Trichosporum pulchrum.

Lobbiànum, Kuntze (*Æschynánthus Lobbiàna,* Hook.). The commonest species in cult. in this country: differs from *T. pulchrum* in narrower and nearly entire lvs., corolla downy and projecting only twice or less the length of the purple downy

calyx. Java. B.M. 4260, 4261.—A very attractive plant when well grown.

T. Boschiànum, Kuntze (Æschynanthus Boschiana, De Vr. Æ. Lamponga, Miq.). Lvs. ovate or elliptic, obtusish, entire: calyx cylindrical, glabrous; corolla twice as long (2 in.), pubescent, scarlet. Sumatra. P.M. 13:175.—*T. fúlgens*, Kuntze (Æschynanthus fulgens, Wall.). Lvs. lanceolate: calyx tubular, short-toothed, glabrous; corolla about 2 in. long, orange-red, pubescent. E. Indies. B.M. 4891.—*T. javánicum*, Kuntze (Æschynanthus javanica, Hook.). Allied to T. pulchrum: differs in having a pubescent calyx and corolla. B.M. 4503. F.S. 6:558.—*T. longiflòrum*, Kuntze (Æschynanthus longiflora, Blume). Vigorous: lvs. 3–5 in. long: calyx deeply cut, the divisions linear-subulate; corolla tubular, scarlet, very long; fls. fascicled. Java. B.M. 4328. P.M. 15:25.—*T. macrócalyx*, Kuntze (Æschynanthus macrocalyx, C. B. Clarke). Lvs. 4–5 in. long, fleshy, oblong, acuminate: fls. axillary, solitary; calyx 1¾ in. long, lobes narrowly lanceolate, acuminate; corolla cylindrical-funnel-shaped, scarlet with dark purple nerves and spots. Siam.—*T. marmoràtum*, Kuntze (Æschynanthus marmorata, F. Moore. Æ. zebrina, Van Houtte). Lvs. 3½ in. long, oblong-lanceolate, obovate-lanceolate or ovate, acuminate, reddish purple beneath: fls. axillary; corolla-tube green, curved, segms. ciliate, blotched with chocolate-brown. Habitat unknown.—*T. miniàtum*, Kuntze (Æschynanthus miniata, Lindl.). Fls. vermilion, in 3's in the axils of the oval or elliptic entire lvs.; corolla pubescent. Java, Borneo. P.M. 16:65.—*T. speciósum*, Kuntze (Æschynanthus speciosa, Hook. Æ. splendens, Lindl. & Paxt.). Branches knotty: lvs. large, oval-lanceolate, nearly sessile, upper ones verticillate or in 3's: fls. fascicled, numerous; calyx with linear-subulate divisions; corolla large, orange-red, curved. Java. B.M. 4320. P.M. 14:199. Gn. 51:188.—*T. tricolor*, Kuntze (Æschynanthus tricolor, Hook.). Lvs. small, oval or lanceolate, hairy at the base: calyx obconic, pubescent; corolla small, pubescent, blood-red, throat orange, upper lobes striped black or purple; fls. mostly twin. Borneo. B.M. 5031. R.B.10:7. I.H. 5:169. F.S. 13:1384.

F. Tracy Hubbard.†

TRICHOSTÈMA (Greek, *hair* and *stamen*, referring to the filaments). *Labiàtæ*. Blue Curls. Hardy or half-hardy herbs, adapted to the wild-garden or rockery.

Leaves entire; floral lvs. similar: floral whorls axillary, densely or laxly many-fld.; calyx campanulate, 10-nerved, 5-toothed; corolla-tube slender, usually exserted, without a ring inside; limb subequally 5-cleft, lobes oblong or broadly declinate; stamens 4, didynamous; ovary deeply 4-lobed: nutlets obovoid, reticulately rugose.—About 10 species, N. Amer.

dichótomum, Linn. Bastard Pennyroyal. Low, viscid annual: lvs. oblong or lanceolate-oblong, obtuse, short-petioled: corolla blue or pink, sometimes white. Sandy fields, Mass. to Ky., Fla., and Texas.

lanàtum, Benth. A perennial shrubby plant with rosemary-like lvs. and cymes of fls. in a naked terminal thyrse: lvs. narrow-linear, 1-nerved, sessile, margins revolute: calyx and corolla covered with dense violet or purple wool; corolla ½in. long. S. Calif.—A very handsome shrub, known as "ramero."

Púrpusii, Brandeg. Perennial, somewhat woody, much branched, 1–1¾ ft. high: lvs. short-petioled, ovate, ¾–1¼ in. long, dark green: floral whorls axillary, few-fld., forming terminal loose leafy panicles: fls. showy, scarlet; corolla shortly hairy, about ¾in. long, upper lip helmet-shaped, 3-lobed, lower lip pendulous. S. W. Mex.

F. Tracy Hubbard.†

TRICHOSTÍGMA (named for the *hairy stigma*). *Phytolaccàceæ*. Three Trop. American erect or scandent shrubs, as defined by Walter in Engler's Das Pflanzenreich, hft. 39 (IV. 83), 1909, of which *T. peruviànum*, Walt. (*Rivìna peruviàna*, Moq. *Villamílla peruviàna*, Hook. f. *V. ròseo-cænìa*, Rusby. *Ledenbérgia ròseo-cænèa*, Lem.), may be expected to appear in choice warmhouse collections. It is a climbing woody plant prized for its ornamental lvs., prop. by cuttings under glass: 6 ft. or more tall, with slender branches: lvs. elliptic, acuminate, usually rounded or cordate but unequal at base, thickish, shining metallic green above and rose-violet beneath: fls. small and whitish, in elongated lax partially erect but becoming drooping racemes. Andean region. I.H. 16:591, which represents a handsome purple plant, with a long raceme of phytolacca-like fls.

Trichostigma is characterized by alternate petiolate entire oval or elliptic lvs. and hermaphrodite racemose small 4-parted fls.: sepals nearly equal, free, ovate or elliptic, reflexed in fr.; petals none; stamens 8–25, more or less inserted on the hypogynous disk; ovary 1-celled, the style very short or none: fr. berry-like, globular.

TRICUSPIDÀRIA (Greek, *three* and *points;* the petals are divided into 3 pointed lobes). Syn., *Tricúspis*. *Elæocarpàceæ*. Trees grown in the greenhouse, hardy in the extreme South where they are used as ornamentals.

Leaves alternate or opposite, serrate: peduncles axillary, solitary, 1-fld.: fls. rather large; calyx campanulate, truncate, obsoletely 5-toothed, deciduous; petals 5, 3-dentate or -lobed; stamens numerous; ovary 3–5-celled, ovules many in a cell: caps. leathery, usually angled, loculicidally 3–5-valved.—Two species, Chile. The accepted name is now **Crinodendron.**

C. depéndens, Schneid. (*Tricuspidària depéndens*, Ruiz & Pav.). Compact tree: lvs. broad oblong-obovate or obovate, apex rather blunt, crenulate-dentate: fls. white, campanulate, pedicels slender. Chile. B.M. 8115.—Intro. into Calif.

C. Patágua, Molina (*C. Hookeriànum*, Gay. *Tricuspidària depéndens*, Hook., not Ruiz & Pav. *T. hexapétala*, Turcz. *T. lanceolàta*, Miq.). Tree, up to 30 ft. high: lvs. elliptic or elliptic-lanceolate, apex acute, sharp-serrate: fls. red, hanging. Chile. B.M. 7160. G. 37:197. Gn. 70, p. 284. G.C. III. 47:75; 55, suppl. Jan. 10. G.M. 47:575. J.H. III. 61:61 (last four as *T. dependens*).

F. Tracy Hubbard.

TRICÝRTIS (Greek, *three convexities*, referring to the nectar-bearing sacs at the base of the three outer perianth-segments). *Liliàceæ*. Toad-Lilies. Half-hardy perennials, pretty garden plants; also used for pot culture.

Rhizome short-creeping: sts. erect, simple below the infl., leafy: infl. terminal, or laxly dichotomous in the upper axils: fls. few, rather large, somewhat long-pedicelled; perianth usually beautifully spotted inside, campanulate, segms. distinct from the base, lanceolate, acute; stamens 6; ovary oblong, 3-cornered, 3-celled: caps. narrowly oblong, prominently 3-cornered, septicidally dehiscent, erect, usually more than 1 in. long.—About 9 species, native to Japan and Formosa. Monographed by J. G. Baker in Journal Linnæan Society, vol. 17, p. 463 (1879).

3841. Tricyrtis hirta. (×¼)

A. *Base of lvs. not clasping the st.*

B. *Plant not stoloniferous.*

formosàna, Baker. Sts. flexuous, about 1 ft. high: lvs. few, sessile, oblanceolate, acute, base cuneate, lower 4–5 in. long, ¾–1 in. broad, both surfaces green: fls. few, in a lax corymb, whitish purple, scarcely spotted, about ¾in. long: style as long as the stigmas. Formosa.

BB. *Plant stoloniferous.*

stolonífera, Matsum. Herbaceous, 2 ft. high, with a stoloniferous base: st. reddish purple below, greenish above, at first hairy, later glabrous: lvs. elliptic-lanceolate, acuminate, narrowed to a sheathing base, 8x1¾ in., glabrous above, with dark blotches and sunken nerves: fls. purple, indistinctly blotched; perianth yellow at base, segms. elliptic, acute, 1 in. long, 2-lobately saccate at base. Formosa. B.M. 8560.

AA. *Base of lvs. clasping the st.*

B. *St. pilose, with spreading hairs.*

hírta, Hook. (*T. japónica,* Miq.). Fig. 3841. St. 1–3 ft. high, everywhere clad with soft whitish spreading hairs: fls. 6–15, racemose or subcorymbose, whitish, the outer segms. covered with rather large purple spots. Widespread in the woods of Japan. B.M. 5355. Gn. 30, p. 431; 49:290. V. 12:204. Var. **nígra,** Hort. (*T. nigra,* Hort.), has black instead of purple spots. Gn. 49:290. A form with variegated lvs. was once offered in this country.

BB. *St. not prominently hairy, puberulent or very slightly pilose.*

C. *Fls. yellow, unspotted.*

flàva, Maxim. St. dwarf: lvs. oblong-lanceolate: fls. racemose, yellow, not spotted. Seen by Maximowicz in the gardens of Yedo only.

CC. *Fls. spotted, not yellow.*

D. *Spots rather large.*

pilòsa, Wall. St. 2–4 ft. high, very slightly pilose: lvs. oblong: fls. numerous, loosely corymbose, whitish, with large purple spots; style half as long as the stigmas. Himalayas, 5,000–6,000 ft. B.M. 4955 (perianth-segms. narrow, oblong). F.S. 12:1219.

DD. *Spots minute.*

E. *Style as long as the stigmas.*

latifòlia, Maxim. St. glabrous, flexuous, 2–3 ft. high: lvs. broadly oblong or the uppermost ovate: fls. few in a terminal corymb, whitish, with minute purple spots; style as long as the stigmas. Japan.

EE. *Style half as long as the stigmas.*

macrópoda, Miquel. St. 2–3 ft. high, puberulous above: lvs. oblong: fls. in a loose corymb, whitish purple, with minute purple spots; style half as long as the stigmas. Blooms in June and July, according to J. B. Keller. Japan, China. B.M. 6544 (segms. broadly ovate, decidedly yellow, spotted red and veined red near tips).—In F. S. 18:1820 is figured a plant with sessile lvs. striated with white, and no fls., which he refers to *T. macropoda.* This was sent out by Van Houtte as *T. hirsuta,* but it is a glabrous plant and probably lost to cult. Var. **striàta,** Hort., is offered in the trade as a form with variegated green-and-white lvs.

3842. Trifolium repens.—The white clover. (×⅓)

T. grandiflòra, Hort., should be compared with T. hirta var. nigra. It is a name scarcely known to botany. It is said to have orchid-like fragrant fls. in Oct. and Nov. (Baker says the genus has no fragrant fls.). Dutch growers say that T. grandiflora has white fls. mottled with black.

WILHELM MILLER.
F. TRACY HUBBARD.†

TRÌDAX (an old Greek name used by Dioscorides, meaning *summer eating,* alluding to a plant that was a summer vegetable). *Compósitæ.* Hardy perennial herbs, possessing little beauty. Plants branched, hirsute or glabrescent: lvs. opposite, incise-dentate or pinnately cut, segms. few and narrow: heads medium-sized, long-peduncled, heterogamous: ray-fls. yellow, male disk-fls. greenish, fertile; involucre ovoid, campanulate or rather hemispherical; bracts few-rowed, slightly unequal: achenes turbinate.—About 27 species, Trop. Amer.; one species also occurs in India and Mauritius. Two species have been cult. occasionally. *T. coronopifòlia,* Hemsl. About 1 ft. high: lvs. variously pinnatifid or trifid, lobes linear: fls. yellow, rays 5-lobed. Mex. *T. trilobàta,* Hemsl. (*Galinsòga trilobàta,* Cav.). About 1 ft. high: lvs. 3-lobed or pinnately incised: fls. yellow; rays 5-toothed. Mex.

T. gaillardioìdes, Hook. & Arn.=Layia gaillardioides. F.S.R, 2:72.

TRIENTÀLIS (Latin for the third of a foot; referring to the height of the plant). *Primulàceæ.* STAR-FLOWER. CHICKWEED-WINTERGREEN. Very glabrous small perennials sometimes grown in wild borders.

Rhizomes slender, creeping: st. solitary, slender, erect: lvs. usually the same number as the petals, somewhat whorled, obovate-elliptical or lanceolate, very entire: peduncles 1–3-fld., filiform, without bracts: fls. white; calyx 5–9-parted, segms. linear-lanceolate, persistent; corolla rotate, 5–9-parted; tube very short, segms. elliptic-lanceolate, very entire; stamens 5–9; ovary free, globose: caps. globose, 5-valved, many-seeded.—Two species, one in Eu., the other in N. Amer.

A. *Lvs. acuminate at both ends.*

americàna, Pursh. St. naked below, 3–8 in. high, 5–9-lvd. at the summit: lvs. lanceolate: divisions of the white corolla finely acuminate. Damp woods, Lab. to Va.

AA. *Lvs. obtuse (acute in var. latifolia).*

europæa, Linn. St. either naked or with a few scattered lvs. below the cluster of obovate or lanceolate oblong, obtuse or abruptly somewhat pointed lvs.: divisions of the white or pink corolla abruptly acuminate or mucronate. Alaska, Eu., and Asia. Var. **árctica,** Ledeb. Dwarf: lvs. 1 in. long, decreasing below: corolla white. Var. **latifòlia,** Torr. St. naked below the cluster of 4–7 oblong-obovate, or oval, mostly acute lvs.: corolla white to rose-red. Woods, W. Calif. to Vancouver's Isl. By Pax & Knuth in Engler's Das Pflanzenreich, hft. 22, this plant is kept separate as *T. latifolia,* Hook., making 3 species in the genus.

F. W. BARCLAY.

TRIFÒLIUM (name refers to the three leaflets). *Leguminòsæ.* CLOVER. Low annual and perennial herbs, useful for cover-crops, soil-enrichment, and also in lawn-seed mixtures.

Leaves digitately 3-, rarely 5–7-foliate; stipules adnate to the base of the petiole: fls. usually purplish, red or white, rarely yellow, in spikes, heads, or umbels, or rarely solitary; calyx-teeth or lobes about equal or the lower longer, the 2 upper sometimes more or less connate; petals usually withering rather than falling off, more or less adnate to the base of the stamen-tube; stamens 9 and 1; ovary small, ripening into a few-seeded, mostly indehiscent pod.—Between 200 and 300 species, most abundant in the N. Temp. zone.

The clovers are very important agricultural plants, but they have little distinctly horticultural value except as cover-crops and green-manures. See *Clover,* page 805, Vol. II. For the rôle of clovers as nitrogen-fixers, see *Legumes,* page 1834, Vol. IV. The species described

here are offered mostly as forage plants. Many clovers are perennial, although they are of relatively short life, so that frequent resowing is necessary if plants are to be kept in robust condition. Some of the species are annual, and these tend to become weeds. All are propagated readily by means of seeds; but as the seeds are small and oily, they may not germinate well in dry hot soils. Three annual yellow-flowered species are weeds in some parts, particularly in the East, where they have been introduced from Europe: *T. agrarium*, Linn., yellow or hop-clover, with oblong-obovate sessile leaflets; *T. procumbens*, Linn., low hop-clover, more spreading, leaflets obovate and the terminal one stalked; *T. dubium*, Sibth., with leaflets truncate or emarginate at apex and the terminal one stalked. A silky-pubescent white-flowered annual species from Europe, *T. arvense* Linn., is the rabbit-foot clover of fields and waste places. *T. odoratum* of seedsmen is evidently Melilotus. Allied genera are Lespedeza, Medicago, and Melilotus.

A. *Fls. in a long spike.*

incarnàtum, Linn. Crimson or Scarlet Clover. Fig. 1003, Vol. II. Annual, erect, 1–3 ft. high, soft-hairy: lvs. long-stalked, the lfts. broadly obovate and denticulate and sessile or nearly so by a cuneate base, the stipules large and thin and veiny and somewhat toothed: heads becoming 2–3 in. long, very dense: fls. sessile, bright crimson and showy, the calyx sharp-toothed and hairy. S. Eu. B.M. 328.—An escape in some places. Now much used as a cover-crop in orchards. See *Cover-Crops*. It is very showy when in bloom. If seeds are sown at midsummer or later, the plants may be expected to survive the winter and bloom early in spring.

rùbens, Linn. Perennial, 20 in. or less tall, in clumps, the sts. erect: lvs. short-stalked, the lfts. oblong-lanceolate and strongly denticulate, the stipules long-lanceolate: heads usually in pairs, becoming 3–4 in. long: fls. purplish red, showy. Eu.— Attractive ornamental species. The heads become silky after flowering. There is a white-fld. form.

AA. *Fls. in globular or ovate heads.*

B. *Corolla yellow.*

filifórme, Linn. Yellow Suckling Clover. Annual, of diffuse growth: lfts. obovate or obcordate, somewhat denticulate, the terminal one stalked, the stipules broadly ovate: peduncles long and filiform, bearing sessile yellow fls. in umbel-like heads, the calyx-lobes unequal. Eu.—Sometimes used for forage or grazing, but little known in this country.

BB. *Corolla white or ochroleucous (yellowish white).*

alexandrìnum, Linn. Egyptian Clover. Berseem. Annual, with appressed hairs, the sts. tall, erect or ascending and branching: lvs. numerous, the lfts. oblong or lanceolate and somewhat denticulate, the stipules lanceolate-subulate and partly free from the petiole: head stalked or sessile, ovate, becoming oblong-conic in fr.: fls. ochroleucous. Egypt, Syria.

pannónicum, Jacq. Hungarian Clover. Perennial, very hairy, the sts. usually simple, 2 ft.: lfts. lance-oblong and subacute to retuse, ciliate and entire, the stipules narrow and longer than the short petioles: heads ovate-oblong, stalked: fls. pale yellowish white or creamy yellow. Eu., Asia.—Handsome plant for the border; also recommended for forage.

rèpens, Linn. White Clover. Fig. 3842. Low creeping glabrous perennial: lvs. long-stalked, the lfts. obcordate and obscurely toothed, the stipules small and scale-like: heads long-peduncled from the ground, small and loose: fls. white, fragrant. Eu. and thought to be native in the northern part of the U. S. and in Canada, but naturalized everywhere.—Much used in lawns, and in some parts prized for pasture. There are forms with red and purplish foliage. This is considered by most authorities to be the shamrock of Ireland. A form of it is offered as *T. minus*, "the genuine Irish shamrock." See *Shamrock*. Var. **atropurpùreum,** Hort., is a dwarf form: lvs. bronze, edged with bright green. Var. **pentaphýllum,** Hort., is a creeping rock-plant: lvs. have a bronze luster. Var. **purpùreum,** Hort., has fine bronzy purple foliage. The species assumes many forms.

BBB. *Corolla rose-tinted or red.*

C. *Individual fls. pedicelled.*

hýbridum, Linn. Alsike or Swedish Clover. Ascending or nearly erect, 1–3 ft. high, branching, glabrous: lvs. long-stalked, the lfts. obovate and serrulate,

3843. Day and night positions of red clover leaf; unfolding young leaf at the right.

stipules ovate-lanceolate and thin: heads small and loose, nearly globular, long-stalked: fls. rose-colored or sometimes white on the top of the head. Eu. B.M. 3702.—A good forage plant; also naturalized. Thrives best on moist lands. Very hardy. Perennial.

CC. *Individual fls. sessile.*

D. *Plant perennial.*

praténse, Linn. (*T. praténse perénna*, Hort.). Common Red Clover. Pea-Vine Clover. Cow-Grass. Fig. 3843. Ascending and somewhat hairy, 1–1½ ft.: lvs. long-stalked, the lfts. oval or obovate and sometimes notched at the end and the blade marked with a large spot, the stipules broad but with a bristle point: heads globular, ovate, sessile: fls. red-purple. Eu., but everywhere intro., and much grown for pasturage hay and green-manuring.

mèdium, Linn. Mammoth or Zigzag Clover. Stouter and less erect: lfts. oblong and entire and without spots: heads usually stalked, and fls. rather deeper colored. Eu., and intro., and much grown by farmers for hay and forage.

DD. *Plant annual.*

resupinàtum, Linn. (*T. suavèolens*, Willd.). Annual, diffuse or trailing glabrous plant: lfts. obovate and serrulate and as long as the petiole, the stipules lanceolate-acuminate: heads globose, with rudimentary involucre: fls. purple. Greece, Egypt to Persia.—Grown for ornament.

L. H. B.

TRIGLÒCHIN (Greek, referring to the *3-pointed fruit* of some of the species). *Alismàceæ*; or by Buchenau in Engler's Das Pflanzenreich, hft. 16 (IV. 14), 1903, placed in the *Scheuchzeriàceæ*. Thirteen species of linear-lvd. marsh plants of little value to the cultivator, although 1 species is listed abroad for planting in bogs or wet places. Perennial, erect: lvs. rush-like, more or less fleshy, sheathing at base: fls. small, spicate-racemose, on a long jointless naked scape, greenish; perianth of 3–6 parts; stamens 3–6; ovaries 3–6, united. *T. marítima*, Linn., the species mentioned, is widely distributed in the northern hemisphere along seashores and also in interiors: scape to 2½ ft. tall: lvs. thick: fr. ovoid or prismatic, pedicelled, in a long open racemose spike. The plant has a grass-like appearance and inconspicuous bloom.

TRIGONÉLLA (Latin, *a little triangle;* probably referring to the shape of the fls.). *Leguminòsæ.* Annual or perennial herbs, usually strong-smelling: lvs. pinnately 3-foliate; lfts. with the veins often running out into teeth; stipules adnate to the petiole: fls. yellow, blue, or white, solitary, capitate, somewhat umbellate or shortly and densely racemose, sessile or peduncled at the axils; calyx tubular; petals free from the stamens, standard obovate or oblong; wings oblong, keel shorter than the wings, obtuse; stamens 9 and 1; ovary sessile or short-stipitate, many-ovuled: pod sometimes thick and long-beaked, sometimes linear, compressed or terete.—About 58 species, 1 from Austral., the others from Eu., Asia, and extra-Trop. Afr.

Fœnum-Græcum, Linn. FENUGREEK, which see. White-fld. annual, 1–2 ft. high, blooming in June and Aug. Distinguished from other species in its section by the erect unbranched st. and obovate lfts., which are obscurely dentate; stipules lanceolate-falcate, entire: calyx pilose: pods falcate, twice as long as the beak. Eu., Orient.

F. TRACY HUBBARD.†

TRIGONÍDIUM (Greek, *three* and *small angle,* alluding to the triangular form of several parts of the plant). *Orchidàceæ.* Epiphytic herbs, grown in the warmhouse.

Stems very short, soon thickened into fleshy 1–2-lvd. pseudobulbs: lvs. leathery, not folded, linear or oblong: scape from below the pseudobulb or from a simple rhizome, many-sheathed, 1-fld.: fls. rather large, short-pedicelled, between spathe-like bracts; sepals about equal, connivent or coherent into a 3-angled tube at base; petals much smaller than sepals; lip erect, lateral lobes clasping the column, midlobe spreading, fleshy or callous at base; column without wings and footless; pollinia 4.—About 10 species, Trop. Cent. and S. Amer.

spatulàtum, Lind. & Reichb. f. Pseudobulb ovate, 2-edged: lf. broadly ligulate, 8 in. long: fl. terminal; dorsal sepal ovate from a ligulate base, acute, lateral sepals oblong-lanceolate, acute, all yellowish purple; petals lanceolate, with a fleshy disk below the apex; lip narrow, angulately 3-lobed, midlobe transversely semi-ovate, rather acute. Colombia.

subrèpens, Rolfe. Rhizome subrepent, stout: pseudobulbs rather distant, oblong, somewhat compressed, obscurely 3-ribbed, about 1 in. long, 1-lvd.: lf. ligulate, rather obtuse, 6–7 by about ½in., rather leathery: scape 6–7 in. high, with numerous lanceolate sheaths; dorsal sepal rhomboid-oblanceolate, about 1 in. long, lateral suboblique, broad-elliptic, all greenish yellow; petals whitish with 3 brown lines, narrowly elliptic-oblong; lip greenish yellow, with brown radiating veins on the side lobes, 3-lobed, short, midlobe oblong. Habitat unknown.

The following species are sometimes found in cult.: *T. acuminàtum,* Batem. Pseudobulbs ovate, acute, sulcate: lf. linear: fl. dull straw-color, penciled with rich brown inside; sepals acuminate recurved at apex; petals oval-lanceolate. British Guiana.—*T. Egertoniànum,* Batem. Pseudobulbs clustered, oval, compressed, 2-lvd.: lvs. narrow ensiform, often 1½ ft. long: fl. pale liver-color, dashed and veined with brown; sepals acute, the lateral ones reflexed; petals slightly acute. Honduras.—*T. latifòlium,* Lindl. Lvs. obovate-oblong, 6 x 2 in.: fls. yellow and purple; lip with a fleshy yellow front lobe and narrow purplish side ones.—*T. obtùsum,* Lindl. Pseudobulb oblong or elongate obovoid, 2-lvd., compressed: lvs. linear-lanceolate: fl. terminal; sepals reddish yellow, obovate; petals white, veined with rose, brown at the apex, obtuse; lip white, dorsally tubercled, lateral lobes red-margined, midlobe yellow in front. British Guiana: B.R. 1923.—*T. ténue,* Lodd. Pseudobulbs oval, compressed, 1-lvd.: lf. ensiform, very acute: fl. brownish purple; sepals reflexed, very acuminate; lip obtuse, glabrous, reflexed at apex. British Guiana.

F. TRACY HUBBARD.

TRÍLISA (anagram of Liatris). *Compósitæ.* Autumn-blooming plants 2 to 3 feet high, with numerous small, purple or white, rayless flower-heads.

Closely related to Liatris, from which it differs in the fibrous roots (those of Liatris being tuberous): the infl. panicled instead of racemose or spicate, and the involucral bracts in only 2 or 3 series, while those of Liatris are in many series.—Two species. Trilisa is not so well known to gardens as the liatris. Although a native of the low pine barrens from Va. to Fla. and La., it is hardy at N. Y., along the coast. It is mentioned in some English books as a hardy plant, thriving in light soil and prop. by division or by seeds sown in autumn. It is more fully described in the native botanies.

odoratíssima, Cass. (*Liàtris odoratíssima,* Michx.). VANILLA PLANT. Also called Carolina vanilla, dog's-tongue, etc. Rather stout, glabrous, perennial herb, 2–3 ft. high, corymbosely branched above: lvs. thick entire or sometimes dentate, obtuse, 4–10 x 1–1½ in., oblong, ovate or oval, sometimes spatulate: infl. corymbose-paniculate: fl.-heads about ¼in. long. Aug., Sept. B.B. 3:319.—The other species (*T. paniculata,* Cass.) has a similar range and is distinguished by its viscid-pubescent st. and thyrsoid-paniculate infl.

WILHELM MILLER.

TRÍLLIUM (Latin, *triplum,* triple: leaves and floral parts in threes). *Liliàceæ.* WAKE-ROBIN. BIRTHROOT. WHITE WOOD LILY. GROUND LILY. Interesting and handsome perennial herbs, hardy and very useful for spring-flowering in the wild border or rockery or even in the garden border.

3844. Vertical rhizome of trillium. (×½)

Rhizome short, thick, ascending or horizontal; sts. simple, erect, sheathed at base: lvs. 3, whorled at the top of the st., broad, subsessile or long-petioled, 3–5-nerved: fls. 1, between the lvs., sessile or pedicellate, erect, cernuous or reflexed, violet, lurid, white or greenish; perianth persistent, segms. distinct, spreading, 3 exterior thin herbaceous, green or rarely colored, 3 inner petal-like usually larger, spreading sometimes recurved; stamens 6; ovary with a broad base, sessile, ovoid or subglobose, 3-celled: berry globose or ovoid, usually 3-ribbed, indehiscent. —About 30 species, N. Amer. and extra-Trop. Asia from the Himalayas to Japan.

Trilliums are amongst the characteristic flowers of American woods. The best-known species is *T. grandiflorum,* which ranges from Canada to the mountains of North Carolina and extends westward beyond the Great Lakes. All trilliums delight in moist rich soil. They thrive in woods mold. The root is a deep-seated mostly perpendicular rhizome (Fig. 3844). It is customary to transplant trilliums from the woods when in bloom. This is because the plants can be found readily at that time and because the desire to grow them is strongest when the plants are in flower. It is better to transplant in midsummer, or later, however, when the growth is completed, although the plants are difficult to find after the tops have died. The bloom is made largely from the energy stored in the tuber the previous season. After flowering, the plant stores energy for the succeeding year. By midsummer this work is accomplished and the tops die: then the plants are at rest and they are in proper condition to be moved. However, good results are sometimes secured by moving them in spring. These remarks will apply to most early spring-blooming small herbs. Give trilliums a rich deep rather moist soil in partial shade. Plant deep. A colony will last for years. Trilliums force well. See *Forcing.* Plants may be propagated by seeds sown as soon as ripe. Blooming plants may be expected in two or three years. Trilliums are among the choicest of all

early spring plants, and they should be more common in gardens. They can be made to thrive well in borders about city yards. They may also be colonized in grass where the lawn-mower is not used. Best results are usually attained, however, when they are planted alone in masses.

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lanceolatum, 5.
nervosum, 14.
nivale, 2.
Nuttallii, 4.
ovatum, 9.
pendulum, 10.
petiolatum, 7.
pictum, 3.
purpureum, 10.
pusillum, 12.
recurvatum, 5, 6.
rivale, 1.
roseum, 8.
rubrum, 4.
sessile, 4.
stylosum, 14.
undulatum, 3.
Vaseyi, 11.
viridescens, 4.
viridiflorum, 10.
Wrayi, 4.

3845. Trillium sessile var. californicum. (×about ¼)

KEY TO THE SPECIES.

A. *Ovary 3-lobed, not winged.*
  B. *Peduncle longer than the lvs.* ..... 1. **rivale**
  BB. *Peduncle shorter than the lvs.*
    C. *Lvs. oblong, acute* ..... 2. **nivale**
    CC. *Lvs. ovate, acuminate* ..... 3. **undulatum**
AA. *Ovary 6-angled, often winged.*
  B. *Fls. sessile.*
    C. *Lvs. sessile.*
      D. *Blades broadly ovate or rhomboidal* ..... 4. **sessile**
      DD. *Blades lanceolate* ..... 5. **lanceolatum**
    CC. *Lvs. petioled.*
      D. *Petioles short: petals oblong-lanceolate* ..... 6. **recurvatum**
      DD. *Petioles as long as the blade or longer: petals oblanceolate* .... 7 **petiolatum**
  BB. *Fls. pedicelled.*
    C. *Pedicel longer than the fl.: lvs. nearly or quite sessile.*
      D. *Sepals much shorter than the petals* ..... 8. **grandiflorum**
      DD. *Sepals nearly or quite as long as the petals.*
        E. *Petals narrowly lanceolate or narrowly ovate (fls. white)* .. 9. **ovatum**
        EE. *Petals ovate or broadly ovate (usually purplish).*
          F. *Filaments stout, much shorter than the anthers* .. 10. **e ectum**
          FF. *Filaments slender, as long as the anthers or nearly so* ..... 11. **Vaseyi**
    CC. *Pedicel generally not exceeding and usually much shorter than the fl.*
      D. *Fl. erect* ..... 12. **pusillum**
      DD. *Fl. declinate under the lvs.*
        E. *Lvs. rhombic or orbicular-rhombic* ..... 13. **cernuum**
        EE. *Lvs. ovate-lanceolate* ..... 14. **stylosum**

1. **rivàle,** Wats. Sts. slender, 2–8 in. high: lvs. lanceolate, rounded or subcordate at base, acute or acuminate, 1–2 in. long; petioles 1–15 lines long: fls. white, on a slender rather erect or at length declinate pedicel, which is a little shorter than the lvs; petals rather rhombic, acute or acuminate, ½–1 in. long, more or less marked with purple. Stream-banks, mountains of Ore. and Calif. G.C. III. 54:43.—Allied to *T. nivale*, which it closely resembles in habit.

2. **nivàle,** Ridd. A dwarf species, 5 in. or less high, early: lvs. narrow and obtuse, 1–2 in. long: fls. white, on a short erect or declined pedicel, the petals about 1 in. long, narrow and nearly or quite obtuse. Low woods, Pa. and Ky. to Minn. and Iowa. B.M. 6449.

3. **undulàtum,** Willd. (*T. erythrocárpum*, Michx. *T. pictum*, Pursh). Of medium to large size, 1 ft. or more high: lvs. large, ovate and acute or acuminate, short-stalked: fls. rather large, white, on a short but slender erect or inclined pedicel, the petals oblanceolate and wavy, about 1 in. long and usually purplish at the base. Woods, Nova Scotia to Mo. and Ga. B.M. 3002. L. B.C. 13:1232.

4. **séssile,** Linn. Strong-growing, 1 ft. or less high: lvs. broadly ovate or rhomboidal, acute, more or less spotted: fls. sessile in the whorl of lvs., small, purple or greenish, the petals narrow and acute. Woods, Pa. to Minn., Ark., and Fla. B.M. 40. L.B.C. 9:875. F.S. 22:2311.—Variable. Var. **gigantèum,** H. & A. (var. *angustipétalum*, Torr.). Similar to var. *californicum*, but the lvs. somewhat petiolate and the petals narrower. Calif. and Ore. Apparently not in the trade. The forms of *T. sessile* appear to be the only trilliums native to Calif. except *T. ovatum*. Var. **californicum,** Wats. (var. *gigantèum*, Torr.). Fig. 3845. Much stouter, the lvs. often 6 in. long and spotted, and the petals sometimes 4 in. long: fls. purple, rose-color, or white, the petals rhombic-ovate or narrower. Calif. and Ore. G.F. 3:321 (adapted in Fig. 3845). Var. **Núttallii,** Wats. (*T. viridéscens*, Nutt.). Lvs. pubescent beneath, as also the upper part of the st.: petals linear-lanceolate, purplish green with brown base. Ark. Var. **rùbrum,** Hort. A form of var. *californicum*, with fls. deep red-purple. Var. **Wràyi,** Wats. (*T. discolor*, Wray). Petals spatulate-obtuse, 1 in. long, greenish. Ga. B.M. 3097.

5. **lanceolàtum,** Boykin (*T. recurvàtum* var. *lanceolàtum*, Wats.). Plant often more than 1 ft. tall: lvs. lanceolate, sessile: fls. dull or brown-purple, an inch or

3846. Trillium grandiflorum. (×½)

more long, narrow-lanceolate or linear, the sepals ascending or somewhat reflexed, the filaments usually exceeding ¼in. in length. Ga. and Ala.—Little known in cult.

6. **recurvàtum,** Beck. Strong-growing, usually 1 ft. or more high: lvs. ovate or ovate-oblong, tapering to both ends, on short but slender petioles: fls. brown-purple or dull purple, about 1 in. or more long, the petals narrow and erect, the sepals narrow and reflexed. Woods, Ga. to Minn., Miss. and Ark.

7. **petiolàtum,** Pursh. St. scarcely arising above the ground: lvs. ovate-elliptic to reniform, with stalks as long as the blade or even longer (blade 3–5 in. long): fls. purple, the petals 1–2 in. long and narrow-oblanceolate, the sepals erect. Idaho, Ore. and Wash.—Little known in cult.

8. **grandiflòrum,** Salisb. Figs. 1558 (Vol. III), 3846. Stout, 1 ft. or more high: lvs. broad-ovate or rhombic-ovate, narrowed to both ends, often wavy: fls. erect or nearly so, pure white, changing to rosy pink as they fade, 2–3 in. long, the petals broadly oblanceolate and spreading and much longer than the sepals. Que. to Minn., Fla., and Mo. B.M. 855 (as *T. erythrocarpum*). L.B.C. 14:1349. G.C. III. 37:308. G. 9:663; 22:67; 28:173; 29:213; 36: 703. G.L. 25:395. Gn. 29, p. 257; 36, p. 394; 40:222; 73, p. 167. G.M. 33:131. Gn.M. 8:172. G.W. 10, p. 36. F.W.1880: 257. Mn.4:17. A.G. 17:243. Gng. 4:305; 6:161.—Sporting forms are not uncommon. Sometimes forms occur with petiolate lvs. A.G. 13:206. *T. grandiflorum* is the best and handsomest species for cult. Var. **ròseum,** Hort. (*T. ròseum,* Hort.), is a form with pink fls. Gn. 76, p. 229.

3847. Trillium erectum. (×⅓)

9. **ovàtum,** Pursh. Much like *T. grandiflorum,* but the petals narrow-lanceolate or narrow-ovate, the sepals usually nearly as long as the petals: plants 1 ft. or less high: lvs. ovate to nearly orbicular, often somewhat rhombic. Calif. to Brit. Col.—The Pacific coast representative of *T. grandiflorum.*

10. **erèctum,** Linn. (*T. péndulum,* Willd. *T. purpùreum,* Kin. *T. fœtidum,* Salisb. *T. atropurpùreum,* Curtis). Fig. 3847. Stout, 1 ft. or more high: lvs. broadly rhombic-ovate: pedicel usually bent over or inclined but sometimes erect: fls. brown-purple to greenish purple, the petals usually about 1 in. long, ovate to lanceolate, not much if any exceeding the sepals. Nova Scotia to Man., N. C. and Mo. B.M. 470. L.B.C. 19:1838. F.S. 10:990. Mn. 2:49. G.C. II. 19:605. G.W. 10, p. 36.—The fls. of *T. erectum* are ill-smelling. Var. **álbum,** Lodd., has white fls. B.M. 1027. L.B.C. 19:1850. Var. **viridiflòrum,** Hook. Fls. greenish. B.M. 3250. Not known to be in the trade.

11. **Váseyi,** Harbison. St. erect from a horizontal rootstock, 10–20 in. high, glabrous: lvs. sessile or subsessile, broadly roundish-rhomboidal, abruptly acuminate, 4–8 in. long: fls. dark purple, recurved or deflexed; sepals lanceolate to ovate-lanceolate, acute; petals about the same length, ovate or broadly ovate, acute or obtuse. N. C., Tenn., and Ga., in the mountains.—Allied to *T. erectum.*

12. **pusíllum,** Michx. Small, usually not 1 ft. high: lvs. lanceolate or oblong, obtuse, sessile: fls. pale flesh-color, less than 1 in. long, on a short erect pedicel, petals lanceolate and exceeding obtuse petals. Pine lands, N. C., S. C.

13. **cérnuum,** Linn. Plant 1 ft. or more high: lvs. very broadly rhombic-ovate, nearly or quite sessile: fls. white, the petals 1 in. or less long, ovate-lanceolate, wide-spreading or reflexed, undulate, equaling or exceeding the sepals. Newfoundland to Ga. and Mo. B.M. 954. Mn. 10:49.

14. **stylòsum,** Nutt. (*T. nervòsum,* Ell., and *T. Càtesbæi,* Ell.). Slender, 12–18 in. high: lvs. ovate-lanceolate, narrow at each end, short-stalked: fls. rose-color, the petals oblong, obtuse or acute, curved, undulate, sometimes 2 in. long. N. C. to Fla.

T. Govenìanum, Wall. A species of Temp. Himalaya, little known and described by Hooker as follows: "Lvs. shortly petioled, ovate or ovate-cordate, acute: sepals subequal, narrowly linear."—*T. obovàtum,* Pursh. Founded on a Canadian plant, which has been referred to T. erectum. Maximowicz keeps it distinct, however, extending its range to Kamchatka and Japan. It is the T. erectum var. japonicum, Gray. According to Watson, the Japanese plant "is distinguished by a somewhat produced connective (between the anther-cells) and very short stigmas." Maximowicz says that the plant differs from T. erectum in the petals being broader and more obtuse and longer than the calyx, the fls. nodding from the first, and the lvs. broader than long, sessile, not attenuate at the base.—*T. Smállii,* Maxim. One of the T. erectum series (T. erectum var. japonicum flore-pleno, Gray), of Japan. Fls. smaller than those of T. obovatum (2 in. across), deep tawny red, the petals not exceeding the sepals, nearly orbicular or obovate.—*T. Tschonóskii,* Maxim. About 1 ft. tall: lvs. sessile, broad-ovate or orbicular, somewhat rhombic, acuminate: fls. dull purple, 1 in. or less across, the petals oblong-lanceolate. According to Hooker, this differs from T. erectum chiefly in the longer filaments. Himalaya to Japan.

L. H. B.
F. Tracy Hubbard.†

TRIÓSTEUM (name shortened by Linnæus from Triosteospermum, which is from Greek for *three bony seeds*). *Caprifoliàceæ.* Feverwort. Horse Gentian. Coarse hardy perennial herbs, glabrous or glandular-pilose: sts. rather simple, terete: lvs. opposite, sessile, rather fiddle-shaped or obovate, entire: fls. usually axillary, solitary or clustered, dirty white, yellow, or purple; calyx-tube ovoid, limb 5-lobed, persistent; corolla tubular-campanulate, base of tube gibbous, limb oblique, lobes unequal; stamens 5; disk small, swollen; ovary 3–5-celled: berry fleshy or leathery, 2 (rarely 3–5)-celled, 2–3-seeded.—About 8 species, N. Amer., Himalayas, and China.

perfoliàtum, Linn. St. 2–4 ft. high, stout: lvs. ovate, shortly acuminate, narrowed below into connate-perfoliate or simply connate base: corolla dull brown-purple. Rich soil, New England and Canada to Ill. and Ala. B.B. 3:234.—Sometimes offered by collectors. It is a weedy plant of very easy cult. F. W. Barclay.

TRIPETALÈIA (Greek, *three* and *petals*). *Ericàceæ.* Two species of Japanese shrubs with deciduous alternate, short-petioled entire lvs. and white or pinkish fls. in terminal racemes or panicles: sepals and petals 3; stamens 6, shorter than the petals, the anthers opening with a longitudinal slit; ovary 3-celled, superior, short-stalked; style slender, curved: caps. septicidal, many-seeded. Closely allied to Elliottia, but easily distinguished by its 3-merous fls. *T. paniculata* has proved hardy at the Arnold Arboretum; it seems to like humid, but well-drained, peaty or sandy soil and will probably grow best in a rockery in a partly shaded place. The second species was only recently intro. and has not yet been tested. Prop. is by seeds treated like those of rhododendron and probably also by cuttings. **T. paniculàta,** Sieb. & Zucc. Shrub, to 6 ft.: lvs. short-petioled, rhombic or rhombic-obovate, acute, cuneate at the base, glabrous except a few hairs on the midrib beneath, 1–2½ in. long: fls. in panicles 2–4 in. long, white, tinged pink, ⅓in. long, style exserted; bracts subulate. Aug.

CXIII. Tsuga canadensis.—The hemlock spruce of the northeastern United States and Canada.

Japan. **T. bracteàta,** Maxim., has smaller obovate obtuse lvs. and pink fls. in racemes, with elliptic or obovate bracts. Japan.

ALFRED REHDER.

TRIPHÀSIA (from the Greek for *triplex*). *Rutàceæ*, tribe *Citreæ*. Small ornamental shrubs or trees distantly related to the orange, sometimes used as hedge-plants.

Plants with spreading branches: spines double, axillary; lvs. alternate, sessile, trifoliate: fls. cupulate, 3-merous, white, stamens 6, free: fr. an ovate berry filled with a sweet, sticky pulp and containing usually a solitary seed.—Only 1 species is known.

trifòlia, P. Wilson (*Limònia trifòlia,* Burm. *T. aurantiòla,* Lour. *T. trifoliàta,* DC.). LIME-BERRY. Fig. 3848. A shrub or small tree, sometimes attaining a height of 15 ft.: lvs. trifoliolate, dark green; lfts. ovate, retuse, entire-margined, lateral ones smaller than the central one; spines in pairs, straight, very sharp, shorter than the lvs.: fls. white, fragrant, axillary, solitary; petals thick; stamens free, filaments subulate, shorter than the corolla; style thick, longer than the stamens: fr. ovate, small, dull red, ½in. diam., having a thick skin, 1-celled, generally with only a single large seed, imbedded in the mucilaginous spicy pulp. Burmann, Fl. Ind., tab. 35. Jacq. Icon. pl. rar. v. 3, pl. 463. L.B.C. 1:18. Riss. & Poit. Hist. nat. or. 2 ed., pl. 108.—Of unknown nativity but widely cult. and naturalized in tropical and subtropical regions, being grown as an ornamental plant. Prop. by seed. The frs., which are filled with a highly aromatic juicy pulp, are sometimes used in tropical countries for making marmalade. The shrub is attractive, flowering and fruiting freely and is used for lawn planting and hedges, but it is injured by severe frosts. This species is able to grow in soil too salty to support the common citrous frs. and is being tested as a stock for use on such soil.

WALTER T. SWINGLE.

TRIPHÒRA (Greek, *bearing three flowers*). *Orchidaceæ*. Terrestrial plants with leafy sts. and fleshy tubers. Fls. axillary, solitary or several; sepals free, equaling the petals; lip erect, not crested, spurless, 3-lobed; column elongated, clavate; pollinia granular-powdery, tailless. —Species about 10, American. By some authors retained in Pogonia.

trianthóphora, Rydb. (*T. péndula,* Nutt. *Pogònia péndula,* Lindl.). Sts. sometimes tufted, 2–12 in. tall: lvs. nearly orbicular to ovate, 2–8 in. long, clasping: fls. single, or 2–7, drooping, pale purple; sepals and petals obtuse, elliptic; lip about as long as petals, narrowed into a short claw. E. N. Amer. B.R. 908.

GEORGE V. NASH.

TRIPLÀRIS (Latin, from *triplex*, the parts of the fructification are in 3's). Syn., *Velasquèzia. Polygonàceæ*. Trees grown out-of-doors in the extreme S., in the warmhouse in the N. Lvs. alternate, short-petioled, usually large, ovate-oblong or lanceolate: fls. sessile or subsessile between bracts, arranged in pilose, simple, long spikes or often in racemes, dicœcious; male perianth funnelform, limb 6-cleft, stamens 9, ovary rudimentary or none; female perianth narrow, deeply 6-cleft, ovary acutely 3-angled: nut prominently subacutely 3-angled. —About 20 species, Trop. S. Amer.

americàna, Linn. Small tree: lvs. petiolate, ovate, acuminate: spikes pilose, bracts ovate, acuminate, small, pilose: calyx in fr. very long, tube ovate with spreading lanceolate wings; lobes subulate: achene ovate, 3-angled. Cent. Amer.—An insufficiently studied and much confused species.

TRÍPSACUM (Greek, to *rub* or *thresh*, probably alluding to the ease with which the fertile spike can be broken up). *Gramineæ*. Perennial grasses with stout culms and monœcious infl., in spikes terminating the culm and branches: fls. monœcious, in the same spike, the staminate above; spikes terminal and axillary; staminate spikelets 2-fld., in pairs at each joint; pistillate single, 1-fld., imbedded in each joint of the rachis, so that the smooth cartilaginous axis and the outer glume form a nearly cylindrical mass; at maturity the pistillate spikes separate into the joints.—Species about 6, of the warmer parts of N. Amer., one extending north to Cent. U. S. and in many places furnishing considerable native fodder.

dactyloìdes, Linn. (*T. violàceum* and *T. Dáctylis* of the trade). GAMA-GRASS. SESAME-GRASS. Culms in bunches, 4–7 ft.; spike 2–3 at summit and often single from the upper axils. Moist soil, Conn., Ill., Kans., and southward. Dept. Agric., Div. Agrost., 20:13.—A wild fodder-grass, sometimes cult. for forage and also in gardens as a curiosity. Raised from seed, or more certainly from cuttings of the rootstocks.

3848. Triphasia trifolia. (×½)

For an illustrated account of Tripsacum-Euchlæna and Tripsacum-Zea crosses, see article by Collins and Kempton, Journal of Heredity, March, 1916.

A. S. HITCHCOCK.

TRIPTERÝGIUM (Greek, *three* and *wing*, in reference to the 3-winged fr.). *Celastràceæ*. Three shrubs from E. Asia with deciduous alternate rather large lvs. and small white fls. in terminal panicles: fls. polygamous; calyx 5-lobed; petals 5; stamens 5, inserted at the margin of a cupular disk; ovary superior, 3-angled, incompletely 3-celled, with short style: fr. a 3-winged, 1-seeded nutlet. The following species has proved hardy at the Arnold Arboretum and is a handsome shrub conspicuous chiefly on account of its large bright green foliage contrasting well with the reddish brown sts. terminated in July and Aug. by conspicuous panicles of small whitish, fragrant fls. It apparently grows well in any soil. Prop. is by seeds and probably by cuttings.

T. Régelii, Sprague & Takeda (*T. Wilfórdii,* Regel, not Hook. f.). Glabrous shrub, to 2 ft., with angled warty reddish brown branches: lvs. petioled, broadly elliptic, acuminate, broadly cuneate at the base, serrate, 3–6½ in. long.: fls. greenish white, ⅛in. across, in terminal panicles leafy at the base, and to 8 in. long: fr. little over ½in. long, with 3 broad wings. July, Aug. Manchuria, Korea, Japan. Gt. 18:612. Not yet in the American trade.

ALFRED REHDER.

TRISÈTUM (Latin, *three* and *bristles:* the florets are 3-awned). *Gramíneæ.* Tufted hardy perennials of no real horticultural interest: infl. terminal spike-like or loose panicles: spikelets 2 (rarely 3–5) -fld.; rhachilla prolonged beyond the upper palea; glumes unequal, keeled; lemma membranaceous, keeled, 2-toothed at apex, bearing a slender dorsal awn; palea narrow, 2-toothed. About 90 species, widely distributed throughout the temperate regions of the world. *T. flavéscens,* Beauv. (*Avèna flavéscens,* Linn.). Culms 1½–2½ ft. high, erect, simple, glabrous: sheaths shorter than the internodes; ligule ½in. long; blades 1½–5 in. long, 1–3 lines wide: panicle open; branches somewhat flexuous: spikelets 3–4-fld.; glumes smooth or scabrous; awn long, bent, and twisted. Eu., Asia, and intro. into Amer. B.B. (ed. 2) 1:217. Not in common cult., but occasionally used in agriculture. F. Tracy Hubbard.

3849. Tristania conferta. (×⅓)

TRISTÁGMA (Greek, *three drops,* alluding to the 3 nectar-glands of the ovary). Including *Stephanotírion. Liliàceæ.* Herbs with subglobose tunicate corms, used for fall-blooming. Lvs. radical, few, narrowly linear: scape simple, leafless: fls. in a terminal umbel, not numerous, pedicelled; perianth salver-shaped, tube cylindrical, 6-lobed; crown fleshy at the throat or lacking; stamens 6, in 2 rows; ovary sessile, ovoid, 3-celled: caps. loculicidally dehiscent.—About 7 species, Chile and Patagonia; probably to be planted in spring in this country.

nivâle, Poepp. (*Milla nivàlis,* Baker). Lvs. 6–9 in. long, about 2 lines wide: scape slender, about 1 ft. long: fls. 1 in. long, 2–8 in an umbel, the segms. linear and greenish; crown none.—Now treated by Baker as *Brodiæa nivalis,* Baker. Likely to be offered by Dutch bulb-growers.

T. narcissoides, Benth. & Hook., does not appear to be in the American trade. It is 1 ft. or more high, with short narrow-linear lvs., and white fls. bearing a bright orange narcissus-like crown of 3–6 broad unequal more or less connate scales.

F. Tracy Hubbard.†

TRISTÀNIA (in honor of Jules M. C. Tristan, 1776–1861, a French botanist). *Myrtàceæ.* Tall trees or shrubs, evergreen, cultivated as greenhouse shrubs in Europe and hardy in California and Florida.

Leaves alternate or somewhat whorled and approximate at the ends of the branches, rarely opposite: fls. usually rather small, yellow or white, in axillary, peduncled cymes; calyx-tube turbinate-campanulate, limb with 5 short segms.; petals 5; stamens numerous; ovary inferior or semi-superior.—About 23 species, Malaya, New Caledonia, and Austral. Prop. by half-ripened cuttings in sand under glass, or by seeds.

conférta, R. Br. (*Lophostèmon arboréscens,* Schott). Brisbane Box. Fig. 3849. An umbrageous tree attaining 150 ft.: young shoots and calyx hoary-pubescent: lvs. 3–6 in. long, ovate-lanceolate, glabrous, usually crowded at the ends of the branches and apparently verticillate: fls. mostly on the branches well below the lvs.; petals about ¼in. long, white and spotted, fringed. Queensland. B.R. 1839 (as *T. macrophylla*). —A handsome evergreen shade tree, valuable for avenues in hot dry regions, as it withstands great drought; it also produces timber valued for strength and durability. Much grown in New S. Wales as a boulevard tree. Hardy in Cent. Calif., withstanding an exceptional temperature of 26° F. at Berkeley.

Joseph Burtt Davy.

TRISTELLATEÌA (Latin, *three* and *star:* each flower has 3 winged frs. which have the appearance of stars). *Malpighiàceæ.* Scandent shrubs, probably adapted only to the warmhouse. Lvs. opposite or verticillate in 4's, entire, petioles usually 2-glandular at the top, base with 2 very short stipules: racemes terminal or lateral, sometimes paniculate: fls. yellow; calyx 5-parted; petals clawed, keeled outside, sagittate-ovate; stamens 10, all perfect; ovary 3-lobed: samaræ 3, many-winged. About 20 species, Madagascar, Indian Archipelago, and Austral. *T. austràlis,* A. Rich. Strong climbing shrub with pendent shoots: lvs. ovate or ovate-oblong, 2–4×1–2¼ in., glabrous: racemes 2–6 in. long, 12–16-fld.: fls. opposite, short-peduncled, yellow; petals 5, oblong or ovate-oblong, 5–6 lines long; filaments finally deep red. Malaya and Australasia. B.M. 8334.

TRITELEÌA: *Brodiæa.* The following species, listed under Triteleia, is to be combined with the treatment of Brodiæa in Vol. I, p. 576. **B. uniflòra,** Baker (*Triteleìa uniflòra,* Lindl. *Milla uniflòra,* Graham). Spring Star-Flower. Lvs. narrow-linear, 1 ft. or less long: scapes 8 in. or less tall, bearing a bract-like spathe toward the top: fl. 1 (rarely 2), 1–1½ in. across, pale lilac or pale blue, with pointed segms. violet-streaked through the center. Argentina. B.R. 1921. B.M. 3327. G. 3:115; 36:610. Gn. 67, p. 203; 68, p. 365. Gt. 61, p. 219. G.W. 15, p. 624. R.H. 1859, pp. 350, 351. Gng. 2:59. Hardy in most of the northern states, although it does not persist long. Grown chiefly as a pot-plant for spring bloom. Var. **cærûlea,** Hort., has porcelain-blue fls. There are other horticultural forms. *T. violacea,* with "delicate violet fls.," is probably a form of this species rather than the *T. violacea,* Kunth, a Chilean species. L. H. B.

TRITHRÌNAX (apparently *triple Thrinax,* alluding to leaf-division). *Palmàceæ,* tribe *Córypheæ.* South American fan palms, some of which are known to be cultivated in the open in the United States.

The genus is distinguished from allied genera chiefly by the following characters: fls. hermaphrodite; petals imbricate; filaments connate into a tube: carpels distinct; styles long, distinct, terminal in fr.—Five species. *T. brasiliensis* is a little-known palm. It seems to have been confused in the trade with *Thrinax Chuco,* which is referred in this work to *Acanthorhiza Chuco.* The lf.-segms. of the former are bifid; of the latter apparently not. André says the first species described below is unique by reason of its sheaths at the base of the lvs. These, he says, "are composed of fibers which are at first parallel and longitudinal, then obliquely intercrossed and finally plaited at right angles like the mats of pandanus in which the coffee of the Antilles and Bourbon is exported. At the summit these narrow strips unite and form a series of very long, robust, recurved spines which are evidently designed to protect the fls. and frs. against climbing animals." Not in common cult. in Amer., although 3 of the 5 known species are planted.

brasiliénsis, Mart. Trunk slender, 6–12 ft. high, 2–3 in. thick: lvs. palmate-flabelliform, glabrous and often

glaucous, the lf.-segms. 22–30, linear, free for two-thirds their whole length, deeply bifid: spadix much branched, with many spirally arranged fls. on its branchlets: stamens 6. Brazil. I.H. 22:202.

campéstris, Drude & Gris. Fig. 3850. Differs from *T. brasiliensis* in the segms. being shallowly bifid and

3850. Trithrinax campestris.

white-tomentose above but nearly glabrous beneath, and with stouter spadix branches: plant more rigid. Argentina.—Said to be a striking palm.

acanthócoma, Drude. Dwarf, stout, with many strong reflexed spines, the caudex with netted sheaths: lvs. large, fan-like, cut nearly to base into about 40 narrow bifid segms.: spadix branched. Brazil. Gt. 27:361.

L. H. B.†

TRÍTICUM (old Latin name for wheat). *Gramineæ.* The genus as now limited comprises 2 sections, Ægilops, with 12 species of S. Eu. and Asia, one of which is thought by some to be the original of the cult. wheats; and Triticum proper, which includes wheats and spelts themselves, that are referred by Hackel to 3 species. Annual grasses with fls. in a terminal spike: spikelets 2–5-fld., placed flat-wise, singly on opposite sides of a zigzag rachis; glumes ovate, 3- to many-nerved, these and the lemmas more or less awned: grain free. The common wheat is *T. æstìvum,* Linn. (*T. satìvum,* Lam. *T. vulgàre,* Vill.). (For account of a wild species of Syria, the probable ancestor of wheat, see Aaronsohn, Bull. Soc. Bot. France, 56:237). *T. Richardsonii,* Trin. Under the name *Cryptopyrum Richardsonii,* Schrad., this species has sometimes been catalogued by seedsmen as an ornamental plant. It is a perennial with a slender nodding spike of awned spikelets. The species properly belongs in Agropyron (*A. Richardsonii,* Schrad.) and resembles the wild *A. caninum,* Linn., with which some authors unite it. It is native from Que. across the continent.

A. S. Hitchcock.

TRÍTOMA: *Kniphofia.*

TRITÒNIA (name explained as follows by Ker-Gawler, its author: "Name derived from *Triton,* in the signification of a vane or weathercock; in allusion to the variable direction in the stamens of the different species"). Including *Montbrètia. Iridàceæ.* Blazing Star. Showy-flowered corm-bearing herbs used both as greenhouse and summer-blooming subjects.

Corms or bulbs small, covered with fibrose sheaths or tunics: sts. simple or slightly branched: lvs. few, narrow-linear or broader and sword-shaped, usually falcate: spathes disposed along the rachis or the few branches, short, membranaceous, often 3-toothed: fls. 1 to a spathe, sessile; perianth-tube slender, limb concave or broadly campanulate, lobes obovate or oblong, nearly equal; ovary 3-celled: caps. membranaceous, ovoid or oblong.—About 50 species, S. Afr. Allied to Crocosmia, Acidanthera, Sparaxis, and Gladiolus. Few of them are in general cult., although many of the species have been intro. at one time or another. Those of the Montbretia class are showy hardy summer-flowering bulbs, to be handled like gladioli; or they may be left in the ground permanently if given protection of mulch in cold climates. As far north as N. Y. and Mass., however, they are usually best wintered in damp (not wet) earth indoors. The best-known kinds are *T. crocosmæflora* and *T. Pottsii.* Most of the Latin names in catalogues belong to these, as *sulphurea, tigridia, pyramidalis, grandiflora, elegans, floribunda.* To gardeners, tritonias are usually known as montbretias. Garden tritonias grow 1 ft. or more tall, producing several to many showy fls. of a yellow, orange, or red color, and bearing several stiffish linear or sword-shaped lvs.

A. *Three lower perianth-segms. bearing hatchet-shaped processes.*

bracteàta, Worsley. True lvs. about 3, appearing after flowering, about 1 ft. high and ½in. broad; the early lvs. are really bracts: scape about 1 ft. high, flexuous, much branched: fls. 30–40, tawny red, scentless, opening singly or in 2's, subtended by the large foliose bracts, irregular in shape, about 1 in. across; outer segms. about ¼in. broad, inner segms. about ⅛in. broad and recurved. S. Afr.

AA. *Three lower perianth-segms. without hatchet-shaped processes.*

B. *Fls. hooded.*

Clusiàna, Worsley. Allied to *T. securigera,* from which it differs in having lvs. twice as long and wide, no obtuse or other indentation on the outer spathe-valves: plant about 1 ft. high: fls. orange (?), hooded, all facing one way. S. Afr.—This species with hooded fls. seems to form a link between Tritonia and Antholyza.

BB. *Fls. not hooded.*

C. *Perianth-segms. obovate.*

crocàta, Ker-Gawl. Slender, simple or branched from near the base, bearing few fls. in loose 1-sided racemes: fls. about 2 in. across, tawny yellow or orange-red, the stamens one-third the length of the perianth-limb. Cape Colony. B.M. 184 (as *Ixia crocata*). Gn. 54: 82. Var. **miniàta,** Baker (*T. miniàta,* Ker-Gawl.), has light red fls. B.M. 609. There are color varieties, as **purpùrea,** Hort., **coccín-**

3851. Tritonia Pottsii. (×½)

ea, Hort., and **aurantiaca,** Hort.—These plants are usually treated as greenhouse bulbs in the N.

cc. *Perianth-segms. oblong.*

rósea, Klatt. Tall and branched, with short linear lvs. and loose 6–15-fld. racemes: fls. bright red, with oblong segms. (the 3 lower ones yellow-blotched at the base) as long as the tube and anthers just protruding from the tube. Cape Colony. B.M. 7280.—Can be left in the open as far north as Mass., if well protected, but are usually safer if taken up.

Pŏttsii, Benth. (*Montbrètia Póttsii,* Baker). Fig. 3851. Strong branching plant 2–4 ft. tall, with several lax racemes, and few or several firm narrow lvs.: fls. about 1 in. long, bright yellow tinged red, the tube broadly funnelform and twice longer than the oblong unequal ascending segms., the stamens about half the height of the limb. Natal, Transvaal, etc. B. M. 6722. G.C. III. 7:301, showing how the corms form one above the other.

3852. Tritonia crocosmæflora. (×½)

crocosmæflòra, Lemoine (*T. Pottsii* × pollen of *Crocosmia aurea* [Fig. 1112, Vol. II]). Fig. 3852. Slender much-branching erect plant 3–4 ft. high, with several or many sword-shaped lvs., and loose more or less distichous racemes: fls. 2 in. across, orange-crimson, with a slender curved tube nearly or quite equaling the oblong spreading segms. R.H. 1882: 124. Gn. 25, p. 363; 31:490. G. M. 36: 484. G.Z. 27:169.—*Crocosmia aurea* was intro. (into England) in 1847, and *Tritonia Pottsii* (into Scotland) in 1877 by G. H. Potts. Victor Lemoine, at Nancy, France, hybridized the two, and the product, *T. crocosmæflora,* bloomed in 1880. This hybrid is now the most popular of tritonias (or montbretias).

The following varieties are offered in the trade under the generic name Montbretia; as they are mainly color-forms it seems inadvisable to make new combinations for them, and they are accordingly retained under the trade name. *Montbrètia crocosmæflòra* var. *aurantiaca,* Hort. (*M. aurantiaca,* Hort.), has deep orange fls. Var. *califórnica,* Hort. (*M. califórnica,* Hort.), has golden yellow fls. Var. *germánia,* Hort. (*M. germánia,* Hort.), has glowing orange-scarlet fls., with blood-red throats. Var. *pyramidàlis,* Hort., is offered in the trade. Var. *speciòsa,* Hort. (*M. speciòsa,* Hort. *T. speciòsa,* Hort.), is said to have close spikes of rich deep yellow fls., the reverse side apricot. J.H. III. 48:391.

Some of the following plants occur in the trade under Montbretia and have never been transferred to Tritonia. They are little known botanically and in some cases are probably hybrids or forms of T. crocosmæflora and are here listed as Montbretias as signified by the M. before the specific name.—*T. aùrea,* Pappe (M. aurea, Hort.). See Crocosmia aurea.—*T. crispa,* Ker-Gawl. Fl. whitish or pale pink, with oblong, obtuse segms. and with crisped lvs. B.M. 678.—*T. deùsta,* Ker-Gawl. Differs from T. crocata in having a purple-black blotch on the claw of the 3 outer segms. B.M. 622.—*M. élegans,* Hort., has yellow and apricot fls.; possibly a form of T. crocosmæflora.—*T. flàva,* Ker-Gawl. Fls. bright yellow, the segms. oblong and the 3 lower ones with a callus in the throat: lvs. very short. B.R. 747.—*M. germánica,* Hort., is offered in the trade as a form with scarlet fls., shaded with orange, 3 in. across.—*T. hyalìna,* Baker. Differs from T. crocata in having the perianth-segms. narrowed at the lower part into a claw with hyaline margin. B.M. 704 (as T. fenestrata).—*T. linedta,* Ker-Gawl. Fls. white or pink, with short oblong segms. and protruding anthers, of the shape of gladiolus fls. B.M. 487 (as Gladiolus lineatus).—*M. Promètheus,* Hort., is a horticultural form which grows up to 4 ft. high, with branching spikes of rich orange or orange-red fls., 3½ in. across, their center crimson. Gn. 71, suppl. Jan. 19. G.M. 49:815.—*M. rósea,* Hort., is offered in the trade as a form growing 3 ft. or more high with long arching spikes of rose or bright salmon-rose fls.—*T. scillàris,* Baker. Small and slender: fls. pink, with wide-flaring narrow segms., ixia-like. B.M. 629 (as Ixia polystachya).—*T. securígera,* Ker-Gawl. Lvs. short: fls. red or copper-colored, the 3 lower segms. with a callus on the claw. B.M. 383 (as Gladiolus securiger).—*T. undulàta,* Baker. Lvs. short and narrow, much crisped: fls. pink, with oblong equal segms. B.M. 599 (as Ixia crispa).—*T. víridis,* Ker-Gawl. Lvs. plane or crisped, linear: fls. green, with nearly equal oblanceolate segms. B.M. 1275.—*T. Wilsonii,* Baker. Lvs. very narrow-linear: racemes simple or forked, lax, few-fld.: fls. white, tinged with purple, the segms. obovate-cuspidate.

L. H. B.
F. Tracy Hubbard.†

TRIUMFÉTTA (named for Giov. B. Trionfetti, 1658–1707 or 8). *Tiliàceæ.* Herbs, subshrubs, or shrubs, which have been sometimes grown in the warmhouse or greenhouse. Plants stellate-pubescent: lvs. serrate, entire, or 3–5-lobed: fls. yellow, axillary or opposite the lvs., few or densely fasciculately cymose; sepals 5; petals 5, rarely none; stamens numerous; ovary 2–5-celled, cells 2-ovuled: caps. small, subglobose, spiny or bristled. About 100 species, widely dispersed over the world. Several species have been intro. abroad but none of them is cult. to any extent.

TROCHÈTIA (named for R.I.G. du Trochet, 1771–1847, Paris). *Sterculiàceæ.* Shrubs or trees, evergreen, grown in the warmhouse or coolhouse. Lvs. entire, leathery: peduncles axillary, 1–3-fld.: fls. usually pendulous, rather large; calyx 5-parted, leathery; petals 5, flat, broad, and persistent; staminal column short, bearing 5 ligulate staminodia; anthers 10, 15, or 20, stipitate; ovary sessile, 5-celled, cells with many ovules: caps. loculicidally 5-valved.—About 6 or 7 species, natives of Mauritius, St. Helena, and Mascarene Isls.

Blackburniàna, Bojer. Shrub or small tree: branches, petioles, and ribs of the lvs. rusty-scurfy with stellate hairs: lvs. long-petioled, elliptic- or obovate-oblong, acute, entire, or crenate-serrate, 7-ribbed from the base, which is slightly cordate: peduncles above the axils, 1-fld., 2-bracted: fls. large, campanulate; sepals elongated lanceolate; petals obliquely obovate-rotundate, white, rose-veined, margins blood-red. Mauritius. B.M. 7209. G.C. III. 36:112.

TROCHODÉNDRON (Greek, *wheel* and *tree,* alluding to the appearance of the fls., the anthers of the numerous spreading stamens forming a ring.). *Trochodendràceæ.* Evergreen tree with aromatic bark and foliage, with alternate or whorled long-petioled lvs. and small fls. in terminal upright racemes: fls. long-pedicelled, perfect, without perianth; stamens numerous, filaments slender: carpels 6–10 in one whorl, connate below, with short linear spreading styles: fr. consisting of 6–10 follicles inserted below in the fleshy receptacle, dehiscent at the apex, with several linear seeds in each carpel. The tree is probably not in cult. in this country, but may be recommended for its handsome evergreen foliage for the middle and southern Atlantic states and for Calif. *T. aralioìdes,* Sieb. & Zucc. Tree, to 50 ft., or in cult. spreading shrub, glabrous: lvs. rhombic-obovate to elliptic-lanceolate, obtusely acuminate, crenate-serrate, lustrous and dark green above, lighter green beneath, 2–5 in. long; petioles 1–3 in. long: fls. green, ¾in. broad across the stamens; anthers yellow: fr. brown, ½–¾in. across. June. S.Z. 1:39. B.M. 7375. S.I.F. 1:42. G.C. III. 15:725. J.H.S. 27, p. 867. R.B. 30:86.

Alfred Rehder.

TRÓLLIUS (old German, *trol*, something round; *trollblume*, in allusion to the shape of the flowers). *Ranunculàceæ.* GLOBE-FLOWER. A group of neat hardy herbaceous perennials of a dozen or more species, mostly found in moist or marshy places of the North Temperate zone; useful in garden borders.

Roots fibrous, thickened: lvs. palmately divided or lobed: fls. large, solitary, whitish, yellow, golden yellow, or purplish, those in cult. usually yellow- or orange-fld.; petals 5 to many, small, unguiculate, with a nectariferous pit at the base of the blade; sepals 5–15, large, usually constituting the showy part of the fl.; stamens many; carpels 5 to many, sessile, many-ovuled: follicles in a head.—Very like Ranunculus in general appearance, but distinguished at once by bearing follicles rather than achenes. For monograph, see Huth, in Helios ix. (Berlin), 1892; and for the Eastern Asian species, Finet & Gagnepain, Contrib. Fl. As. Or. 1: 136–139; also in Bull. Soc. Bot. France 51:393–396 (1904).

Trolliuses are grown for the beauty of their globular flowers and show of dark green leaves. They are suited to wet sunken gardens, wild borders, and edges of water-gardens, although in a good garden soil not lacking in moisture they do well. They may be increased either by seeds or by dividing the old plants; but the young plants grow slowly at first, and will not flower before the second season from seed. The usual globe-flower of the horticulturist is *T. europæus*, with incurving sepals so that the flower has a ball-like appearance; in most of the species the sepals spread nearly or quite horizontally. They bloom in spring and early summer.

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A. *Number of sepals exceeding 10 (15–20).*

B. *Sepals incurved, forming a globe-shaped fl.*

1. **europæus,** Linn. (*T. globòsus*, Lam.). Fig. 3853. Sts. erect, 15 in. or more high, often branching: lower lvs. petioled, others sessile; lfts. only 5-parted, lobed, cleft, and toothed, those of the root-lvs. on short petioles: fls. of a lemon-yellow color, solitary or in 2's, 1–2 in. across, globular in form; sepals 10–15, ovate; petals spatulate, often longer than the stamens: fr. much as in *T. laxus*. Wet upland meadows of N. Eu. May–July. Gn. 40:102; 71, p. 310. G. 19:609. G.W. 15, p. 129. J.H. III. 51:594; 54:555.—Different forms are offered or sometimes listed. Var. **Lóddigesii,** Hort., has deep yellow fls.

Var. **napellifórmis,** Huth (*T. napellifórmis*, Roep.). St. many-fld. and lvs. deeply divided.

BB. *Sepals spreading, making an open fl.*

C. *Petals longer than the stamens.*

2. **asiáticus,** Linn. Plant much like *T. europæus*, often taller, the smaller bronze-green lvs. more finely lobed and cleft: fls. a rich orange-color with sepals spreading. May. Siberia. B.M. 235.—The blossoms of this are well suited for cut-fl. purposes. The plants thrive best and produce richest colors if partially exposed to the sun. *T. gigantèus*, found in garden lists, is a very tall form of this species.

CC. *Petals shorter than the stamens or not exceeding them.*

3. **dschungáricus,** Regel. Much like *T. europæus*, but fls. open or spreading, golden yellow within and reddish outside; sepals about 15, rounded and mucronate; style subulate and straight. Turkestan.—Mentioned in foreign lists.

4. **altàicus,** C. A. Mey. (*T. caucásicus* var. *altàicus* Fin. & Gagn.). Plant 1–2 ft., with foliage much like that of *T. europæus:* fls. large (2 in. across), yellow or pale orange, with 15–20 broad and obtuse sepals (perhaps sometimes as few as 10); petals 5–15, narrowly linear and obtuse. Altai region, Siberia. Gt. 6:66.—Little known in the trade.

AA. *Number of sepals 5–10, spreading.*

B. *Petals one-third or one-half longer than the stamens.*

5. **Lédebouri,** Reichb. f. Plant about 2 ft., with lvs. divided to the base and the divisions lobed and toothed: fls. yellow, with 5 spreading veined ovate sepals; petals 10–12, narrowly linear, not prominent but surpassing the stamens. Siberia.—Listed, but apparently little known horticulturally.

6. **chinénsis,** Bunge (*T. sinénsis*, Hort.?). Long regarded as a form of *T. asiaticus*, but now separated: stout striate glabrous herb: radical lvs. obsolete; lower st.-lvs. reniform and the upper orbicular-reniform, sometimes 7 in. across, palmately 5-parted, the segms. broad-oblanceolate: sepals 12 or 13, the outer ones broad-ovate and obtuse, the inner ones rather longer and narrower; petals 20, linear, over 1 in. long, exceeding the glabrous stamens. N. China. B.M. 8565.—

3853. Trollius europæus (×⅓).

In English gardens this species is said to thrive well and to seed freely when grown in the bog-garden or beside water.

7. **japónicus,** Miq. St. low (4–8 in. high), scape-like and 1-fld., the lvs. being radical and involucrate: fl. yellow, with 5 or 6 sepals which are 1 in. or less long. Japan.—Sometimes combined with *T. chinensis;* apparently closely allied to *T. laxus.* Franchet & Savatier, in Flora of Japan, maintain the species as distinct.

BB. *Petals about equaling the stamens in length (or somewhat shorter in No. 10 var.), and shorter than the sepals.*

8. **pátulus,** Salisb. Low, 1 ft. or less high: radical lvs. palmately dissected, the segms. incised-dentate: fl. golden yellow; sepals usually 5, sometimes 6 or 7, ovate and spreading; petals and stamens nearly equal, the former 1–5; style erect and about equaling the ovary. Caucasia to Persia.—Finet & Gagnepain define this species very broadly, to include others. They make var.

genuìna, Fin. & Gagn. to include *T. laxus*, Salisb., *T. pumilus*, Don, and *T. pumilus* var. *yunnanensis*, Franch; also var. *Lédebouri*, Fin. & Gagn. (*T. Lédebouri*, Reichb. f.), differing from the type in having the sepals longer than the stamens.

9. **caucásicus**, Stev. (*T. pátulus* var. *caucásicus*, Huth). Radical lvs. palmately dissected, the segms. incised-dentate: sepals 5–8, elliptic, spreading; petals 10, about equaling the stamens; style about equaling the ovary. Caucasia, Armenia, etc.—Perhaps a form of *T. patulus*, as considered by Huth. Under the name *T. caucasicus*, the plant offered abroad is described as a hardy perennial, with large orange fls. in June and July; 2–3 ft. In horticultural literature the fls. are usually described as globular, which raises a question as to the identity of the cult. plant.

10. **pùmilus**, Don. St. 1 ft. or less high, from a horizontal rootstock, the base bearing old lvs., with few lvs. on the st. and those above the middle: lvs. small, 1–2 in. diam., orbicular, thickish, 5-parted, the segms. broadly obovate and 3-lobed: fls. 1 in. across, solitary, yellow; sepals 5 or 6, rounded, notched at the end; petals 10–12, about equaling the stamens, cuneate-oblong: follicles many. Alpine Himalaya.

Var. **yunnanénsis**, Franch. St. to 2 ft. high and sometimes 3-fld.: lvs. narrowly dentate, the teeth short and rigidly mucronate; cauline lvs. 1 or 2: sepals 6–8, broadly ovate or suborbicular; petals long-clawed, shorter than stamens. W. China.—Described as horticulturally not unlike *Caltha palustris*, but superior, with dark green lvs. and bright golden yellow salverform fls.

BBB. *Petals shorter than the stamens and scarcely equaling the filaments, and shorter than the sepals.*

11. **láxus**, Salisb. (*T. americànus*, Muhl.). Sts. slender, weak, ½–2 ft. long, somewhat ascending: radical and lower st.-lvs. long- or short-petioled; all the lvs. 5–7-parted; lfts. cuneate and much cleft and toothed: fls. usually solitary, 1–2 in. across; sepals 5–7, entire or toothed at the end, more spreading than the other species; petals many, much shorter than the stamens: follicles ¼in. long, straight beak one-fourth as long: head of fr. ¾in. across. Bogs and damp places, Mich., to New England and Del. and westward. May–July or Aug. B.M. 1988 and L.B.C.:56 (both as *T. americanus*).

Var. **albiflòrus**, Gray (*T. albiflòrus*, Rydbg.). Much like the type but usually lower, more slender: lfts. usually 5: fls. pale or white; petals nearly equaling the stamens. Mountain tops, Colo., northward and westward.

12. **acaùlis**, Lindl. Plant only 3–4 in. high: lvs. as in the above, or only 5-parted: fls. lemon-yellow, spreading, on sts. hardly reaching from the ground; sepals 9, nearly lanceolate, acute, sometimes toothed; petals spatulate, shorter than the stamens. N. India. B.R. 29:32.

T. aurantiacus, Hort., described as lemon-yellow: probably a form of T. europæus.—*T. Excélsior*, Hort., and *T. hýbridus*, Hort., with deep orange fls., are probably T. europæus forms.

K. C. Davis.
L. H. B.†

TROPÆOLUM (from Greek word for *trophy;* the leaves are shield-shaped and the flowers helmet-shaped). *Tropæolàceæ*. Nasturtium of gardens (but not of botanists). Climbing or rarely diffuse soft-growing herbs, grown in the garden for their showy flowers.

Roots fusiform, sometimes tuberous: lvs. alternate, peltate or palmately angulate, lobed or dissected; stipules none or rarely minute, bristle-like or dissected: peduncles axillary, 1-fld.: fls. irregular, usually orange or yellow, rarely purple or blue, but the garden forms now show a great range of color; sepals 5, connate at their base, posterior produced into a long slender spur; petals 5 or fewer by abortion, usually narrowed into distinct claws, two upper smaller or dissimilar and inserted in the mouth of the spur; stamens 8, free, unequal, with declined usually curving filaments; ovary 3-lobed, 3-celled, ripening into 3 1-seeded indehiscent carpels (these constitute the "seed" of commerce).—About 45 species, S. Amer., chiefly from the cooler parts of Peru and Chile. Monographed in 1902 by Buchenau in Engler's Pflanzenreich hft. 10 (IV. 131).

The common species, *T. minus* and *T. majus*, are also grown for their young pods and seeds, which are made into pickles. The peppery-tasting leaves are sometimes used like cress, in salads, whence the name "Indian cress" in England. In America this use of the plant is little known. Certain kinds, particularly *T. tuberosum*, produce edible subterranean tubers.

3854. Flower of Tropæolum minus. One of the lower petals shown at *a*. (×⅓)

Tropæolums thrive in any warm sunny fairly moist place. The tops are tender to frost. For early effects, seeds may be started indoors in pots or boxes. The common climbing species are *T. majus* and *T. peltophorum*, both of which are very useful for window-boxes, balconies, for covering banks and walls, and for growing amongst shrubbery. The common dwarf species, *T. minus*, is earlier and usually more floriferous, and is very useful for the front row in the border. On rich soils, nasturtiums produce very heavy foliage that overtops the bloom. *T. peregrinum*, the canary-bird flower, is grown either indoors or in the open. Probably most species are perennial. Many of them are tuberous and withstand some frost at the root; but the half-hardy species are little known in this country.

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A. *Species annual or perennial but not tuber-bearing.*

B. *Petals 5, entire or rarely emarginate or crenate at the apex.*

C. *Inferior petals not ciliate at the base.*

D. *Plants perennial, low, prostrate, glabrous.*

1. **polyphýllum**, Cav. Perennial, half-hardy: st. succulent, prostrate or climbing: lvs. peltate, orbicular, cut beyond the center into 7–9 narrow divisions: fls. much like *T. majus* in shape, but smaller; spur slender but rather short, the calyx-lobes triangular; petals obovate-cuneate, unguiculate, yellow, wavy or emarginate, the 2 upper ones streaked with red. Chile. B.M. 4042. P.M. 10:175. F.S. 20:2066. G.C. II. 20:241. Gn. 45, p. 158. G.M. 58:367. St. naturally prostrate.—**T. Leichtlínii**, Hort. Garden hybrid between *T. polyphyllum* and *T. leptophyllum* (see suppl. list), raised by Max Leichtlin, of Baden-Baden. More closely approaching the former, but with larger lvs., more

numerous and more vivid-colored fls. and said to be more hardy.

DD. *Plants perennial, tall, scandent.*

2. **speciòsum,** Poepp. & Endl. Half-hardy slender climbing vine: lvs. peltate at the base, short-petioled, parted to the base into 6 obovate-oblong obtuse divisions or lfts.: pedicels very slender, red, fls. shaped much like those of *T. majus,* but smaller, vermilion-red, showy, upper cuneate, lower almost quadrate. Chile. B.M. 4323. F.S. 3:281. P.M. 14:173. Gn. 37, pp. 253, 545; 61, p. 274; 79, p. 68. R.H. 1904:88.—A perennial fleshy-rooted plant, hardy in England.

3855. Tropæolum majus, the common climbing nasturtium. (×⅓)

CC. *Inferior petals ciliate at base (near the claw).*

D. *Plant pubescent.*

3. **peltóphorum,** Benth. (*T. Lobbiànum,* Veitch). Annual, climbing, hairy all over except the under parts of the lvs. and the petals: lvs. very long-stalked, peltate, nearly orbicular, undulate and with points on the margin: fls. large, long-spurred, orange-red, the 2 upper petals large, rotundate, broad and entire, the 3 lower ones small and clawed and coarsely toothed and also fringed on the claws. Colombia. B.M. 4097. F.S. 2:67. P.M. 11:271. Gn.M. 9:16. Var. **fimbriàtum,** Hubb. (*T. Lobbiànum* var. *fimbriàtum,* Hort.), has all the petals toothed or fringed. R.H. 1856:101. Seldom seen in its pure state. Var. **hederifòlium,** Hubb. (*T. Lobbiànum* var. *hederifòlium,* Hort.), has variegated lvs. which resemble those of *Hedera helix* in shape. Var. **miniàtum,** Hubb. (*T. Lobbiànum* var. *miniàtum,* Hort.), is said by some to be a hybrid with bright vermilion fls. Var. **Regìna,** Hubb. (*T. Lobbiànum* var. *Regìna,* Hort.), is a form with bright salmon-red or salmon-orange fls. There is a horticultural strain of more compact growth known as *T. Lobbiànum compàctum*; this strain occurs in numerous colors. Horticultural color-forms listed under the name *T. Lobbianum* are *atropupùreum,* dark purple; *aùreum,* clear golden yellow; *fúlgens,* dark scarlet; *Chaixiànum,* yellow, washed with red.

DD. *Plant glabrous.*

E. *Lvs. orbicular-reniform; nerves terminating in mucrons: petals mucronate.*

4. **mìnus,** Linn. Fig. 3854. Dwarf annual, not climbing, smaller in all its parts than *T. majus:* lvs. orbicular-reniform, apiculate at the ends of the veins: petals narrow and apiculate at the apex, the lower intensely maculate. Peru. B.M. 98.—Very likely blended with *T. majus* by hybridization, in garden forms. **T. pinnàtum,** Andr., is either a monstrosity of this species or more probably a hybrid between *T. minus* and *T. peregrinum,* having the lvs. somewhat peltate, with obtuse, unequal lobes: fls. pinnate; petals cuneate with the apex dentate. A garden form. Gt. 62, p. 279. The form known as *bimaculàtum,* Hort., has red petioles and peduncles and the 2 upper petals bear a dark blood-red blotch. There is also a yellow form known as *lùteum,* Hort.

EE. *Lvs. orbicular; nerves and petals muticous (blunt).*

5. **màjus,** Linn. Fig. 3855. Strong-growing somewhat succulent climbing annual: lvs. peltate, nearly orbicular and undulate-angled: fls. large, mostly in shades of yellow or orange, with straight spur, the 2 upper petals entire or undulate (not apiculate), the 3 lower ones narrower and fringed on the claws. Peru, Colombia, and Brazil. G. 4: 2. B.M. 23; 3375 (var. *atrosanguineum*). F.S. 12:1286 (var. *atropurpureum nanum*). P.M. 1:176 (var. *atrosanguineum*). G.C. II. 11:665.—This species has been in cult. in Eu. since 1684. It is the foundation of the common climbing nasturtiums. Some of these garden forms are probably the offspring of hybridization with *T. peltophorum.* Some of the horticultural color forms are *atropurpùreum,* dark red; *atropurpùreum fòliis-aùreis,* with golden yellow lvs.; *coccíneum,* scarlet and the form of it with golden lvs. known as *coccíneum fòliis-aùreis; Heìnemannii,* chocolate; *hemisphéricum,* light yellow; *lùteum,* yellow; *Regeliànum,* purple-violet; *Scheueriànum,* straw-colored, dotted; *Scheueriànum coccíneum,* scarlet, striped; *Schíllingii,* yellow, brown-spotted; *Schùlzii,* scarlet, with dark lvs. Var. **flòre-plèno,** Hort., is a strain with double fls. occurring in different colors. Var. **nànum,** Hort. Tom Thumb Nasturtiums. A dwarf strain occurring in numerous color-forms, some of which are *atrococcíneum,* brilliant scarlet; *atropurpùreum,* dark purplish red; *atrosanguíneum,* a deep blood-red; *coccíneum,* scarlet and also the golden-lvd. form offered as *nànum coccíneum fòliis-aùreis; cærùleo-ròseum,* dark rose; *lùteum,* clear yellow; *Regeliànum,* purple-violet.

BB. *Petals 5, serrate-ciliate, lobed or aristate-ciliate above.*

6. **peregrìnum,** Linn. (*T. canariénse,* Hort.). Canary-bird Flower. Fig. 3856. Annual, tall-climbing; gla-

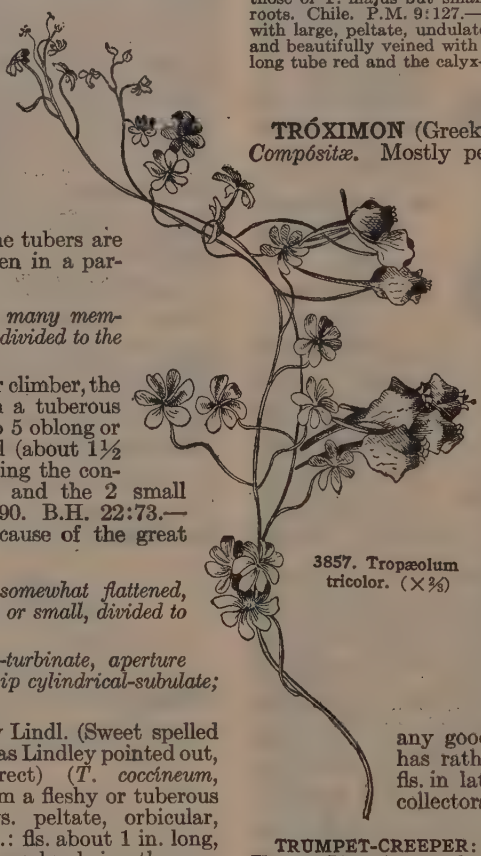
3856. Tropæolum peregrinum, the canary-bird flower. (×⅓)

brous: lvs. peltate near the margin, cordate-orbicular, divided to about the middle into 5 lobes, which are mostly apiculate: fls. canary-yellow, odd and very irregular; spur green, hooked; 2 upper petals erect and large, obovate-clawed, much fringed; 3 lower petals small and narrow and ciliate. Supposed to be native of Peru and Ecuador. B.M. 1351. B.R. 718. G.W. 10, p. 497.—An excellent quick-growing vine, although the fls. can scarcely be called showy.

AA. *Species tuber-bearing.*

B. *Tuber large, obconical or pear-shaped.*

7. **tuberòsum,** Ruiz & Pav. Root producing a pyriform irregular tuber 2–3 in. long: st. climbing, glabrous: lvs. peltate near the base, cordate-orbicular, 5-lobed nearly or quite to the middle: fls. rather small, the calyx and long spur red, the petals yellow, small and nearly erect and little exceeding the calyx. Peru and Bolivia. B.M. 3714. F.S. 5:452. P.M. 5:49. R.H. 1853:341 (tubers). J.H. III. 30: 385. H.U. 1, p. 4.—Plant stands some frost. In Peru, the tubers are eaten, and the plant is sometimes cult. in Eu. for the tubers. It appears in the American catalogues of European dealers. The tubers are usually boiled, or said to be eaten in a partially dried condition.



3857. Tropæolum tricolor. (×⅔)

BB. *Tuber longer, moniliform in many members: lvs. in 5 parts, usually divided to the base: petals scarlet.*

8. **pentaphýllum,** Lam. Slender climber, the glabrous colored sts. arising from a tuberous root: lvs. divided to the base into 5 oblong or obovate segms. or lfts.: fls. small (about 1½ in. long), the large red spur being the conspicuous part, the lobes green, and the 2 small petals red. Argentina. B.M. 3190. B.H. 22:73.—A half-hardy species, showy because of the great number of bright small fls.

BBB. *Tuber small, sphæroid or somewhat flattened, rarely elongated: lvs. smaller or small, divided to the base.*

C. *Throat of the spur ventricose-turbinate, aperture narrow; spur cone-like, its tip cylindrical-subulate; petals lemon-yellow.*

9. **trícolor,** Sweet, emended by Lindl. (Sweet spelled the specific name *tricolorum*, but, as Lindley pointed out, this is orthographically incorrect) (*T. coccíneum*, Miers). Fig. 3857. Perennial from a fleshy or tuberous root, half-hardy, climbing: lvs. peltate, orbicular, divided into 6 oblong villous lfts.: fls. about 1 in. long, somewhat cornucopia-shaped, the calyx being the conspicuous part; main part of the calyx vermilion, the short lobes purplish, the small petals yellow. Chile. B.M. 3169. B.R. 1935. F.S. 4:369. P.M. 2:123. Gt. 62, p. 273. G.W. 6, p. 277.—Very choice half-hardy plant and probably the best known in this country of the tuberous-rooted kinds. Usually grown indoors. Its growth is very delicate. Var. **grandiflòrum,** Hort. (*T. Jarátti*, Paxt. *T. Yarátti*, Buchen.), differs only in having larger fls. P.M. 5:29.

CC. *Throat of spur open; spur short or very short, conical; throat of corolla narrow, almost closed when old; petals blue.*

10. **azûreum,** Miers (*T. violæflòrum*, Dietr.). Very slender glasshouse climber: lvs. peltate, 5-parted, nearly or quite to the base, into narrow-obovate or oblanceolate divisions: fls. small, the calyx and short spur green, the wide-spreading corolla azure-blue, the petals 2-lobed or emarginate. Chile. B.R. 28:65. R.H. 1843:300. F.S. 2:110. P.M. 9:247. R.B. 20:157. Var. **grandiflòrum,** Hort., has larger fls. F.S. 11:1160. I.H. 3:85.

CCC. *Throat of spur conical, aperture broad; throat of corolla broad, open; petals yellow.*

11. **brachýceras,** Hook. & Arn. A very slender climber, resembling *T. tricolor* in habit: lvs. peltate, nearly orbicular, deeply parted into 6 or 7 oblong or obovate obtuse lobes: fls. small, on short pedicels, the calyx green and very short-spurred, the corolla with spreading yellow petals. Chile. B.M. 3851. B.R. 1926. F.S. 4:368. P.M. 4:55.—Half-hardy perennial.

T. digitàtum, Karst. Climber, with root fibrous: lvs. peltate, 5–7-lobed: fls. yellow, 1 in. diam., the spur long and red, the petals fimbriate. Venezuela.—*T. leptophýllum*, Don (T. edule, Paxt.). Climber: lvs. orbicular, with 5 or 6 narrow lfts.: fls. in shape like those of T. majus but smaller, yellow. Produces tuberous edible roots. Chile. P.M. 9:127.—*T. Lindenii*, Wallis. Beautiful climber with large, peltate, undulate-lobed lvs. that are purplish beneath and beautifully veined with white above: fls. on long pedicels, the long tube red and the calyx-lobes green. Colombia. I.H. 41:17.

L. H. B.
F. Tracy Hubbard.†

TRÓXIMON (Greek, *edible*, which does not apply). *Compósitæ.* Mostly perennial nearly stemless herbs, belonging to the Cichoriaceæ, with clusters of sessile radical lvs. and simple scapes bearing a head of yellow or purple fls. in summer, on a naked or bracted stalk: involucre campanulate, the bracts in several rows: rays blunt and 5-toothed at the apex.—Species 30, in N. Amer., except possibly 2 species which are S. American. The plants are little known to horticulturists. The name Troximon is now given up for Agoseris (Greek, *goat chicory*).

Agóseris cuspidàta, Dietr. (*Tróximon cuspidàtum*, Pursh. *Nothocalàis cuspidàta*, Greene). Root thick: lvs. entire, linear-lanceolate, thickish, 4–10 in. long, the margins conspicuously white-woolly and crisped: scape about 1 ft. high: fls. yellow, about 1–1½ in. wide: achene not beaked. Prairies of Ill. and Wis. to N. D.—Cult. easy in any good border. Not unattractive. It has rather large dandelion-like heads of fls. in late summer. May be offered by collectors.

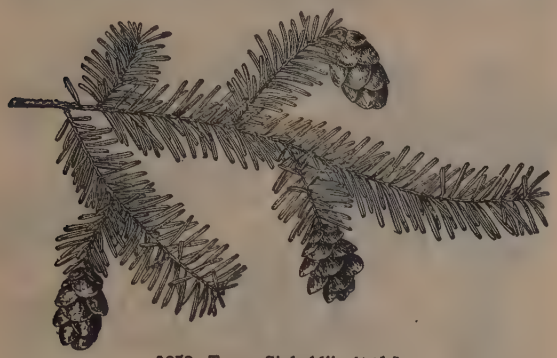
N. Taylor.†

TRUMPET-CREEPER: *Campsis*, especially *C. radicans*. **T.-Flower:** *Bignonia capreolata*. **T.-Honeysuckle:** *Lonicera sempervirens* and *Campsis radicans*. **T.-Vine:** *Campsis radicans*.

TSÙGA (its Japanese name). *Pinàceæ.* Hemlock Spruce. Hemlock. Ornamental trees, grown chiefly for their graceful habit and handsome evergreen foliage.

Resinous trees with slender horizontal branches: lvs. usually 2-ranked, short-petioled, linear, flat or angular, falling away in drying: staminate aments axillary, subglobose; ovule-bearing aments terminal, the scales about as long as the bracts, each with 2 ovules at the base: cones small, ovate, or oblong with thin flexible persistent scales, much longer than the bracts; seeds winged.—Nine or 10 species in N. Amer., E. Asia, and the Himalayas. The genus is closely allied to Abies and Picea and differs little in the structure of the fls.; the cones are very similar to those of the larch, but the lvs., which are much like those of Abies in their outward appearance, though smaller, are very different in their internal structure from all allied genera, having a soli-

tary resin-duct situated in the middle of the lf. below the fibro-vascular bundle. The light, soft, brittle and coarse-grained wood is not durable and not much valued except that of *T. heterophylla*, which is harder and more durable, and that of *T. Sieboldii*, which is esteemed in Japan for its durability. The bark is rich in tannin and that of *T. canadensis* is extensively used for tanning



3858. Tsuga Sieboldii. (×½)

leather. *T. canadensis* should be called "hemlock spruce," but in common speech it is usually alluded to as "hemlock." The "hemlock" of the ancients is a poisonous umbelliferous herb described in this work as *Conium maculatum*.

The hemlock spruces are evergreen trees of pyramidal habit, with spreading irregularly whorled much ramified branches clothed with small linear usually two-ranked leaves and small cones which are usually freely produced. The cones are only about 1 inch long except in one species, which has cones two or three times as large. *T. canadensis* is quite hardy North and the Japanese species and *T. caroliniana* have proved hardy as far north as Ontario. *T. Mertensiana* is almost as hardy. *T. heterophylla* is tenderer. There are probably no more beautiful hardy conifers than the hemlocks, and they must be ranked among the most ornamental and useful trees for park planting. They do not have the stiff formal appearance of many of the conifers, but are graceful and stately at the same time. *T. heterophylla* is the most vigorous species and is more graceful than the Canadian hemlock, but tenderer. *T. Mertensiana* is noticeable for its light bluish green foliage and the more narrow pyramidal habit. *T. Sieboldii* is a very handsome species with dark green glossy foliage, but of slow growth and in cultivation usually remains shrubby. *T. canadensis* bears pruning well and is well suited for tall hedges (see Gng. 2:289. Gn. M. 2:15; 4:19). The other species will probably bear pruning equally well. The hemlocks are not very particular as to the soil, provided it contains a sufficient amount of constant moisture. Tsugas are not difficult to transplant. Propagation is by seeds sown in spring and by grafting on *T. canadensis*. The varieties and the Japanese species are also raised from cuttings. See also *Arboriculture*, *Abies*, and *Picea* for cultivation.

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KEY TO THE SPECIES.

A. *Lvs. with 2 white lines beneath, grooved above, much flattened, distinctly 2-ranked: cones ½–1½ in. long.*
- B. *Margin of lvs. entire; apex of lvs. usually emarginate, sometimes obtuse.*
  - C. *Scales of cones suborbicular.*
    - D. *Branchlets yellowish brown, glabrous* ..... 1. Sieboldii
    - DD. *Branchlets reddish brown, pubescent* ..... 2. diversifolia
  - CC. *Scales of cones oblong: lvs. often obtuse* ..... 3. caroliniana
- BB. *Margin of lvs. finely denticulate, at least toward the apex; apex of lvs. obtuse or acutish.*
  - C. *Cones peduncled; scales almost orbicular, glabrous* ..... 4. canadensis
  - CC. *Cones sessile; scales oval, slightly puberulous outside* ..... 5. heterophylla

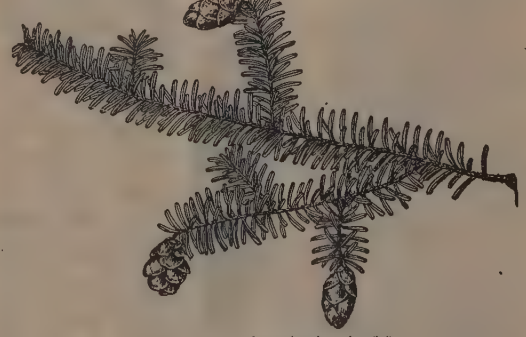
AA. *Lvs. stomatiferous on both sides, flat or convex above, spirally arranged: cones 2–3 in. long (Hesperopeuce)* ..... 6. Mertensiana

1. **Sièboldii,** Carr. (*T. Araràgi*, Koehne). Fig. 3858. Tree, attaining 100 ft., with spreading slender branches: branchlets pale yellowish brown, somewhat glossy, glabrous, with reddish lf.-cushions: lvs. linear, usually broadest at the apex, emarginate, grooved and glossy dark green above, with 2 whitish lines beneath, ¼–¾in. long: cone ovate, 1–1¼ in. long, the peduncle exceeding the bud-scales: bracts bifid. Japan. G.F. 10:492 (adapted in Fig. 3858). F.E. 32:1301. S.I.F. 2:4.

2. **diversifòlia,** Mast. (*Àbies diversifòlia*, Maxim. *T. Sièboldii nàna*, Carr.). Fig. 3859. Tree, very similar to the preceding, but smaller and chiefly distinguished by the reddish brown pubescent branches: lvs. linear, emarginate or obtuse, shorter and narrower, broadest at the middle or toward the base: cone smaller, ½–¾in. long: peduncle not exceeding the bud-scales; bracts truncate, crenulate, not or slightly bifid. Japan. G.F. 6:495; 10:493 (adapted in Fig. 3859). S.I.F. 2:4.

3. **caroliniàna,** Engelm. Carolina Hemlock. Tree, attaining 70 ft., of more compact habit and with darker green foliage than the following: young branchlets light reddish brown, finely pubescent or almost glabrous: lvs. linear, obtuse or emarginate, dark green and glossy above, with 2 whitish lines beneath, ⅛–¾in. long: cones oblong, 1–1½ in. long, peduncled; scales oblong. Va. to S. C. S.S. 10:603. G.C. II. 26:780. G.F. 2:269. Gn.M. 12:214.—More graceful than the following.

4. **canadénsis,** Carr. (*Àbies canadénsis*, Michx.). Common Hemlock. Fig. 3860. Tree, attaining 70 and



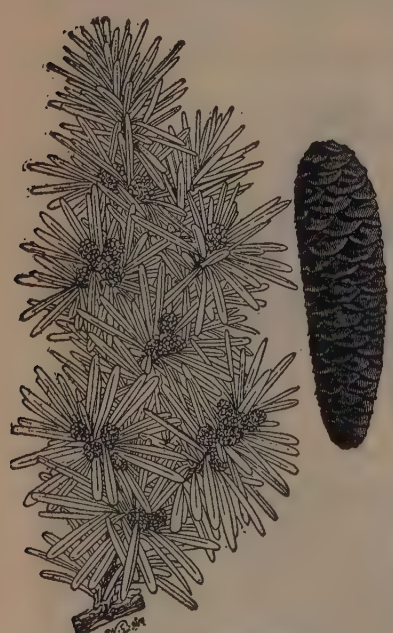
3859. Tsuga diversifolia. (×½)

occasionally 100 ft.: young branchlets yellowish brown, pubescent: lvs. linear, obtuse or acutish, dark green and obscurely grooved above, with 2 whitish lines beneath, ¼–⅔in. long: cones ovoid, ½–¾in. long, peduncled; scales almost orbicular. New Bruns. and Wis., south to Ala. S.S. 10:603. G.C. III. 48:350. Gn.M. 12:215. J.H. III. 66:467. G.W. 1, p. 359; 5, p. 536; 9, p. 213.—The hemlock spruce yields the lumber

most commonly used in the E. for framing and clapboarding of buildings. It is not used for finishing lumber. A number of garden forms have been raised; the following are the most important: Var. **álbo-spìca,** Nichols. Tips of the young branchlets creamy white. Var. **compácta,** Sénécl. (var. *compácta nàna,* Beissn.). Dwarf conical pyramid with numerous short branchlets clothed with small lvs. Var. **globòsa,** Beissn. (var. *globulàris erécta,* Kunkler). Dense, globose, much-branched form with numerous upright branches nodding at the ends. Var. **grácilis,** Gord. (var. *microphýlla,* Hort.). Slow-growing form with slender sparingly ramified branches, spreading and more or less drooping at the ends: lvs. very small, about ¼in. long. Var. **nàna,** Carr. Dwarf and depressed form with spreading branches and short branchlets. Var. **parvifòlia,** Veitch. Lvs. very small, ¼in. long or shorter: branchlets stout, closely set and numerous. Var. **péndula,** Parsons (var. *Sárgentii péndula,* Hort., var. *Sargentiàna,* Kent). Flat-topped form with spreading branches and drooping branchlets. Gn. 32, p. 363; 39, p. 81. M.D.G. 1900:367, 368, 491. Very distinct and desirable form.

5. **heterophýlla,** Sarg. (*T. Albertiàna,* Sénécl. *T. Mertensiàna,* Carr.). Tree, attaining 200 ft., with short slender, usually pendulous branches forming a rather narrow pyramidal head in older, but rather broad in young trees: young branchlets pale yellowish brown, pubescent: lvs. linear, obtuse or acutish, distinctly grooved and dark green above, with 2 white lines below, ½–¾in. long: cones oblong-ovoid, sessile, ¾–1 in. long; scales oval, slightly puberulous outside. Alaska to Calif., west to Mont. S.S. 10:605. G.C. III. 12:11. Var. **argénteo-variegàta,** Schneid. Tips of the young branchlets white.

6. **Mertensiàna,** Sarg., not Carr. (*T. Pattoniàna,* Sénécl. *T. Hookeriàna,* Carr. *T. Roèzlii,* Carr. *Àbies Williamsonii,* Newb. *Hesperopeùce Pattoniàna,* Lemm.). Fig. 3861. Tree, attaining 100 and occasionally 150 ft., with slender pendent branches usually forming an open pyramid: young branchlets light reddish brown, pubescent, usually short and upright: lvs. spirally arranged around the branches, linear, usually curved, acutish, mostly rounded or keeled, rarely slightly grooved above, light bluish green or pale bluish white, with whitish lines on both sides, ½–1 in. long: cones cylindric-oblong, usually violet-purple before maturity, brown when ripe, 2–3 in. long; scales obovate, puberulous outside. Brit. Col. to Calif., west to Mont. S. S. 10:606. G. C. III. 12:10; 13: 659; 21:150, 151 (adapted in Fig. 3861). G.F. 4:380; 10:6, 7. R. H. 1870, p. 21. Var. **argéntea,** Schneid. Foliage bluish white. G.W. 14, p. 602. Var. **Jéffreyi,** Schneid. (*T. Pattoniàna* var. *Jéffreyi,* Henry). Lvs. greenish, flattened and grooved above.—To avoid confusion one has to bear in mind that *T. heterophylla* was known for a long time as *T. Mertensiana* and still bears this name in many gardens.



3861. Tsuga Mertensiana. (×⅓)

T. chinénsis, Pritz. Tree, to 120 ft.: branchlets yellowish gray, pubescent: lvs. ½–1 in. long, rounded or emarginate at the apex, green or nearly so beneath, entire, on young plants sparingly toothed and with narrow white lines beneath: cones sessile, about 1 in. long, lustrous. Cent. and W. China. G.C. III. 39:236 (cones, as T. yunnanensis). Has proved hardy at the Arnold Arboretum and thrives well.—*T. dumòsa,* Sarg. (T. Brunoniana, Carr.). Tree, to 120 ft.: lvs. gradually tapering from the base, serrulate, acutish, with broad silvery white lines beneath, ¾–1¼in. long: cone 1 in. long. Himalayas. G.C. II. 26:73, 501. Tender.—*T. Frétzii*= Pseudotsuga taxifolia var. Fretzii.—*T. yunnanénsis,* Mast. Tree, to 150 ft.: branchlets with rufous-gray pubescence: lvs. rounded at the apex, entire, with white lines beneath, ½–1 in. long: cones ¾–1 in. long, dull, with fewer scales than T. chinensis. W. China. G.C. III. 39:236 (excl. cones). Growing at the Arnold Arboretum, and apparently quite hardy.

3860. A spray of hemlock spruce. — Tsuga canadensis. (×1)

ALFRED REHDER.

TSUSIOPHÝLLUM (*Tsusia,* a subdivision of Rhododendron, and Greek for *leaf*). *Ericàceæ.* A low prostrate shrub, native of Japan, resembling small-lvd. rhododendrons of the section Tsusutsi (Tsusia), like *R. Tschonoskii,* but corolla tubular, regular, smaller, anther-cells dehiscent with a longitudinal slit, ovary 3-celled and the scales of the winter buds dropping from the base. Recently intro. and probably as hardy as *Rhododendron Kaempferi.* Cult. and prop. like other alpine Ericaceæ. **T. Tanákæ,** Maxim. Low prostrate shrub with setose branchlets: winter buds with the outer scales longer than the inner ones: lvs. obovate-elliptic, acute and apiculate, setose above, glabrous and glaucous below except the setaceous midrib, ⅓–½in. long: fls. 1–2, short-stalked, white or pinkish; calyx-lobes ovate, obtuse; corolla scarcely ⅖in. long, tubular with short roundish spreading lobes, the tube pubescent outside and inside; stamens not exceeding the tube, style shorter than the stamens; ovary paleaceous-setose. Cent. Japan.

ALFRED REHDER.

TUBEROSE: *Polianthes.*

TULBÁGHIA (Tulbagh, a Dutch governor at the Cape of Good Hope, died 1771). *Liliàceæ.* Perennial herbs with a short thick woody sometimes corm-like rhizome, usually grown in the greenhouse: lvs. radical, ligulate: scape simple, leafless: fls. in a terminal umbel, numerous, pedicellate; perianth urn-shaped or almost salver-shaped; lobes 6, subequal, spreading; crown rather fleshy at the throat, shorter than the lobes; stamens 6; ovary sessile, ovoid or subglobose, 3-celled: caps. ovoid or oblong, loculicidally dehiscent.—About 20 species, Trop. and S. Afr. Greenhouse subjects, little cult.; prop. by seeds and offsets.

Símmleri, Beauverd. Bulb ovoid: lvs. lorate-lanceolate, rather obtuse: scape much longer than the lvs.: fls. small, rose, segms. ovate-oblong; corona urn-shaped, crenately 3-lobed. Transvaal.

TULIP: *Tulipa.* **T., Butterfly:** *Calochortus.* **T., Cape:** species of *Hæmanthus.* **T. Poppy:** *Hunnemannia.* **T. Tree:** *Liriodendron;* also *Hibiscus* (or *Paritium*) *elatus.*

TULIPA (originally from Persian *tolĭban*, turban; which the inverted flower resembles). *Liliàceæ.* TULIP. Popular spring-flowering hardy bulbs, and much used for forcing; of easy culture.

Low plants, the fls. mostly single (sometimes 2–5) on a scape or scape-like peduncle that arises directly from the bulb and is 30 in. or less high: bulb tunicated, the outer tunic often hairy or woolly on the inner face: lvs. linear or broad: fls. erect, rarely nodding, showy; perianth deciduous, campanulate or slightly funnel-shaped; segms. distinct, often spotted or blotched at base, without pitted nectaries; stamens 6, hypogynous, shorter than perianth-segms.; filaments longer or shorter than anthers, attenuate or filiform; anthers dehiscing laterally; ovary sometimes narrowed at collar, rarely into a distinct style; stigmas adnate: seeds numerous, flat. Differs from Fritillaria in the absence of nectariferous pits and usually erect (never pendulous) fls., and from Erythronium in its erect broader perianth-segms., erect fls., and usually 1-fld. sts. Native of Siberia, Turkey, Asia Minor, China, Japan, and Medit. countries of Eu.; the species are particularly abundant in Cent. Asia, in the Bokhara region. The genus includes probably 100 species as usually defined but perhaps reducible to much fewer; the number in cult., outside the collections of specialists and botanic gardens, is very few. For literature, see J. G. Baker, Journal Linnean Society xiv. (1875), 275–96; also in Gardeners' Chronicle, for 1883 (vols. 19 and 20); Levier, "Les Tulipes de l'Europe," 1885; Solms-Laubach on the history of the garden tulips (see his "Weizen und Tulpe, und deren Geschichte," Leipzig, 1899); Burbridge, The Garden, Sept. 22, 1900.

3862. A garden tulip. (×½)

Tulips are flowers of rich and brilliant colors, and of good "substance." The tulip is the most showy of spring flowers, and the habit and shape of the plant are so formal and definite that it is adapted to the vicinity of buildings, walks, and to parterres. They are also charming subjects for "spotting in" singly and in little clumps among shrubbery and along well-planted borders.

The range of season is great, from the early Duc Van Thols to the Cottage and late Darwins, covering nearly two months. By a judicious selection of seasons and colors, the amateur may have a most satisfactory successional display, one kind blending into the other. The catalogues of plantsmen and seedsmen usually contain reliable lists of varieties for the different seasons. They are dwarf, from about a foot high in the early races, to very tall, as much as 2 and 3 feet in some of the Darwins and other month-later races. There are double tulips of good form and many colors; also the Parrot tulips with curiously enlarged and cut or frayed petals and odd color-markings. The graceful chalice-lines of the single tulips are lost in the double and semi-double forms; the doubles, however, make striking mass displays; they are usually somewhat later-blooming than the singles of the same class.

The form of the chalice or perianth-cup, the substance of the flower, the shape of the segments, and the color, are marked features in the tulips of the different classes and seasons. The usually cultivated tulips have very broad flower-segments, obtuse or abruptly narrowed and short-pointed, as in Fig. 3862. In the wild, however, are many forms with long-narrowed segments, as shown in Fig. 3863 (adapted from Gardeners' Chronicle), and these may be seen sometimes in the gardens of amateurs; they are very interesting and often showy. It appears that in earlier times the sharp-pointed flower-parts were desired. Other tulip forms are represented in Figs. 3864 and 3865, as well as in the succeeding pictures accompanying this article.

The colors of tulips cover a wide range except that there are no real blues. There are clear whites, yellows and orange, crimsons and reds, violets and purples, and many vari-colored types. The tulips known as "breeders" are self-colored kinds; that is, the flowers are of solid colors, usually in dull and neutral shades of red and yellow with tints of bronze, buff, and brown. The reason for the name is this: When tulips are grown from seeds, the flowers at first are usually self-colored; the same bulbs when grown for a few years tend "to break" into mixed colors, particularly into feathered markings: the self-colored state is a breeding-stage for other kinds. When the bulbs are multiplied asexually (as explained farther on), they reproduce the stage in which they then are; if propagated in the "breeder" stage, they give self-colored flowers; if in the "broken" stage, they give parti-colored flowers. These stages are longer or shorter in different lots of seedlings, and are not definite epochs. The "broken" tulips are of many kinds. Those with white ground or under-color and lilac or purple markings are "bybloemen" or "bybloems," and those with yellow ground-color and red to brown over-color are "bizarres." The terms "bybloem" and "bizarre" are also sometimes applied to selfs, or breeders, when the colors are prevailingly lilac or purple in the one case or prevailingly yellow in the other. Selected strains of breeder tulips, with very large bloom, long stems, and "art colors" are now popular. The so-called "rectified" tulips are broken breeders with solid colors in stripes, flames, plumes, and patches; they are bybloemen and bizarres. It is said that the "breaking" is facilitated by certain soils.

3863. A tulip with acuminate flower parts.

There are many classes of tulips. We might distinguish three roughly: (1) The early single tulips of the Duc Van Thol kind, of small stature, excellent for first bloom and for early bedding, being out of the way for other bedding plants; they lack the size of bloom and the "substance" of later kinds. There are also later-flowering single tulips of the early class. (2) Later-flowering or Cottage tulips, comprising the main-season kinds that have been preserved by cottagers in the old countries since the collapse of the tulipomania of Holland. (3) The Darwins are stately plants, mostly selfs or "breeders," closing the tulip season, with very rich and deep colors in crimsons, reds and purples; there are

some whites but no yellows. This Darwin race is relatively recent, having been given its present name (in compliment to Charles Darwin) little more than twenty-five years ago. Broken rectified Darwins in several color combinations are known as Rembrandt tulips.

There are many other classes or subclasses, and races of intermediate season, that need not be mentioned here.

Vari-colored garden tulips are classified by F. D. Horner (England) into six main sections or classes, and the self-colored or "breeder" strains into three classes, as follows: "(1) *Flamed Bizarres.* These have a yellow ground flamed with red, very dark, almost black, and chestnut-brown. (2) *Feathered Bizarres.* These have similar colors, but the yellow grounds are marked or penciled on the margin, whereas the flamed flowers have a heavy 'beam' of color in the center of the petals. (3) *Flamed Bybloemens.* These have a white ground marked with lilac, purple, and very deep black-purple color. (4) *Feathered Bybloems.* Similar in color, but with feathered instead of flamed petals. (5) *Flamed Roses.* These are flamed with rose and scarlet colors on the pure white ground. (6) *Feathered Roses.* These have a white ground, and are flamed with rose and scarlet colors. There are three more classes of what are termed 'breeders.' *Bizarres.* Yellow selfs. *Bybloemens.* Lilac and light to deepest purple selfs. *Roses.* Rose and scarlet selfs. They are termed 'breeders' because in the course of a few years these self-colored flowers become flamed or feathered, and pass out of the breeder state."

3864. The common contemporaneous garden tulip.

The common garden tulips, in their many forms, are probably all developments of the Gesneriana group, comprising *T. Gesneriana*, *T. suaveolens*, and the like. Many of the forms sometimes catalogued as "botanical tulips" are also very ornamental and are always interesting in a collection. A number of species may be had in the trade. They should be better known.

3865. Acute-petaled style of tulip. (×¼)

Tulip history (Stubenrauch).

The tulip has an unusual and interesting history, on which we may pause briefly.

The origin of the garden tulip seems to be lost beyond recovery. It is often said that it is derived from *Tulipa Gesneriana*, but this does not explain. It merely means that in 1753 Linnæus grouped all the garden tulips he knew under the name of *Tulipa Gesneriana*. But the tulips of that day had been cultivated for two centuries by Europeans, and previously for an indefinite period by the Turks, from whom, of course, we have no exact records. (Fig. 3866.) One might study wild tulips in their native places and compare them with descriptions without being certain of the original form which the Turks brought from the wild, simply because of the lack of records at the beginning. It is necessary to have some scientific name for the garden tulips. The most one dare say is that the garden tulips are chiefly referable to *T. Gesneriana* and *T. suaveolens*, with the distinct understanding that these names do not represent an original wild stock. *Tulipa suaveolens* requires explanation. This name, which dates from 1797, stands for a kind of tulip discovered wild in southern Europe long before that date. There is no proof that it was native; the probability is that it had escaped from gardens and run wild. In 1799, it was distinguished from the other tulips then known by the fragrance of the flowers, the earliness of bloom, slightly greater size and pubescent scape. From the early records it appears that there were fragrant early-blooming flowers among the first tulips received from Turkey. This is one of the main reasons for thinking that *T. suaveolens* is not native to southern Europe. At all events, it is clear that *T. suaveolens* has played an important part in the evolution of the garden tulip, the Duc van Thol class being credited to this source. The distinctions between *T. suaveolens* and *T. Gesneriana* given in the sequel are those of Baker, but they do not hold at the present day. It is impossible to refer any given variety with satisfaction to either type. Some writers have said that the leaves of *T. suaveolens* are shorter and broader than those of *T. Gesneriana*. This character also fails. All grades of pubescence are present. Some pubescent plants have long leaves and odorless flowers. Others have short glabrous leaves and fragrant flowers.

For practical purposes it may be said that most of the common garden tulips, at least the late-flowering ones, are *T. Gesneriana*, while many of the early-flowering kinds, e.g., the Duc van Thol class, are supposed to be derived from *T. suaveolens*. It is impossible to press much nearer the truth, as the prototypes of the old garden favorites cannot be known completely and precisely.

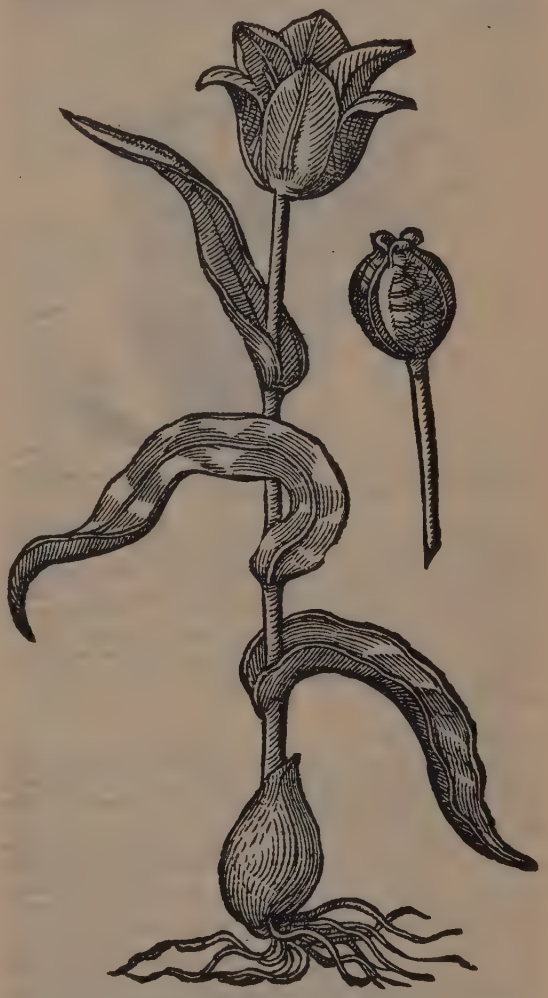
The first tulip seeds planted by Europeans were sent or brought to Vienna in 1554 by Busbequius, the

Austrian ambassador before the Sultan of Turkey. Busbequius reported that he first saw the flowers in a garden near Constantinople, and that he had to pay dearly for them. After the introduction of seed to Vienna the tulip became rapidly disseminated over Europe, both by home-grown seed and by new importations from Turkey. In 1559 Gesner first saw the flower at Augsburg, and it is mainly on his descriptions and pictures that the species *T. Gesneriana* was founded. One of the earliest enthusiasts was the herbalist Clusius, who propagated tulips on a rather large scale. A picture from him is shown in Fig. 3866. He did not introduce the tulip into Holland, but the appearance of his specimens in 1591 did much to stimulate the interest in the flower in that country. The best of Clusius' plants were taken from him, as the admirers of the tulip were unwilling to pay the high prices he demanded. After this, the propagation of the tulip proceeded rapidly in Holland and the flower soon became a great favorite. The production of new varieties became a craze throughout the Netherlands, culminating in the celebrated "tulipomania" which began in 1634. The excitement continued for four years, the price of bulbs often being above that of the precious metals. Thirteen thousand florins were paid for a single bulb of Semper Augustus; but the dealings were often in the nature of pure speculation, no bulbs changing hands. Governmental interference was necessary in order to end the ruinous speculation. After the craze subsided, the production of varieties continued upon a normal basis, and has persisted throughout the centuries in Holland, making that country the center of the bulb-growing industry of the world down to the present day.

The introduction of the tulip into England is credited to Clusius, about the year 1577. Tulips reigned supreme in English gardens until the beginning of the eighteenth century, when they were neglected by the rich for the many new plants from America. For a time the tulip was considered more or less of a poor man's flower, although it has at no time been without many staunch admirers among the upper classes.

With the Turks the narrow acuminate flower-segments were in favor, while western taste preferred the rounded forms (Fig. 3868). The Turks seem to have been satisfied with a preponderance of the reds and yellows, for in the first sowings of Turkish seeds the larger part of the resulting blooms were of those colors. It thus came about that flowers so colored were considered common and undesirable in the European gardens and all effort was directed to the production of the rarer white-grounded varieties with finely and distinctly marked stripes, those with a sharp bright red being the favorites. Indisputable evidence of this is seen in the old Holland "still-life" paintings of that time, where one finds none but the rarer forms represented (Solms-Laubach). All the early tulips of direct Turkish origin had acute more or less narrow and reflexed segments. Indeed, among all the old engravings, including those of Pena and Lobel (1570), Clusius (1576), Dodoens (1578), and Besler (1613), no round-petaled forms are found. Besler's work, "Hortus Eystettensis," contains magnificent copper plates, the first in any book on plants. In some copies the plates are beautifully colored by hand. The fifty-three figures of tulips in this great work show how widely diversified was this flower even at that early date. In this and in Parkinson's "Paradisus Terrestris" (1629), many are figured with inner segments rounded and outer acute, but none vice versa (so far as can be seen), although that form is mentioned in the descriptions. The broad, rounded, erect-petaled forms were developed later, apparently first by the Dutch growers before the tulipomania and contemporaneously with it, and produced wholly by selection. This ideal has prevailed down to the present time, for the narrow-petaled varieties are practically unknown among our common garden forms, so much so that the extreme typical one has been referred to a separate species (*T. acuminata*, Fig. 3872). In the Dutch fields they are now known as "thieves," and are destroyed as soon as they make their appearance. The quest for unusual colors appears to have been one feature of the tulip furore. Dumas' "Black Tulip" is interesting in this connection.

Parrot tulips were known toward the end of the seventeenth century. They were often considered



3866. A sixteenth-century tulip.
From the work of Clusius published in 1576. One of the oldest pictures of tulips. Same size as original plate.

to be monstrosities and were pictured as such. According to Solms-Laubach, no traces of them are to be found in the old Dutch books. They were evidently developed by the French, who did not disdain the yellow and red forms, to which these belong, to such an extent as did the Hollanders. At one time they were made a separate species, *T. turcica*, and were later said by one author to be hybrids, between *T. acuminata* and *T. sylvestris* (E. S. Rand, Jr., 1873), by another between *T. Gesneriana* and *T. suaveolens* (Mrs. Loudon, 1841). That the Parrot tulips are hybrids is perhaps true, but to state with certainty the parents seems impossible, for as early as 1613, among the figures in Hortus Eystettensis, there is one which shows laciniation of the petals to a marked degree, sufficiently so, in fact, to be

the original form from which this strain might have been developed. Many of the garden varieties of today exhibit more or less laciniation, so that it is probable that "Parrot" strains might be developed from them by simple selection.

Double tulips seem to have made their appearance at an early date. In "Hortus Eystettensis" (1613), there are four forms figured, one of which, at least, seems to have been almost wholly made up of bracts, as it is shown entirely green and is described as being "wholly herbaceous and green." The other three there figured

3867. A pan of Murillo tulips, one of the few double varieties that are really desirable. (×¼)

are: one red, one yellow, and the other white with maroon borders. Solms-Laubach places the advent of double tulips at a much later date, 1665, and gives as the first authentic record the account of "*Tulipa lutea centifolia, le monstre jaune double.*" Flowers with as many as 200 petals are mentioned. A double form of "*T. serotina*" was known in 1701, and at the beginning of the nineteenth century a double form of *T. sylvestris* was described.

Cultivation of the tulip.

The tulip is one of the easiest plants to grow, but, like other plants, it profits by extra care. In any ordinary soil it gives excellent satisfaction, if good bulbs are secured in the first place.

For outdoor cultivation for spring bloom the bulbs should be set in September to December in the latitude of New York. They should be planted before hard freezing weather comes. The soil should be a sandy loam, well worked to a depth of at least 12 inches for best results, and enriched with leaf-mold and well-rotted cow-manure. Fresh manure of any kind should never be used near bulbs of any sort. On heavier soils tulips can be successfully raised if extra care is given to insure perfect drainage. Drainage is important under all conditions. The bulbs will never prove satisfactory in low wet situations, and if there is danger from standing water it is best to raise the beds several inches above the surrounding ground. The production of large perfect flowers depends on a large supply of fibrous roots. Size of bulbs is not so important: a large bulb cannot offset a deficiency of roots.

Plant the bulbs 4 to 6 inches deep (to the bottom of the bulbs) and 4 to 9 inches apart, depending on the class or size of the plants, the closer distances being for the early single kinds and the wider distances for the later and larger kinds. Care should be exercised to place all the bulbs at the same depth, as otherwise they will not all bloom at the same time. When the ground begins to freeze, cover the beds with leaves, dry forest litter, or other light material. After danger of heavy frosts is past in spring the beds should be uncovered, and if the work of preparation and planting has been well done the tulips will require little or no further care. In England many of the beds of choice and delicate varieties of tulips are protected when in flower from heavy rains and hot sun by means of light cloth screens, and are thus kept in good condition for some time.

Tulips may remain in the ground several years if the tops are not cut off and if the maturing leaves are not smothered by other plants. In practice, however, the best results are usually not secured in this country after the bulbs have been in the ground two or three years. The Darwin class seems to lack in constitution, and the plants should be renewed every two years or so.

In old-fashioned gardens, tulips often remain year after year; but when the beds are needed for other flowers in succession, the bulbs are lifted as soon as the flowers are past and reset elsewhere until the plants mature and the tops die down naturally. Then the bulbs are taken up, sorted and dried, and stored in a cool dark place until planting-time; or they may be planted at once in the permanent quarters if the area is ready to receive them. Even in borders and among shrubbery, it is well to take up the bulbs every two or three years and sort out the small ones, replanting the remainder; or, if they are weak, to discard all of them for new ones. For the best bedding work, it is advisable to use strong freshly imported stock each year.

To make design-beds, choose bulbs of very uniform size. Dig out the bed, removing all the earth a little deeper than the bulbs are to be planted, then make a thin layer of soft earth on which the bulbs may rest; this surface should be stroked level and be at a uniform depth. Then place the bulbs in the design and fill in around them carefully by hand; then place the earth back in the bed.

For pot culture (winter and spring bloom), a mixture of fine garden loam, two parts to one of well-rotted manure (cow-manure composted for two years is best), mixed with enough clean sand to make the mass easily friable, is most suitable. If no loam is obtainable and a heavier garden soil must be used, one part of the latter will be sufficient, in which case the addition of an equal proportion of leaf-mold will be advantageous. From three to five bulbs, according to size, to a 5-inch pot are effective. Deep pans are often used with good effect; a 6-inch pan may hold five or six early singles, and an 8-inch pan as many as ten (Figs. 3867, 3868). Fill the pots lightly and press the bulbs into the soil, thus bringing the base in close contact with the soil-particles. Cover the bulbs to the tip and press the soil firmly all around. Water once freely and cover the pots entirely with soil, leaves, or litter, so that they will be out of reach of frost, or place them in a dark cold (not freezing) cellar or room until the bulbs have become well rooted, which under ordinary conditions will re-

3868. Round-petaled tulips in a 5-inch pot. (×¼)

quire five or six weeks. When the pots have become well filled with roots—the more the better—they are ready to be brought into the house. For the first few days at least the temperature should be moderate and even, and the atmosphere not too dry. Water freely but not to excess. Some of the varieties—especially the white thin-petaled ones—are said to resent overwatering very quickly. If raised in living-rooms greater care is necessary, as the atmosphere of such a room is drier than that of a greenhouse. On cold nights the plants should be removed from exposed places where they are liable to freeze, and when the flowers appear they should not be allowed to stand in the direct rays of the sun shining through a window. Many of the handsomest flowers are thus easily burned and wilted. Practically all of the early single varieties are adapted to pot culture, especially the Duc van Thols when well rooted; otherwise they are extremely unsatisfactory. For a succession, pot every week or ten days from September to December or pot early and bring into the house at fortnightly intervals. Avoid caking the soil beneath bulbs. The single early tulips are best for forcing, although some of the Darwins give good results.

3869. Three leafy bulb-scales from young bulb, exhibiting the homology of leaves and bulb-scales (×⅓). At the right an old tulip bulb, showing formation of new bulb within the old, and flower-stem attached directly to root-crown.

Many of the early single varieties are adapted to water-culture. For this purpose use ordinary "hyacinth glasses" and select only well-formed solid perfect bulbs of fair size. Put a little charcoal in the water to keep it pure. The bulbs must be placed so that the base is just in contact with the water—not immersed in it. Place them in a dark closet for ten days or a fortnight until the bulbs have become well rooted, then give them plenty of light and air.

Propagation is effected in various ways. Tulips may be increased by the side offsets, but these are not so constant as new bulbs produced within the outer tunics by means of cutting the old bulbs. Fig. 3869 shows a section of a bulb with new inner bulb and outer offset in place. The new bulb is completely inclosed in a sac which afterward becomes the outer dry membranous tunic. The pubescence, if any, may be found on the inside of this sac, even in the earliest stages of growth. The new bulb is attached to the base of the flower-stem, immediately above the root-crown from which the former proceeds directly upward. Each new bulb-tunic (including the outer sac) is provided with a growing tip, which often extends above ground into a leaf, each one coming up within the other. Fig. 3869 shows the separated leafy bulb-scales, and indicates the homology of tunics and leaves. Sports among the offsets are at present mainly depended on for the production of new varieties. These have been found susceptible to the "breaking" process, though perhaps slower to respond than the seedlings. Seed production is now practised only in exceptional cases. The production of hybridized varieties by crossing the old forms with some of the newly introduced species is likely to come into favor.

Tulips are "Holland bulbs;" that is to say, the bulbs are grown mostly in Holland and are extensively shipped to this country. Considerable interest has been aroused in the growing of commercial bulbs in this country, particularly in the Puget Sound region. The tulip can be grown to perfection in the Pacific Northwest, but the cost of production, on account of the high wage-rate, may be a controlling problem. As the situation looks now, the American can produce fully as good a bulb, and one that will mature earlier than the Holland-grown; but whether the product can be sold in the eastern market in competition with the Dutch is a question yet to be determined. It is probable that the bulbs can be grown as far south as San Francisco. South of San Francisco, the single early tulips bloom very close to the ground; on the other hand, the Darwins seem to do very well in the Santa Cruz and Ventura regions. At the government bulb-farm at Bellingham, Washington, good tulip bulbs with normal increase have been produced under adverse conditions.

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KEY TO THE GROUPS.

It is a matter of regret that the key used below is based on technical botanical characters of no interest to the horticulturist, but it seems to be impossible to group the species primarily according to the color and shape of the flowers or other marked external features. It is difficult to determine the cultivated forms botanically. For the most part, the portraits cited in this treatment are under the names that accompany them; the authors can not vouch for all of them.

Subgenus I. ORITHYA. *Style distinct by the attenuation of the ovary, bearing 3 small stigmas: dwarf, small-fld. and fragile plants little known in cult.* Species **1**

Subgenus II. TULIPA proper. *Style lacking, the stigma sessile on the ovary.*

A. *Outer coat or tunic of bulb glabrous or practically so inside.* Species **2–4**

AA. *Outer bulb-coat or covering variously hairy on inside.*

B. *Bulb-tunic always hairy at base inside around root-crown, and usually with a few scattering hairs above but sometimes without them.* Species 5–13

BB. *Bulb-tunic with a few appressed hairs inside toward the top.* Species 14–23

BBB. *Bulb-tunic with scattering appressed hairs all over inside.* Species 24–38

AAA. *Outer coat variously pubescent or woolly inside.*

B. *Bulb-tunic pubescent inside, often densely so at apex.* Species 39–42

BB. *Bulb-tunic woolly at base inside.* Species 43–47

BBB. *Bulb-tunic everywhere woolly inside.* Species 48–53

Subgenus I. ORITHYA, *small plants with a distinct style.*

1. **dasystèmon,** Regel (*Orithya dasystèmon*, Regel). "Belongs to the Orithya section of the genus, which

includes species that are nearly all of small stature and possess comparatively small fls. It is a charming plant, growing about 6 in. high. The fls. have yellow segms. edged with white. When fully open in sunny weather a group produces a brilliant effect, and it is one of those small bulbous plants that are most appropriate for the rock-garden planted between other low-growing plants. The bulbs may be left undisturbed in the ground; a group planted amongst *Alyssum spinosum* in the rock-garden at Kew flowered quite as freely the second year as the first."—W. I. in G.C. III. 52:206 (with fig.). Baker describes it as st. 1-fld. and not more than 3 or 4 in. long: lvs. 2, glaucous, lanceolate: perianth above 1 in. long, funnel-shaped, bright yellow inside, the outer segms. oblanceolate and green-tinged on outside. E. Turkestan.

Subgenus II. TULIPA proper, *without distinct style.*

A.1. *Outer bulb-tunic quite or nearly glabrous inside.*

B. *Perianth yellow, flushed with green outside* ..... 2. **fragrans**
BB. *Perianth crimson tinged with yellow outside* ..... 3. **Hageri**
BBB. *Perianth vermilion* ..... 4. **præstans**

2. frágrans, Munby. Height 6–12 in.: proper lvs. 3, crowded at middle of st., linear or lorate: fls. yellow, greenish outside; perianth funnelform-campanulate, 1–1½ in. long, 3 in. across, slightly fragrant; segms. all acute; filaments bearded at base; ovary slightly narrowed at collar; stigmas small. Algeria. Gn. 45:486.—Allied to *T. sylvestris*, differing in position of the lvs. and segms. uniformly wide.

3. Hágeri, Heldr. Height 6 in.: lvs. 4–5, lorate acute, not undulate: fls. chiefly red, about 2 in. across; perianth broad-campanulate, 1¼ in., inodorous; segms. acute, red, with a large, green or purple-black basal blotch margined with yellow; stamens purple-black; filaments linear, bearded at base; ovary narrowed at collar; stigmas small. Hills of Parnes range in Attica. B.M. 6242. F. 1877:169. Var. **nítens,** Hort. Wallace. Said to be much finer than the type: fls. 3 in. across, bright orange-red, the outer segms. flushed with gray and bronze, black at base. Asia Minor. Gn. 63, p. 372.

4. præstans, Hoog (*T. suavèolens* var. *sylvéstris,* Regel). Bulb about 1 in. diam., rounded, with leathery skin which is almost glabrous inside: scape to 18 in., white-hairy, 1- to several-fld.: fls. light scarlet-vermilion, the segms. all uniform in shape, pointed: lvs. hairy, rather broad. Bokhara. B.M. 7920. G.C. III. 33:325. Gn. W. 24:317.—Once confused with *T. suaveolens,* but now considered to be clearly distinct, and that species is identified with the Duc van Thol forms.

A2. *Outer bulb-tunic always hairy at base inside around root-crown, and usually furnished with a few scattering hairs above but sometimes without them.*

B. *St. and lvs. pubescent* ..... 5. **suaveolens**
BB. *St and lvs. glabrous* ..... 6. **strangulata**
C. *Leafy only at base of st.*
D. *Lvs. lanceolate: fl. yellow* ..... 7. **australis**
DD. *Lvs. linear: fl. yellow* ..... 8. **primulina**
DDD. *Lvs. lorate-lanceolate: fl. greenish.* 9. **viridiflora**
CC. *Leafy to middle of st. or above.*
D. *Perianth uniformly dark scarlet with a bright yellow basal blotch.* 10. **fulgens**
DD. *Perianth uniformly with a blackish basal blotch, bordered with bright yellow* ..... 11. **macrospeila**
DDD. *Perianth variable, but rarely with a bordered dark basal blotch* ..... 12. **Gesneriana**
13. **nitida**

5. suavèolens, Roth. DUC VAN THOL TULIPS. Height 3–6 in.: lvs. 3–4, mostly at base of st., lowest lorate-lanceolate and broad: perianth campanulate, 1–2½ in. long, erect, fragrant, bright red or yellow or variegated; segms. all acute; filaments glabrous; anthers yellow; ovary prismatic; stigmas very large. S. Russia and S. Eu., but possibly only a naturalized form of old intro. Turkish garden varieties. F.S. 12:1223. B.M. 839. Var. **plurifòlia,** Hort. St. with 2 fls., bright scarlet, rather pointed in form, with black mark at base of each segm.

6. strangulàta, Reboul. Said by Baker to be very near *T. suaveolens,* but much taller and the segms. furnished at base with a large black blotch: typically red-fld., but with yellow varieties. Italy. B.R. 1990 (as *T. scabriscapa*). Var. **maculàta,** Hort., has soft yellowish fls. blackish at base.

7. austrális, Link. Height 12–18 in.: st. slender: lvs. 2–3, crowded together at lower portion of scape, channeled: bud nodding; perianth 1½ in. across, funnelform-campanulate, yellow, outside reddish; segms. oblanceolate-oblong, acute at apex, slightly puberulent; anthers yellow; filaments flattened, bearded at base; ovary narrowed at collar. Savoy, France, Spain, Portugal, and Algeria. Gn. 45:486.

3870. A Parrot tulip.—Tulipa Gesneriana var. Dracontia. (×⅙)

8. primúlina, Baker. Bulb ovoid, 1 in. diam., the outer coats brown and thinly appressed-hairy inside: st. glabrous, 1-fld., less than 1 ft. long: lvs. 3–6 near base of st., linear and channeled, glabrous: fl. very fragrant, pale primrose-yellow somewhat red-tinged on outside, funnel-shaped, 1½ in. long; segms. oblong-lanceolate and acute, the inner ones hairy at base. Algeria. B.M. 6786.—Closely allied to *T. australis.*

9. viridiflòra, Hort. Outer bulb-tunic glabrous except around root-crown, where there is a dense fringe: st. glabrous and glaucous: lvs. lorate-lanceolate, undulated, glabrous, glaucous, edges slightly ciliated near base: fl. large, soft green, edged with yellow or white. Gn. 32: 514.—Garden form. Bears some resemblance to a Parrot tulip. Var. **præcox,** Hort., is larger, pale green.

10. fúlgens, Hort. Garden form with beautiful scarlet fls.: height 8–18 in.: lvs. 3, lanceolate or ovate, very wavy: perianth-segms. all oblong-ovate, acute; anthers yellow; pollen yellow; filaments white, flattened, glabrous; ovary prismatic; stigmas small, not wavy.

11. macrospeila, Baker. A supposed hybrid of unknown origin, *T. Gesneriana* probably being one of its parents. Height 10–18 in.: lvs. 3–4, long and narrow, lowest long-lanceolate, flat, pendent: peduncle wiry: perianth campanulate, slightly funnelform, emitting a heavy sweetish unpleasant odor, bright crimson to cerise or cherry-red, with a distinct nearly black cuneate basal blotch broadly margined with yellow or yellowish white at top; segms. obtuse or outer sometimes acute, outer reflexed, inner erect; filaments dilated, white at base, black, violet or striated above, glabrous; ovary prismatic, creamy white; stigmas same color, large, slightly undulated.

12. Gesneriàna, Linn. COMMON GARDEN OR LATE TULIPS. Figs. 3862, 3864, 3865, and others. Height 6–24 in.: st. erect: lvs. 3–4 or more, lower lorate-lanceolate or ovate-lanceolate, often undulated, glaucous, pubescence variable: peduncle erect: perianth campanulate, 1–2½ in. long, inodorous, bright red or varicolored, when bright red with only an obscure basal

blotch, which is usually yellow but may be dark or even blackish or mixed, sometimes white; segms. all obovate-oblong, obtuse, broadly rounded at apex, often with a small cusp in the center; filaments glabrous, flattened; ovary prismatic; stigmas large and usually crisped. Origin uncertain. Intro. from the Turkish gardens in 1554. Long since hybridized and cult. out of all semblance to any wild forms. Supposed original form (Baker) in B.M. 6439 (as *T. Schrenki*). Darwin tulips (Fig. 3871) are a strain of long-stemmed late self-colored tulips.

Var. **Dracóntia,** Baker. PARROT TULIP. Fig. 3870. Similar in habit: perianth usually yellow and red striped and splotched; segms. deeply cleft and laciniately dentate. F.S. 21:2211 (as *T. turcica*).

Var. **spathulàta,** Hort. (*T. spathulàta,* Bertol.). This differs from the type in its larger fls. of a brilliant red color with a large purplish black blotch at the base of each of the segms. Italy.—Probably the largest of the wild tulips.

Var. **Strangewaysiàna,** Hort. Very large brilliant dark scarlet fls., with a handsome dark basal blotch. One of the naturalized tulips found without disposition to vary in fields near Florence, Italy. F. 1881:65.

Var. **álbo-oculàta,** Krelage. Deep campanulate fl., with a slight sweetish mawkish odor, bright red, with a distinct white basal blotch; inner segms. obtuse, outer acute; filaments white.

13. **nítida,** Hoog. Bulb óvoid and small, with long neck, the brown coats glabrous inside except a few short hairs at base and top: scape slender and very short (2–3 in. high), glabrous: lvs. 3, linear-lanceolate, falcate and channeled: fl. bell-shaped, 1½ in. long, intense and very brilliant vermilion-scarlet with small well-defined black blotch at base of segms.; inner segms. obovate, outer segms. oval and shorter. Bokhara. G.C. III. 31:351.

A3. *Outer bulb-tunic with a few appressed hairs inside toward the top.*
- B. *St. pubescent.*
  - C. *Lvs. blotched with linear chestnut-brown spots: filaments not bearded at base* ..... 14. **Greigii**
  - CC. *Lvs. not blotched: filaments bearded at base* ..... 15. **Eichleri**
- BB. *St. glabrous (T. Kolpakowskiana sometimes obscurely pubescent).*
  - C. *Lvs. ovate or broadly lanceolate.*
    - D. *Filaments bearded at base* ..... 16. **pulchella** 17. **violacea**
    - DD. *Filaments not bearded* ..... 18. **carinata** 19. **vitellina**
  - CC. *Lvs. narrowly lanceolate to linear or linear-lanceolate.*
    - D. *Filaments bearded at base* ..... 20. **sylvestris**
    - DD. *Filaments not bearded, glabrous* . 21. **Ostrowskiana** 22. **Kolpakowskiana** 23. **Sprengeri**

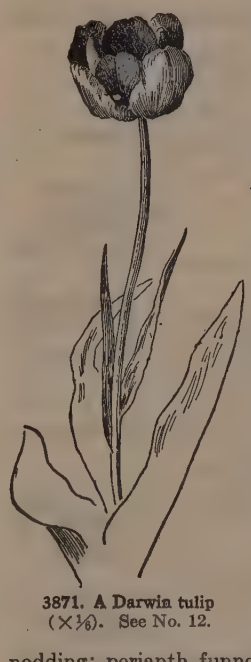
14. **Greigii,** Regel. Height 2–8 in.: lvs. usually 4, obscurely downy, much undulate toward cartilaginous border: perianth campanulate, 3–3½ in. long, 5 in. across, spreading abruptly from about the middle, bright crimson with a large dark basal blotch margined with yellow; segms. uniform, obovoid, cuspidate or emarginate; anthers yellow; filaments black, glabrous; ovary narrowed at collar; stigmas yellow, twice as broad as neck of ovary, reflexed. Turkestan. B.M. 6177. F.S. 21:2261. F. 1876:217. G.Z. 21:265.—Early-blooming. Var. **álba,** Hort., has segms. white-margined.

15. **Eichleri,** Regel. Height 6 in.: lvs. 12–15 in. long, lanceolate-acuminate, margins plane and smooth: perianth broadly campanulate, 2½–3½ in. across, deep scarlet with a broad-cuneate dark violet-blue basal blotch margined with yellow; segms. rounded at top with a mucro; anthers violet-brown; filaments black; stigmas very thick, undulate, pale yellow. Georgia in Asia. B.M. 6191. F. 1877:169.—Allied to *T. Greigii.*

16. **pulchélla,** Fenzl. Height 4 in.: lvs. 2–3, crowded and spreading close to the surface of the ground, channeled, obscurely ciliate on edges: perianth funnelform, erect, 1–1½ in. long, 2½ in. across, bright mauve-red above, passing downward into a slaty lilac without any dark-colored blotch, but bright yellow at base; segms. all acute, densely pilose at base; filaments linear; ovary clavate; stigmas less than ovary-diam. Alpine regions of Cilician Taurus, 1877. B.M. 6304.—A dwarf species near to *T. Hageri.*

17. **violàcea,** Boiss. & Buhse. Less than 12 in. high: lvs. 3–5, crowded: perianth campanulate with a contracted base, 1½ in. long, 2 in. wide, fragrant, typically bright mauve-red or rosy crimson flushed with purple, varying to white with a slight flush of red outside, with a large brown or black basal blotch, usually bordered with white; segms. uniformly oblong, subacute; stamens black or purple; stigmas small. Persia. Intro. to cult. 1890. B.M. 7440. G.M. 39:390.—Allied to *T. Hageri* and *T. pulchella.*

18. **carinàta,** Hort. Krelage. Lvs. 3, not crowded, as long as fl.-stalk, slightly undulate, lightly ciliate on edge near base: perianth open-campanulate, 3 in. long, dark scarlet, tinged with green just above and blending into a bright yellow basal blotch; segms. acute, cuspidate; stamens yellow; ovary prismatic; stigmas white, not undulated. Habitat unknown. Vars. **rùbra** and **violàcea,** Hort., are offered.



3871. A Darwin tulip (×⅙). See No. 12.

19. **vitellìna,** Hort. Lvs. 4, not crowded, as long as fl.-stalk, not undulated, thinly ciliate on edges: peduncle slightly tinged with red near fl.: perianth campanulate, 2 in. long, sulfur-yellow, no basal blotch; inner segms. rounded, outer acute; filaments yellowish white; stigmas not undulated.—Said to be "hybrids between *T. suaveolens* and *T. Gesneriana.*" It is one of the "Cottage Garden" tulips, a class of old-fashioned tulips which have been preserved from oblivion in the gardens of the poor. Recently they have been restored to popular favor. Well worth attention.

20. **sylvéstris,** Linn. Height 9–15 in.: lvs. usually 3, at base of scape, channeled, linear-lorate: peduncle sometimes 2-fld. in cult.: bud nodding; perianth funnelform-campanulate, 1½–2 in. long, yellow; segms. all acute, inner narrower; ovary bladder-form (narrowed at collar); stigmas smaller than ovary-diam., yellow. Said to be native in England and widely so in Eu.—In cult. as *T. florentina* and *T. florentina* var. *odorata.*

21. **Ostrowskiàna,** Regel. Outer tunics of the bulb blackish, strigose-pilose at their apex inside: st. 3-lvd., glabrous, 1-fld., 8–10 in. high including the peduncle: lvs. glaucescent, glabrous, immarginate, the lower narrowly lanceolate, strongly undulate, the upper linear-lanceolate to sublinear, shorter than the st.: peduncle glabrous: sepals more or less spreading, elliptic, per-

ceptibly narrowed into a short cusp, purplish brick-red, base marked with a blackish spot, glabrous; filaments glabrous. Turkestan. Gt. 33:1144. B.M. 6710 (as *T. Kolpakowskiana*).

22. **Kolpakowskiàna,** Regel. Tunics of the bulb fuscous, strigose-pilose toward the apex inside: sts. 3-lvd., 1-fld.: lvs. erect-spreading or spreading, undulate, obscurely cartilaginous margined, margin smooth or scaberulous, lower lvs. narrowly lanceolate or linear-lanceolate, upper rather linear (sublinear): peduncle glabrous: perianth erect; sepals spreading, elliptic-lanceolate to lanceolate, all acute or rarely rather obtuse, yellow, outer ones very often becoming reddish or greenish dorsally or entirely purple in a variety, apex and base glabrous; stamens glabrous. Turkestan. B.M. 6635 and G.C. III. 27:309 (both as *T. Borszczowii*).—Nearly allied to *T. Gesneriana*, Linn., which differs in the 3–4-lvd. st., the broader immarginate lvs. and in the campanulate-connivent frequently obtuse segms. of the perianth.

23. **Sprèngeri,** Baker. Late-flowering: height 10–18 in.: lvs. 4, close together, long, linear-lanceolate, stiff: peduncle wiry, tinged with deep red under fl.: perianth open-campanulate (star-shaped), 2 in. long, bright scarlet with a somewhat dull brown basal blotch margined all around with dull orange-yellow, all blending into one another; segms. all oblong-ovate and cuspidate; filaments reddish brown; ovary reddish; stigmas equal to narrow collar. Hab.(?). Intro. by Dammann & Co., Naples, 1894. Gn. 56:438. Gt. 44:1411. G.M. 49:665. Said to be the latest tulip.

A4. *Outer bulb-tunic with scattering appressed hairs all over inside.*
- B. *St. pubescent (T. maculata finely so and sometimes glabrous; T. Tubergeniana not considered).*
  - C. *Perianth usually bright red with a yellow basal blotch*.....24. **elegans**
  - CC. *Perianth orange-scarlet, vermilion, or red, with a dark brown, purplish, or bluish black basal blotch*.....25. **maculata**
    26. **Micheliana**
    27. **Tubergen-**
    28. **ingens** [iana
- BB. *St. glabrous, or essentially so (see No. 27).*
  - C. *Lower lvs. linear*.....29. **Maximowiczii**
  - CC. *Lower lvs. lorate or linear-lanceolate.* 30. **Kesselringii**
  - CCC. *Lower lvs. lanceolate or broadly so.*
    - D. *Lvs. very much undulated*.....31. **platystigma**
    - DD. *Lvs. slightly or not at all undulated.*
      - E. *Perianth-segms. all rounded or obtuse at top, not ending in point*.....32. **Korolkowii**
      - EE. *Perianth-segms. (or at least half of them) acute or cuspidate.*
        - F. *Inner and outer segms. acute or at least short-pointed.* [niana
          33. **Kaufman-**
          34. **Hoogiana**
          35. **saxatilis**
        - FF. *Inner segms. rounded, the outer acute*.....36. **armena**
          37. **Billietiana**
          38. **Didieri**

24. **élegans,** Hort. Height 12–18 in.: lvs. 3–4, below middle of st., lorate-lanceolate, finely ciliate upon upper face: perianth beautiful scarlet with yellow base, campanulate, 3–3½ in. long; segms. uniform, narrowed gradually to a very acute point; anthers violet; filaments glabrous; stigmas larger than ovary-diam., yellowish.—Known in gardens only. Krelage catalogues a variety as "Cottage *elegans picotee*," which has larger lvs. and white fls. edged with rose, and without basal blotch. Probably a hybrid between *T. acuminata* and *T. suaveolens*, according to Baker.

25. **maculàta,** Hort. Height 12–18 in.: lvs. 3–4, lorate-lanceolate: perianth fine scarlet, campanulate, 2–2½ in.; segms. obovate, cuspidate, very wide beyond middle; anthers purple; filaments glabrous; stigmas small.—"A well-marked garden race, with the habit of *T. Gesneriana*, from which it differs by its small stigma, pubescent peduncle, and bright red fl.-segms., with a broad black basal blotch."—Baker.

26. **Micheliàna,** Hoog. Bulb ovoid, to about 1½ in. diam., the outer brown coats clothed inside with long buff-colored hairs: scape pubescent, about 1 ft. high: lvs. usually 4, very glaucous, often brown-striped, lanceolate and the upper ones linear-lanceolate, very undulate: fls. single, large, vermilion-scarlet inside and lilac-tinged outside; outer segms. oblong-ovate and cuspidate; inner segms. obovate, mucronate; all segms. with black lanceolate blotches at base. Steppes of Trans.-Caspia. G.C. III. 31:353.

27. **Tubergeniàna,** Hort. Outer bulb-scales hairy inside: lvs. broad-lanceolate-acuminate: fls. single, large, vivid crimson with very dark-margined blotch at base of the broad acuminate-pointed segms.; bud before expansion conical with tips of outer segms. reflexed. Bokhara. G.C. III. 35, suppl. June 4. G.M. 51:711. F.E. 3:94.

28. **íngens,** Hoog. Bulb ovoid and large, the outer scales covered on inside with long silky hairs, especially toward the base and the apex of the bulb: st. or scape about 10 in. high, pubescent: lvs. 3, undulate, the lowest broad-lanceolate and the upper linear-lanceolate, very glaucous, and the upper surface white-hairy: fls. very large, to 4 in. long, funnel-bellshaped, bright scarlet-vermilion with a prominent black blotch at base or covering entire claw; inner segms. obovate, mucronate; outer segms. oblong-ovate, mucronate, bearing outside a broad yellowish band; filaments subulate, glabrous. Bokhara. G.C. III. 32:14.

29. **Maximòwiczii,** Regel. Lvs. erect: peduncle glabrous: perianth crimson, with a black basal blotch; segms. obtuse, ending in a short sharp point; anthers light purple; filaments linear, not bearded. E. Bokhara, 1889. Closely allied to *T. linifolia*, from which it differs in having outer bulb-tunic hairy at apex (not woolly), erect lvs. and sharp-pointed perianth-segms. Gt. 38:1307. G.C. III. 19:757.

30. **Késselringii,** Regel. Lvs. 4–5, crowded at base of st., lorate-lanceolate, or linear channeled: peduncle sometimes obscurely puberulent: perianth campanulate, 1½–2 in. long, bright yellow, flushed with red and green outside; inner segms. subobtuse, outer acute; stamens bright yellow; filaments glabrous; stigmas not equal to ovary-diam. Turkestan. B.M. 6754.

31. **platystígma,** Jord. Height 18 in.: st. slender, glabrous: lvs. 3–4, very much undulated: peduncle glabrous: perianth campanulate, 2 in. long, violet-scented, magenta-red; segms. obovate-oblong; claw blue tinted with a yellow spot in the middle; filaments not bearded; anthers violet-colored; ovary prismatic; stigmas very large and undulated. France.

32. **Korolkòwii,** Regel. Height 6–9 in.: lvs. 2–3, falcate, margin crisped: perianth campanulate, red, with a distinct black basal blotch; inner segms. oblong, outer obovate; filaments lanceolate; stigmas small. Turkestan, 1875. Var. **bícolor,** Hort. Wallace. Described as having fls. about the size of those of *T. Clusiana* and "of extreme beauty in form and coloring; the buds are of a soft buff and yellow tone, and, when expanded, the segments display a scarlet blotch." Gn. 59, p. 275.

33. **Kaufmanniàna,** Regel. Less than 12 in. high: lvs. 2–3; perianth subcampanulate, 2–3 in. long, 2½–4 in. across, bright yellow in original form, tinged with red outside, without basal blotch; in cult. very variable in color, often cream-white, and nearly always with a deep yellow basal blotch; anthers lemon-yellow, linear;

filaments bright orange, linear flattened; ovary pyramidal; stigmas small in cult. form, but described as large. Turkestan, 1877. B.M. 6887. G.C. III. 51:217. Gn. 65, p. 198; 71, p. 199; 72, p. 190; 75, p. 216; 77, p. 195; 78, pp. 178, 506. Gn.W. 21:345. G.M. 56:211. Var. **aûrea,** Hort. Segms. of perianth red, with yellow markings outside and entirely yellow or orange-yellow inside. Gn. 74, p. 241. G.M. 47:147. Var. **coccínea,** Hort. Fls. rich brilliant scarlet, at the base clear yellow.—*T. Kaufmanniana* is a handsome and valuable species, blooming exceptionally early. Sometimes called "water-lily tulip" from the resemblance of the partially opened fls. to those of nymphea.

34. **Hoogiàna,** Fedtsch. Outer bulb-scales covered on inside with reddish hairs: st., including bloom, 6–18 in. high, smooth: lvs. 4–6, lanceolate-tapering, smooth, with a narrow membranous white short-ciliate margin, the lowest 8–10 in. long and 1½–3 in. broad: fl. scarlet, with a large black blotch bordered with orange on each segm. within the cup and a corresponding yellow mark on the outside; segms. broad, somewhat abruptly acuminate at apex; filaments linear-lanceolate, blackish violet; anthers blackish. Cent. Asiatic desert (Bokhara), "a brilliant and striking species." G.C. III. 48:62.

3872. Tulipa acuminata.—A form with long-pointed petals, the old Turkish garden pattern. (×⅓)

35. **saxátilis,** Sieber. Distinct: bulb ovoid, medium size: height 12 in. or more: st. usually branched low down and bearing 2 fls.: lvs. usually 3, sometimes lowest 12 in. long, lanceolate or linear and glabrous: perianth oblong-funnelform, 2–2½ in. long, 3 in. across, light mauve-purple, at base bright yellow; segms. pubescent at base, all acute and the inner ones obovate-cuspidate; anthers blackish; filaments bright yellow; ovary prismatic; stigmas small. Crete. B.M. 6374. Gn. 56:102; 72, p. 214; 77, p. 196.

36. **armèna,** Boiss. Lvs. 5, crowded at base of st., falcate, glaucous and glabrous, slightly undulated, long, ciliate on edge all around, longer than fl.-stalk: peduncle glabrous, finely dotted: perianth open-campanulate, slightly sweet-scented, 2 in. long, dark scarlet with black basal blotch margined all around with yellow; inner segms. rounded, outer acute; anthers purple; filaments flattened, black, not bearded.—This name is referred by Baker without hesitation to *T. Gesneriana,* but the plants in the trade as *T. armena* differ as indicated above.

37. **Billietiàna,** Jord. & Fourr. Lvs. 3–4, undulate, not ciliate on edge: perianth open-campanulate, 2 in. long, 3½ in. across, inodorous, bright yellow, flushed with scarlet-pink, especially outside, with obscure basal blotch striated with blue-black lines; anthers dark gray or blackish; filaments yellow, with dark striations; ovary narrowed at collar; stigmas light yellow, very large and crisped. Savoy, Italy. B.M. 7253. G.M. 38:311.—One of the late tulips.

38. **Didièri,** Jord. Height 12–18 in.: lvs. 3–4, undulate, acuminate: perianth campanulate, 2–2½ in. long, 4½ in. across, bright crimson, with purple basal blotch margined with yellow or yellowish white; outer segms. reflexed; stamens same color as basal blotch; ovary narrowed at collar; stigmas larger than collar-diam., white. Savoy, Italy, and Alps. B.M. 6639. Gn.W. 21:1067. Var. **Mauriàna,** Baker. Lvs. narrower, slightly undulate: perianth brilliant red, with wide yellow blotch. Var. **planifòlia,** Baker. St. slender: lvs. narrow, not undulated: perianth deep red, faintly marked with yellowish red or blackish blotch. Var. **álba,** Krelage. Peduncle stiff, mottled with red: perianth light lemon-yellow, or white tinged green outside, basal blotch limited to a few dark striations; filaments same color as fl. Var. **lutéscens,** Krelage. Lvs. 3, slightly falcate: perianth light yellowish white streaked with red, with a bluish violet, dark basal blotch; filaments colored like the blotch in perianth. Var. **albiflòra,** Hort., white-fld., is mentioned. G.W. 12, p. 378.

A5. *Outer bulb-tunic pubescent inside, often or mostly densely so at apex.*

B. *Perianth-segms. very long, linear, and acuminate* ..... 39. **acuminata**

BB. *Perianth-segms. oblong, all uniform and acuminate* ..... 40. **retroflexa**

BBB. *Perianth-segms. abruptly cuspidate.* 41. **Borszczowii**

BBBB. *Perianth-segms. all narrowly oblong; inner acute, outer rounded at top* ..... 42. **Dammannii**

39. **acuminàta,** Vahl. Fig. 3872. Height 12–18 in.: lvs. 4, lowest lanceolate, all undulated at margins: peduncle shining: perianth very open, light yellow splotched with red lines; segms. sometimes 4½ in. long, less than ½in. wide, with edges rolled in; stamens yellow; filaments flattened, glabrous; ovary prismatic; stigmas very large, yellow, not undulated. Turkey(?) "This, the well-known Turkish tulip, is a most distinct type, of which the native country is not clearly known. It has the bulb, leaf, and glabrous peduncle of *T. Gesneriana,* and the flower is similarly variable in color."—Baker.

40. **retroflèxa,** Hort. Lvs. long-lanceolate, sometimes linear-lanceolate, slightly ciliate on edge, otherwise glabrous: peduncle somewhat shining: bud nodding; perianth open funnelform-campanulate, yellow, a shade darker at base—a trace of a very obscure basal blotch; segms. uniform in width, linear-lanceolate, acuminate, twisted, undulated edges; stamens yellow; filaments flattened, glabrous. A supposed garden hybrid between *T. Gesneriana* and *T. acuminata.* Gn.W. 23: suppl. July 7. Gn. 78, p. 452.

41. **Borszczòwii,** Regel (later spelled *Borsczowii.* Pronounced *Borshòvii*). Bulb ovate, fuscous, outer tunics pubescent within: plant glaucous, very glabrous: st. 12–18 in. high, white pruinose, lower third covered with lacerate scarious sheaths, 1-fld.: lvs. bluish green, ovate-lanceolate, gradually attenuate from the broader base to the apex, decreasing in size, four in number, the lower up to 6 in. long, more or less undulate: petals cuneate-obovate, apex rounded to the noticeably abrupt cusp, red with an obovate black blotch at base; stamens glabrous. Steppes of Kara-Kum on the Aral Sea. Gt. 33:1175.

42. **Dámmannii,** Regel. Height 6 in.: lvs. 4, placed whorl-like at middle of st., linear-lanceolate, recurved, obscurely bristly, ciliate on margin, otherwise glabrous: peduncle glabrous: perianth spreading, star-shaped, purplish or reddish with an oblong-lanceolate black blotch without yellow border; segms. narrowly oblong; filaments filiform, glabrous; stigmas broader than ovary-diam. Mt. Lebanon, 1889. Gt. 38:1300.—Allied to *T. linifolia* and *T. Maximowiczii.*

A6. *Outer bulb-tunic woolly at apex inside.*

B. *Filaments bearded at base*.....43. **Lownei**
BB. *Filaments not bearded.*
C. *Perianth crimson or scarlet, with a distinct basal blotch*.....44. **linifolia**
45. **Wilsoniana**
46. **montana**
CC. *Perianth yellow, without basal blotch*.47. **Batalinii**

43. **Lòwnei,** Baker. Height 2–4 in.: st. glabrous, sometimes 2-headed: lvs. 2, lanceolate, acuminate, falcate, glabrous: peduncle slender, glabrous: bud slightly nodding; perianth funnelform, small, white with a bright yellow basal blotch, tinged outside with light purple or purplish pink, inner segms. wider; stamens yellow; ovary narrowed at collar; stigmas very small. Mountains of Syria and Palestine, 1874.

44. **linifòlia,** Regel. Dwarf: bulb ovoid, ½–¾in. diam., the tunics blackish and "bearded inside at the apex with brownish hairs:" st. somewhat shining, sometimes 2-headed: lvs. 6 or 7, linear and grass-like, spirally arranged, spreading, glabrous: perianth open-campanulate, small, bright crimson; basal blotch bluish black; inner segms. oblanceolate, outer ovate and slightly wider; anthers pinkish; pollen gray; filaments bluish black; ovary pyramidal; stigmas very small, yellowish white. Bokhara. B.M. 7998. Gn.W. 21:707.

45. **Wilsoniàna,** Hoog (*T. Watsoniàna,* André). Differs from *T. linifolia* in bearing a mass of protruding woolly hairs from the bulb rather than short and bristly hairs, in having fewer and somewhat broader lvs., fls. more distinctly margined with red and more upright-growing in the later stages of development, in the obovate inner segms., and in the longer ovary and broader filaments. Mountains of Trans-Caspia, southwest of Aschabad. G.C. III. 29:327.—Named for G. F. Wilson of Weybridge, England. The fls. are "of a particularly deep and full vermilion-scarlet;" outer segms. oblong, with small cusp; inner segms. obovate, more or less retuse: scape short, 2–4 in. high.

46. **montàna,** Lindl. Bulb large and ovoid, with dense pubescence: height 4–8 in.: lower lvs. oblong-lanceolate, acuminate, undulated, very glaucous: peduncle glabrous: perianth campanulate, 1½–2 in. long, 2 in. across, deep crimson, paler outside; segms. ovate or oblong, flat, acute, the inner often obovate obtuse; filaments purplish; ovary prismatic; stigmas small. Mountains of Persia. B.R. 1106. Var. **Julia,** Koch. Dwarf, from Caucasus. Not more than 3–4 in. tall: fls. bright red, 1 in. or less long; all 6 segms. obovate and obtuse.

47. **Batalínii,** Regel. Bulb globose, with thin tunic: height 5 in.: st. glabrous: lvs. 5, crowded into a sort of whorl just below middle of st., linear-lanceolate, glabrous, slightly undulated: perianth campanulate, slightly funnelform, pale yellow; segms. slightly unequal, oblong-ovate, obtuse or short-acute, sometimes deeply incised on the edge near the top; filaments linear, terete, yellow; ovary elliptic-oblong, compressed, trigonous; stigmas coroniform. E. Bokhara, 1889. Gt. 38:1307. B.M. 7991. G.C. III. 19:759; 49:382.—One of the early tulips.

A7. *Outer bulb-tunic everywhere woolly inside.*

B. *Filaments bearded at base.*
C. *The filaments flattened*.....48. **biflora**
CC. *The filaments cylindric*.....49. **Clusiana**
BB. *Filaments not bearded*.....50. **stellata**
C. *Perianth bright yellow, with obscure basal blotch or none*.....51. **Bieber-**
CC. *Perianth bright scarlet, with a distinct black or purplish basal blotch margined with yellow*.....52. **Oculus-solis** [**steiniana**
53. **præcox**

48. **biflòra,** Pall. Height 3–6 in.: st. glabrous or slightly pilose, usually 2- or 3-fld., rarely 4-, 5- or 6-fld.: lvs. often 2, sometimes 3, linear, long: perianth funnelform-campanulate, 1 in. long, 2 in. across, pale yellow or white inside, tinged with green or red or even purplish outside; segms. acute; filaments flattened, ciliated at base; ovary narrowed at collar; stigmas small. Mountains of Cent. Siberia and the Caucasus. B.R. 535. B.M. 6518. Var. **turkestánica,** Hort. More robust than the type and larger in all its parts: fls. often 4 or 5 on the scape. G.C. III. 47:85.

49. **Clusiàna,** Vent. Described by Baker as "one of the most widely spread and clearly marked of all the tulips, and one that shows the least tendency to vary:" bulb small and densely pilose: height 12–18 in.: st. slender, glabrous: lvs. 4–5, very long and narrow and folded double, linear-acuminate, pendent: peduncle slender, tinged with brown directly under fl.: perianth small, when open 2 in. across, funnelform-campanulate, very fragrant, delicate white (sometimes described as lemon-yellow), with a purplish black base and black stamens, outside flushed with red; segms. acute; claw hirsute on edge; stamens yellow; filaments cylindric, densely bearded at base; ovary pyramidal; stigmas small, tinged with red. Portugal, through Medit. region to Greece and Persia. B.M. 1390. Gn. 77, p. 171. Gn.W. 22:329.

50. **stellàta,** Hook. Close ally of *T. Clusiana,* with similar lvs. and habit, according to Baker, but the segms. more obtuse and the fl. always without the distinct purple eye, the fl. very wide open in sunlight. Himalaya. B.M. 2762.—Bright yellow variations are mentioned.

51. **Biebersteiniàna,** Schult. f. Height 6 in.: st. slender, glabrous: lvs. 2–4, crowded together, long, channeled, glabrous, slightly ciliated on edge: bud slightly nodding; perianth open-campanulate, 2½ in. long, bright yellow tinged with scarlet-pink on edges and sometimes green outside; at base a brownish yellow discoloration; inner segms. obtuse, outer acute; anthers gray; pollen yellow; filaments yellow; ovary prismatic; stigmas yellow, undulated. Asia Minor.

52. **Óculus-sòlis,** St. Amans. Tall, 12–18 in.: st. slender, glabrous: lvs. 3–4, lorate-lanceolate, acute, glabrous: perianth funnelform-campanulate, 2½–3 in. long, 4½ in. across, scentless, erect; segms. bright red, with a large long black yellow-bordered blotch, very acute, the inner ones often less so; anthers yellow; filaments purple; ovary prismatic. South of France, Italy, and Switzerland. B.R. 380 (as *T. Gesneriana*). Var. **Lortétii,** Baker. A slight variety, the basal spot oblanceolate and black. Marseilles. Var. **lỹcica,** Baker. St. 6–8 in. long: lvs. crowded: perianth-segms. all acute, inner oblanceolate-oblong; apex subdeltoid; blotch black; anthers and filaments dark purple. Lycia, Asia Minor. Var. **aléppica,** Baker. A form with fls. considerably smaller than W. European type, with a smaller black basal blotch. Asia Minor, Syria, and Palestine.

53. **præcox,** Tenore. Height, 12–18 in.: st. slender, glabrous: lvs. 3–5, lorate-lanceolate, acute, undulated at margin: perianth beautiful scarlet, campanulate, 2–3 in. long, 3 in. across, erect, scentless; basal blotch oblong or oblanceolate and purplish black, margined with yellow; segms. widely imbricated, outer slightly longer, acute, puberulent at apex; inner shorter, obtusely cuspidate; anthers yellow; filaments long, dark purple, glabrous; ovary prismatic; stigmas pubescent, reddish. Italy and S. France; also Algeria,

CXIV. Tulip varieties of the Tulipa Gesneriana type

Greece, Syria, Palestine, and Persia. Very closely allied to last, and figured as such in B.R. 204, 1143, 1419; differs, according to Baker, "by its more robust habit of growth, earlier flowering, and ovate more imbricated perianth-segms., with a less clearly marked basal blotch."—One of the oldest known species.

T. flàva, Hort., is "often confused with vitellina in gardens, though perfectly distinct. Flava is yellow, very robust, tall, and at least a fortnight later in blooming. Vitellina is almost white when old." Imperfectly known.—*T. Fosteriàna*, Hort. Fls. very large, rich intense glowing crimson with a darker blotch at the base of the segms.: lvs. very broad, many-nerved: of robust habit and easily grown. Bokhara. G.C. III. 39:323.—*T. galàtica*, Freyn. Tunics silvery hirsute within: st. glabrous: lvs. linear-lanceolate, acuminate: fls. yellow; outer segms. elliptic to oblong-elliptic; inner segms. spatulate, rounded. Asia Minor.—*T. lanàta*, Regel. Dwarf: fls. large, goblet-shaped, rich vermilion, with a large black spot at the base of each of the segms. Bokhara.—*T. Leichtlinii*, Regel. Bulb-tunics glabrous inside: height 9–18 in.: st. glabrous: lower lvs. lanceolate-linear: fl. erect; perianth between campanulate and funnelform; outer segms. narrow and acute, the outer bright purple with broad white margin, the inner much shorter and obtuse at apex and yellowish white. Kashmir. Gn. 40:174.

ARNOLD V. STUBENRAUCH.
L. H. B.†

TUMBÒA (native name). *Gnetàceæ*. Applying strictly the rules of priority, *T. Bàinesii*, Hook. f., becomes the name of the strange plant long known as *Welwitschia mirabilis;* in this work, the description is given under the latter name.

TUNGSHU: *Aleurites Fordii*.

TÙNICA (Latin, a *tunic* or *coat*, from the imbricated involucre). *Caryophyllàceæ*. Annual or perennial hardy herbs, usually slender but stiff garden plants, with the habit of Gypsophila but botanically more nearly allied to Dianthus; sometimes grown in flower-gardens.

Leaves narrow: fls. as in Dianthus, but smaller, gathered in cymose panicles or heads; calyx turbinate or elongate-tubular, obtusely 5-toothed, 5–15-nerved; petals 5, claw elongate, blade retuse or emarginately 2-cleft; stamens 10; ovary 1-celled: caps. ovoid or oblong, dehiscent by 4 valves.—About 20 species, S. Eu. and E. Asia. Prop. by seeds or division

Saxífraga, Scop. Apparently the only species in cult. A tufted spreading hardy plant suitable for rockwork and blooming in summer and fall. It is a wiry-stemmed perennial, growing 6–10 in. high: fls. small, with rosy white, lilac or pale purple notched petals. G. 34:211. —Has become adventive in some parts of the E. Var. **álba,** Hort., is a white-fld. form. Var. **álbo plèno,** Hort., is a double white-fld. form. Var. **flòre-plèno,** Hort. (*T. Saxífraga* var. *plèna*, Hort.), has semi-double fls. about ½in. across and deeper pink than the type.

F. TRACY HUBBARD†.

TÙPA (Peruvian name of the plants). *Campanulàceæ*. Tall herbs with many-fld. terminal racemes: fls. usually red or yellow; corolla-lobes all incurved, cohering at the apex by day. About 8 species from Chile. Now considered a section of Lobelia. *T. crassicàulis*, Hook. Subshrub about 3 ft. high: st. erect, simple, stout: lvs. densely clustered at the top of the st., spreading, reflexed, lanceolate, or broad-lanceolate, acute, base attenuate to a short petiole, serrate, pubescent above, hoary-tomentose beneath: calyx-tube hemispherical, segms. spreading, acuminate; corolla yellow-orange (finally scarlet), tube laterally compressed, limb 2-lipped. Habitat uncertain. B.M. 4505. J.F. 1:107. This has never been transferred to Lobelia; it may be a Siphocampylus rather than a Lobelia.

T. salicifòlia, Don=Siphocampylus giganteus.

TUPIDÁNTHUS (Greek, *mallet* and *flower*, referring to the shape of the fl.-buds). *Araliàceæ*. At first a glabrous small tree, becoming with age a tall climber: lvs. large, digitately compound; lfts. coriaceous, entire; stipules connate: umbellules arranged in a short panicle or compound umbel: fls. large for the order; petals connate in a leathery or fleshy hood; stamens numerous; disk convex: fr. leathery to fleshy, subglobose. One species, India. *T. calyptràtus*, Hook. f. & Thoms. Lvs. digitate; lfts. 7–9, entire, 7x2½ in., narrow-oblong, short-acuminate, narrowed at base; petiolules 2 in. long: main umbel about 3-rayed, branches 3 in. long with large bracts at their bases; umbellules 5–7-cleft: fls. green; stamens 50–70. India. B.M. 4908.

TUPÍSTRA (Greek, *mallet*, alluding to the peculiar shape of the stigma). *Liliàceæ*. Perennial herbs grown in the warmhouse. Rhizome stout, sometimes short and tuberous, sometimes elongated and annulate: lvs. radical, long, large, contracted into the petiole: scape radical, between the lvs., short or elongated, erect or recurved at the top, simple, terminated by a dense cylindrical spike: fls. sessile, grouped, violet or lurid; perianth campanulate, 6-, rarely 8-lobed, short and spreading; stamens as many as corolla-lobes; ovary free, sessile, 3- rarely 4-celled, cells 2-ovuled: berry globose, usually 1-seeded.—About 13 species, India, Burma, and Malaya. Probably no species in general cult.

The following species have been intro. into botanic gardens: *T. Clàrkei*, Hook. f. Robust glabrous herb with a thick creeping rhizome: lvs. oblanceolate, 4–5 ft. long, 2–5 in. broad, entire, shining: peduncles 3 in. long, bearing nodding or almost pendulous spikes, 3–4 in. long: fls. about 1¼ in. across, dull reddish purple inside, at first green with perianth-lobes purple-margined, finally all buff. Sikkim. B.M. 7957.—*T. grándis*, Ridley. Lvs. tufted, 2–3 ft. long, lanceolate: peduncle stout, red-brown, bearing a spike 10–12 in. long: fls. subsessile, crowded; perianth campanulate, tube ½in. long, red-brown, lobes dark red-purple; stigma broadly peltate, on a white columnar, exserted style. Perak. B.M. 7829.—*T. Macrostigma*, Baker (Macrostigma tupistroides, Kunth). Rhizome thick, creeping: flowering tufts usually 2-lvd.: lvs. petioled, lanceolate, 1 ft. or more long, acute, chartaceous, narrowed from above the middle to the point and petiole, bright green on both surfaces: peduncle dark purple, erect; spike drooping, lax, about 2–3 in. long: perianth campanulate, dark purple, about ½in. across; ovary globose. Mountains of N. India. B.M. 6280. Gt. 6:130.—*T. perakénsis*, Hort., is not known botanically; it is described as having elegant narrow lvs. and erect fl.-spikes 8 in. long, the upper half clothed with fleshy shining, purple fls. with a pure white, disk-like spreading flat stigma. Singapore.

F. TRACY HUBBARD.

TURNÈRA (named after William Turner, died 1568). *Turneràceæ*. Glabrous, pubescent or tomentose herbs, shrubs, or subshrubs, suitable for warmhouse cult. Lvs. sparse, entire, serrate or somewhat pinnatifid; stipules small or none: fls. axillary, solitary, rarely racemose or fascicled, yellow; calyx tubular, funnelform or campanulate, limb 5-parted; petals 5; stamens 5; ovary sessile, free, oblong: caps. ovoid or oblong, 3-valved at base, many-seeded, very rarely 3-seeded. About 85 species, Trop. and Subtrop. Amer., S. Afr., and Madagascar. *T. ulmifòlia*, Linn. Shrub, 2–4 ft. high: lvs. biglandular at base, oblong, ovate or lanceolate, acuminate, serrate above the cuneate base, petioled, pubescent above, white-tomentose beneath: fls. yellow, almost sessile; calyx deeply 5-lobed, lobes lanceolate, acuminate; petals large, obovate. Mex., W. Indies, and S. Amer. B.M. 4137. Var. *élegans*, Hort. (*T. trioniflòra*, Sims), is about 1 ft. high: lvs. oblong-lanceolate, coarsely serrate: fls. sessile, pale yellow or sulfur-colored, with purplish brown claws. Brazil. B.M. 2106. G. 28:381. H.F. II. 3:160. The family Turneraceæ is placed near Violaceæ and Passifloraceæ.

TURNIP is a name somewhat loosely applied to two species of vegetables. In this country, and apparently properly, it is applied to vegetables characterized by thick light-fleshed roots that are usually more or less flattened or at least not greatly elongated, with leaves that are hairy and not glaucous. These vegetables belong to the species *Brassica Rapa* (see page 543). In the term is sometimes included the Swedish turnip or rutabaga, a plant that is characterized by having a more uniformly elongated-oval yellow-fleshed tuber with roots springing from its lower part, a thick elongated leafy neck, and glaucous-blue leaves that are not hairy. This plant is considered to be *Brassica*

campestris var. *Napo-Brassica*. Whether these two species exist separately in wild nature is not positively known, but they appear to be well defined under cultivation. Both species tend to run wild in old fields and to lose their thickened roots. They are then sometimes, though erroneously, known as charlock. (The real charlock is *Brassica* [*Sinapis*] *arvensis*, one of the mustards). The nativity of these species is unknown, but they are almost certainly European or Asian in origin. Characteristic tubers of these two plants are contrasted in Figs. 3873 and 3874. The former is commonly known here as "flat turnip" and the latter as rutabaga or merely "baga." According to Vilmorin, the plant that we know as rutabaga is known to the French as chou-navet and in England as Swedish turnip and turnip-rooted cabbage.

The culture of turnips and rutabagas is very similar, except that the rutabaga requires a longer season. The rutabaga is nearly always grown as a main-season

3873. Turnip—Brassica Rapa.

3874. Rutabaga.—Brassica campestris var. Napo-Brassica.

crop, whereas the turnip may be sown very late for winter use or very early for late spring or summer use. Usually the flat turnip is not grown in the hot weather of summer. In the northern states it is sown from the middle of July to the middle of August for late crop, or on the first approach of spring in order that tubers may be had for the early vegetable market. The late or winter crop is ordinarily used for storing in cellars and also for feeding, whereas the early crop is often sold in bunches in the open market, and later by the basket or bushel.

The turnips and rutabagas are hardy; that is, the young plants can withstand some frost. They are cold-weather plants and demand loose moist soil. Usually the seeds are sown in drills that stand from 10 to 20 inches apart. In the drills the plants are thinned until they stand from 6 to 10 inches apart, depending on the variety. For general field operations, the rows are sometimes placed as far as 30 inches apart, to allow horse tillage. Sometimes the late or winter crop is raised from seed sown broadcast, but this method gives good results only when the soil is well supplied with moisture, very thoroughly tilled beforehand and is free from weeds, since subsequent tillage is impossible. The seeds of turnips and rutabagas are of similar size, two or three pounds being required to the acre for broadcasting. When sown in drills, one-half or one-third this amount may be sufficient. The yields will sometimes reach 1,000 bushels to the acre, although the average is much less than this.

The turnip needs no special care as to cultivation. The greatest difficulties are the root-maggot, which is the larva of a small fly, and the flea-beetle. The maggot may be killed by injecting bisulfide of carbon into the soil about the roots before the grubs have burrowed deeply into the tissues. In general field operations, however, this treatment is impracticable and one must rely on growing the crop in fields which are not infested with the maggot; that is, rotation is the chief recourse. The flea-beetle may be kept in check by spraying the plants with bordeaux mixture, or perhaps better by sprinkling them with paris green diluted with land-plaster (one part by bulk of paris green to fifty of plaster).

Rutabagas have firmer and richer flesh than the turnips. They are usually more prized for consumption in winter, and turnips are usually more popular in the spring and early fall markets. Rutabagas are also more prized for stock-feeding. They yield heavily, are rich and succulent and keep well in any ordinary cellar. Rutabagas started in the middle or last of June in the northern states will reach their full growth by October. They are usually not harvested until heavy frosts have come. The roots of rutabagas and turnips sometimes persist through the winter, even though they have been solidly frozen, and send up flower-stalks in the spring; but unlike salsify and parsnips the roots should not be left in the ground to freeze if they are to be used.

L. H. B.

TURNIP, INDIAN: *Arisæma triphylla.*

TURPÍNIA (named for Turpin, French fl.-painter, died 1840 in Paris). *Staphyleàceæ*. A genus of about 10 shrubs or trees in Trop. and Subtrop. Asia, the Malay Archipelago, W. Indies, and Mex., with opposite odd-pinnate or simple lvs. and small fls. in large terminal or axillary panicles: calyx 5-parted, persistent; petals 5, broadly spatulate to orbicular; stamens 5; ovary superior, 3-celled, with a large lobed disk at the base; styles 3, distinct or united: fr. 3-celled, fleshy or leathery, with few or many seeds in each cell. Occasionally planted for their handsome foliage in S. Calif. Prop. is by seeds or by cuttings of mature wood under glass with bottom heat.

pomífera, DC. Glabrous tree: lvs. odd-pinnate, 5–20 in. long; lfts. 3–9, elliptic-oblong or ovate, acuminate, crenate-serrate, 3–8 in. long: fls. yellowish, ⅛in. across, in large terminal panicles, 6–10 in. long: fr. fleshy, red, yellow, or greenish, 1–2 in. across. Himalayas. The closely allied *T. nepalensis*, Wall., with smaller fls. and much smaller fr. is probably only a variety of this species. S.I.F. 2:40 (as *T. pomifera*).

argùta, Seem. (*Ochránthe argùta*, Lindl.). Glabrous shrub or small tree: lvs. simple, obovate-oblong to oblong-lanceolate, acuminate, cuneate at the base, serrate, 3–5 in. long: fls. white, changing to yellowish, about ⅛in. long, in terminal panicles 2½–5 in. long: fr. about ⅛in. across. S. China. B.R. 1819.

ALFRED REHDER.

TURRÆA (named for Giorgio della Torre or Turra, 1607–1688, botanist of Padua, Italy). *Meliàceæ*. Trees or shrubs, sometimes grown in the greenhouse in the North; in the South used as outdoor ornamentals.

Leaves alternate, petioled, entire or obtusely lobed: peduncles axillary, few-fld. and many-bracted: fls. elongated, white; calyx 4–5-toothed or parted; petals 4–5, elongated, free, twisted; staminal tube 8–10-toothed, anthers 8–10; disk annular; ovary oblong, 5–10–20-celled; ovules 2, superposed in each cell: caps. 5- to many-celled, loculicidally 5- to many-valved.—About 73 species, Trop. and S. Afr., Trop. Asia, and Austral.

A. *Fls. solitary or in pairs, axillary.*

heterophýlla, Smith, not Sond. Lvs. more or less obovate-cuneate, 3-lobed above, varying to subentire: fls. ½–¾in. long. Upper Guinea. B.R. 30:4 (as *T.*

lobata).—This name is in the Fla. trade, but it seems open to doubt whether the plant is this species.

AA. *Fls. clustered at ends of branches.*

floribúnda, Hochst. (*T. heterophýlla,* Sond.). Shrub: foliage falls away before flowering season: lvs. ovate, acute or produced into a short obtuse point, undivided or 3-lobed: fls. clustered at ends of branches: peduncles and calices silky tomentose. Natal.

F. TRACY HUBBARD.†

TUSSILÀGO (Latin, *tussis,* cough, and *ago,* referring to the medicinal use of the lvs.). *Compósitæ.* Here belongs the COLTSFOOT, the flowers of which look much like the dandelion; the leaves are large and make an attractive low covering for rough banks.

Acaulescent perennial herb more or less white-tomentose: fls. in a dense head on a scaly scape, before the lvs. of the season; tubular and ray-fls. about in equal numbers, the rays pistillate and fertile and in several rows; disk-florets sterile; receptacle flat; involucre campanulate or cylindrical, the scales in a single series: achene narrow, with soft capillary pappus.—One species.

Fárfara, Linn. COLTSFOOT. Resembles the dandelion in having scapes bearing solitary yellow fl.-heads composed of rays, but the scapes are scaly and the heads are smaller, lighter colored and borne in early spring before the main crop of dandelions. After the fls. have lost their beauty, the lvs. appear; they are heart-shaped and rounded at first, but as they grow they become more and more angled. They are covered with a soft cottony matting which diminishes toward the end of the season. It grows naturally in moist places and thrives on steep raw banks in the stiffest clay. Spreads rapidly by underground sts. Flowers in March. Native to Eu., India, and N. W. Asia. Naturalized in Amer. Gn. 23, p. 113.

Var. **variegàta,** Hort., has lvs. margined and more or less blotched with white or yellow. Gn. 37, p. 435. Lowe 56.—More commonly cult. than the type.

T. frágrans=Petasites.

WILHELM MILLER.

TUTCHÈRIA (after W. J. Tutcher, assistant superintendent of the Botanical and Forest Dept. of Hong-Kong). *Ternstrœmiàceæ.* Two species of evergreen trees in S. E. China, with alternate, ovate-lanceolate lvs. and axillary, showy, white fls.: sepals imbricate in 2–3 series, silky outside, the inner ones becoming petaloid; petals 5, large; stamens many, connate at the base and adnate to the petals; ovary 4–6-celled; styles united nearly to the apex: caps. globose, woody, dehiscent with 3–6 valves; seeds angular, 2–5 in each cell. The following species has been recently intro. into England; to be recommended for its showy white fls. Hardiness and cult. probably like camellia. **T. spectábilis,** Dunn (*Camélia spectábilis,* Champ.). Small tree: lvs. short-petioled, ovate-lanceolate, acuminate, cuneate at the base, slightly crenate, lustrous above, 5–6 in. long: fls. short-stalked, white, cup-shaped, about 3 in. across, slightly fragrant; petals broadly obovate, emarginate, 1½–2 in. long: caps. globose, 2–3 in. across. Seemann, Bot. Herald, 78.

ALFRED REHDER.

TWAYBLADE: *Liparis liliifolia.*

TWEÈDIEA: *Oxypetalum.*

TWIN-FLOWER: *Línnæa borealis.* **T.-Leaf:** *Jeffersonia diphylla.*

TWISTED STALK: *Streptopus.*

TYDÆA is now considered a synonym of *Isoloma;* by some authorities called *Kohleria* (see *Isoloma*). *T. ocellàta,* Regel=*Isoloma ocellatum.* Gt. 4:180. Other species which may have been cult., but probably are no longer in trade are *T. venòsa,* Hort. (H.F. II. 3:248), and *T. Warscewiczii,* Regel (Gt. 3:72).

TÝPHA (ancient name). *Typhàceæ.* CAT-TAIL. REED MACE. Hardy perennial marsh- or swamp-growing herbs, useful in the water-garden or along brooks or the margins of ponds.

Plants forming colonies, slender or stout, often tall, smooth: rhizome strong, creeping: sts. erect, simple, base often under water: radical lvs. linear-elongated, rather thick, spongy, with or without ribs; cauline lvs. few and shorter: peduncles erect, terete, strict and not divided: spadices, male and female similar, superposed: fls. monœcious, densely clustered in the cylindrical spadix; perianth consisting of slender hairs: fr. minute, subsessile.—About 17 species, temperate and tropical regions. Monographed by Graebner in Engler's Pflanzenreich, hft. 2 (IV. 8) in 1900.

A. *Female fls. without bracts.*

B. *Plant robust, more than 3 ft. high: lvs. flat.*

C. *Pedicels columnar, 1.5–2 mm. long.*

latifòlia, Linn. Fig. 3875. Plant stout, 4–8 ft. high: lvs. usually broad, linear, ¾–1 in. broad, exceeding the flowering culm: male and female spikes contiguous, rarely remote. N. Amer., Eu., Asia. R.B. 20, p. 196. V. 2:197. J.H. III. 65:325. Var. **elàtior,** Graebn. (*T. elàtior,* Bor.), has narrow lvs. and shorter contiguous or slightly remote spikes. Eu.

CC. *Pedicels short or elongate-conoid, 1–1.5 mm. long.*

Shúttleworthii, Koch & Sond. Plant stout, 3–4½ ft. high: lvs. linear, 2–6 lines broad, longer than the flowering culm: spikes cylindrical, contiguous, pistillate spikes thick and longer than the staminate. Eu.

BB. *Plant slender, rarely over 3 ft. high: lvs. semi-cylindrical or rather flat.*

Láxmannii, Lepech. (*T. stenophýlla,* Fisch. & Mey.). Plant slender, 2½–4½ ft. high: lvs. very narrow, rarely even 3 lines broad, semi-cylindrical, grooved inside, convex outside: pistillate spike ovate-oblong or shortly cylindrical, brown, remote from the elongate staminate spike. S. E. Eu. to China.

AA. *Female fls. in the axils of bracts.*

B. *Plant stout, 3–12 ft. high: axis of male spike hairy.*

angustifòlia, Linn. Plant stout, 3–9 ft. high: lvs. narrow, 1–5 or 6 lines broad: spikes about equally long, remote, rarely contiguous; pedicels shortly conoid. N. Amer., Eu. and Asia; also in Trop. Amer.

BB. *Plant slender, 1½–3 ft. high: axils of male spike destitute of hairs.*

mínima, Funk. Plant slender, 1–2½ ft. high: lvs. of the sterile shoots very narrow, linear, less than 1 line broad, of the flowering st. basally inflated sheaths rarely bearing very short involute blades: spikes remote or contiguous, female spike broadly ovate or shortly cylindrical, rusty brown. Eu., Caucasus, and Asia.

F. TRACY HUBBARD.

TYPHÒNIUM (an old name of some plant of the family, named for *Typhon,* a mythological giant). *Aràceæ.* Perennial tuberous herbs, occasionally grown in the greenhouse. Lvs. appearing with the fls., sagittate or hastate, 3–5-lobed or -parted or pedately cut; petiole elongated: peduncle usually short: spathes persistent, throat constricted, blade ovate or lanceolate; spadix sessile or stipitate, included; male infl. cylindrical, female short: fls. in an appendiculate monœcious spadix, male and female elements remote; perianth none; stamens in the male fl. 1–3; ovary in female fl. ovoid or oblong-ovoid, 1-celled: berry ovoid, 1–2-seeded.—About 20 species, Trop. Asia, Austral., and islands of the Pacific.

gigantèum, Engl. Tuberous herb of large size: lvs. with petioles 2 ft. long, the lower 8 in., wing-sheathed; blades 1 ft. or more long, hastate, the lobes large, apex acute: spathe-tube oblong, 1¼ in. long, blade acumi-

nate, 6 in. long; spadix with the female fls. below, the male above, the two separated by a sterile portion and the top of the spadix also sterile. China. The type does not seem to be in cult.; the form cult., var. **Giráldii**, Baroni, has larger and broader lvs., the spathe is purplish outside and is somewhat the color of a ripe olive, the tube and blade are more equal in length than the type; spadix is darker, being purplish black; pollen white. Mountains of N. China. G.C. III. 32:151. Probably adapted to outdoor planting for ornament.

F. Tracy Hubbard.

TYPHONODÒRUM (Greek, *stormy wind* and *gift*). *Aràceæ*. Robust herb, with a stout caudex 4–10 ft. high: lvs. thick, petioled, triangular-ovate or hastate, acuminate: spathes with oblong tubes attenuate at both ends, blade 3 times longer than the tube, oblong-lanceolate, caudate-acuminate; spadix erect, strict, cylindrical; male infl. elongated, female short and cylindrical: fls. monœcious in an elongated somewhat appendiculate spadix; perianth none; stamens 4–8 in the male fls.; ovary ovoid or subglobose and 1-celled in the female: berry large, compressed, orbicular. One species, Madagascar, Mauritius, and Trop. Afr. *T. Lindleyànum*, Schott (*T. madagascariénse*, Engler). St. stout, 3–10 ft. high, 4–12 in. thick: lvs. deeply cordate or sagittate, 1¼–3½ ft. long, 7 in. to 2 ft. across; petiole terete, 2–4 ft. long: spathe 1½–2 ft. long, tube 3–5 in. long, oblong, green, blade 13–19 in. long, 3–5 in. across, lanceolate, convolute below, yellow: seeds 1¾–2 in. across, flattened-orbicular, edible. B.M. 8307.—A striking plant with the habit of Zantedeschia, growing in deep water. See Engler in Das Pflanzenreich, hft. 64 (IV. 23 *Dc*), 1915.

3875. Cat-tail.—Typha latifolia.

U

UDO, a spring blanched vegetable introduced in 1903 by Lathrop and Fairchild from Japan; it is *Aralia cordata,* and for botanical description see page 344, Vol. I.

The plant is a sturdy hardy perennial, and the strong young shoots are blanched as they grow; these shoots are used as a cooked vegetable or as a salad. It is a plant of ancient and widespread cultivation in Japan, where there are distinct strains or varieties of it. The cultivation of udo in this country is in its amateur stage for the most part, although it has been grown by the acre in the Sacramento Valley. The following account is chosen from Bulletin No. 84 of the United States Department of Agriculture, 1914, written by David Fairchild.

"There is no doubt that the udo is worthy of adding to our list of spring vegetables, for it is easily grown, its shoots are readily blanched, and it requires little care. A patch of it can be forced every spring for at least six years, and probably much longer. When properly prepared its blanched shoots are delicious; they have their own characteristic flavor, can be prepared for the table in a great variety of ways, and are keenly appreciated by people of discriminating taste. Space for space, udo will yield about the same amount of food for the table as asparagus and will be ready for use at about the same time in the spring. Possibly more labor is required to blanch the shoots of the udo than those of asparagus, but the udo is probably somewhat easier to take care of and yields sooner."

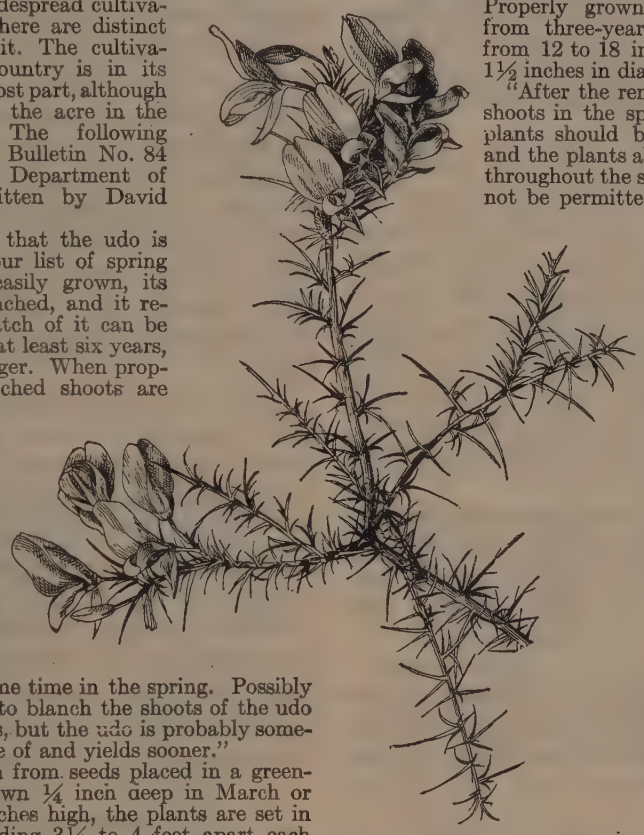
Udo is readily grown from seeds placed in a greenhouse or coldframe, sown ¼ inch deep in March or April. When 3 to 4 inches high, the plants are set in the open ground, standing 3½ to 4 feet apart each way; often they will be 6 feet high by autumn. When it is desired to propagate a particular strain, cuttings may be made of the green shoots taken when about ⅜ inch in diameter and cut 5 inches or more long, the lower end being severed just below a joint.

The stout young shoots are blanched as they emerge from the ground. In mild climates, earth may be mounded over them, but a large drain-tile placed over the mound provides a better method for the home garden.

This method "has at least one disadvantage, however, in that the shoots have a tendency to leaf out and produce a number of unopened leafstalks which take away from the robust growth of the shoots. A method which has obviated this defect in using tiles is to put around each hill a deep box or small half cask from which the bottom has been removed and fill it with light sand or such a light material as sifted coal-ashes. Shoots which come up through such a medium are almost free from the elongated leafstalks which are developed when the shoots are produced in the dark air-chambers under the tiles. Care must be taken in any method of mounding up or filling in dirt or ashes over the crowns that the shoots do not break through into the sunlight, for as soon as they do this they become green and take on a rank objectionable flavor. Properly grown udo shoots produced from three-year-old plants should be from 12 to 18 inches long and 1 inch to 1½ inches in diameter at their bases.

"After the removal of the crop of udo shoots in the spring, the crowns of the plants should be completely uncovered and the plants allowed to grow normally throughout the summer, but they should not be permitted to flower unless seed is required, the flower-clusters being pinched or cut back as they form."

For use, the shoots are first boiled in salt-water for ten minutes or so and the water changed to remove the turpentine flavor. An hour's stay in ice-water will remove the resin from the shoots, provided they are cut into thin slices or shavings; the slices may then be used in salads without cooking. It is used also in soups, and on toast.



3876. Ulex europæus.—Furze. (×⅜)

UHDÈA. A name proposed by Kunth in 1847 for a Mexican composite, still sometimes listed as *U. bipinnatifida,* Kunth. It is properly *Montanoa bipinnatifida,* Koch, the name Montanoa dating from 1825. See page 2064, Vol. IV.

ÙLEX (ancient Latin name of this or a similar plant). *Leguminòsæ.* Furze. Gorse. Whin. Ornamental woody plants grown for their handsome yellow flowers and evergreen appearance.

Spiny shrubs: lvs. mostly scale-like, only vigorous shoots near the ground bearing fully developed lvs.: fls. papilionaceous, axillary at the end of the branchlets; calyx 2-lipped, divided nearly to the base; standard ovate, wings and keel obtuse; stamens alternately longer and shorter: pods small, ovoid, few-seeded; seeds strophiolate.—About 20 species in W. and S. Eu. and in N. Afr. Closely allied to Cytisus and chiefly distinguished by the deeply 2-lobed calyx. The fls. yield a yellow dye. Sometimes cult. as a winter fodder plant in Eu., the green sprigs of one year's growth being eaten.

The furzes are much-branched shrubs with dark green spiny branches, usually almost leafless, and with

showy yellow papilionaceous flowers which are axillary and often crowded at the ends of the branches. They are not hardy North, but under protection they survive the winters in New England. They are valuable as sand-binders for covering dry sandy banks and are also well suited for seaside planting. On account of their dark green branches they have the appearance of evergreen plants and they are very showy when covered with their yellow flowers. They are also sometimes used for low hedges. They prefer sandy or gravelly porous soil and a sunny position; in rich garden soil they grow more rampant, but do not bloom so well. They should be sown where they are to stand, as they do not bear transplanting well, or if this is not feasible, they should be sown singly in small pots and the plants then planted out in their permanent places. Propagation is by seeds sown in spring after the danger from frost has passed; by greenwood cuttings under glass; or by cuttings of nearly mature wood in early summer in a coldframe under glass, forming roots the following spring. Varieties and rarer kinds are sometimes grafted in spring in the greenhouse on *U. europæus*.

europæus, Linn. Furze. Gorse. Whin. Fig. 3876. Much-branched very spiny rigid shrub, 2–4 ft. high: branchlets striped, villous when young: lvs. scale-like or narrow-lanceolate, pubescent: fls. axillary, 1–3, crowded at the end of the branches and forming racemes; corolla bright yellow, about ¾in. long, fragrant; calyx yellow, hairy: pod oblong, over ½in. long, villous, dark brown. April, June and often again in Sept., Oct.; in Calif. almost the whole year. W. and S. Eu; naturalized in waste places in the Middle Atlantic states and also on Vancouver Isl. S.E.B. 3:323. R.F.G. 22:2068. G.W. 17, p. 285.—There is a variety with double fls., var. **plēnus,** Schneid. (var. *flòre-plèno*, Loud.). Gn. 63, p. 441. G.M. 52:393. Another variety is var. **strictus,** Webb, of upright, pyramidal habit and less spiny, but as it does not bloom freely, it is of little value.

nànus, Forst. Dwarf shrub of dense habit, similar to the preceding species, but smaller in every part, less rigid and with slenderer spines: fls. about ½in. long, with the wings straight and shorter than the keel; calyx slightly downy, not hairy: pod ½in. long, nearly inclosed in the calyx. Autumn. W. Eu., England to Spain. S.I.F. 3:325. R.F.G. 22:2068, 3.

Alfred Rehder.

ULLÙCUS (native name). *Chenopodiàceæ;* Volkens in Engler's Pflanzenfamilien places this in *Basellàceæ*. Fleshy perennial herbs, decumbent and climbing, grown in Peru and Chile for the tubers: rhizomes creeping, roots tuber-bearing: sts. angulate: lvs. alternate, thick, petioled, rotund-cordate: fls. hermaphrodite, in axillary, large, lax-fld. racemes, golden yellow; perianth rotate, 5-parted, tube very short; stamens 5; ovary minute: fr. ovoid, berry-like.—One species, Peru, Bolivia, and Chile. **U. tuberòsus,** Caldas. Ulluco or Olluco. Description same as generic. B.M. 4617. G.C. II. 23:216. H.F. 2:48. J.F. 3:221. The tubers, produced near the base of the plant underground, are much eaten in S. Amer. Sometimes the plant is cult. in northern countries, but only as a curiosity. It is prop. by the tubers, as are potatoes.

3877. Elm fruits. *1*, Ulmus americana; *2*, U. racemosa; *3*, U. alata; *4*, U. fulva; *5*, U. glabra. (×2)

ULMÀRIA: *Filipendula.*

ÚLMUS (ancient Latin name of the elm). *Ulmàceæ.* Elm. Ornamental trees chiefly grown for their handsome foliage and often planted as shade and street trees.

Deciduous, rarely half-evergreen: winter buds conspicuous, with imbricate scales: lvs. short-petioled, usually unequal at the base, with caducous stipules: fls. perfect or rarely polygamous, apetalous, in axillary clusters or racemes; calyx campanulate, 4–9-lobed, with an equal number of stamens; ovary superior, with a 2-lobed style, usually 1-loculed and with 1 ovule: fr. a slightly compressed dry nutlet, with a broad rarely narrow membranous wing all around (Fig. 3877).—About 18 species of Ulmus are known, distributed through the colder and temperate regions of the northern hemisphere, in N. Amer. south to S. Mex., but none west of the Rocky Mts., and in Asia south to the Himalayas. The wood is heavy, hard, and tough and often difficult to split. It is especially useful in the manufacture of wagon-wheels, agricultural implements, and for boat-building. The inner mucilaginous bark of the branches of *U. fulva* is used medicinally and that of some Chinese species is made into meal and used for food. The tough inner bark of some species furnishes a kind of bass which is sometimes woven into a coarse cloth, especially that of *U. japonica* in Japan.

The elms are mostly tall trees, rarely shrubby, with alternate usually 2-ranked, medium-sized or sometimes rather small leaves and with inconspicuous generally greenish brown flowers appearing mostly before the leaves. Most of the cultivated species are hardy North, but *U. crassifolia* and *U. alata* are tender; *U. parvifolia* and *U. serotina* are of doubtful hardiness, although they have persisted near Boston. The elms are mostly tall and long-lived and are very valuable for park planting and for avenue trees, especially *U. americana*, which is the favorite tree for street planting and as a shade tree for dwelling houses in the northeastern states. It is the most characteristic tree of this region and of characteristic beauty. Its habit is at once majestic and graceful, and the wide-spreading head, borne usually at a considerable height on a straight and shapely trunk, affords ample shade and shelter. Besides the American elm several other species are used as avenue trees, as *Ulmus fulva*, *U. racemosa*, and the European *U. campestris*, *U. hollandica*, and *U. foliacea*. Of *U. hollandica*, the vars. *belgica*, *superba*, *Klemmer* are among the best for street planting; of *U. foliacea*, the vars. *stricta*, *Wheatleyi*, and *Dampieri*. In the southern states *U. serotina*, *U. crassifolia*, and *U. alata* are sometimes used as avenue trees. There are several varieties of striking and peculiar habit, as *U. glabra* var. *fastigiata* and *U. foliacea* var. *monumentalis*, with narrow columnar head; *U. glabra* var. *pendula*, with horizontal limbs forming widespreading tiers; *U. glabra* var. *Camperdownii* with long pendulous branches. *U. foliacea* var. *umbraculifera*, with a dense, globose and rather small head, may be used as an avenue tree for formal gardens. Several species and varieties are interesting in winter on account of their branches being furnished with broad corky wings. The foliage of most species turns pale yellow in fall, but that of the European species remains green much longer.

Unfortunately many insects and fungi prey upon the elm, especially on the American elm. One of the most

destructive is the elm leaf-beetle, which destroys the foliage. The canker-worm is also serious; to keep it from doing damage, band the trunks a few feet above the ground with cloth covered with a sticky substance, which prevents the ascent of the wingless female. The trees should be sprayed. A borer, *Saperda tridentata*, sometimes does considerable damage to the wood. The elms grow best in rich and rather moist soil, and the American elm especially requires such a soil to attain its full beauty, but some species, as *U. racemosa* and *U. alata*, do well in drier situations. Elm trees are not difficult to transplant, and rather large trees may be moved successfully if the work is done carefully. They bear pruning well, but generally do not need much attention of this kind. Propagation is by seeds ripening usually in May or June and sown at once. Most of the seeds will germinate after a few days, but some remain dormant until the following spring. Increased also by layers, which are usually put down in autumn and are fit to be removed in one year. A moist and rather light soil is best for this method. Trees raised from layers are said to bear seed less early and less profusely and are therefore especially recommended for street trees, as the foliage of trees that fruit slightly or not at all is larger and more abundant. Dwarf forms of *U. foliacea* and also *U. parvifolia* and *U. pumila* may be raised from greenwood cuttings under glass, the cuttings growing most readily if taken from forced plants. *U. campestris*, *U. foliacea*, and some of their varieties are also propagated by suckers. In nurseries most of the varieties are propagated by grafting, either by budding in summer or by whip- or splice-grafting in spring outdoors or on potted stock in the greenhouse. *U. americana*, *U. campestris*, *U. foliacea*, and *U. glabra* are used for stocks.

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KEY TO THE SPECIES.

A. *Blooming in spring, before the lvs.: calyx not divided below the middle.*
  B. *Fls. on slender pedicels, drooping: fr. ciliate.*
    C. *Fr. glabrous except the ciliate margin: branches not corky: margins of lvs. ciliate.*
      D. *Lvs. widest above the middle, densely pubescent beneath: buds elongated, pointed*..... 1. **lævis**
      DD. *Lvs. widest about the middle, more or less pubescent beneath: buds ovoid, obtusish or acute.* 2. **americana**
    CC. *Fr. pubescent: branches usually more or less corky.*
      D. *Margin of lvs. not ciliate; lvs. about 3 in. long, without axillary tufts beneath: buds pubescent*..... 3. **racemosa**
      DD. *Margin of lvs. minutely ciliate; lvs. about 2 in. long, with axillary tufts beneath: buds glabrous*..... 4. **alata**
  BB. *Fls. short-pedicelled, in dense clusters, not pendulous.*
    C. *Buds covered with rusty hairs, obtuse: branchlets scabrous with minute tubercles: lvs. ciliate: fr. pubescent in the middle*..... 5. **fulva**
    CC. *Buds pale pubescent or glabrous: branchlets smooth: lvs. not ciliate: fr. glabrous.*
      D. *Lvs. doubly serrate, unequal at the base, 2–7 in. long.*
        E. *Young branchlets pubescent: lvs. scabrous above.*
          F. *Fr. with the seed in the center, about ¾in. broad: petioles short, about ⅛in. long.*
            G. *Mature branchlets reddish brown, hairy while young: lvs. only occasionally 3-lobed*... 6. **glabra**
            GG. *Mature branchlets pale yellowish or grayish brown, glabrous or nearly so while young: lvs. usually 3-lobed at the apex* ..... 7. **laciniata**
          FF. *Fr. with the seed near the apex, ½in. broad or less: petioles ⅛–¼in. long.*
            G. *Lvs. broadly oval or ovate, 2–3 in. long: branchlets not corky*... 8. **campestris**
            GG. *Lvs. obovate or elliptic, 3–4 in. long: branchlets often with corky wings.* 9. **japonica**
        EE. *Young branchlets glabrous or with few scattered hairs: lvs. smooth or nearly so above: fr. with the seed above the middle.*
          F. *Length of lvs. 3–5 in.; petioles ¼–½in. long*....10. **hollandica**
          FF. *Length of lvs. 2–3½ in.; petioles ¼–½in. long*....11. **foliacea**
      DD. *Lvs. simply serrate, nearly equal at the base, 1–2 in. long*..12. **pumila**
AA. *Blooming in the axils of this year's lvs. in summer or autumn: calyx divided below the middle.*
  B. *Lvs. simply serrate, small: fr. glabrous*.....13. **parvifolia**
  BB. *Lvs. doubly serrate: fr. pubescent.*
    C. *Racemes 3–5-fld.: lvs. 1–2 in. long, obtuse or acute*.....14. **crassifolia**
    CC. *Racemes many-fld.: lvs. 2–3 in. long, acuminate*.....15. **serotina**

1. **lævis**, Pall. (*U. pedunculàta*, Foug. *U. effùsa*, Willd. *U. ciliàta*, Ehrh. *U. racemòsa*, Borkh., not Thomas). Tree, attaining 100 ft., with spreading branches, forming a broad open head: branchlets pubescent, usually until the second year: buds glabrous, acute: lvs. oval or obovate, very unequal at base, acuminate, sharply doubly serrate, usually glabrous above, pubescent beneath, 2–4 in. long: fls. slender-pedicelled; calyx with 6–8 exserted stamens: fr. ovate, notched, the incision not reaching the nutlet. Cent. Eu. to W. Asia. H.W. 2:39, p. 9. I.T. 6:220. R.F.G. 12:666.—Rarely cult., and with less valuable wood. The trunk and the limbs are, as in the American elm, often clothed with short branchlets.

2. **americàna**, Linn. (*U. álba*, Raf.). WHITE ELM. WATER ELM. AMERICAN ELM. Figs. 3877, 3878, 3879.

Tall and wide-spreading tree, attaining to 120 ft., usually with high light gray trunk, limbs gradually outward-curving with pendulous branches: branchlets pubescent when young, glabrous in fall: buds acutish, glabrous: lvs. ovate-oblong, unequal at the base, acuminate, doubly serrate, pubescent when young, at length glabrous and rough above, pubescent or almost glabrous beneath, 3–6 in. long: fls. in many-fld. clusters; stamens 7–8, exserted: fr. oval or elliptic, veined,

3878. Ulmus americana. (×¼)

deeply notched, incision reaching to the nutlet. Newfoundland to Fla., west to the base of the Rocky Mts. S.S. 7:311. Em. 2:322. G.F. 3:443, 467; 6:175. Mn. 7, p. 125; 8, p. 71. F.E. 15:86, pl. 46. F.S.R. 1, p. 195. V. 14:79; 20:10. M.D.G. 1900:392–4.—One of the favorite avenue trees in the northeastern states. The elm varies considerably in habit, and the following forms have been distinguished. In the "vase form" the main trunk separates at 15–30 ft. into several almost equal branches, which diverge at first slightly and gradually, but at the height of 50–70 ft. sweep boldly outward and form a broad flat head, with the branches drooping at the extremities. This is the most beautiful and also the commonest form. The "plume form" is much like the foregoing, but the trunk is less divided and the limbs are clothed with short branchlets, thus forming feathery plumes. The "weeping-willow form" usually has a rather short trunk with limbs curving outward more rapidly and with long and very slender pendulous branches, forming usually a broad and round head. The "oak-tree form" is distinguished by its limbs spreading abruptly and in sharp turns and the branches being usually less pendulous. The name "feathery" or "fringed" elm is applied to trees which have the limbs and the main trunk clothed with short somewhat pendent branchlets thrown out usually in clusters at short intervals. This may appear in any of the forms named, but is most conspicuous in trees of the plume form. (Fig. 3879.) There are a few named varieties in nurseries: Var. **aùrea,** Temple, with yellow foliage, found in Vt., by F. L. Temple; var. **péndula,** Ait., with slender pendulous branches; this is the "weeping-willow form" described above.

3. **racemòsa,** Thomas, not Borkh. (*U. Thómasii,* Sarg.). Cork Elm. Rock Elm. Fig. 3877. Tree, attaining 100 ft., with short spreading branches, forming an oblong round-topped head: branchlets pubescent usually until the second year and mostly irregularly corky winged when older: buds acute, pubescent: lvs. oval to oblong-obovate, unequal at the base, shortly acuminate, sharply and doubly serrate, glabrous or somewhat rough above, pubescent beneath, 2–4 in. long: fls. in slender pendulous racemes; calyx with 5–8 exserted stamens: fr. oval or obovate, with a shallow notch at the apex, pale, pubescent, ½–¾in. long. Que. to Tenn., west to Neb. S.S. 7:312.

4. **alàta,** Michx. Wahoo or Winged Elm. Fig. 3877. Tree, attaining 50 ft., with spreading branches forming an oblong, round-topped or rather open head: branches usually with 2 opposite very broad wings; branchlets almost glabrous: buds acute, glabrous: lvs. ovate-oblong to oblong-lanceolate, often falcate, acute or acuminate, doubly serrate, subcoriaceous, glabrous above, pubescent beneath, 1½–2½ in. long: fls. in short, few-fld. racemes; stamens usually 5: fr. elliptic-ovate, with narrow wing and with 2 incurved horns at the apex, villous, ⅓in. across. Va. to Fla., west to Ill. and Texas. S.S. 7:313.—Handsome round-headed tree, sometimes used as an avenue tree in the southern states; not hardy N.

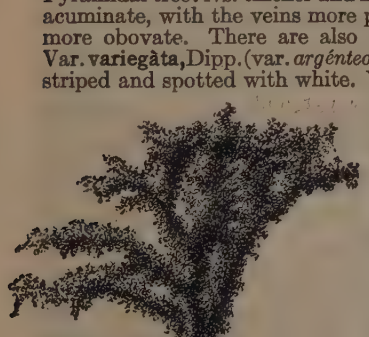
5. **fúlva,** Michx. (*U. rùbra,* Michx. *U. elliptica,* Hort., not Koch. *U. Heyderi,* Spaeth. *U. sibírica,* Hort.). Slippery Elm. Red Elm. Figs. 3877, 3880. Tree, attaining 70 ft., with spreading branches, forming usually a broad, open, flat-topped head: branchlets pubescent and scabrous with minute tubercles: lvs. obovate to oblong, very unequal at base, long-acuminate, doubly serrate, of firm texture, very rough above, pubescent beneath, 4–7 in. long: fls. in dense clusters; stamens 5–9: fr. orbicular-oval, little notched at the apex, ½in. across. Que. to Fla., west to Dakotas and Texas. S.S. 7:314. Em. 2:334.—The reddish brown pubescence of the bud-scales is very conspicuous in spring, when the buds are unfolding.

6. **glàbra,** Huds. (*U. scàbra,* Mill. *U. montàna,* With.). Wych Elm. Scotch Elm. Fig. 3877. Tree, to 120 ft., with spreading branches forming an oblong or broad round-topped head; without suckers: bark remaining smooth for many years (hence its Latin specific name): branches never with corky wings; young branchlets pubescent: buds obtuse, ciliate, and pubescent with yellowish brown hairs: lvs. very short-petioled and unequal at base, broadly obovate to oblong-obovate, abruptly acuminate or sometimes 3-lobed at the apex, sharply and doubly serrate, rough above, pubescent beneath, 3–6 in. long: fls. clustered; stamens 5–6, little exserted: fr. oval or roundish obovate, little notched at the apex, with the seed in the middle, ¾–1 in. long. Eu. to Japan. H.W. 2:38, pp. 7, 8. F.S.R. 3, pp. 269, 271, 272. G.C. III. 39:152, suppl. S.E.B. 8:1287.—A variable species of which many forms are cult.: Var. **grandidentàta,** Moss (*U. scàbra tricúspis,* Koch. *U. triserràta* or *trìdens,* Hort.). Lvs. 3-lobed at the apex, particularly on vigorous shoots: young branchlets pubescent, reddish brown in autumn. Var. **crìspa,** Rehd. (*U. montàna crìspa,* Loud. *U. crìspa,* Willd. *U. aspleniifòlia,* Hort.). Slow-growing form with narrow lvs. incisely serrate with incurved twisted teeth. Var. **atropurpùrea,** Rehd. (*U. montàna atropurpùrea,* Spaeth). Lvs. dark purple and folded. Var. **lutéscens,** Rehd. (*U. montàna lutéscens,* Dipp.). Lvs. yellow. Var. **rùbra,** Rehd. (*U. campéstris rùbra,* Simon-Louis. *U. montàna libro rùbro,* Planch.). Inner bark of the young branchlets deep red. Var. **fastigiàta,** Rehd. (*U. montàna fastigiàta,* Loud. *U. pyramidàlis,* Hort. *U. plumòsa pyramidàlis,* Hort. *U. exoniénsis,* Hort. *U. Fórdii,* Hort.). Columnar form with strictly upright branches: lvs. rather small, dark green, obovate, wrinkled above and somewhat twisted. Var. **péndula,** Rehd. (*U. montàna péndula,* Loud. *U. montàna horizontàlis,* Kirchn.). Branches horizontally spreading forming a flat-topped head, branchlets pendulous. Gn. 17, p. 539; 77, p. 385. G.C. III. 50:221. M.D.G. 1901: 163. G.M. 49:749. G.L. 20:431. Var. **Camperdòwnii,** Rehd. (*U. Camperdòwnii,* Hort. *U. montàna péndula Camperdòwnii,* Henry. *U. montàna péndula,* Hort., not Loud.). Camperdown Elm. Figs. 3881, 3882. Branches and branchlets pendulous, forming a round head. Gn. 40, p. 158. G.C. III. 50:221. G.W. 2, p. 33; 8, p. 352; 15, p. 662. Var. **nàna,** Rehd. (*U. montàna nàna,* Simon-Louis). Dwarf slow-growing form with

horizontal branches, stunted branchlets, and small lvs., forming a hemispherical bush. Forms of *U. glabra* are frequently planted in the East.

7. **laciniàta,** Mayr (*U. montàna* var. *laciniàta*, Trautv. *U. màjor* var. *heterophýlla*, Maxim.). Tree, usually not exceeding 30 ft., but occasionally taller: branchlets sparingly hairy or glabrous, finally pale yellowish brown or grayish brown, older branches brown: lvs. obovate or obovate-oblong, at the broad apex usually with 3, sometimes with 5 lobes, very unequal and semi-cordate at the base, doubly serrate, rough above, pubescent beneath at least on the veins, 3–7 in. long; petioles pubescent, very short, about ⅛in. long: fls. in clusters, short-stalked: fr. elliptic, glabrous, ¾in. long, with the seed in the middle. Manchuria, N. China, Japan. S.I.F. 2:15.—This species has been sometimes confused with *U. glabra* var. *grandidentata*, but is easily distinguished by the pale color of the mature branchlets glabrous or slightly pubescent while young and by the presence of 3-lobed lvs. even on the fruiting branchlets of mature trees, while in the variety of *U. glabra* the mature branchlets are reddish brown and quite hairy while young and the 3-lobed lvs. appear chiefly on vigorous shoots.

8. **campéstris,** Linn. (*U. pròcera*, Salisb. *U. satìva*, Mill., according to Henry. *U. suberòsa*, Smith. *U. surculòsa* var. *latifòlia*, Stokes). English Elm. Tall tree, to 130 ft. high, with a straight st. and spreading or ascending branches forming an oval head; usually suckering abundantly: bark deeply fissured: young branchlets pubescent: buds ovoid, minutely pubescent: lvs. broadly oval or ovate, short-acuminate, very oblique at the base, dark green and scabrous above, soft-pubescent beneath and with axillary tufts of hairs, 2–3 in. long; pairs of veins about 12; petioles ⅛in. long, pubescent: fls. short-stalked with 3–5 stamens: fr. nearly orbicular, ½in. across, with a short closed notch at the apex, seed touching the base of the notch. England, W. and S. Eu. F.S.R. 2, p. 267. S.E.B. 8:1285. Em. 2:336. M.D.G. 1900:577.—This is the most stately of the European elms and much planted in England; the famous "Long Walk" in Windsor Park consists of this elm. This tree is sometimes planted as an avenue tree in this country; it succeeds very well and fine old trees may be seen occasionally in the northeastern states. The foliage remains green several weeks longer than that of the American elm. The form of S. Eu. has been distinguished as var. **austràlis,** Henry. Pyramidal tree: lvs. thicker and firmer; more cuspidate-acuminate, with the veins more prominent beneath: fr. more obovate. There are also several garden forms. Var. **variegàta,** Dipp. (var. *argénteo-variegàta*, Hort.). Lvs. striped and spotted with white. Var. **purpùrea,** Kirchn. Lvs. tinged purple, 2–2½in. long. Var. **purpuráscens,** Schneid. (var. *myrtifòlia purpùrea*, L. de Smet). Lvs. tinged purplish, about 1 in. long. Var. **Van Houttei,** Schneid. (var. *Louis Van Houtte*). Lvs. tinged with yellow. Var. **Berárdii, Simon-Louis.** Bushy tree or shrub with slender upright branches: lvs. oblong, with few coarse teeth, nearly glabrous, ½–1 in. long. Var. **viminàlis,** Loud. (*U. antárctica*, Kirchn. *U. stricta*, Hort.). Tree with ascending branches and pendulous slightly pubescent branchlets: lvs. obovate to narrowly elliptic, incisely doubly serrate, acuminate, scabrous above and slightly pubescent beneath, 1–2½ in. long. G.C. III. 51:236. Var. **viminàlis aùrea,** Henry (*U. Rosseèlsii*, Koch. *U. campéstris aùrea*, Morr. Var. *antárctica aùrea*, Nichols.). Like the preceding but with yellow lvs. B.H. 16:19. I.H. 14:513. Var. **viminàlis marginàta,** Kirchn. (var. *viminàlis variegàta*, Nichols.). Like var. *viminalis*, but lvs. variegated with white. Var. **Wéntworthii,** Schelle (*U. Wéntworthii péndula*, Hort.). A form with pendulous branches.



3879. A feathered elm.—Ulmus americana.

3880. Fruit of slippery elm.—Ulmus fulva. (× ½)

9. **japónica,** Sarg. (*U. campéstris* var. *japónica*, Rehd.). Tree, to 100 ft., with a broad head and often more or less pendulous branchlets: young branchlets densely pubescent and rough with minute tubercles, pale yellowish brown, sometimes developing corky ridges: lvs. obovate or elliptic, acuminate, oblique at the base, scabrous and hairy above, pubescent beneath with slight axillary tufts of hairs, 3–5 in. long; pairs of veins 12–16; petiole ⅛–¼in. long, densely pubescent: fls. nearly sessile, tetramerous: fr. obovate-oblong, about ¾in. long, gradually narrowed toward the base, with an open notch at the apex; seed touching the notch. Japan, Manchuria, Amurland. G.F. 6:327. S.T.S. 2:101.—Intro. into the Arnold Arboretum in 1895; it has proved perfectly hardy there, grows rapidly, and promises to become a valuable ornamental tree.

10. **hollándica,** Mill. (*U. Dippelìana*, Schneid. *U. glàbra* × *U. foliàcea*). Under this name are united here a number of elms which are apparently hybrids between the Scotch elm and the smooth-leaved elm. They are more or less intermediate between the parents, in some forms resembling the first, in others the second parent. As the type of this collective group the following variety may stand, as it is probably not different from Miller's *U. hollandica*. Var. **màjor,** Rehd. (*U. màjor*, Smith. *U. scàbra* var. *màjor*, Gürke. *U. campéstris* var. *màjor*, Planch.). Dutch Elm. Tree, to 100 ft. or more, with a short trunk and wide-spreading branches, suckering: bark of trunk deeply fissured: young branchlets glabrous or with few hairs: buds ovoid, minutely pubescent: lvs. broadly oval, acuminate, very unequal at the base, dark green, lustrous and nearly smooth above, sparingly and minutely pubescent and glandular beneath, with conspicuous axillary tufts, 3–5 in. long; pairs of veins 12–14; petiole ¼in. or slightly longer: fls. mostly 4-merous: fr. oval-obovate, ¾–1 in. long; seed touching the base of the notch. R.F.G. 12:665. Var. **végeta,** Rehd. (*U. végeta*, Lindl. *U. glàbra* var. *végeta*, Loud. *U. Húntingdonii*, Hort.). Huntingdon Elm. Tall tree with rough bark and forked st.; suckering: young branchlets stout, glabrous or sparingly hairy: lvs. oval, acuminate, very unequal at the base, smooth and glabrous above, glabrous below except small axillary

tufts, 3½–5 in. long; pairs of veins 14–18; petiole ¼in. or slightly longer: fr. oval-obovate, with closed notch; seed above the center. Var. **péndula,** Rehd. (*U. Smíthii,* Henry. *U. glàbra* var. *péndula,* Loud.). Downton Elm. Tree with ascending branches and long pendulous branchlets more or less pubescent when young: lvs. oval, firm, long-acuminate, very unequal at the base, glabrous and smooth above, sparingly pubescent beneath, about 3½ in. long; petiole ⅓in. long, pubescent: stamens 3–5: fr. obovate, ¾in. long, with open notch; seed above the center. Var. **bélgica,** Rehd. (*U. bélgica* Burgsd. *U. batavìna,* Koch. *U. latifòlia,* Poederle. *U. campéstris* var. *latifòlia,* Gillekens). Belgian Elm. Tall tree with a straight rough-barked st. and a broad crown: young branchlets more or less pubescent: lvs. obovate-elliptic, very oblique at the base, slightly scabrous above, soft-pubescent beneath, 3–5 in. long, with 14–18 pairs of veins; petioles ⅛–⅕in. long: fr. nearly 1 in. with the seed slightly above the middle. Much planted in Belgium and Holland. Var. **Dumóntii,** Rehd.(*U. bélgica* var. *Dumóntii,* Henry. *U. campéstris* var. *Dumóntii,* Mott.). Similar to the preceding variety with more ascending branches forming a narrower more pyramidal head. Var. **Klémmer,** Rehd. (*U. campéstris* var. *Klémmer,* Gillekens. *U. campéstris Clémmeri,* Hort. *U. Klémeri,* Spaeth). Tall tree with a smooth-barked st. and ascending branches forming a narrow pyramidal head: young branchlets with short hairs: lvs. ovate, short-acuminate, glabrous, but scabrous above, minutely pubescent beneath, about 3 in. long; pairs of veins about 12: fr. with the seed close to the notch at the apex. Tree of rapid growth much planted in Belgium. Var. **supérba,** Rehd. (*U. montàna supérba,* Spaeth, also of Morr.? *U. supérba,* Henry. *U. præstans,* Schoch). Narrow pyramidal tree with smooth bark and ascending branches: young branchlets glabrous: lvs. obovate or obovate-elliptic, very oblique at the base, glabrous and smooth above, glabrous below except small axillary tufts, with 15–18 pairs of veins, 3–5 in. long; petioles ¼–⅓in. long, sparingly pubescent: fls. 5-merous. Var. **Pitteùrsii,** Rehd. (*U. Pitteùrsii,* Kirchn. "Orme Pitteurs," Morr.). Vigorous-growing tree with large lvs. similar to *U. glabra,* to 8 in. long, broadly ovate, said to produce annual shoots to 9 ft. long. B.H. 2, pp. 133, 136.

11. **foliàcea,** Gilib. (*U. nìtens,* Moench. *U. glàbra,* Mill., not Huds. *U. campéstris* var. *lævis,* Spach. *U. campéstris* var. *glàbra,* Hartig. *U. surculòsa* var. *glàbra,* Stokes). Smooth-leaved Elm. Tree, with straight trunk, wide-spreading branches and usually

3881: Camperdown elm.—Ulmus glabra var. Camperdownii.

pendulous branchlets; suckering: bark gray, deeply fissured: young branchlets glabrous or nearly so: buds minutely pubescent: lvs. oval or obovate, acuminate, very unequal at the base, lustrous and smooth above, with white axillary tufts beneath and glandular, sparingly and minutely pubescent at first, doubly serrate, not ciliate, 2–3½ in. long; pairs of veins about 12; petiole ¼–½in. long: fls. 4–5-merous: fr. obovate, cuneate at the base, broad and rounded at the apex; the seed nearly touching the closed notch at the apex. Eu., N. Afr., W. Asia. S.E.B. 8:1286 (as *U. suberosa glabra*). R.F.G. 12:664. H.W. 2:37, p. 3 (as *U. campestris*).—A variable species with several geographical varieties and a number of garden forms. Var. **suberòsa,** Rehd. (*U. suberòsa,* Moench, not Ehrh.

3882. Ulmus glabra var. Camperdownii. (×⅙)

U. campéstris suberòsa, Wahl.). Branches with corky wings. R.F.G. 12:663. Var. **propéndens,** Rehd. (*U. glàbra propéndens,* Schneid. *U. microphýlla péndula,* Hort. *U. suberòsa péndula,* Hort.). With pendulous branchlets, and small lvs. about 1 in. long. M.D.G. 1901:166. Var. **itálica,** Rehd. (*U. nìtens* var. *itálica,* Henry). Similar to the typical form, but lvs. more coriaceous, with 14–18 pairs of veins, quite glabrous at maturity except conspicuous axillary tufts beneath; petioles ¼in. long. Italy, Spain, Portugal. Var. **umbraculífera,** Rehd. (*U. campéstris umbraculífera,* Trautv. *U. dénsa,* Litwinow). Tree, with dense globose head, otherwise like the type. Persia, Armenia. Gt. 30:1034. M.D.G. 1900:579. M.D. 1910, pp. 72, 73. Var. **grácilis,** Rehd. (*U. campéstris umbraculífera grácilis,* Spaeth). Similar to the preceding but with a more ovoid, not globose head, and smaller lvs. Var. **Koòpmannii,** Rehd. (*U. campéstris Koòpmannii,* Hort. *U. Koòpmannii,* Spaeth). Closely allied to var. *umbraculifera,* but with a dense oval head: branchlets paler: lvs. ovate, 1–1¼ in. long. Var. **Ruepéllii,** Rehd. (*U. campéstris Ruepéllii,* Spaeth). Similar to var. *umbraculifera,* but branchlets pubescent and branches slightly corky: lvs. rather small, scabrous above. Var. **stricta,** Rehd. (*U. stricta,* Lindl. *U. nìtens* var. *stricta,* Henry. *U. campéstris* var. *cornubiénsis,* Loud.). Cornish Elm. Narrow pyramidal tree with ascending branches: young branchlets often pubescent at the insertion of the lvs.: buds glabrous: lvs. obovate to oval, somewhat unequal at the base, 2–2½ in. long, glabrous and smooth above; petioles ⅓in. long: fls. usually 4-merous: fr. ⅔in. long, narrower than in the type. S. W. England. Var. **Whèatleyi,** Rehd. (*U. nìtens* var. *Whèatleyi,* Henry. *U. campéstris Whèatleyi,* Simon-Louis. *U. sarniénsis,* Lodd. *U. campéstris monumentàlis,* Hort., not Ruiz). Wheatley, Jersey, or Guernsey Elm. Narrow pyramidal tree with ascending branches: lvs. similar to those of the preceding variety, but broader, with less conspicuous axillary tufts and glandular beneath and on the petiole. G.C. III. 41:150. M.D. 1910, p. 273. Var. **monumentàlis,** Rehd. (*U. campéstris monumentàlis,* Ruiz). Columnar tree with few upright branches and numerous short branchlets: lvs. crowded, rather short-petioled, dark green and somewhat rough above. Var. **Dampièri,** Rehd. (*U. nìtens* var. *Dampièri,* Henry. *U. campéstris Dampièri,* Spaeth). Fastigiate tree, forming a narrow pyramidal head: lvs. crowded on short branchlets,

broadly ovate, 2–2½ in. long, glabrous. Var. **Wrèdei,** Rehd. (*U. campéstris Dampièri Wrèdei,* Hort. *U. Wrèdei aùrea,* Hort.). Like the preceding, but lvs. yellowish. M.D.G. 1898:160. Var. **péndula,** Rehd. (*U. nìtens* var. *péndula,* Henry). With slender pendulous branches. Var. **Webbiàna,** Rehd. (*U. campéstris Webbiàna,* Lee). Pyramidal tree with ascending branches: lvs. folded longitudinally. Var. **variegàta,** Rehd. (*U. campéstris variegàta,* Dum.-Cours. *U. campéstris* var. *argénteo-variegàta,* Rehd.). Lvs. variegated with white, smooth above.

12. **pùmila,** Linn. (*U. microphýlla,* Pers. *U. sibírica,* Hort.). Small tree or shrub, with slender pubescent, sometimes pendulous branches: lvs. oval-elliptic to elliptic-lanceolate, short-petioled, acute, firm, dark green and smooth above, pubescent when young beneath, ¾–3 in. long: fls. short-pedicelled; stamens 4–5, with violet anthers: fr. obovate, with the nutlet somewhat above the middle, incision at the apex reaching about half-way to the nutlet. Turkestan to Siberia and N. China. Gn. 65, p. 133.—A graceful small hardy tree. **Var. arbòrea,** Litwinow (*U. pinnàta-ramòsa,* Dieck. *U. turkestànica,* Regel). Tree with long, pinnately branched shoots pubescent when young: lvs. oblong-lanceolate, 1–2½ in. long; petioles pubescent at first. Var. **péndula,** Hort. (*U. parvifòlia péndula,* Hort. *Planèra rèpens,* Hort.), has slender more pendulous branches.

13. **parvifòlia,** Jacq. (*U. chinénsis,* Pers.). Chinese Elm. Half-evergreen small tree or shrub, with spreading pubescent branches: lvs. ovate to obovate or oblong, very short-petioled and little unequal at base, acute or obtusish, subcoriaceous, simply serrate, glabrous and glossy above, pubescent beneath when young, usually glabrous at length, ¾–2 in. long: fls. short-pedicelled, in clusters; stamens 4–5, much exserted: fr. oval to elliptic, notched at the apex, with the seed in the middle, ⅛–½in. long. July–Sept. N. China, Japan. S.I.F. 1:37. R.H. 1909, pp. 398, 399. —Has proved hardy near Boston. The recently described *U. Sièboldii,* Daveau, and *U. Shirasawàna,* Daveau, are probably only forms of this species; they are said to differ in their deciduous lvs. and the former besides by the persistent deeply fissured bark, exfoliating in the other two species and the larger fr. exceeding ½in. (B.S.D. 1914: 24, 25); the latter differs in the crenate-dentate lvs. with 8–10 pairs of veins and in the contracted fr. (B.S.D. 1914: 24; also S.I.F. 1:37 represents this form).

14. **crassifòlia,** Nutt. Cedar Elm. Tree, attaining 80 ft., with spreading limbs and slender, often pendulous branches, often furnished when older with 2 opposite corky wings: lvs. short-petioled, ovate to ovate-oblong, usually very unequal at the base, obtuse or acute, doubly and obtusely, sometimes almost simply serrate, subcoriaceous, somewhat rough and lustrous above, pubescent beneath, 1–2 in. long: fls. in 3–5-fld. very short racemes; stamens 5–8, little exserted: fr. oval-elliptic, pubescent, notched, ½in. long. Aug. Miss. to Ark. and Texas. S.S. 7:315. —Tender N.

15. **serótina,** Sarg. Tree, with short spreading and pendulous branches, often furnished with irregular corky wings: lvs. oblong to obovate, unequal at the base, acuminate, doubly serrate, glabrous and lustrous above, pubescent on the veins beneath, 2–3 in. long: fls. in 1–1½-in.-long pendulous racemes; calyx 5–6-parted to the base: fr. elliptic, deeply notched, densely ciliate, ½in. long. Sept. Tenn. to Ga.; sometimes planted in avenues in Ga. (S.S. 14:718); has proved hardy at the Arnold Arboretum, Boston.

U. arbúscula, Wolf (U. glabra × U. pumila). Shrubby tree: lvs. elliptic to elliptic-oblong, doubly serrate, nearly equal at the base, ¾–3 in. long, on shoots to 6 in. long. Originated in St. Petersburg. —*U. Bergmanniàna,* Schneid. Allied to U. glabra. Tree, to 50 ft.: branchlets glabrous: lvs. obovate-oblong to elliptic, acuminate, doubly serrate, glabrous, 2½–5 in. long; petioles very short: fr. roundish-obovate, glabrous, ½–¾in. long. Cent. China. Var. *lasiophýlla,* Schneid. Lvs. pubescent beneath. W. China.—*U. Davidiàna,* Planch. Allied to U. japonica. Medium-sized tree: young branchlets glabrous, later pale grayish brown or pale brown: lvs. short-petioled, obovate or elliptic ovate, doubly serrate, slightly pubescent beneath, 2–4½ in. long: fr. pubescent in the middle, but glabrous toward the margin. N. China.—*U. elliptica,* Koch. Allied to U. glabra. Branchlets pubescent: lvs. elliptic to elliptic-oblong, glabrous and nearly smooth above, slightly pubescent beneath, 3½–6 in. long: fr. obovate, with the seed in the pubescent middle. Transcaucasia, Armenia. The plant cult. under this name is U. fulva.—*U. Keàkii,* Sieb.=Zelkova serrata.—*U. macrocárpa,* Hance. Small tree or shrub: young branchlets pubescent, later pale brown, often with 2 corky wings: lvs. ovate, coarsely doubly serrate, rough above, slightly pubescent or nearly glabrous below, 1½–3 in. long: fr. obovate, with the nutlet in the middle, pubescent and ciliate, about 1 in. long. N. China. Possibly U. rotundifolia, Carr. (R.H. 1868, p. 374), belongs here.—*U. mìnor,* Mill. (U. surculosa var. argutifolia, Stokes. U. sativa, Moss, not Mill. U. Plotii, Druce). Allied to U. foliacea. Suckering tree, to 90 ft., with ascending branches and pendulous branchlets: lvs. obovate or elliptic, dull and slightly scabrous above, pubescent beneath at first, 1½–2½ in. long; petioles ⅛in. long: fr. narrowly obovate, ½in. long. Eu. G.C. III. 50:408, 409; 51:235. R.F.G. 12:660.—*U. Plòtii,* Druce=U. minor.—*U. sativa,* Moss=U. minor. —*U. Verschaffèltii,* Hort.=Zelkova Verschaffeltii.—*U. Wilsonìana,* Schneid. Tree, to 50 ft.: young branchlets pubescent, later brown and often corky: lvs. elliptic or elliptic-obovate, doubly serrate, smooth above, finely pubescent or nearly glabrous beneath, 1½–4 in. long: fr. obovate with the nutlet near the apex, glabrous, about ¾in. long. Cent. China.

Alfred Rehder.

UMBELLULÀRIA (from Latin *umbella,* a sunshade; referring to form of inflorescence). *Laurâceæ.* California Laurel. Tall umbrageous tree, glabrous, used as a shade tree in California and similar regions.

Leaves alternate, evergreen, petioled, slightly coriaceous: fls. small, greenish, in simple pedunculate umbels, which in the bud are surrounded by an involucre of 6 caducous bracts; perianth-tube very short; limb with 6 segms.; stamens 9, filaments with an orange-colored gland at base, anthers opening by uplifted valves: drupe subglobose or ovoid with a hard endocarp.—One species, Calif. Prop. by seeds.

3883. California laurel.—**Umbellularia californica.** (×¼)

californica, Nutt. (*Oreodáphne califórnica,* Nees). Fig. 3883. Handsome evergreen tree, 20–30 or even 80–90 ft. high, with erect or suberect slender branches, conical outline and dense foliage: lvs. containing a highly aromatic and volatile essential oil, and burning vigorously in the campfire, even while green: fls. fragrant: drupes at first yellowish green, becoming purple when ripe. Dec. to May.—One of the most abundant and characteristic of Californian trees, common in moist

places, particularly along streams in the Coast Range foothills and mountains, and attaining its greatest size in the cool fog-moistened alluvial valleys of the coast of N. Calif. and S. Ore.; it is but rarely seen in the drier interior valleys of the state. It often crowns the highest points of the coast-range hills, up to about 2,500 ft. altitude and far from the nearest spring or other visible sign of moisture, but in such cases the rock strata are nearly vertical and easily penetrated by the long roots which are able thus to reach hidden supplies of water. In such places it usually forms dense clumps or thickets of shrubs or small trees which are frequently shorn by the cutting ocean winds as though by a gardener's shears, suggesting its adaptability for clipped-hedge and windbreak work. It is used in boat-building, for jaws, bits, cleats, cross-trees, and the like. The branches are occasionally used for poles for chicken-roosts, as the strong odor pervading wood and bark as well as lvs., is said to keep away lice. The lvs. are used for flavoring soups and blancmanges but are too strong to give as agreeable flavor as those of *Laurus nobilis* or *Prunus Laurocerasus*. The tree is sometimes cult. for ornament in S. European parks and gardens. Sargent describes it as "one of the stateliest and most beautiful inhabitants of the North American forests, and no evergreen tree of temperate regions surpasses it in the beauty of its dark dense crown of lustrous foliage and in the massiveness of habit which make it one of the most striking features of the California landscape and fit it to stand in any park or garden."

3884. Uniola latifolia. (×¼)

JOSEPH BURTT DAVY.
F. TRACY HUBBARD.†

UMBRELLA LEAF: *Diphylleia.* **U. Pine:** *Sciadopitys.* **U. Plant** or **U. Palm:** *Cyperus alternifolius.* **U. Tree:** *Melia Azedarach* var. *umbraculiformis.*

UMBÍLICUS: *Cotyledon.*

UNGNÀDIA (named for Baron Ungnad, who in 1576 introduced the common horse-chestnut to western Europe by sending seeds to Clusius at Vienna). *Sapindàceæ.* MEXICAN BUCKEYE. Small tree or shrub which has been grown abroad in the coolhouse, but is hardy in the S. U. S., where it is used as an ornamental. Lvs. alternate, without stipules, odd-pinnate; lfts. 3–7 pairs, serrate, terminal long-petioled: fls. polygamous, irregular, aggregated in lateral fascicle or corymbose; calyx subequal, campanulate, 4–5-parted, lobes imbricate; petals 4–5, subequal, clawed, apex connate-cristate; disk 1-sided, oblique, tongue-shaped; stamens 7–10, unequal in length; ovary stipitate, ovoid, 3-celled: caps. 3-lobed, loculicidally 3-valved, leathery, cells 1-seeded; seed emetic.—One species, Texas. The seed, or "bean," has a sweet taste, but is considered emetic and poisonous. The fr. does not have a prickly husk like the horse-chestnut.

speciòsa, Endl. MEXICAN BUCKEYE. Commonly a slender deciduous shrub, 5–10 ft. high or sometimes a small tree: wood brittle: lvs. alternate, odd-pinnate; lfts. 5–7, ovate-lanceolate, acuminate. Common in S. W. Texas; winter-kills in N. Texas at a temperature of zero. S.S. 2:73. F.S. 10:1059. Gn. 19, p. 309. H.F. II. 7:231.—Intro. into Ga. at one period.

F. TRACY HUBBARD.†

UNÌOLA (an ancient Latin name of some unknown plant, derived from *unio*, unity). *Gramíneæ.* Perennials with loose usually showy panicles: spikelets broad and very flat, several-fld., some of the lower lemmas empty; glumes and lemmas keeled, nerved, pointed, but awnless.—Species 5, all American. Cult. for the ornamental panicles, which are suitable for dry bouquets.

latifòlia, Michx. SPIKE-GRASS. Fig. 3884. Culms 2–4 ft.: lvs. broad and flat, often 1 in. wide: spikelets large and thin, at maturity drooping on slender pedicels, forming a very graceful and ornamental panicle. Pa. to Kans., and southward.—Often grown in hardy borders. One of the best of our hardy native perennial grasses.

paniculàta, Linn. SEA OATS. Fig. 3885. Culm taller, 4–8 ft.: lvs. narrow and convolute: spikelets narrower, upright on short pedicels, forming an elongated drooping panicle. Sand-hills along the seashore of the southern states; can be grown as far north as S. Ont. Dept. Agr., Div. Agrost., 7:271.

U. Pálmeri, Vasey, a dicœcious perennial with extensive root-stocks, growing in sand-flats along rivers of N. Mex., is harvested by the Cocopa Indians who use the grain for food. G.F. 2:403.

A. S. HITCHCOCK.

3885. Uniola paniculata.

UNÒNA (in imitation of *Anona*). *Annonàceæ.* A genus based by the younger Linnæus on an American plant belonging to the previously established genus Xylopia, and afterward incorrectly applied to the Old World genus Desmos, of which it becomes a synonym. *U. discolor*, Vahl, cult. in tropical gardens for its sweet-scented fls., is identical with the

previously described *Desmos chinensis*, Lour.; *U. Désmos*, Dunal, is *D. cochinchinensis*, Lour. (see *Desmos*, in Vol. II). Belonging to other genera are Dunal's *U. uncinàta*, which is the fragrant *Artobotrys odoratissimus* of the Orient; *U. violàcea*, which is undoubtedly a species of carrion fls., Sapranthus, closely allied to *Sapranthus nicaraguensis; U. penduliflòra*, which is the aromatic ear-flower, or xochinacaztli, of the Aztecs (*Cymbopetalum penduliflorum*, Baill.); and his *U. acutiflòra* and *U. xylopioìdes* are both synonyms of the spicy *Xylopia grandiflora*, St. Hil. B. L. Robinson's *U. bibracteàta*, the fragrant "flor de guineo," which ranges from Nicaragua to Panama, and his *U. panaménsis* have been set apart by the writer under the generic name of Desmopsis. The latter has recently been rediscovered by Henry Pittier at its type locality in the Canal Zone. Both of the latter species are figured by the writer in the Bull. Torr. Bot. Club, vol. 43, pp. 183–93 (1916). See also W. E. Safford, Bull. Torr. Bot. Club. 39:501–8 (1912).

W. E. Safford.

UPAS TREE: *Antiaris.*

URÀRIA (Greek *oura*, tail, referring to bracts). *Leguminòsæ*. Subshrubby perennials, adapted to the warmhouse; 1 species has been tried in S. Fla. Lvs. pinnately 3- rarely 5–7-foliate or the lower rarely all 1-foliate; lfts. usually large, stipellate; stipules free, acuminate: fls. purplish or yellowish, arranged in terminal hirsute racemes, which are sometimes elongated, sometimes dense and spike-like; calyx-lobes subulate acuminate, 2 upper teeth short, 3 lower usually elongated; standard broad; wings adhering to the obtuse keel; stamens diadelphous; ovary sessile or stipitate, few-ovuled: pod of 2–6 small, turgid, 1-seeded indehiscent joints, often placed face to face.—About 17 species, Trop. Asia, Afr., and Austral.

crinita, Desv. Erect little-branched subshrubby perennial, 3–6 ft. high, distinguished from other species by having its upper lvs. composed of 3–7 oblong lfts. and pedicels clothed with long bristles: lfts. 4–6 x 1½–2 in.: racemes dense, 1 ft. long, 1–1½ in. thick; standard ovate, violet-purple within, pale blue outside; wings pinkish. Bengal to Assam, eastward through Burma to China, south to Malacca and the Malay Isls. to Timor Laut, but not Austral. and not indigenous in Ceylon. B.M. 7377.—Sometimes the raceme has 200 or more fls., each of which is ½in. long.

F. Tracy Hubbard.†

URBÍNIA (named for Dr. Manuel Urbina). *Crassulàceæ*. Perennial succulent herbs, caulescent or acaulescent: lvs. closely imbricated, thick and rigid: infl. rather few-fld., cymose: calyx small, 5-lobed, lobes ovate to lanceolate, equal or unequal, much shorter than the corolla which is somewhat cone-shaped, lobes united at base into a tube; stamens 10, borne on the corolla; carpels 5. Three or 4 species, Mex. See also *Cotyledon*, Vol. II, p. 868. *U. obscùra*, Rose. Caulescent: st. about 4 in. high: lvs. ovate, about 3 x 2 in., thick but flattened, somewhat rounded at base: fl.-sts. thickish, with many narrow lvs.: infl. a 2-branched raceme: fls. about 10; calyx-teeth lanceolate; corolla about ½in. long, bright rose below, lobes slightly spreading, yellow. Habitat unknown. *U. Púrpusii*, Rose. Acaulescent: lvs. forming a very compact rosette, broadly ovate, acuminate, 1¼ in. long and nearly as broad at the base, glabrous, mottled with brown: flowering st. reddish, nearly 1 ft. high, bearing numerous small, ovate, appressed lvs.: infl. about 6-fld., in a raceme: sepals green, ovate, acute; corolla somewhat urn-shaped, pinkish outside, pale yellow inside, petals acute. S. Mex.

F. Tracy Hubbard.

URCEÓCHARIS (from the genera Urceolina and Eucharis). *Amaryllidàceæ*. A hybrid between *Urceolina pendula* and *Eucharis grandiflora*, or in gardener's language *Urceolina aurea* and *Eucharis amazonica*. A flower of the hybrid and of each of its parents is shown in Fig. 3886. It is a tender winter-blooming bulbous plant with broad lvs. a foot long and half as wide, and large white bell-shaped 6-lobed fls. a dozen or so in an umbel, and each 2 in. across. The hybrid gets its white color from Eucharis, the fls. of Urceolina being yellow. The shape of its fl. is so singular a mixture of the two as to be very different in appearance from either. The hybrid lacks the beautiful staminal cup of Eucharis, and has a distinctly bell-shaped perianth. The showy part of Urceolina is the urn-shaped portion of the fl., the spreading tips being very short. The perianth of Eucharis is funnelform, the spreading portion being large and showy. The perianth-tube and ovary of the

3886. At the left, Eucharis grandiflora; middle, Urceolina pendula; at the right, the hybrid Urceocharis Clibranii. (All half size.)

hybrid are like those of Urceolina, the ovary being deeply 3-lobed instead of globose as in Eucharis. The pedicels are ascending, as in Eucharis, not pendulous as in Urceolina. The appendages at the base of the stamens are more distinctly marked than in either of the parents. This bigeneric hybrid was intro. to the trade under the name of *Eucharis Clibranii*, but the changes wrought in the structure of the fl. by the cross are so great that Dr. Masters was justified in giving the plant a new genus.

Clibranii, Mast. (*Eucharis Clibranii*, Hort.). Tender bulbous hybrid of *Urceolina pendula* and *Eucharis grandiflora*, with petioled lvs. 1 x 1½ ft. and umbels of white bell-shaped 6-lobed fls. each 2 in. across and a dozen in an umbel, anthers depauperate. Blooms in early winter. For cult., see *Urceolina*. G.C. III. 12:215; 26:251. Gn. 44, p. 459. G.M. 35:790. G. 16:450.—Intro. about 1892 by Messrs. Clibran, Oldfield Nurseries, Altrincham, England.

edentàta, C. H. Wright. From Peru, described from a plant that bloomed in the establishment of Sander & Sons, supposed to be a natural hybrid between an Urceolina and a Eucharis; differs from *U. Clibranii* in having no teeth on the corona between the filaments. B.M. 8359.

Wilhelm Miller.
L. H. B.†

URCEOLÌNA (Latin, *small pitcher*, alluding to the pitcher- or urn-shaped flowers). *Amaryllidàceæ*. Bulbous herbs, used both in the greenhouse and for summer and autumn blooming out-of-doors.

Scape solid: lvs. flat, ovate, oblong or narrow, contracted to the petiole: fls. in an umbel, numerous, rather long-pedicelled; involucral bracts 2, scarious; perianth erect, finally recurved or pendulous, tube contracted above the ovary, then suddenly dilated, lobes subequal, spreading; ovary 3-celled: caps. ovoid-globose or subpyramidal, 3-angled or nearly 3-lobed.—About 3 species, S. Amer.

The species of urceolina are attractive plants and easily grown, flowering every year, but for some reason they are rather scarce. The bulbs are about 3 inches across and during the growing season have one or two leaves. The plants flower in December. After flowering the bulbs may be removed from the warmhouse to the intermediate house and placed in a spot where they will be kept dry. Just before growth begins in the spring, the bulbs should be taken out of the pots and the exhausted soil removed. The bulbs may then be replaced, one bulb in a 5-inch pot, using clean pots, plenty of drainage material and a rich light porous soil. Place the top of the bulb level with the soil. Remove the pots to the stove, and as soon as growth begins water freely. In the fall when the leaves turn yellow, water sparingly and finally withhold water altogether. The flower-scapes appear a few weeks after the leaves disappear. (Robert Cameron.)

A. *Fls. red.*

miniàta, Benth. & Hook. (*Pentlándia miniàta*, Herb.). Bulb about 1½ in. through: lvs. produced after the fls., short-petioled, about 1 ft. long, 1½ in. wide, narrowed at both ends: scape over 1 ft. long: fls. 2–6, bright scarlet. Andes of Peru and Bolivia. B.R. 25:68. R.B. 23:49.—Offered by Dutch bulb-growers.

AA. *Fls. yellow.*

péndula, Herb. (*U. aùrea*, Lindl.). Bulb about 1½ in. through: lvs. 1–2 to a st., produced after the fls., oblong, acute, 1 ft. long by 4–5 in. broad: scape about 1 ft. long: fls. 4–6, bright yellow tipped with green. Andes of Peru. B.M. 5464. G.C. III. 12:211. G. 32:241. J.H. III. 48:445.

F. W. Barclay.
F. Tracy Hubbard.†

URECHÌTES (*tailed Echites*, alluding to the appendages of the corolla). *Apocynàceæ*. Prostrate plants or twining vines, allied to Dipladenia and having similar cultural requirements. Sts. woody or nearly so: lvs. opposite, the blades entire: fls. often showy, in axillary or terminal cymes or racemes, or sometimes only 2 together; calyx-lobes 5, long and narrow; corolla funnel-shaped, rather large, abruptly widened into a throat, 5-lobed, the lobes sometimes elongated and twisted; stamens inserted at top of the corolla-tube and included in the throat, the anthers sagittate; disk cup-shaped, 5-lobed or nearly entire: fr. comprised of 2 long spreading follicles. Species about 10, in Trop. Amer. and extending into Fla. *U. suberécta*, Muell. Arg., of Colombia, is sometimes grown in the warmhouse: somewhat woody and partially erect: lvs. ovate to elliptic: fls. large, yellow, in a terminal peduncled cyme. B.M. 1064 (as *Echites suberecta*), and 4702 (as *Dipladenia flava*).

URÈNA (from Uren, the Malabar name). *Malvàceæ*. Herbs or subshrubs of little horticultural interest: plants more or less covered with rigid stellate hairs: lvs. angled or lobed: fls. clustered; calyx 5-cleft; petals 5, often tomentose at the back, free above, connate below; staminal tube truncate or minutely toothed, anthers nearly sessile; ovary 5-celled, cells 1-ovuled: ripe carpels covered with hooked bristles or smooth, indehiscent.—About 8 or 9 species, natives of the tropics and subtropics. *U. lobàta*, Linn. Herbaceous, more or less hairy: lvs. rounded, angled, not divided beyond the middle, cordate, 5–7-lobed, lobes acute or obtuse, about 1–2 x 2–3 in.: fls. pink: carpels densely pubescent, spiny. Tropics of both hemispheres. Very variable. *U. stellipila*, Lem. Shrubby with a few elongated, fulvous-pilose branches: lvs. distant, rather short-petioled, cuneately ovate-lanceolate, base somewhat cordate, stellate, hairy, coarsely crenulate-dentate: fls. rather large, 1½ in. across, white, in axillary clusters; calyx-segms. lanceolate, acute; petals spatulate. Brazil. J.F. 3:281.

URÈRA (derivation not obvious, possibly from *uro*, to burn, alluding to the stinging hairs). *Urticàceæ*. Trees or shrubs, rarely subshrubs, with stinging hairs usually scattered, one of which has been rarely cult. as an ornamental greenhouse shrub. Lvs. alternate, entire, dentate or lobed, feather-veined or 3–5-nerved; stipules free or more or less connate in one: panicles dichotomous, cymose or irregularly racemose, unisexual: fls. dicœcious or rarely monœcious; perianth of male fls. 4–5-parted, segms. ovate, stamens 4–5, ovary rudimentary; perianth-lobes or segms of female fls. 4, subequal or outer smaller, ovary straight or oblique: achenium straight or oblique, compressed or ventricose.—About 40 species, Trop. Amer., Afr., also Mascarene Isls. and Pacific islands.

alceæfòlia, Gaud. (*Urtìca caracasàna*, Jacq.). Tree or shrub: lvs. broadly ovate, acuminate, basal sinus wide and open, crenate-dentate: fls. dicœcious, in regularly dichotomous cymes; male cymes 4–6 times dichotomous, stinging or not, rose-colored; female fls. many times dichotomous, the fls. solitary or in 3's. Trop. Amer.

F. Tracy Hubbard.†

URGÍNEA (from the name of an Arabian tribe in Algeria). *Liliàceæ*. Bulbous herbs used both in the greenhouse and out-of-doors.

Leaves radical, sometimes very narrowly linear, sometimes broadly strap-shaped or almost oblong: scape simple, leafless: fls. in a terminal raceme, usually numerous, rather small or medium-sized, whitish, or rarely pale yellowish or rose, color more intense in the center of the segms.; bracts small, scarious; perianth finally deciduous, segms. 6, distinct, campanulate-connivent or spreading after anthesis; stamens 6; ovary sessile, 3-celled, usually 3-cornered: caps. 3-cornered, grooved, or intruded between the angles, loculicidally dehiscent.—About 75 species, Eu., Medit. region, India and Trop. and S. Afr. The sea-onion is closely related to the genus Scilla, but seems to be much closer to Ornithogalum, especially in habit, infl. and color of fls. The seeds of Urginea are numerous in each locule (in the sea-onion 10–12), strongly compressed and winged; in Ornithogalum and Scilla they are not compressed or winged and in Scilla they are solitary or few in each locule.

The sea-onion, known to apothecaries by the name of squill, and to gardens as *Urginea maritima*, is a bulbous plant native to the Mediterranean region. It has the same style of beauty as *Ornithogalum pyramidale* but unfortunately it is only half-hardy. As an ornamental plant it is little known in America. The name seems not to appear in American catalogues, but the Dutch bulb-growers offer the bulbs in different sizes. A plant erroneously called sea-onion is *Ornithogalum caudatum*. There is considerable difference of opinion as to when the sea-onion blooms, but the plant is generally considered an autumn bloomer, and it is clear that the leaves appear after the flowers. In England the plant is said to have flowered as early as July and August. Baker writes that the leaves appear in winter. Some English cultivators say the leaves appear as early as October and November; others say not until spring.

The plant grows near the seashore and inland, in dry sandy places from the Canaries to Syria. It is also found in South Africa, which is unusual, as the North and South African species of any genus are not usually identical.

The bulbs of Urginea are collected in large quantities in the Mediterranean region for the drug trade. They sometimes attain a maximum weight of fifteen pounds. The bulbs contain about 22 per cent of sugar and are used in Sicily in the manufacture of whiskey. Squills have emetic and cathartic properties. Sirup of squills is a popular croup medicine. The bulb, as it appears in the wholesale drug market, has been deprived of its outer scales and cut into thin slices, the central portions being rejected.

Scílla, Steinh. (*U. marítima,* Baker). Sea-Onion. Squill. Height 1–3 ft.: bulb 4–6 in. thick: lvs. appearing after the fls., lanceolate, somewhat fleshy and glaucous, glabrous, 1–1½ ft. long, 2–4 in. wide above middle: racemes 1–1½ ft. long, 1–1½ in. wide, 50–100-fld.: fls. ½in. across, whitish, with the oblong segms. keeled, greenish purple. Autumn. Canaries to Syria, S. Afr. B.M. 918 (as *Ornithogalum Squilla*).—In Italy it is said to be seen often blooming in many houses on top of shelves or cupboards, the bulbs producing their long spikes of fls., which last in perfection for weeks, without earth or water.

Wilhelm Miller.
F. Tracy Hubbard.†

UROSTÍGMA: *Ficus.* The following species now in cult. abroad was not included under Ficus in Vol. III, p. 1229. **Fícus subtriplinérvia,** Mart. (*Urostígma subtriplinérvium,* Miq.). Large tree: lvs. chartaceous, ovate- or lanceolate-elliptic or oblong, 1–2 x ½in.: fls. in axillary pairs, very short-peduncled, dicœcious. Brazil.

URSÌNIA (John Ursinus, of Regensburg, 1608–1666; author of "Arboretum Biblicum"). *Compósitæ.* Here belongs the hardy annual known to the trade as *Sphenogyne speciosa.*

Annuals, perennials, or subshrubs: lvs. alternate, serrate, pinnatifid or usually pinnatisect: rays the same color on both sides or purplish brown beneath; involucre hemispherical or broadly campanulate: achenes often 10-ribbed.—A genus of about 60 species, all native to S. Afr. One species, *U. annua,* is also found in Abyssinia. In Flora Capensis, vol. 3 (1864–65), Sphenogyne and Ursinia are treated as separate genera, the distinctions being as follows: the achene is cylindrical in Sphenogyne, but obovate or pear-shaped in Ursinia, distinctly tapering to the base: the pappus is uniseriate in the former, biseriate in the latter, the inner series consisting of 5 slender white bristles. In the course of time these distinctions have been dropped and Sphenogyne included in Ursinia.

púlchra, N. E. Br. (*Sphenógyne speciósa,* Knowles & Westc.). Fig. 3887. Annual, 1–2 ft. high, with lvs. bipinnately dissected into linear lobes and yellow or orange fl.-heads 2 in. across: rays about 22, 3-toothed, spotted purple-brown at base: st. glabrous, branched: lvs. alternate: scapes nearly leafless, about 5 times as long as lvs.: involucre 4-rowed; scales increasing in size from the base, outer rows with a brown scarious border, inner with a white scarious border. F.C. 2:77. P.M. 6:77. G.C. III. 4:356. Gn. 44, p. 217. R.H. 1843:445. G. 16:352. J.H. III. 54:85.—Both yellow and orange-colored fls. are sometimes found on the same plant. When well managed it blooms all summer. It is a native of the Cape region of S. Afr. It has been in cult. since 1836 but was not correctly described until 1887. It is much praised by connoisseurs, though it is not known to the general public. It seems to have enjoyed a longer continuous period of cult. than many other showy composites, in which the Cape is wonderfully rich.

Wilhelm Miller.

URTÌCA (classical name, alluding to the burning hairs). *Urticàceæ.* Nettle. About 30 annual and perennial erect simple or branching slender herbs, widely distributed, little if at all planted because of the stinging hairs and sts. and lvs.: fls. small, greenish and inconspicuous, racemose, spicate or clustered in the axils, monœcious or dicœcious, sometimes hermaphrodite; sterile fls. with 4 sepals and 4 stamens; fertile fls. with 2 pairs of sepals and a single erect ovary: lvs. simple, opposite, strongly nerved, dentate or crenate or incised. Several species of nettle are native in N. Amer. and a few are intro. weeds. The plants have very little ornamental value.

3887. Ursinia pulchra. (×¼)

URVÍLLEA (bears the name of Capt. Dumont D'Urville, French botanist and naval officer). *Sapindàceæ.* About a dozen species of climbing shrubs of Trop. Amer. Lvs. alternate, ternate, the lfts. entire or coarsely dentate and more or less pellucid-dotted: fls. whitish, on jointed pedicels, in axillary racemes, the peduncles ending in a pair of tendrils; sepals 5, the 2 outer ones smaller; petals 4; disk of 4 glands; stamens 8: fr. a 3-winged samara. Probably no species is in cult., the *U. ferruginea,* Lindl., of lists being *Serjania cuspidata.*

UTRICULÀRIA (Latin, *a little bag* or *skin,* referring to the bladders). *Lentibulariàceæ.* Bladderwort. As known to gardeners, the bladderworts are of two rather distinct groups,—the aquatic mostly native kinds sometimes used in pools and aquaria, and the tropical terrestrial kinds sometimes grown in warm-houses with orchids and other special plants. The whole group is of little importance horticulturally.

As commonly understood, Utricularia is a genus of some 200 aquatic and terrestrial herbs, of cosmopolitan distribution. Recently, however, the genus has been split into several genera, and the name Utricularia retained for certain aquatic species; with this taxonomic innovation, however, we are not concerned in this brief account. Under the older and prevailing definition,

Utricularia comprises plants with numerous slender wiry scapes bearing one or many fls.: calyx large, 2-parted or 2-lobed; corolla with a spur which is usually long and curved under the fl.; posterior lip erect, entire, emarginate or 2-fid; anterior lip often large, broad, and showy, spreading or reflexed, entire, crenate or 3-lobed, or the middle lobe various: lvs. of the aquatic species much dissected, sometimes disappearing at flowering-time, very delicate: plant floating or rooting in the mud, the lvs., branches, and sometimes the roots bearing minute bladders; lvs. of terrestrial species linear or spatulate and rosulate at base of plant. The bladders trap small aquatic animals. These bladders have a valve-like door through which the animals enter when

3888. Utricularia longifolia. (×¼)

looking for food or when trying to escape from other creatures; they are most numerous and effective in the species which float in stagnant water. They are fewer in the marsh-inhabiting species. The terrestrial kinds often have minute deformed and useless bladders; these kinds are common in the tropics and are characterized by erect foliage of the ordinary type. These often form little tubers by which they may be propagated. The native aquatic species propagate themselves by seeds and also by winter buds. (A winter bud of another aquatic plant is figured under *Elodea*, p. 1110). Some of the utricularias are epiphytic in a way. Those who are familiar with bromeliaceous plants know how the water gathers in the axils of the lvs. These bromeliads are themselves often epiphytic, perching on high trees in moisture-laden tropical jungles. In the miniature ponds supplied by the lf.-axils of Vriesia and other bromeliads live certain utricularias with fully developed and effective bladders. Occasionally they send out a long "feeler" or runner-like shoot which finds another bromeliad and propagates another bladderwort.

The aquatic utricularias are sometimes cultivated in aquaria, but their flowers are not showy, nor are those of any of the hardy kinds. A number of them are native in lakes and ponds in the United States and Canada. The showy species are the terrestrial and epiphytic kinds of the tropics. These, for complexity of floral structure, beauty of color and lasting qualities, vie with certain orchids. In fact, they are usually grown by orchid-lovers in orchid-houses. Perhaps the most desirable of the genus are *U. montana*, *U. Endresii*, and *U. longifolia*, each of which represents a different color. Well-grown baskets of these plants have numerous scapes a foot or so high bearing five to twenty flowers, each 1½ to 2 inches across. In general, such plants are grown in warmhouses, *U. Endresii* requiring a stove temperature, while some of the others may thrive in an intermediate house. As a class they are grown in baskets, near the light, using a compost of fibrous peat and sand. The plants are kept constantly wet during the growing season and until the flowers are gone. During the winter they are rested, being kept in a cooler place and given just enough water to keep the tubers from shriveling.

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A. *Habit aquatic.*

B. *Foliage dissected into numerous thread-like segms.; lvs. floating.*

1. **vulgàris,** Linn. Hardy aquatic: sts. a few inches to 3 ft. long, with crowded 2–3 pinnately divided floating lvs. ½–1 in. long, provided with numerous bladders and yellow fls. ½in. long or more, borne in few-fld. racemes: scapes 6–8 in. high: corolla closed, with reflexed sides and a conical blunt spur. Eurasia, in ponds and channels. Gn. 28, p. 403.—Sometimes listed among aquatic plants. What is considered by some to be the same species occurs far northward in N. Amer.; represented in the U. S. by var. *americàna*, Gray, with a more slender and rather acute spur. Some authors consider the American plant to be distinct, and it then takes the name *U. macrorhìza*, LeConte, distinguished from the Eurasian material by longer sts., shape and direction of spur and reduced or rudimentary stolons. Sometimes collected for aquaria.

BB. *Foliage ribbon-like.*

2. **prehénsilis,** E. Mey. An aquatic plant with fl.-shoots twining above the water: lvs. (often disappeared at flowering-time) linear-lanceolate to lingulate, obtuse, sometimes nearly 1 in. long, narrowed into a slender petiole: bladders numerous on the lvs. and rhizoids, with the mouth near the stalk, nearly or quite globose, almost ½ line in diam.: fls. yellow, 1–6; upper lip of corolla broadly oblong-spatulate; palate erect, crested; spur straight and acute, descending, ¼in. or more long. Trop. Afr. G.C. III. 48:447.—A rapid grower and profuse bloomer in cult. Annual.

AA. *Habit terrestrial or epiphytic: foliage entire, erect.*

B. *Color of fls. white, with a yellow palate.*

3. **montàna,** Jacq. Tropical American epiphyte, with clusters of tubers ⅛–½in. long, minute, deformed, useless bladders and large white fls. with a yellow palate, the fls. 1–4 on a scape, each 1½ in. across: lvs. 4–6 in. long, elliptic-lanceolate. Trunks of trees, W. Indies and S. Amer. B.M. 5923. F.S. 19:1942. I.H. 18:64. G.C. III. 49:405. G. 29:251. G.W. 2, p. 414; 3, p. 518; 15, p. 301.—A lovely species.

BB. *Color of fls. yellow, with an orange palate.*

4. **bífida,** Linn. Terrestrial species from Trop. Asia, with minute bladders and small fls. resembling a diminutive linaria: lvs. densely matted, erect, thread-like, 1–2 in. long: fls. yellow, with an orange palate, ⅜in. long, 5–8 in a raceme: pedicels drooping in fr.: scape about 6 in. or less high. India, Malaya, China, Japan, Philippines. B.M. 6689.

BBB. *Color of fls. purple, violet, or lilac, with a yellow palate.*

C. *Lvs. broader than long.*

D. *Shape of lvs. reniform.*

5. **jânthina,** Hook. f. Epiphytic Brazilian species growing in the lf.-axils of a bromeliad (Vriesia), with kidney-shaped lvs. and beautiful pale blue or lilac fls. 1½ in. across, ornamented by 2 vertical yellow lines on the palate edged with dark violet: lvs. with stalks 4–6 in. long and blades 2–4 in. across: scape about 6-fld.: upper lip hemispheric, arching; lower lip transversely oblong, entire. B.M. 7466.—Intro. by Sander, 1892. "Janthina" is the same as "ianthina," meaning violet-colored.

6. **renifórmis,** St. Hil. Brazilian species found in sphagnum bogs, having kidney-shaped lvs. and rose-colored fls. with 2 darker lines on the palate: upper lip truncate, emarginate; lower lip 3-lobed, the lateral lobes broad, the midlobe much shorter and scarcely produced. Brazil.—Once advertised in this country, but probably lost to cult. Very large for the genus, the lvs. ½–1 ft. long and scapes 1½–2 ft. high.

DD. *Shape of lvs. obcordate.*

7. **Húmboldtii,** Schomb. Guiana species, with long-stalked, cordate or obcordate, mostly solitary lvs. and dark purple-blue fls. 2½ in. across, with a triangular lower lip: scapes about 5-fld. F.S. 13:1390.—One of the showiest species. Cult. in England, perhaps not in Amer.

CC. *Lvs. long and narrow, linear, oblong or lanceolate.*

8. **Éndresii,** Reichb. f. Epiphytic Costa Rican species, with tubers about ¼in. long, solitary lvs. and pale lilac fls. 1¾–2 in. across, with a yellow palate: lvs. 1–3 in. long, narrowly elliptic-lanceolate: scape about 5-fld. B.M. 6656. J.H. III. 49:233. G.Z. 24, p. 217. Var. **màjor,** Hort., was once offered.—A deciduous species found at altitude of 2,000 feet.

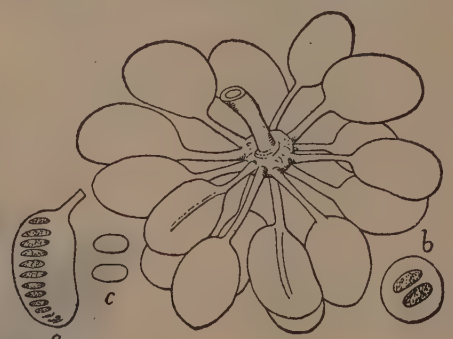
9. **longifòlia,** Gardn. Fig. 3888. A Brazilian species, perennial and densely tufted: lvs. lorate or linear-lanceolate, narrowed into a petiole, to 12 in. long: scape slender, reaching 2 ft., with fls. 10 or less. *U. Forgetiàna,* Hort., intro. by Sander, is said to be a form of this species and the same as the plant figured in Gn. 52:142 (adapted in Fig. 3888) under the erroneous title of *U. latifolia.* It has beautiful violet-purple fls. nearly 2 in. across, with an orange palate. B.M. 8516. G.C. III. 13:713. The lvs. are singularly variable or plastic. Under favorable conditions, according to Prain, they may grow out into bladder-bearing stolons and may produce from their tips tufts of leaves and stolons and rhizoids. The species thrives under conditions suitable for nepenthes.

WILHELM MILLER.
L. H. B.†

UVÀRIA (Latin, from *uva,* grape, on account of the grape-like clusters of the fruit). *Annonàceæ.* A group very closely allied to the American Asimina, but composed of Old World tropical plants, more or less clothed with stellate-pubescent hairs, and with a climbing or scrambling habit.

Flowers either solitary or in few-fld. clusters, either terminal or lf.-opposed; sepals 3, often combined into a cup-shaped calyx; petals 6, in 2 rows, one or both rows imbricate, or overlapping in the bud (not edge-to-edge as in Desmos), often connate at the base; stamens numerous, short, cuneate or nearly truncate, with parallel pollen-sacks on the back, very much as in Asimina, but with the connective either truncate or terminating in a lf.-like crest: gynæcium formed of a cluster of carpels projecting from the center of the mass of stamens, and developing into a cluster of pedicelled fleshy berries somewhat like those of Artabotrys or Canangium, but with the seeds usually numerous and arranged in 2 vertical rows, as in Asimina, or sometimes apparently 1-seriate. Few of this genus are in cult. For the principal Philippine species, see E. D. Merrill, in Philippine Journ. of Science, Section Botany, 10:228–30 (1915). The following species is the only one occurring about Manila.

rùfa, Blume (*U. purpùrea,* Blanco). SUSONG CALABAO. CARBAO'S TEATS. Fig. 3889. A scandent shrub, often 16–20 ft. in length, the younger parts and lower surfaces of the lvs. rather densely and softly pubescent with radiating starlike clusters of short rusty hairs: lvs. oblong-ovate to oblong-lanceolate, 3–6 in. long, apex acuminate, base rounded or cordate, the petioles very short: fls. extra-axillary or lf.-opposed, solitary or 2 or 3 together in depauperate cymes: frs. a cluster of 18–28 pedicelled oblong velvety berries, red when mature; seeds many, in 2 rows, surrounded by whitish, aromatic, acidulous fleshy pulp.—According to P. J. Wester the fr. of this species together with that



3889. Uvaria rufa. *a,* longitudinal section of fruit; *b,* cross-section of fruit; *c,* seeds.

of an allied species having an orange-yellow, velvety skin and yellowish, granular, somewhat sweetish flesh is offered for sale in the markets of Manila. See The Philippine Agricultural Review 6:321, pl. 7, figs. *a* and *b* (1913) for further information.

W. E. SAFFORD.

UVULÀRIA (Latin, *uvula,* palate, referring to the hanging flowers). *Liliàceæ.* BELLWORT. "WILD OATS" in some parts. Graceful woodland hardy perennial herbs, useful in the wild border or in heavy shade; not showy, and little planted.

Stem erect and stout, from a creeping or horizontal short rootstock, naked or scaly at base, forking above: lvs. oblong, perfoliate, flat and membranaceous: fls. yellow, drooping, in spring, solitary on terminal peduncles; perianth narrowly campanulate, deciduous, segms. 6, spatulate-lanceolate, acuminate, obtusely gibbous at base, with a deep honey-bearing groove within bordered on each side by a callus-like ridge: caps. truncate, coriaceous, 3-lobed, loculicidal at summit.—About 4 species, N. Amer. Another species sometimes kept in this genus is treated under Oakesia.

Uvularias grow 1–1½ feet high, with a number of clustered slender stems which are forked and leaf-bearing mainly above. The foliage is of a delicate green, which with the terminal narrow bell-shaped drooping flowers make the plants elegant though not showy. The species are perfectly hardy and easy of cultivation in any light rich soil and a shady situation. They do well north of a wall in a well-prepared border and in such a position they far exceed the plants of the woods in luxuriance. Strong roots may be slowly forced for spring flowering. For distinction from Oakesia, see that genus, to which some of the plants commonly known as uvularias are referred.

A. *Lvs. pubescent beneath.*

grandiflòra, Smith. Sts. 1–1½ ft. high, with 1 or 2 lvs. below the fork: lvs. oblong, oval or ovate, somewhat acuminate: fls. pale yellow, 1–1½ in. long; segms. usually smooth on both sides: stamens exceeding the styles: caps. obtusely 3-angled, truncate. May, June. Rich woods, Que. to Minn. south to Ga., Tenn., and Iowa. B.B. 1:409.

AA. *Lvs. not pubescent beneath.*

perfoliàta, Linn. Fig. 3890. Sts. more slender than in *U. grandiflora*, with 1–3 lvs. below the fork: lvs. oval-oblong or ovate: fls. pale yellow, about 1 in. long; segms. glandular papillose within; stamens shorter than the styles: caps. obtusely 3-angled, truncate. May, June. Rich woods, U. S.

U. sessilifòlia, Linn.=Oakesia sessilifolia.

F. W. Barclay.

3890. Bellwort.—Uvularia perfoliata. (×⅔)

V

VACCÍNIUM (ancient Latin name of the blueberry). *Ericàceæ*. BLUEBERRIES, BILBERRIES, DEERBERRIES, and CRANBERRIES. Erect or creeping shrubs, often with green speckled twigs, well known in this country as the source of excellent wild berries; sometimes planted for ornament.

Leaves alternate, evergreen or deciduous, coriaceous or herbaceous: fls. solitary, axillary or terminal or in racemes; sepals 4–5 or obsolete; corolla gamopetalous, urceolate, cylindrical, campanulate, or rotate, 4–5-toothed or -parted, white or pink; stamens 8–10; anthers dehiscing by pores at the tips of long slender terminal tubes, epigynous: carpels 4–5; ovary inferior, 4–5-celled, or 8–10-celled by intrusion of the midrib of each carpel: fr. a many-seeded berry capped by the persistent calyx.—The genus consists of about 130 species of wide geographic distribution, extending from the Arctic Circle to the higher mountains of the tropics. They are most common in North America and the Himalayas. The genus is almost without representation in the southern hemisphere.

3891. Vaccinium stamineum. (×1)

The well-known confusion in the popular names applied to Vaccinium is stated by Munson as follows: "The terms 'bilberry' and 'whortleberry' usually mentioned as 'common names' by American writers are seldom or never heard among the common people in this country; while 'huckleberry' is often used indiscriminately for plants of this genus and for the Gaylussacias. In the central states the term 'huckleberry' is usually applied to *V. corymbosum*, while 'blueberry' is given to the low-growing species, like *V. canadensis* and *V. pennsylvanicum*. In New England, 'huckleberry' is reserved for species of Gaylussacia, while 'blueberry' is applied to the lower-growing species as above, and 'high-bush blueberry' to *V. corymbosum*. The red-berried species are, in general, referred to as 'cranberries.'"

Among the plants that lend tone to the landscape in October and November by reason of their bright foliage, many of the species of Vaccinium may be included—the brilliant red, crimson, and orange colors often persisting much longer than the bright-hued leaves of a large number of other plants. Of the ornamental species none is more strikingly beautiful late in the autumn than the common high-bush blueberry, *V. corymbosum*. When well grown it is a stout, thick, spreading bush 8 to 10 feet high. The plant is beautiful when in flower; the fruit is attractive and of the best quality, and the bright scarlet and crimson effects in late autumn, rivaling the sumach in brilliancy, are unsurpassed. As an ornamental plant the species deserves a place in every garden. *V. pennsylvanicum* also brightens waste places for a short time, but drops its foliage too early to be worthy of planting as an undershrub. The same is true of *V. canadense*, which is in many respects similar. *V. stamineum*, though early deciduous, is attractive when in bloom and throughout the summer by reason of its graceful habit. It is particularly adapted for sterile sandy or gravelly situations, and it is one of the very few ornamental shrubs specially suited for densely shaded situations. It has the peculiarity of never forming a true flower-bud, the blossom being open from the first. *V. arboreum* forms an irregular shrub too diffuse and straggling to be of value except when planted in masses at the South. *V. hirsutum* is as beautiful in its autumn coloring as is *V. corymbosum* and, like that species, retains its foliage late in the season. *V. Vitis-Idæa* and *V. uliginosum*, with their shining box-like foliage, can be used very effectively as edging for the shrubbery border. (W. M. Munson.)

For the most part, vacciniums are plants of peaty or sandy acid soil, and will not thrive in soils of a richer nature. Many species are very sensitive to the presence of lime, and they require special attention as to soil. See *Blueberry*.

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Quoted statements in the specific descriptions in the following treatment are from the original article on this genus by the late W. M. Munson in the "Cyclopedia of American Horticulture;" that article also gives an interesting account of the native production of the fruit.

KEY TO THE SECTIONS (No. 25 doubtful).

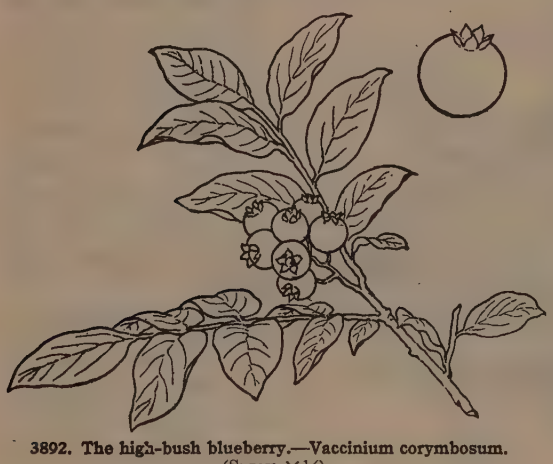
A. *Corolla campanulate to urceolate or cylindrical.*
B. *The corolla 5-lobed, open-campanulate; anthers awned on the back.* Section I. BATODENDRON
BB. *The corolla 4–5-toothed, urceolate, cylindrical, or campanulate-oblong.*

c. *Filaments hairy; anthers awned on the back: ovary 10-celled.* Section II. Cyanococcus
cc. *Filaments glabrous: ovary 4–5-celled.*
d. *Anthers 2-awned on the back: lvs. deciduous.* Section III. Euvaccinium
dd. *Anthers awnless on the back: lvs. coriaceous, evergreen.* Section IV. Vitis-Idæa
aa. *Corolla rotate or nearly so, 4-parted or divided, the narrow divisions revolute.* Section V. Oxycoccus

Section I. Batodendron. Corolla open-campanulate, 5-lobed; anthers tipped with long slender tubes, and 2-awned on the back: ovary and berry spuriously 10-celled, ripening in autumn, scarcely edible: lvs. deciduous, but of rather firm texture: fls. axillary and solitary or in leafy-bracted racemes, slender-pedicelled: bractlets minute or none.

A. *Fls. articulated with the pedicel; anthers included: berries black, many-seeded.* 1. **arboreum**
AA. *Fls. not so articulated; anthers much exserted: berry greenish, few-seeded.*
B. *Berries greenish or yellowish* ..... 2. **stamineum**
BB. *Berries longer, plum-purple* ..... 3. **melanocarpum**

1. **arbòreum,** Marsh. Farkleberry. Sparkleberry. Spreading shrub or small tree, 6–25 ft. high, with glabrous or somewhat pubescent branchlets: lvs. 1–2 in. long, evergreen in the S., somewhat coriaceous, smooth and shining above, paler and sometimes



3892. The high-bush blueberry.—Vaccinium corymbosum.
(Spray ×½)

pubescent beneath, obovate to oval, acute or obtuse, entire or obscurely denticulate: fls. profuse, axillary, and leafy-racemose, pendulous, articulated with the slender pedicel; corolla open-campanulate, 5-lobed, white; stamens included: berry small, globose, black, rather astringent, inedible. Sandy soil along river banks, Fla. and Texas to N. C. and Ill. L.B.C. 19:1885. B.M. 1607 (as *V. diffusum*). B.B. 2:580.—"It forms an irregular shrub too diffuse and straggling to be of use except in masses, for which purpose it is useful at the South."

2. **stamíneum,** Linn. Deerberry. Squaw Huckleberry. Fig. 3891. A divergently branched shrub, 2–5 ft. high, with pubescent twigs, not white-speckled: lvs. 1–4 in. long, oval to obovate-oblong or elliptical, acute, entire, pale, glaucous and pubescent beneath: fls. very numerous in large leafy-bracted racemes, showy, jointed with the slender spreading or pendulous pedicels; calyx glabrous; corolla pure white, rarely purple-tinged, open-campanulate, 5-cleft, anthers and style exserted: fr. large, ⅜–½in. long, globose or pyriform, greenish or yellowish, glaucous, few-seeded, almost or quite inedible. Dry woods and thickets, E. N. Amer. R.H. 1907, p. 94.—Corolla peculiar in not being closed in the bud.

3. **melanocárpum,** Mohr. Southern Gooseberry. Similar to the last but more white-pubescent: calyx white-tomentose: berries twice as large, shining black, with a juicy purple pulp, sweetish and slightly tart. Southern states.

Section II. Cyanococcus. Corolla from cylindraceous to campanulate-oblong or ovoid, 5-toothed; filaments hairy; anthers included, awnless: ovary and berry completely or incompletely 10-celled by a spurious partition or projection from the back of each carpel; berry blue or black with a bloom, juicy, sweet, and edible, many-seeded: fls. white or rose-color, in fascicles or very short racemes, developed with or a little before the lvs. from large and separate scaly buds, short-pedicelled: scaly bractlets as well as bracts mostly caducous or deciduous.

A. *Lvs. thick, evergreen: bracts reddish, firm, tardily deciduous.*
B. *Sepals obtuse: teeth of lvs. glandular: berries black* ..... 4. **nitidum**
BB. *Sepals acute: teeth of lvs. bristly: berries blue* ..... 5. **Myrsinites**
AA. *Lvs. thinner, deciduous: bracts scaly, deciduous.*
B. *Corolla cylindrical, mostly over twice as long as broad.*
C. *The lvs. hairy beneath, serrulate* ... 6. **virgatum**
CC. *The lvs. glabrous beneath, entire or nearly so* ..... 7. **corymbosum**
BB. *Corolla urceolate or short-cylindrical, mostly less than twice as long as broad.*
C. *Ovary and berry glabrous.*
D. *Lvs. very pubescent at least beneath.*
E. *Plant tall* ..... 8. **atrococcum**
EE. *Plant low* ..... 9. **canadense**
DD. *Lvs. glabrous or nearly so except sometimes the midrib.*
E. *The lvs. elliptic, acute, green both sides, serrulate.* ..... 10. **pennsylvanicum**
EE. *The lvs. broader, less acute, dull above, glaucous beneath, nearly entire* ..... 11. **vacillans**
CC. *Ovary and berry glandular-hirsute* 12. **hirsutum**

4. **nítidum,** Andr. A diffusely much-branched shrub, ½–2 ft. high, with smooth or rarely pubescent branchlets: lvs. thick, coriaceous, shining, ¼–¾in. long, elliptic-oblong or obovate, acute or apiculate, serrulate, often with glandular teeth, nearly sessile, glabrous: racemes umbel-like: sepals and bracts rounded, obtuse; corolla small, ⅛–¼in. long, short-campanulate-cylindrical, 5-toothed, rose-color or whitish: berry small, black. Dry pine lands, Ga. to Fla.—Closely related to the next.

5. **Myrsinites,** Lam. Low evergreen nearly or quite glabrous shrub, erect or decumbent: lvs. firm, variable, spatulate to oblong-obovate, ¼–1 in. long, entire or serrulate, sometimes denticulate, mostly shining above, glabrate or puberulent beneath, strongly veiny: bracts and calyx-teeth acute or acutish; corolla cylindrical, ¼–⅜in. long: berries blue, globose. Sandy pine barrens, Va. to Fla. and La. B.M. 1550 (as *V. nitidum* var. *decumbens*).—The chief points of difference between this and the last species are the puberulent branchlets, prominently veined, bristly ciliate lvs., and acute calyx-teeth and bracts. "Grown as a pot-plant in coolhouses in England under the name of *V. Sprengerii*."

6. **virgàtum,** Ait. A shrub 2–12 ft. high, with slender green branchlets, the young twigs puberulent: lvs. ovate-oblong to cuneate-lanceolate, ¾–2 in. long, thinnish, acute, often mucronate, entire or minutely serrulate, green and glabrous above, pale or glaucous beneath; veins pubescent: fls. in short racemes, on naked twigs, appearing before the lvs.; corolla long and

nearly cylindrical, ¼–⅜in. long, white or pink: bracts small, deciduous: berry black, almost or quite destitute of bloom. Swamps, S. Va. to Fla. and La. B.M. 3522. B.R. 302 (as *V. fuscatum*).—The distinction between this species and *V. corymbosum* is very slight. It is probable that, possibly excepting var. *tenellum*, this is only a southern form of *V. corymbosum* and should be reduced to varietal rank.

3893. Vaccinium pennsylvanicum.—Low blueberry. (×⅓)

Var. **tenéllum,** Gray (*V. tenéllum,* Ait.). A low form, mostly less than 2 ft. high, with smaller lvs. and nearly white fls. in short close clusters. S. Va. to Ark., Fla., and Ala.

7. **corymbòsum,** Linn. High-Bush Blueberry. Swamp Blueberry. Fig. 3892. A tall handsome bushy shrub, 4–12 ft. high, with yellowish green warty branchlets: lvs. large, 1½–3 in. long, ovate-oblong to elliptical, acutish, glabrous, half grown at flowering time: corolla long-cylindrical, ¼–½in. long, white: berries blue-black, of excellent flavor. Moist woods or bogs, N. E. N. Amer. Em. 2:454. Amer. Agric. 1886:364.—Exceedingly variable, and many forms unite the several varieties. Apparently many natural hybrids occur between this and other species, rendering the taxonomy very difficult. *V. corymbosum* is one of the most valuable species both for fr. and as an ornamental shrub. It thrives in peaty acid soil.

Var. **amœnum,** Gray (*V. amœnum,* Ait.?). A form with lvs. bristly ciliate or serrulate, bright green on both sides, shining above. "Mainly in the Middle Atlantic states." B.R. 400. B.M. 3433 (as *V. corymbosum*). Probably of hybrid origin.

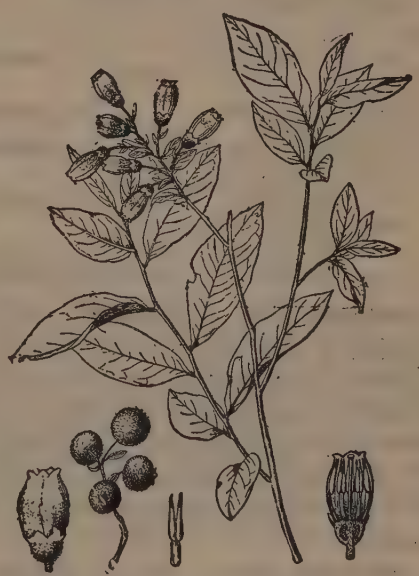
Var. **pállidum,** Gray (*V. pállidum,* Ait. *V. albiflòrum,* Hook. *V. Constáblæi,* Gray). A pale and glaucous or glaucescent form with or without some pubescence: plant generally low, 2–4 ft. high: lvs. ciliate-serrulate. Common in mountainous regions southward. B.M. 3428.—Probably a distinct species.

Var. **fuscàtum,** Gray (*V. fuscàtum,* Ait.). A tall form with the mature entire lvs. fuscous-pubescent beneath: fls. virgate, somewhat spicate on the naked flowering twigs. In and about swamps, Ga. and Fla. to La. and Ark.

8. **atrocóccum,** Heller (*V. corymbòsum* var. *atrocóccum,* Gray). Downy Swamp Blueberry. A tall branching shrub similar to the last species: lvs. elliptic-oblong, acute, entire, dark green above, densely pubescent beneath, unexpanded at flowering-time: fls. in dense racemes; corolla shorter, greener, and often redder than in the last: berries said to be always black without bloom, smaller than in the last, of good flavor. Moist woods and bogs of E. N. Amer.—Apparently distinct from *V. corymbosum,* but seeming to hybridize with it.

9. **canadénse,** Kalm. Canada Blueberry. Low erect shrubs, 1–2 ft. high, much branched: the branchlets very downy: lvs. entire, dark green, ¾–1½ in. long, oblong-lanceolate or elliptical, acute, downy on both sides: corolla short-cylindraceous, greenish white, often tinged with red: berries medium or small, late, blue with much bloom. Low woods and bogs, New England, mountains of Pa., northward and northwestward. B.M. 3446.—"This species, commonly known as "velvet-leaf" or "sour-top" because of the character of its foliage and the somewhat acid fr., usually grows in rather boggy localities. The fr. is more acid than the other low forms and matures from 1–3 weeks later. It is not so popular in the market as the sweeter kinds, but it is very prolific and its lateness in ripening is in its favor."

10. **pennsylvánicum,** Lam. Low Blueberry. Fig. 3893. A dwarf shrub, 6–15 in. high: branchlets glabrous or hairy northward: lvs. membranous, oblong-lanceolate or elliptical, acute, distinctly serrulate with bristly pointed teeth, shining and green on both sides but often hairy on the midrib beneath: fls. on short pedicels; corolla short-cylindraceous, greenish white: berries large, bluish black with a bloom, sweet, the earliest to ripen in the North. E. N. Amer. B.M. 3434. Em. 2:456. Rep. Me. Exp. Sta. 1898:171. Var. **angustifòlium,** Gray. A dwarf form with more decidedly lanceolate lvs. Newfoundland, mountains of New England and northward. Var. **nigrum,** Wood (*V. nigrum,* Brit.). Foliage very glaucous: berries black, without bloom. Usually found in colonies in the same situations as the typical form and occasionally the two are found intermingled. Rep. Me. Exp. Sta. 1898: 171. The fls. are said to appear earlier than those of *V. pennsylvanicum.*—"This species is extremely variable in size and shape of fr. and fls., but, with the exception of the varieties noted, the variations do not appear sufficiently constant to warrant making separations. In general the plant is of low, semi-prostrate habit, is extremely prolific, and thrives well on dry sandy hills. It furnishes the bulk of the blueberries found in the eastern markets. When mown down or



3894. Vaccinium hirsutum. (×¾)

burned, the new erect shoots produce, the following year, a long spike-like mass of bloom and fruit, which may be stripped off by the handfuls. Because of its character and early ripening habit, it is known on the blueberry plains as 'Early Sweet' or 'Low Sweet.'"

11. **vacíllans,** Kalm. Low Blueberry. Erect, glabrous, widely branched, ½–3 ft. high: lvs. 1–2 in. long, obovate or oval, scarcely acute, entire or sparingly serrulate, pale or dull glaucous on both sides: fls. in

rather dense clusters generally on the leafless summits of twigs; calyx reddish; corolla short-cylindraceous, greenish white, often tinged with red: berries large, with much bloom, of excellent flavor, ripening late with *V. canadense*. Dry sandy or rocky places, N. E. N. Amer. Em. 1:454.—"One of the most common species of the northern and central states, particularly west of the Alleghanies. One of the two commonest upland dwarf blueberries."

12. **hirsùtum,** Buckl. HAIRY BLUEBERRY. BEAR BLUEBERRY. Fig. 3894. Low shrub, 1–2 ft. high: sts. green, grooved, obscurely 4-angled: branchlets hirsute with spreading white hairs: lvs. oblong-elliptic to ovate, acute or cuspidate, ¾–1¼ in. long, entire, deep green above, paler beneath, pubescent or hirsute on both faces, very short-petioled: racemes few-fld.: ovary, calyx, and corolla densely hirsute; sepals acute; corolla large, ovoid, campanulate, pale or reddish: berries purplish black, glandular-hirsute. Shaded mountain slopes, N. C. to Tenn. and Ga. G.F. 2:365 (adapted in Fig. 3894).—"This species, discovered about 1840, was lost sight of for half a century until rediscovered by Sargent, and transferred to the Arnold Arboretum. It is readily distinguished by the hairy fls. and fr. The fr. is described as fully as large as that of *Gaylussacia baccata*, shining black, and of an agreeable flavor. Under cult., it is not so densely hairy as in the wild state. It gives promise of being valuable under cult. as one of the latest of its kind to ripen. At the Arnold Arboretum the period of greatest fruitage is in the middle of Aug., berries remaining into Sept."

Section III. EUVACCINIUM. Corolla from ovate to globular and more or less urceolate, 4–5-toothed, rose-color or nearly white; filaments glabrous; anthers 2-awned on the back, included: ovary and berry 4–5-celled, with no false partitions: lvs. deciduous: fls. on drooping pedicels, solitary or 2–4 together, developing with or soon after the lvs.

A. *Fls. 2–4 in a fascicle, from separate scaly buds, 4-merous*.....13. **uliginosum**
AA. *Fls. solitary, axillary, usually 5-merous.*
B. *Branchlets not angled*.....14. **cespitosum**
BB. *Branchlets angled.*
C. *Shrubs low (1½ ft. or less)*.....15. **Myrtillus**
CC. *Shrubs tall (3–6 ft.).*
D. *Lvs. serrate: berries blackish, without bloom*.....16. **membranaceum**
DD. *Lvs. entire or nearly so.*
E. *Berry blue with bloom: lvs. 1–2 in. long*.....17. **ovalifolium**
EE. *Berry red: lvs. ¼–¾in. long*.18. **parvifolium**

13. **uliginòsum,** Linn. BOG BILBERRY. A low spreading much-branched shrub, ¼–1½ ft. high: lvs. thickish, obovate or oval, obtuse or retuse, ½–1 in. long, entire, nearly sessile, pale and glaucous on both sides, slightly pubescent beneath: fls. 2–4 together or sometimes solitary; calyx 4-parted, rarely 5-parted; corolla urn-shaped, 2–5-lobed, pink: berries bluish black with a bloom. Arctic and alpine N. Amer., Eu., and Asia. B.B. 2:576.—"The plant is useful for the shrubbery border in cold wet acid situations and its fr., though of poor quality, is used for food by the natives of the Northwest."

14. **cespitòsum,** Michx. DWARF BILBERRY. A dwarf tufted shrub, 3–12 in. high, nearly glabrous throughout: branches rounded: lvs. ¼–1½ in. long, obovate, cuneate-lanceolate or cuneate-spatulate, narrowed at base, obtuse or acutish, serrulate, smooth and shining: fls. solitary, on short axillary peduncles, nodding; corolla urceolate, small, slightly 5 (rarely 4) -toothed, pink or red: berries large, blue with bloom, sweet. Gravelly or rocky woods and shores, Maine, Vt., Wis., Col., Calif., and northward; also on alpine summits of New England and N. Y. B.M. 3429.—May be used in rock-gardens.

15. **Myrtillus,** Linn. WHORTLEBERRY. BILBERRY. Low glabrous shrub with sharply angled branches: lvs. ½–⅔in. long, ovate or oval, serrate, conspicuously reticulate-veined, glabrous, thin and shining: corolla globular ovate; calyx-limb almost entire: berries black, nodding. Mountainous regions, Eu., Asia, possibly N. Amer.—"Generally used as an article of diet and in making of drinks, particularly in the Old World. It is from this species that the common name whortleberry is derived. It is not of much economic importance in Amer." The red-fruited form of the Rocky Mts., and the N. W. has been separated as *V. scopàrium*, Leiberg, and is so recognized by Piper and by Coulter & Nelson. Its occurrence in the trade is doubtful.

16. **membranàceum,** Douglas (*V. myrtilloìdes*, Hook., not Michx.). An erect branching shrub, mostly glabrous throughout: the twigs slightly angled: lvs. 1–2 in. long, oval, oblong or ovate, acute or obtuse, finely serrate, membranous, reticulate-veined, green above, paler beneath, not shining: calyx-limb entire; corolla depressed-globose, yellowish green or purplish: berries large, oblate, black or purplish black, rather acid. Lake Superior, N. Wyo., westward and northwestward.

3895. Mountain cranberry.—Vaccinium Vitis-Idæa.
(× about ⅓)

17. **ovalifòlium,** Smith. A slender straggling shrub, 3–12 ft. high, with slender, more or less angled branches: lvs. 1–2 in. long, oval to oblong, glabrous, thin, mostly rounded at both ends, entire or nearly so, pale green above, glaucous beneath: fls. solitary, on short recurved pedicels; calyx minutely 10-toothed; corolla ovoid or globose, urceolate: berries ½in. diam., large, bluish purple with bloom, acid but very good. Moist woods, Que. to Ore. and Alaska.—"This species is very abundant in the N. W., forming a large part of the undergrowth along the southern coast of Alaska. The berries, rather larger than peas, are collected in great quantities by the Indians, who use them fresh and dry them for winter. The exceptionally large berries and vigorous habit of this species suggest its value for cult., and particularly for crossing with the low-growing species."

18. **parvifòlium,** Smith. Shrub, 6–12 ft. high, straggling, with slender green sharply angled branches: lvs. ¼–¾in. long, oblong or oval, obtuse, entire, dull or pale: pedicels short, nodding in fr.: sepals 5; corolla globular, nearly white: berries bright red, acid, but fine for table use. N. Calif. to Alaska.—Not common in cult.

Section IV. Vitis-Idæa. Corolla from ovate to globular and more or less urceolate, 4–5-toothed, rose-color or nearly white; filaments hairy; anthers awnless on the back: ovary and berry 4–5-celled, with no false partitions: lvs. coriaceous and persistent: fls. in short racemes or clusters from separate buds, bracteate and 2-bracteolate.

A. *Corolla 5-lobed; stamens 10.*
B. *Branchlets pubescent: plant erect*....19. **ovatum**
BB. *Branchlets glabrous: plant procumbent*....20. **crassifolium**
AA. *Corolla 4-toothed; stamens 8*....21. **Vitis-Idæa**

19. **ovàtum,** Pursh. An erect, rigid, evergreen shrub, 2–8 ft. high, with pubescent branchlets: lvs. ½–1 in. long, thick and firm, very numerous, shining, ovate to oblong-lanceolate, acute, minutely and acutely serrulate, glabrous or nearly so, bright green both sides: fls. in short and close axillary clusters; deciduous bracts usually red; corolla campanulate, ¼in. long, rose-color or nearly white; calyx-lobes acute, red: berries black, acid, with or without bloom. Moist woods, Vancouver to Monterey, Calif. B.R. 1354. J.F. 4:424.—"A distinctly western species, and one of California's most beautiful hedge-plants, but not well known. It is very tenacious of life and bears pruning well. It is prop. from suckers, cuttings, and seeds, which last it bears freely."

20. **crassifòlium,** Andr. Slender trailing shrub: sts. 2–3 ft. long: twigs pubescent: lvs. small, ¼–½ in. long, leathery and shining, oval to narrowly oblong or ovate or obovate, obtuse, sparsely serrulate or entire: fls. few, almost sessile, in small axillary clusters; corolla globose-campanulate, small (⅛in. long), rose-red, rarely whitish: berries black. Sandy moist pine lands, N. C. to Ga. B.M. 1152.—"Useful for the shrubbery border South."

21. **Vìtis-Idæa,** Linn. (*Vìtis-Idæa Vìtis-Idæa,* Brit.). Mountain Cranberry. Cowberry. Partridge Berry in the N. Foxberry. Fig. 3895. Plants low, 6–10 in. long, creeping, glabrous: lvs. coriaceous, evergreen, obovate or oval, ¼–¾in. long, obtuse, dark green and shining above, with blackish bristly points beneath: fls. in short subterminal racemes; corolla bell-shaped, white or rose-colored, 4-cleft: berries dark red, acid. Arctic region, to the coast and mountains of New England, Minn., and Brit. Col. L.B.C. 7:616 (as var. *major*); 11:1023 (as var. *minor*).—"The frs., which are rather larger than currants, acid and somewhat bitter when uncooked, are largely used in the more northern regions for tarts, jellies, and preserves, or as a substitute for the common cranberry. According to Macoun, the fishermen's families along the Gaspé coast and the north shore of the Gulf of St. Lawrence gather the fr. of this species in large quantities for their own use and for sale, calling it 'low-bush cranberry.' Throughout the whole of N. Canada, hunters and trappers, as well as the native Indians, have frequently to depend upon it for food. It is valuable for the shrubbery border, where the strong contrast of the dark green foliage and the bright colored persistent fr. is very striking."

Section V. Oxycoccus. Corolla deeply 4-cleft or 4-parted; the lobes linear or lanceolate-oblong and reflexed; anthers exserted, awnless on the back, with very long terminal tubes: ovary and berry 4-celled, destitute of false partitions: fls. axillary and terminal, nodding, on long filiform pedicels, appearing in early summer: fr. maturing in autumn.

A. *Shrubs erect: lvs. deciduous, 1½–2 in. long*....22. **erythrocarpum**
AA. *Shrubs trailing: lvs. very small, evergreen.*
B. *Lvs. ovate, acute*....23. **Oxycoccus**
BB. *Lvs. oblong, obtuse*....24. **macrocarpon**

22. **erythrocárpum,** Michx. (*Oxycóccus erythrocárpus,* Pers.). An erect, divergently branching shrub, 1–4 ft. high: lvs. 1½–3 in. long, oblong-lanceolate to ovate, acuminate, finely bristly serrulate, thin, green both sides, paler beneath: pedicels solitary, axillary, shorter than the lvs., recurved, bractless: corolla flesh-color, ⅓in. long, 4-cleft, the lobes narrow, acute, revolute: berries globose, ¼in. diam., bright red turning darker, acid, scarcely edible. Higher Alleghanies, Va. to Ga. B.M. 7413.

23. **Oxycóccus,** Linn. (*Oxycóccus Oxycóccus,* McM.). Small Cranberry. Cranberry of the Old World. Slender creeping plants with short filiform sts., 4–10 in. long: lvs. ovate, acute, ¼in. long, with strongly revolute margins, coriaceous, evergreen, dark green and glossy above, white-glaucous beneath, glabrous: pedicels 1–4, terminal: filaments one-half length of anthers: berry red, ¼–⅓in. diam. Sphagnum swamps in subarctic and alpine regions of Old and New Worlds.—"Though smaller, its fr. is by many considered superior to that of the next."

24. **macrocárpon,** Ait. (*Oxycóccus macrocárpus,* Pers.). Larger American Cranberry. Sts. slender, creeping, elongated, 1–4 ft. long, somewhat coarser and stouter than in the last, the fl.-branches ascending: lvs. oblong or oval, obtuse or retuse, ⅓–½in. long, in texture and coloration similar to the last, margin less revolute: pedicels several, axillary and lateral: fls. larger; filaments shorter than in the last: berry red, larger, ½–1 in. long. N. N. Amer. B.M. 2586. Em. 2:456. See *Cranberry.*

Section VI (Position of this species doubtful)

Anthers muticous: branches red....25. **erythrinum**

25. **erythrìnum,** Hook. An erect, glabrous, evergreen shrub, with bright red twigs: lvs. ovate, obtuse, coriaceous, entire: fls. in long, 1-sided, terminal racemes; corolla cylindraceous, 5-toothed, ½in. long, purple-red; anthers without terminal tubes. Mountains of Java. B.M. 4688. J.H. III. 34:39; III. 51:593. J.F. 4:364. —"Sent to England in 1852, and since grown by various nurserymen as a greenhouse plant. It is a strong plant, furnishing an abundance of bloom in Dec. and Jan. Not remarkable, but worthy of a place in collections. A very distinct type." The position of this species is doubtful. The absence of anther-tubes suggests that it may not belong to the genus Vaccinium.

K. M. Wiegand.

VAGÀRIA (derivation obscure). *Amaryllidàceæ.* Large tunicate bulbous herb, useful for autumn-flowering: lvs. strap-shaped, appearing rather late: fls. in many umbels, short-pedicelled, white; perianth narrowly funnel-shaped, tube slender, lobes narrow, erect-spreading; stamens affixed to the throat, slightly shorter than the perianth; ovary ovoid-globose, 3-celled: caps. membranaceous, somewhat valvately dehiscent.—One species, Syria.

parviflòra, Herb. Bulb globose, about 1½ in. through: fls. white. Offered by European bulb-growers for outdoor planting.

F. Tracy Hubbard.

VALERIAN: *Valeriana.* **Greek V.:** *Polemonium.* **Red V.:** *Centranthus.*

VALERIÀNA (Latin *valeo,* to be strong, in allusion to medicinal uses). *Valerianàceæ.* Valerian. Glabrous or rarely pubescent or villous perennial herbs, subshrubs, or shrubs, which are erect or scandent, most of them hardy and showy garden plants.

Roots strong-smelling: lvs., especially the radical ones, entire or dentate, or the cauline or all pinnatifid or once-, twice-, or thrice-pinnatisect: cymes sometimes dense, few-fld. and terminal, or clustered in dense or interrupted spikes, sometimes laxly corymbosely or variously panicled: fls. small, white or rose; calyx-limb

before anthesis not conspicuous, after flowering divided into 5–15 plumose-ciliate setæ; corolla-tube attenuate at base, limb 5-cleft; stamens 3, rarely by abortion 1 or 2: fr. a compressed achene with the rear face 1-nerved, the front face 3-nerved.—About 265 species, mostly in the temperate and colder regions of the northern hemisphere but a few in the tropics and in the extra-tropical regions of the southern hemisphere.

The valerians in the American trade are hardy perennials of easiest culture. Only *V. officinalis* is well known. This is one of the characteristic plants of old gardens, being prized for the spicy fragrance of its numerous flowers in spring. It spreads rapidly from suckers arising from the roots, soon forming large colonies. The common species are often grown from seeds. *V. alba* and *V. rubra* of the trade are no doubt *Centranthus ruber*.

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A. *Rootstock perpendicular, branching below.*

1. edûlis, Nutt. Perennial, 2–4 ft. high, glabrous or nearly so: rootstock perpendicular, fusiform, branching below: lvs. thickish, not serrate, slightly pubescent; radical oblanceolate to spatulate, entire or some sparingly laciniate-pinnatifid, tapering into a margined petiole; cauline rarely none, commonly 1–3 pairs, sessile and pinnately parted into 3–7 linear or lanceolate divisions, the terminal one spatulate: fls. polygamous-dicœcious, yellowish white, in an elongated panicle. Ohio to Ariz. and Brit. Col. in wet or moist lands.—The roots are eaten by Indians.

3896. Garden heliotrope.—Valeriana officinalis. (×⅓)

2. alliariifòlia, Vahl. Perennial, glabrous, erect: rhizome thick and branched: st. tall, sulcate: radical and lower lvs. long-petioled, broadly cordate, coarsely toothed or repand; upper smaller, sessile or subsessile, cordate-triangular: corymb terminal, compound: fls. clustered, pink: fr. glabrous. E. Eu. and W. Asia.

AA. *Rootstock turnip-shaped.*

3. ceratophýlla, HBK. Perennial, glabrous, sparingly leafy, up to about 16 in. high: rootstock turnip-shaped: st. herbaceous, terete, striate: lvs. pinnatisect; segms. trifid-hastate, sessile; divisions linear, acuminate: corymb terminal, dichotomous: fls. snow-white: fr. pubescent. Mex.

AAA. *Rootstock horizontal or ascending, with small fibrous roots.*

B. *St.-lvs. not compound or lobed, but sometimes dentate.*

4. montâna, Linn. Perennial, glabrous or nearly so, about 1 ft. high: rhizome slender, many-branched: lvs. entire or dentate; those of the sterile young shoots and the lowest ovate-rotundate or ovate, subcordate, rather long-petioled; cauline lvs. triangular-oblong, acute or acuminate; uppermost linear-lanceolate: corymb terminal, compound or simple: fls. bright rose, dicœcious. Eu. and Caucasus. L.B.C. 4:317.

BB. *St.-lvs. (at least the lower ones) pinnate or pinnately lobed.*

C. *Fls. dicœcious or polygamous.*

5. alpéstris, Stev. (*V. alpìna*, Adams). Perennial, glabrous, about 6 in. high: rhizome horizontal, short, slightly branched: radical and lower lvs. ovate-oblong, repand-dentate; intermediate lvs. acuminate, subsessile, unequally 2–3-parted or often undivided; uppermost linear, small: corymb terminal, clustered and head-like: fls. pink; ovary glabrous. Caucasus region.

6. dioîca, Linn. Marsh Valerian. Perennial, rather glabrous, about 1–2 ft. high: rhizome slender, stoloniferous, long-creeping: lower lvs. and those of the sterile shoots ovate-subcordate, elliptic or spatulate, entire, rather long-petioled; cauline lower lyrate-pinnate-parted; upper pinnatisect with linear segms. in 3–5 pairs: corymb terminal: fls. dicœcious, pale rose-color, the sterile fls. larger. Moist soil. Eu.

CC. *Fls. hermaphrodite.*

D. *Radical lvs. (at least some of them) pinnatisect or pinnate.*

7. officinàlis, Linn. Common Valerian. Garden Heliotrope. Cat's Valerian. St. George's Herb. Fig. 3896. Perennial, glabrous or more or less pubescent below, 2–5 ft. high: rhizome truncate, sometimes stoloniferous: sts. erect, simple below, somewhat branching above, sulcate: lvs. all pinnatisect; segms. 7–10-paired, usually dentate-serrate, those of the lower lvs. ovate-oblong, of the upper lvs. lanceolate, acuminate: corymb broadly paniculate, long-branched: fls. numerous, whitish, pinkish or lavender, very fragrant. Eu., N. Asia. G.W. 12, p. 472.—Variable. The medicinal valerian is obtained mostly from the roots of this species. Var. **álba,** Hort., is a white-fld. form. Var. **rùbra,** Hort., is a red-fld. form.

8. excélsa, Poir. (*V. sambucifòlia*, Mikan). Perennial, with long runners ending in rosettes: st. channelled, glabrous: lvs. pinnate; lfts. 3–5 pairs, coarse serrate or serrate-dentate, rarely entire, terminal lft. largest: infl. rather crowded: fls. reddish or white, rather larger than *V. officinalis*. Eu. Gn. 67, p. 3.

9. sitchénsis, Bong. Perennial, 1 ft. or less high: rootstock ascending, thick: radical lvs. ovate or oblong, simple or somewhat lobed; cauline lvs. short-petioled, 3–5-foliate, divisions or lfts. orbicular to oblong-ovate or in the upper ones ovate-lanceolate: fls. white, very fragrant, in contracted cymes; corolla funnelform, about ⅜in. long. Rocky Mts. to Alaska. G.F. 9:515.—A very early bloomer.

DD. *Radical lvs. entire or merely dentate.*

10. arizónica, Gray. Perennial, glabrous, 6 in. high: rhizome creeping, rather thick: sts. erect: lvs. succulent, basal ovate, entire or nearly so, 1 in. long, intermediate few, long-petioled, 2–4-lobed; cauline subsessile, 3–5-parted: cyme glomerate-congested: fls. whitish or pinkish; corolla ½in. long, tubular broadened gradually. Ariz. G.C. III. 29:198. G.W. 12, p. 102.

11. Phû, Linn. Perennial, glabrous or pilose, not so tall as *V. officinalis:* rhizome inclined, simple, fusiform: st. stout, tall, simple or slightly and shortly branched: radical lvs. ovate-oblong, long-petioled, entire or at base

incised-lobed; cauline pinnately parted into 3–4 pairs of oblong, acute, entire, decurrent segms.: corymb trichotomous: fls. whitish to somewhat flesh-colored. Caucasus region. Var. **aûrea,** Hort., has young shoots golden yellow.

12. pyrenàica, Linn. Perennial, 2–4 ft. high, pubescent: rhizome large; stolons none: st. erect, sulcate: lvs. glabrous, radical large, long-petioled, cordate, coarsely and unequally toothed; cauline auriculate,

3897. Valerianella olitoria.—Corn salad.

3-cut, segms. dentate, terminal larger and ovate-cordate, lateral 2 (rarely 4 or 0) obliquely elliptic: cyme large, corymbose: fls. pale rose: fr. glabrous, linear-oblong. Pyrenees.

V. álba, Mazz., is Centranthus ruber var. albus.—*V. coccínea,* Hort., is offered (Centranthus?).—*V. coccínea álba,* Hort., is offered in the trade.—*V. Cornucòpiæ,* Linn., is Fedia Cornucopiæ.—*V. macrosíphon,* Vilm., is Centranthus macrosiphon.—*V. rósea,* Hort., is offered in the trade.—*V. rùbra,* Linn., is Centranthus ruber.

F. Tracy Hubbard.†

VALERIANÉLLA (diminutive of Valeriana). *Valerianàceæ.* Annual dichotomously branched herbs, chiefly spring plants, sometimes planted in wild-garden or rock-garden; one is a salad plant.

Leaves, lower, in a radical rosette, entire; cauline entire, dentate or rarely incise-pinnatifid: cymes sometimes corymbosely paniculate fastigiate, sometimes densely globose at the ends of the branches: fls. whitish, pale bluish, or rose; corolla-tube short or rarely elongate, limb 5-cleft, spreading; stamens 3: fr. 3-celled, 2 of which are empty.—About 58 species, Eu., N. Afr., W. Asia, and N. Amer., mostly in the Medit. region.

Corn salad is both a salad plant and a pot-herb, chiefly the former. The name "corn salad" is probably derived from the fact that the plant grows spontaneously in the grain-fields of Europe, large quantities of it being gathered in early spring. It is rather tasteless compared with lettuce, and is little known in America. Abroad it is prized as a fall and winter salad. It is a cool-season crop, grown like lettuce and matures in six to eight weeks. Plants should stand about 6 inches apart in the row. An ounce of seed should give 2,000 to 3,000 plants. The following description of the varieties is derived from Vilmorin's "Vegetable Garden." See Vol. II, p. 851.

olitòria, Moench. Corn Salad. Lamb's Lettuce. Fetticus. Fig. 3897. An "autumnal annual" herb, the seed of which ripens in April or May, soon falls to the ground, and germinates in Aug. The plant makes its growth in the fall and flowers the following spring. In cult. the seed is generally sown in early spring or late summer. The plant forms a dense rosette of spoon-shaped lvs. which grow in a decussate fashion, and has an angular forking st. bearing small bluish white fls. in terminal clusters. Eu., Orient.—The Round-leaved variety has much shorter lvs. than the common type and they are half-erect instead of spreading, and less prominently veined. This kind is the one grown almost exclusively for the Paris market. The Large-seeded variety is more robust than the common type and the seed is nearly twice as large; lvs. marked with numerous secondary veins. Much grown in Holland and Germany. The Etampes variety has very dark-colored lvs., which are often undulate or folded back at the margins; lvs. narrow, prominently veined, thicker and more fleshy than the other kinds and specially suited to cold weather and long-distance shipment. The cabbaging variety differs from the others in forming a heart or head of fine flavor. Unfortunately it is the least productive type, but it bears shipment well if properly grown.

eriocárpa, Desv. Italian Corn Salad. Distinguished from the common species by the lighter color of the lvs., which are slightly hairy and somewhat toothed on the edges toward the base. The plant is native to the south of Eu., where it is highly esteemed because it does not run to seed so quickly in a warm climate. It is undesirable for northern climates.

Wilhelm Miller.

VALLÀRIS (perhaps from the latin *vallo,* to inclose; the plants are said to be used in Java for fences). *Apocynàceæ.* Twining shrubs, suitable only for the warmhouse in the N., but hardy outdoors in the extreme S. where used as an ornamental. Lvs. opposite, minutely dotted: fls. white, in axillary, subaxillary, or superaxillary dichotomous cymes; calyx 5-parted, glandular or not within, segms. narrow; corolla salver-shaped, lobes broad, overlapping to the right; disk various; carpels 2, at first connate, many-ovuled.—About 5 or 6 species, Trop. Asia and Malaya.

Hèynei, Spreng. (*V. dichótoma,* Wall.). Tall climbing shrub; bark pale: lvs. elliptic, oblong or linear-oblong, 1½–4 x ¾–1½ in., glabrous or pubescent, acuminate: cymes pubescent, 3–10-fld., sessile or peduncled, dichotomous: fls. pure white, ⅔in. across, fragrant; sepals ovate-oblong, obtuse; disk ciliate: follicles 6 x 2 in., straight, tapering from a rounded base to a stiff point. Himalaya to Burma and Ceylon. —Intro. into Fla.

VALLISNÈRIA (Antonio Vallisneri, 1661–1730, Italian naturalist). *Hydrocharitàceæ.* Two species of aquatic plants, including the well-known eel-grass or tape-grass. This plant is found in fresh water around the world. It is a submerged plant with linear lvs. ½–6 ft. long, depending on the depth of the water. The lvs. originate in a tuft at the bottom of the water, and the plant spreads by runners sent out from these tufts. Eel-grass is usually found in quiet waters. It has no horticultural rank, except as an aquarium plant. Like many other aquarium plants, it has special interest for students of botany. The pistillate fls. are borne on very long spiral threads and come to the surface, as shown in Fig. 3898. The staminate fls. are borne on very short stalks near the bottom of the water. At the proper time the staminate fls. break away from their stalks and rise to the surface of the water. As they float about, some of the pollen is conveyed to the pistillate fls., and in this haphazard way the blossoms are fertilized and seed is produced

3898. Eel-grass.—Vallisneria spiralis. (Reduced.)

Both kinds of fls. are very small, and they are borne on separate plants. Eel-grass is readily collected, or can be procured from dealers in aquarium supplies or from collectors of native plants. The plant is sometimes called "wild celery," because it is said to impart a celery-like flavor to wild ducks that feed on it.

spirâlis, Linn. Eel-Grass. Tape-Grass. Fig. 3898. Hardy submerged aquatic plant: lvs. thin, linear, 5-nerved, sometimes serrate near the apex: fls. white. Aug., Sept. N. S. to Fla. and westward; Eurasia; Austral. R.B. 20, p. 194. V. 4:157.

Wm. Tricker.
Wilhelm Miller.

VALLÒTA (named for Pierre Vallot, French botanist). *Amaryllidàceæ.* Scarborough Lily. Greenhouse tunicate bulb: scape robust, hollow: fls. large, in many umbels, sessile or shortly pedicelled; perianth funnel-shaped, straight, erect, tube short, throat large, lobes oblong-ovate; stamens affixed at the base of the lobes and shorter than them; ovary 3-celled: caps. oblong-ovate, dehiscent from the base.—One species, S. Afr. It has been proposed that Vallota be considered a subgenus of Cyrtanthus. The latter is a group of about 20 species of plants with fls. of various colors and naked at the throat. Cyrtanthus proper and the subgenus Monella have beautiful pendulous fls. in umbels, but the plants are not so easy to grow as Vallota. It has been suggested that they be crossed with the more robust Vallota in the hope of combining their varied colors and pendulous grace with the strong constitution of the Vallota. Such a process would be similar to the one by which the noble race of Hippeastrum hybrids has been given to the world. Vallota is undoubtedly related to Cyrtanthus through the subgenus Gastronema, which has erect fls. and differs chiefly in the stamens. Of this subgenus *C. sanguineus* is in the trade (p. 945). The best form of Vallota seems to be the variety *magnifica.*

The Scarborough lily is generally rated as a greenhouse bulb, but it can be grown by the amateur who has no glass, provided the plant can be kept over winter in a well-lighted cellar. Many persons have had no success with vallota. Such failures are generally due to the plants being kept too dry during winter. Although Baker says the leaves die down at the Cape in autumn, the plant acts like an evergreen in cultivation. Unlike most bulbous plants, the vallota should never be dried off but kept moderately moist about the roots throughout the year. The vallota is also strongly opposed to interference with its roots. It is possible to preserve a flowering specimen in most luxuriant health for three or four years without repotting, simply by applying liquid manure to the roots occasionally during the summer. The culture of vallota is not difficult when its peculiarities are understood. Several years are needed to work up a good plant to the specimen size. A vallota bulb is about twice as large as a hyacinth. For the first potting use a light soil, with a little sand at the base of the bulb, and place the bulb a distance below the surface equal to its own diameter. Use as small a pot as possible at every stage; shift only when the soil is well filled with roots and be careful to break no roots when shifting to a larger pot. The final potting is an important operation, as the plant is not to be disturbed again for three or four years. Drainage should be ample and perfect. It is essential that the potting soil be of a strong permanent nature and rich in plant-food. A good compost consists of turfy loam, fibrous peat and old cow-manure in equal parts. Add a little sand and charcoal. Avoid repotting until it is strictly necessary, and do so only when it is required to increase the number of plants or when there is danger of the roots breaking the pot. For amateurs the best time to repot the plants is directly after the flowering period. Use the greatest care in handling the roots. Allow the bulbs to project a little beyond the surface. Some gardeners prefer to repot vallota in June or July when root-action has started, but before the flower-stems have pushed up. Vallota likes full sunshine at all times of the year. The plant will stand a few degrees of frost in winter. Beware of over-potting; it is better to have the bulbs crowd one another out of the pot. Amateurs sometimes raise vallotas in the window-garden, one bulb in a 6-inch pot with one or two flower-stalks, but a large specimen is well worth years of care. The Scarborough lily has been cultivated by rich and poor for over a century. Its popular name is supposed to have been derived in same way as the Guernsey lily,—a Dutch bark having been wrecked off the coast of England, some bulbs washed ashore and became established as garden plants. Vallota is considerably grown for the London market, and it is said that some growers succeed in blooming their plants twice the same year, in winter and summer. At the Cape, the species is said to be native to peat-bogs, which fact would account for the special winter treatment which it needs. In California the plant blooms at various times of the year. (Michael Barker.)

purpûrea, Herb. Scarborough Lily. Fig. 3899. Bulb large: lvs. appearing with the fls., strap-shaped, 1½–2 ft. long, dying down in autumn: peduncle hollow, slightly 2-edged, 2–3 ft. long: fls. scarlet. G. 1:36; 3:479; 9:331; 10:77; 37:89. Gn. 30, p. 245; 42, p. 273; 59, p. 44; 68, p. 385; 71, p. 544. G.Z. 15:32. J.H. III. 45:453. R. H. 1870:50 (as *V. grandiflora*). A. F. 9:211. Gng. 2:361. A. G. 14:81.—The typical form has the scapes about 1½ ft. high and blood-red fls. 2½ in. across. Var. **álba,** Hort., is a white-fld. form. G.C. III. 36:150. Var. **màjor,** Hort., is 3 ft. high and has fls. over 3 in. across. B.M. 1430 (as *Amaryllis purpurea*). Var. **mìnor,** Hort., is smaller than the type in all parts. B.R. 552 (as *Amaryllis purpurea* var. *minor*). Var. **exímia,** Bull., has fls. 4 in. across, with whitish, feather-like blotches on the base of the perianth-segms. Var. **magnífica.** Hort., is probably the best and most robust form: fls. 5 in. across, with a white eye. Colors said to be brighter and more uniform than in any other kind. Gn. 30:244. G.C. III. 3:240.—*V. purpurea* is a S. African representative of the American genus Hippeastrum, popularly known as "amaryllis." It is a bulbous plant with large red funnel-shaped 6-lobed fls., blooming in Sept. and later. A pair of well-grown specimens in large pots or tubs make a showy ornament for the porch. Plants have been grown with over 50 fl.-trusses, each truss bearing an umbel of 4–9 fls., the individual fls. being 3–4 in. or more across. Vallota is a monotypic genus and is distinguished from Hippeastrum by the seeds being winged at the base. The tube of the fl. is longer than in the typical Hippeastrums and at the base of each perianth-segm. is a cushion-shaped callus somewhat different from the minute scales or distinct neck that is often found at the

3899. Scarborough lily.—Vallota purpurea. (From a specimen 2 feet high.)

throat of a Hippeastrum. The plant deserves to be better known among amateurs and cottagers.

hýbrida, Hort. Bull., is a hybrid between *Vallota purpurea* and *Cyrtanthus sanguineus*, which is intermediate in character between the two parents, both in foliage and fls., the latter being borne in umbels and a uniform bright orange-vermilion in color.

WILHELM MILLER.
F. TRACY HUBBARD.†

VANCOUVÈRIA (after Capt. George Vancouver, commander of the Discovery in the voyage to the northwest coast in 1791–1795). *Berberidàceæ*. Low hardy perennial herbs, grown in the garden border.

Rhizome creeping: lvs. pinnate, 2–3-ternately compound: scape leafless, racemose or somewhat paniculate at the summit: sepals 6, in 2 rows, obovate, petal-like, reflexed; petals 6, ligulate; stamens 6: fr. a follicle, dehiscent by a dorsal suture.—Three species, natives of the Pacific coast of N. Amer. The lvs. are somewhat like maidenhair or rue, and the fls. are rather small and white or yellow. Vancouverias demand a rich soil in rather shady positions. They are not showy plants, but have foliage of an elegant and refined type.

hexándra, Morr. & Decne. About 1 ft. high: rootstock woody, slender: lfts. roundish, mostly angulately 3-lobed and cordate: scape naked or 1-lvd.: panicle simple or loose-branched: fls. white or cream-colored. May, June. Coniferous woods, Brit. Col. to N. Calif. near the coast. Gn. 30, p. 263.

chrysántha, Greene (*V. hexándra* var. *aùrea*, Rattan). About 1 ft. high: lfts. evergreen, rather 3-lobed, usually whitened and pubescent beneath: infl. subracemose: fls. somewhat larger than in *V. hexandra*. Ore.

parviflòra, Greene. INSIDE-OUT FLOWER. From 8–20 in. high: lvs. glabrous or with rusty hairs, persisting through winter; lfts. thickish, roundish in outline, broadly cordate at base, obscurely or evidently 3-lobed with a notch at summit of each lobe: panicle bearing 25–55 white or lavender-tinged fls. Coniferous woods, Calif.

F. TRACY HUBBARD.†

VÁNDA (native name in India). *Orchidàceæ*. One of the most attractive groups of East Indian orchids, nearly all species having large handsome flowers.

Dwarf and short-stemmed or tall and branched, sometimes climbing to a considerable height; erect species forming compact plants, with sts. and branches well clothed with 2 opposite rows of lvs.; species like *V. teres* with a loose straggling habit: lvs. flat or channeled and keeled or terete, sometimes fleshy and deeply channeled; apex pointed, lobed or toothed: fls. in racemes from the axils of the lvs.; sepals and petals similar, spreading, narrowed at the base almost to a claw; labellum firmly united to the column, spurred, lateral lobes small, erect, middle lobe spreading; pollinia on a common stipe.—About 25 species, natives of India and the Malay Isls., with outlying species in China and New Guinea.

Notwithstanding the various conditions surrounding the different species of vanda in their natural habitats, the plants may nearly all be cultivated successfully under the same general treatment. When a general collection is grown, a house of east and west exposure will be found best suited to the wants of vandas. The plants require plenty of light and do not need any shade from November until the middle of February. A house of east and west aspect will require less shading during late fall and early spring than one of southern exposure, and there will be fewer ill effects from direct solar heat at all times. From February until November shading will be necessary, but it should never be too heavy or black-spot is likely to appear. The winter temperature should range from 60° to 65° F. by night and 70° to 75° by day, with a gradual increase of 10° during the summer months. A few degrees more with solar heat and ventilation will do no harm. The atmosphere must be kept moist by damping the benches and paths freely once or twice a day, and ventilation should be given whenever possible, in greater or less degree according to outside conditions. Especially during wet cheerless weather is ventilation important, even if fire heat has to be applied to retain the desired temperature. Vandas may be grown well in either pots or baskets, but the latter are preferable, as they admit air more freely to the roots, whereby they are not so liable to decay from overwatering during severe weather. The best potting or basketing material consists of chopped live sphagnum moss freely interspersed with large pieces of charcoal. This material should be pressed in rather firmly about the roots, leaving a convex surface when finished. A plentiful supply of water is essential at all seasons with copious syringing over the foliage in bright weather. The compost should never be allowed to remain dry for a long time. *V. tricolor* and similar species grow very well among foliage plants in the warmhouse, where their large aërial roots, which are freely emitted from the sides of the stems, may ramble among the foliage and thereby retain moisture a long time after syringing. A few species, such as *V. Amesiana, V. cærulea*, and *V. Kimballiana*, with one or two other alpine species, require about 10° cooler temperature, but otherwise similar treatment to other species of the genus. Stock is increased by removing a foot or more of the leading growth with a sharp knife, allowing several roots to remain attached to each growth and basketing them in the usual manner. These new pieces should be frequently syringed overhead until they become established or they are likely to shrivel. The old stems will nearly always send out several new growths. The principal insect enemies of vandas are several species of scale, which breed fast in a dry atmosphere. They can be kept in check by syringing with strong tobacco-water and by sponging the plants with a 20 per cent solution of alcohol. (Robt. M. Grey.)

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KEY TO THE SPECIES.

A. *Labellum spurred.*
B. *Lvs. flat, or channeled and keeled, toothed or lobed at the apex.*
C. *Racemes loose: labellum with lateral lobes.*
D. *Fls. 1–1½ in. across.*
E. *Color blue* ..... 1. **cærulescens**
EE. *Color yellow* ..... 2. **parviflora**
3. **spathulata**
EEE. *Color white or pale yellow, but streaked and shaded with brown* ..... 4. **lamellata**
5. **Boxallii**
DD. *Fls. 2 in. or more across (sometimes less in Nos. 8 and 11).*
E. *Color blue* ..... 6. **cærulea**
EE. *Color white* ..... 7. **Denisoniana**
EEE. *Color white or yellowish, but spotted with purple or brown.*
F. *Middle lobe of the labellum dilated, reniform* ..... 8. **Bensonii**
9. **insignis**

FF. *Middle lobe slightly dilated, truncate or emarginate.*
G. *Apex emarginate or 2-lobed*.....10. **tricolor**
11. **Roxburghii**
GG. *Apex truncate and obscurely mucronate*....12. **limbata**
FFF. *Middle lobe shorter than the sepals; flabelliform*...13. **Parishii**
CC. *Raceme dense, cylindrical: labellum without lateral lobes*.....14. **densiflora**
BB. *Lvs. semi-terete and deeply channeled, pointed*.....15. **Amesiana**
16. **Kimballiana**
BBB. *Lvs. terete*.....17. **teres**
18. **Hookeriana**
AA. *Labellum not spurred*.....19. **Cathcartii**
20. **Sanderiana**

1. **cæruléscens,** Griff. St. 1–2 ft. high: lvs. 5–7 in. long, deeply channeled, truncate and 2-lobed at the apex: racemes many, slender and pendulous, each bearing about 12 fls.: fls. 1 in. across; sepals and petals obovate, subacute, undulate or twisted, pale lilac-blue; labellum shorter than the sepals, middle lobe cuneate-obovate, with a delicate 2-lobed tip, violet with fleshy dark blue ridges, side lobes small, dark blue. Spring. Burma. B.M. 5834. F.M. 1877:256. G.C. 1870:529. C.O. 13.—Color varies from blue to nearly white. Var. **Bóxallii,** Reichb. f. Fls. pale violet or nearly white; disk of the labellum deep violet with white lines on the sides. B.M. 6328. C.O. 13*a*. Var. **Hennisiàna,** Schlecht. Fls. similar in color to *V. cærulea,* with dark blue lip, and slender spur about ½in. long. Var. **Regnièri,** André. Fls. deeper colored. R.H. 1900:634.

2. **parviflòra,** Lindl. St. 4–6 in. high: lvs. strap-shaped, 4–8 in. long, unequally obtusely 2-lobed: racemes erect, many-fld.: fls. small, yellow; sepals and petals obovate-spatulate; labellum shorter than the sepals, middle lobe obovate, dilated, truncate and 2-lobed at the apex, yellow below, white above, spotted and dashed with purple and having thick fleshy ridges. Himalayas. B.M. 5138 (as *Aërides Wightianum*).

3. **spathulàta,** Spreng. St. 2 ft. high: lvs. 2–4 in. long, obtusely 2-lobed: peduncle robust, 12–18 in. tall, few-fld.: fls. 1¼ in. across, golden yellow; sepals and petals oblong-spatulate, flat; labellum as long as the sepals, clawed, side lobes very small, broadly obovate, middle lobe suborbicular, obscurely 3-fid. Ceylon, India.

4. **lamellàta,** Lindl. Lvs. channeled, leathery, obliquely and acutely bifid at the apex: fls. pale yellow, stained with red; sepals and petals obovate, obtuse, undulate, the lower sepal larger and somewhat incurved; middle lobe of the labellum obcuneate, retuse, auriculate, having a pair of red elevated plates and 2 red tubercles just below the apex. Aug.–Nov. Philippines.

3900. Vanda cærulea. (×⅓)

5. **Bóxallii,** Reichb. f. (*V. lamellàta* var. *Bóxallii,* Reichb. f.). St. tall, with long recurved lvs.: raceme longer than the lvs., bearing 14–20 fls.: sepals white, with the lower margins of the lateral pair sepia-brown; petals white, with violet streaks which are also found on the sepals, pandurate with large lamellæ and square auricles, mostly lilac. Nov., Dec. Philippines. G.C. II. 15:87. Gn. 19:574. C.O. 9.

6. **cærùlea,** Griff. Fig. 3900. St. 1–2 ft. high: lvs. rigid, linear, 6–10 in. long, obliquely truncate and toothed at the tip: raceme 1–2 ft. long: fls. 3–4 in. across, pale blue; lateral sepal obovate; petals broadly obovate, clawed; labellum less than one-third the length of the sepals, dark blue, linear-oblong, side lobes small, rounded, middle lobe with 2 thickened ridges. Late autumn. India. F.S. 6:609. I.H. 7:246. Gn. 21:254; 31, p. 566; 47, p. 145; 50, pp. 59, 418; 52, p. 410. R.B. 17:265. G.C. III. 3:41; 7:17; 11:272; 44:374; 45:264. Gng. 3:135; 15:132. G.F. 3:77. A.F. 6:685; 25:1092; 27:1136. Gn.W. 11:377. J.F. 1:102. C.O. 5. G. 18:66. F.R. 1:371. R.H. 1881:290 (as var. *grandiflora*).—This is considered to be one of the best species in cult. The fls. are often tessellated. Var. **álbens,** Hort. Sepals and petals pure white, with slight tinge of reddish purple at tips. Var. **albídula,** Hort. Fls. white with blue veining on lip. Var. **blenheiménsis,** Hort. Fls. closely veined with pure blue on white ground. Var. **Chárlesworthíi,** Hort. Fls. entirely pure white except a little yellow on base of lip. G.M. 51:831. O.R. 1908:361. Var. **Peetersiàna,** Cogn. Sepals and petals very pale rose-lilac, lip rose. C.O. 5*a*. Var. **Rógersii,** Hort. "A distinct, nearly white variety, with fls. of moderate size and an unusually long spur." Var. **Sánderæ,** Hort. Tips and margins of sepals tinged with magenta-pink, the petals flushed with same color; lip deep magenta. G.C. III. 48:415. Var. **Wríglei,** Hort. Fls. smaller than type; sepals and petals pure white; lip rose-pink.

7. **Denisoniàna,** Benson & Reichb. f. St. short: lvs. linear, 6–10 in. long, recurved, deeply notched at the apex: peduncles short, stout, bearing 4–6-fld. racemes: fls. white, 2 in. across; sepals and petals waved and twisted, the lateral sepals broadly obovate, falcate; petals clawed, spatulate; labellum longer than the sepals; side lobes large, subquadrate; middle lobe panduriform, with 2 orbicular, diverging, terminal lobes. Summer. Burma. B.M. 5811. I.H. 19:105. F. 1869, p. 250. G.C. II. 24:105. A.F. 6:607. C.O. 8.

8. **Bénsonii,** Batem. St. about 1 ft. high, very leafy: lvs. linear, leathery, 6–8 in. long, obliquely toothed at the apex: fls. 2 in. across, 10–15 in a raceme, 1–1½ ft. long; sepals and petals obovate, obtuse, clawed, white outside, yellowish green with numerous brown dots inside; labellum violet, with white spur and side lobes, middle lobe terminating in a reniform, bifid apex. Summer. Burma. B.M. 5611. F.S. 22: 2329. G.C. 1867:180. C.O. 2.

9. **insígnis,** Blume. St. erect: lvs. linear, 10 in. long, apex with 2 or 3 teeth: raceme rather short, 6–10-fld.: fls. 2–2½ in. across; sepals and petals obovate, fleshy, the petals narrower, ochraceous brown, with darker brown blotches inside, almost white on the outside; labellum pandurate, the apical lobe being broadly reniform, concave, white tinted with rose. Summer. Malaya. B.M. 5759. Gn. 25:168. C.O. 3. Var. **Schroederiàna,** Hort., has yellow fls. with a white labellum, and 2 orange spots in front of spur. Gn. 25:168.

10. trícolor, Lindl. St. branched, tall, erect and leafy: lvs. strap-shaped, 10–12 in. long, channeled: raceme drooping, longer than the lvs.: fls. 2–3 in. across; sepals obovate, attenuated at the base, yellow with numerous brownish crimson spots; petals similar to the sepals in form and color but narrower; labellum about as long as the sepals, lateral lobes small, rounded; middle lobe lyrate, notched, purple, with elevated lines. F.S. 6:641. I.H. 42, p. 161. B.M. 4432. J.F. 2:136. C.O. 6. Var. **suàvis,** Hort. (*V. suàvis,* Lindl.). Fig. 3901. Ground-color of the fls. white; sepals and petals spotted with purple; labellum deep purple. Fls. irregular from March to May. Java. B.M. 5174. F.S. 5, p. 510; 6:641. Gn. 3, p. 103; 23, p. 134 (as *V. tricolor*); 31, p. 242; 47:272. I.H. 42, p. 162. G.C. II. 22:237 (var.); III. 7:133 and 135. C.O. 4. Var. **Veìtchii,** Hort. Fls. with rather large spots of deep rose; labellum deep rose. R.B. 20:145. Var. **Pátersonii,** Hort. Sepals and petals creamy white, heavily spotted with brown; labellum magenta-crimson. Gn. 23:134. Var. **Córningii,** Hort. Sepals and petals bright yellow, spotted with deep crimson and bordered with rose-purple on both sides; labellum deep violet. Var. **tenebrósa,** Hort. Sepals and petals yellow marked with dark red-brown; labellum rose-crimson. J.H. III. 47:3. Vars. **Robinsoniàna, grándis, spléndens,** and **supérba,** Hort., are also advertised.

3901. Vanda tricolor var. suavis.

11. Róxburghii, R. Br. (*V. tessellàta,* Hook.). St. 1–2 ft., climbing: lvs. narrow, complicate, 6–8 in. long, 2–3-toothed at the apex: racemes erect, 6–8-fld.: fls. greenish yellow, tessellated with olive-brown inside, white outside; sepals and petals subequal, clawed, obovate, waved; labellum nearly as long as the sepals, lateral lobes small, acute, middle lobe panduriform, violet, truncate. May–Aug. Bengal. B.R. 506. B.M. 2245. F.S. 2:75; 6, p. 330. I.H. 32:579 (var. *rubra*). P.M. 7:265. Var. **cærùlea,** Hort., is advertised.

12. limbàta, Blume. St. about 3 ft. high: lvs. linear, keeled, 6–8 in. long, unequally bifid at the apex: racemes 10–12-fld., 6–8 in. long on peduncles of equal length: fls. 2 in. across; sepals and petals spatulate, bright cinnamon, tessellated, bordered with golden yellow, white suffused with lilac outside; middle lobe of the labellum oblong-pandurate, truncate, mucronate, pale lilac. June, July. Java. B.M. 6173.

13. Párishii, Reichb. f. St. very short: lvs. few, 8–10 in. long, 2–3 in. wide, obtusely 2-lobed: raceme drooping, 6–8-fld., on a short peduncle: fls. 2 in. across, fleshy, greenish yellow, freely spotted with reddish brown; sepals broadly ovate-oblong; petals orbicular; labellum half as long as the sepals, white striped with orange at the base; lateral lobes rounded, middle lobes flabelliform. Summer. Moulmein, India. C.O. 11. Var. **Mariottiàna,** Reichb. f. Sepals pale mauve with numerous darker blotches outside, petals mauve; both sepals and petals are mauve inside; labellum white at base, with yellow spots and mauve lines. C.O. 11*a*.

14. densiflòra, Lindl. (*Saccolàbium gigantèum,* Lindl.). St. short, thick: lvs. very thick, 6–12 in. long, notched: raceme dense, cylindrical, about as long as the lvs., nodding: sepals white, cuneate-ovate, subacute; petals narrower, with few purple spots at the base; labellum cuneate, obtusely 3-lobed, with 2 pubescent ridges at the base, terminal lobes bright shining purple. Winter. Burma. B.M. 5635. F.S. 17:1765. C.L.A. 6:164. Var. **illústris,** Reichb. f. Raceme and fls. larger: sepals and petals spotted with purple; labellum bright purple. I.H. 31:517.

15. Amesiàna, Reichb. f. St. very short and stout: lvs. fleshy, rigid, almost terete, with a groove down the center, 6–12 in. long: raceme simple or branched, erect, 1–2 ft. long and bearing 20–80 fls.: fl. 1½ in. across, white, with rose-colored ridges on the labellum, sepals and petals ovate-oblong, obtuse; labellum with a broadly cuneate, undulate middle lobe, having 5 ridges converging into a reflexed callus, side lobes small, rounded. Flowers at various seasons. India. B.M. 7139. J.H. III. 29:491; 33:271; 48:315. G. 32:183. C.O. 1. A.F. 6:441. Var. **álbens,** Hort. Fls. almost entirely white.

16. Kimballiàna, Reichb. f. Fig. 3902. St. 6 in. high, probably climbing to a great height: lvs. 6–10 in. long, terete, with a deep, narrow furrow: peduncle slender,

3902. Vanda Kimballiana. (×½)

6–10 in. long, bearing a drooping raceme 8–10 in. long: fls. 2–3 in. across; petals and dorsal sepal obovate-spatulate, lateral sepals very much larger, oblong, falcate, all pure white; labellum smaller than the lateral sepals, middle lobe orbicular, notched, rose-purple with darker veins, margin erosely toothed, lateral lobes small, yellow; spur 1 in. long, curved. Autumn. Burma. B.M. 7112. Gn. 37:322. R.H. 1897:352. Gt. 45:1428 and p. 338. J.H. III. 20, p. 41; 29, p. 53. G.C. III. 6:335; 17:69; 31:384. G. 29:669. C.O. 7. A.G. 12:89. Var. **álba,** Hort. Fls. white with yellow base to lip.

17. **tères,** Lindl. Fig. 3903. St. long, climbing: lvs. terete, 6–8 in. long: peduncle 6–12 in. long, bearing a 3–6-fld. raceme: fls. 4 in. across; sepals nearly orbicular, white tinged with rose; petals a little larger, deep rose; side lobes of the labellum broad, incurved, yellow spotted with crimson, middle lobe exceeding the sepals, fan-shaped, reniform, purple or rose-colored. May–Sept. Burma. B.M. 4114. B.R. 1809. P.M. 5:193. R.H. 1856:421. Gt. 43:1404. G.C. II. 20:273; III.

3903. Vanda teres. (Detached flower ×⅓).

27:307. G.M. 43:298. C.O. 10. S.H. 2:385. Gn. 42:276.—A plant of straggling habit, but with very beautiful fls. Var. **Andersonii,** Hort., has fls. larger and more highly colored. Var. **álba,** Hort. Fls. white. G. 36:373.

18. **Hookeriàna,** Reichb. f. St. and lvs. terete, as in *V. teres*, but the latter only 2–3 in. long, and slender: fls. 3–5 in. across; dorsal sepal and petals white, dotted with purple; lateral sepals narrower, oblong or somewhat obovate, white; labellum as large as the rest of the fl., side lobes incurved, white and purple, middle lobe fan-shaped, with 3 large lobes, white spotted purple. Sept. Borneo. I.H. 30:484. Gn. 23:10. G.M. 40:645. Gn.W. 8:53.—In cult. racemes usually 2-fld.

19. **Cáthcartii,** Lindl. St. 1–2 ft.: lvs. linear-oblong, 6–8 in. long, unequally bifid at the tips: racemes longer than the lvs., 3–6-fld.: fls. 2½ in. across, orbicular in outline; sepals and petals nearly equal, orbicular-oblong, concave, pale straw-colored, transversely streaked with numerous narrow red-brown lines; labellum shorter than the sepals; lateral lobes quadrate, incurved, white with red streaks; middle lobe reniform, margin white, slightly crenate, center thick, yellow with a crenate border. Spring. Himalaya. B.M. 5845. F.S. 12:1251. G.C. 1870:1409. Gn. 19, p. 351; 33, p. 224; 42, p. 276. R.H. 1900:452.—Found near waterfalls, where it is always kept damp.

20. **Sanderiàna,** Reichb. f. St. very leafy: lvs. rigid, fleshy, recurved, 1 ft. long, strap-shaped, truncate, with 2–3 teeth at the apex: raceme bearing about 12 fls. each 5 in. across, with the broad sepals and petals overlapping: sepals orbicular, the dorsal one smaller, pale lilac, dotted at the base, the lower pair tawny yellow veined and tessellated with brownish crimson; petals smaller, rhomboid obovate, colored like the dorsal sepals; lateral lobes of the labellum forming a cup-like base, middle lobe subquadrate, reniform, much smaller than the sepals, dull crimson. Sept. Philippines. B.M. 6983. I.H. 31:532. R.H. 1885:372. Gn. 25:104; 32, p. 399; 49, p. 88; 50, p. 480. J.H. III. 35:535; 57:149; 63:505; 69:199. F.E. 23:454. O. 1909:105. C.O. 12. G.C. II. 20:440. Gng. 6:115.—A very remarkable free-flowering species. Var. **Froebeliàna,** Cogn. Fls. very large, nearly circular in outline, richly colored. Var. **ròseo-álba,** Hort. Upper sepal and petals nearly white with purple spots; lower petals greenish with purple veining.

V. Bàtemannii, Lindl.=Vandopsis lissochiloides.—*V. cathàrtica*, Hort., is presumably an error for V. Cathcartii.—*V. confùsa* is a new name proposed for V. cærulescens var. Boxallii.—*V. cristàta*, Lindl. Sts. erect: sepals and petals yellow-green, the petals incurved; lip buff, striped with rich purple. B.M. 4304. B.R. 28:48.—*V. Dalleàna*=V. lamellata × V. Boxallii.—*V. Flòreyæ*. A natural hybrid. Resembles V. cærulea in habit, but fls. smaller, white with violet lip.—*V. gigantèa*, Lindl.=Vandopsis gigantea.—*V. Lòwei*, Lindl.=Renanthera Lowei.—*V. Marònæ*=V. teres × V. tricolor var. suavis.—*V. Nièmannii*.—*V. præmórsa*.—*V. pùmila*, Hook. f. Lvs. 4–8 in. long: racemes 3-fld.: fls. fragrant, ivory-white, 2–2½ in. across, the lip crimson-striped; sepals and petals oblong-spatulate. Sikkim. B.M. 7968.—*V. stricta*, Reichb. f.=V. cristata.—*V. Wàtsonii*, Rolfe. About 1 ft. tall: lvs. subterete, acute, up to 14 in. long, dark green spotted with brown on sheath: scape brown-spotted, 10–12-fld.: fls. white, the crest and interior of sac yellow spotted brown; sepals and petals obovate-spatulate; lip 3-lobed, the front lobe oval, fimbriate. Annam. B.M. 8109. G.C. III. 37:123; 43:131, 132.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

VANDÓPSIS (like *Vanda*). *Orchidàceæ*. Includes two or three species of orchids which formerly have been united with Vanda or with Stauropsis. They are distinguished from allied genera by the labellum, which is firmly united with the column, not spurred, concave at the base, with the terminal lobe compressed laterally. In appearance these plants resemble robust vandas, with which they are usually classed for horticultural purposes. Treatment the same as for vanda.

lissochiloìdes, Pfitz. (*Vánda Bàtemannii*, Lindl.). Fig. 3904. St. 1–5 ft. high: lvs. strap-shaped, obliquely emarginate, 2 ft. long: raceme tall, erect, bearing 12 and more fls.: sepals and petals obovate, yellow, spotted with brownish crimson, purple outside; labellum crimson-purple or yellowish. July–Sept. Philippines. B.R. 32:59. F.S. 18:1921.—By some authorities retained in Stauropsis, and so described on p. 3233.

gigantèa, Pfitz. (*Vánda gigantèa*, Lindl.). St. pendulous: lvs. 1–2 ft. long, thick, flat, obtusely notched: raceme 10–15 in. long, decurved, many-fld.: fls. 3 in. across, golden yellow, blotched with cinnamon; sepals and petals spatulate-obovate; labellum white. Burma. B.M. 5189. I.H. 8:277. R.H. 1874: 290.

HEINRICH HASSELBRING.

VANGUÈRIA (the Madagascan name of *V. madagascariensis* is *Voa-Vanguer*). *Rubiàceæ*. Shrubs or trees, sometimes spiny or somewhat climbing in habit, adapted to the warmhouse and may be hardy in the extreme southern United States.

Leaves opposite or rarely pseudo-verticillate in 4's, oval: fls. small, white or greenish, in axillary clusters; calyx 5- or 4-lobed, lobes deciduous or rarely persistent; corolla hairy or not outside, usually furnished inside with a ring of deflexed pilose hairs; lobes spreading or reflexed; stamens 5, rarely 4; disk fleshy or depressed; ovary 5–3-celled; ovules solitary: fr. drupaceous;

pyrenes 5–3 in number or putamen 5–3-celled.—About 70 species, tropical and subtropical regions of the world, Austral. excepted. Considered a section of Epimedium by Prantl, in Engler & Prantl, Pflanzenreich III. 2.

The voa vanga of Madagascar is a tropical fruit that has been recommended by the American Pomological

3904. Vandopsis lissochiloides.

Society as worthy of cultivation in southern Florida. The fruit is imperfectly described in horticultural writings. It is said to be a delicious berry ¾ inch thick, but in Mauritius it becomes 1½ inches thick. It is a globose drupe, shaped something like an apple and contains five large "stones" or bony pyrenes. The plant is a shrub 10 to 15 feet high. The species is widely spread in the tropics of the Old World. It was introduced to American horticulture by A. I. Bidwell, of Orlando, Florida. In 1887, the late H. E. Van Deman reported that the shrub grew exceedingly well, sprouting readily from the roots when frozen down. It grows readily from imported seeds.

madagascariénsis, J. F. Gmel. Glabrous shrub, 10–15 ft. high: lvs. very large, oblong, obtuse or acute, membranous, short-petioled: fls. in copious, peduncled, axillary dichotomous cymes; corolla funnel-shaped, ¼in. long, with 5 spreading deltoid teeth. Madagascar.

infaùsta, Burch. Shrub, 4–10 ft. high, tawny-tomentose, unarmed, sometimes a small tree: lvs. ovate, oval, or suborbicular, horizontal, usually rounded or obtuse at base, greenish above, rather paler beneath: fls. greenish, 5-merous, ¼in. long; calyx-lobes ovate or oval; corolla-tube cylindrical, glabrous, lobes ovate; ovary 5–3-celled: fr. globose, smooth, glabrous. Trop. Afr. B.M. 3014 (as *V. velutina*).—Fr. said by some to be edible. Intro. into S. Calif. F. Tracy Hubbard.†

VANHOÙTTEA (named for Louis Van Houtte, a Belgian nurseryman). Syn., *Hoùttea. Gesneriàceæ.* Low branching appressed-hairy shrubs, probably adapted only to warmhouse culture: lvs. opposite, fleshy, crowded at the ends of the branches, lower surface more or less canescent-felty: fls. solitary, axillary, long-pedicelled, red or speckled; calyx-tube adnate to the ovary, 5-ribbed, lobes elongated, acute; corolla-tube elongated-cylindrical, lobes 5, rounded, spreading disk broad with 5 glands, the 2 posterior usually grown together; ovary almost entirely inferior: caps. with a twisted beak. About 5 species, Brazil. *V. calcaràta,* Lem. (*Hoùttea pardìna,* Decne. *Gesnèra pardìna,* Hook.). St. about 1½ ft. high, erect, rather stout, terete, brown, branched: lvs. rather stoutly petioled, elliptical, acute, rather thick and fleshy, strongly serrated, downy above and more so beneath: peduncle axillary, solitary, 1-fld., shorter than the lvs.: calyx-tube turbinate, adherent with the lower part of the ovary, segms. large, acute, spreading; corolla 1½ in. or more long, ochre-red, yellow within, spotted with deep red, especially the limb and tube inside; ovary semi-inferior, hairy, with 5 yellow glands. Brazil. B.M. 4348. H.U. 6, p. 289. Cult. probably as for achimenes and similar plants. F. Tracy Hubbard.

VANÍLLA (Spanish, *little sheath* or *pod*). *Orchidàceæ.* Vanilla. Climbing orchids whose branched stems ascend to a height of many feet, ornamental but known mostly as the source of vanilla used for flavoring and which is produced from the seed-pods.

Nodes bearing lvs. or scales and aërial roots in alternate arrangement: fls. in axillary racemes or spikes, without an involucre at the top of the ovary; sepals and petals similar, spreading; labellum united with the column, the limb enveloping the upper portion of the latter; column not winged.—About 20 species in the tropics. The genus was monographed in 1896 by R. A. Rolfe in Journ. Linn. Soc., vol. 32.

The most important species is *V. planifolia,* the vanilla of commerce. It is a native of Mexico, but is now widely cultivated in the West Indies, Java, Bourbon, Mauritius, and other islands of the tropics, its chief requirement being a hot damp climate. The plants are propagated by cuttings varying in length from 2 to about 12 feet, the longer ones being the more satisfactory. These are either planted in the ground or merely tied to a tree so that they are not in direct connection with the earth. They soon send out aërial roots, by which connection with the soil is established. They are usually trained on trees so that the stems are supported by the forked branches, but posts and trellises are also used as supports. In most places where vanilla-culture is practised, pollinating insects are lacking and the flowers must be pollinated by hand. Plants bear their first fruit about three years after setting. They then continue to fruit for thirty or forty years, bearing up to fifty pods annually. The vanilla pods are picked before they are ripe, and dried. The

3905. Vanilla planifolia. Cluster of flowers about 4 inches across. (The pod ×⅓).

vanillin crystallizes on the outside. For a full description of vanilla culture and methods of curing the pods, see Bulletin No. 21, United States Department of Agriculture, Division of Botany, by S. J. Galbraith. Vanillin is also made from other sources by chemical means.

planifòlia, Andr. (*V. aromática,* Willd., in part). COMMON VANILLA. VANILLA BEAN (from the pods). Fig. 3905. Tall climbing herbs with stout sts.: lvs. thick, oblong-lanceolate, acuminate, with short, stout petioles: fls. yellow, large, in axillary racemes of 20 or more blossoms; sepals and petals oblanceolate; labellum trumpet-shaped, with small, reflexed, crenulate lobes. Winter. A native of Mex., but widely cult. throughout the tropics and in greenhouses. B.M. 7167. L.B.C. 8:733. G.C. III. 25:213. Gn. 57, p. 35. O. 4:8.—Partially epiphytic.

aromática, Sw. St. angular: lvs. broadly ovate, with a bluntish point, contracted at the base: fls. greenish and white. Jamaica, Colombia, Trinidad.

V. Éggersii, Rolfe. Sts. thick: lvs. abortive, oblong-lanceolate: sepals and petals greenish; lip white or lilac. W. Indies.—*V. grandifòlia,* Lindl. Lvs. 7 in. long, 5 in. broad, narrowed at base into more or less elongated petiole: fls. very large. W. Trop. Afr.—*V. Húmblotii,* Reichb. f. Fls. bright yellow, about 5 in. across, with brown markings on lip and rosy hairs in throat. Madagascar. B.M. 7996.—*V. Lùjæ,* Walden. Lvs. resembling V. planifolia: fls. very large. Congo.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

VARIATION: See *Breeding,* page 547.

VARIEGATION. This term is usually applied to a class of variations, especially in leaf-coloration, in which the leaves become striped, banded, spotted, and blotched with yellow, white, red, and various other colors in connection with the normal green of other portions of the leaves. In the case of yellow-and-white variegation, the term albinism is sometimes used, especially when the plants are largely marked with white or yellow, as in *Abutilon Sellovianum, Pelargonium zonale,* and variegated forms of *Evonymus japonica, Hydrangea hortensis, Hedera helix, Polyscias Guilfoylei* var. *Victoriæ,* and others.

Among the dracenas, caladiums, and codieums, besides the white variegation, there are developed beautiful reds, pinks, yellows, and so on. As a rule, the term variegation is not used in cases of color-variation in which only the surface of the leaf is involved, as in many of the begonias, sansevierias (*S. thyrsiflora* and *S. zeylanica*), *Alocasia cuprea, Cissus discolor,* and others. In many such plants the markings are due in part to hairs, scales, or air in the cuticle or epidermal cells, as in sansevieria and begonia. In some begonias, many varieties of calathea (as *C. ornata* var. *albo-lineata*), the epidermal cells develop decided and definite color-variation, though the changes do not usually involve the mesophyl or inner cells of the leaf. In some genera, however, especially calathea, all gradations are found between purely epidermal variegation and changes involving the deeper layers of the leaf, as in *C. Veitchii* and *C. Makoyana.* The same is true of many other genera. Different kinds of variegation are shown in Figs. 3906, 3907.

3906. Variegation in abutilon.

True variegations may be distinguished from ordinary colorations, bleaching, chlorosis, and the like, by the fact that the colored areas are usually quite sharply defined. They do not gradually blend into each other, but have definite boundaries. Cells in the variegated areas are found, as a rule, to contain the same chlorophyl bodies (chromatophores) as the ordinary green cells of the plant. However, in the variegated parts, the green color is not developed, and the chromatophores are often smaller or are somewhat swollen and vacuolate. In the case of chlorosis due to the lack of iron, or yellowing due to the lack of light, a leaf will quickly develop its normal color if given the proper conditions. This is not the case, however, in variegated leaves. While the intensity of whatever color the chromatophores may have can be varied by light and food, a variegated cell can never be changed by these means to a normal cell.

The chlorophyl granules (chromatophores) appear to have lost entirely, in many cases, the power to make starch and sugar from the carbonic acid gas in the air, and in other cases this power is very greatly reduced. In practically all cases, however, when the chromatophores are not destroyed, they retain the power to convert sugar into starch and they thus store up starch in their tissues from the sugar manufactured by the healthy cells of the leaf.

White or albino variegation is of course due to a lack of any coloring in the chromatophores, and sometimes to the entire absence of these bodies. The cells seem to have lost completely the power of making chlorophyl. These albicant variegations are to be looked upon as the more extreme forms of variegation, and usually arise through a feeble or atrophied condition of the plant. Seedlings raised from parents both of which are variegated in this way are usually very weak. High feeding and favorable conditions of growth, while they will not cause a variegated plant to return to its normal condition, will often stimulate the development of a normal green shoot that takes most of the nourishment and thus causes the starvation and disappearance of the albicant parts. In other cases, as in codieums, modified chlorophyl is made. Large yellowish oil-like drops occur in the substance of the chromatophores, and the various changes that these undergo, as the leaf becomes older, produce the remarkable and beautiful colorations of this group of plants. The coloration here, as in dracenas and caladiums, is intensified by strong light and nourishing food. The more of the modified chlorophyl there is produced and the more rapid the changes in the modified chlorophyl brought about through the action of light and the acids and oxidizing ferments of the leaves, the more highly developed will be the colors, though here again high feeding is likely to cause the plant to revert to its normal condition.

Variegated plants or parts of plants are usually of slower growth and smaller than green plants of the same variety or the green parts of the same plant.

Variegation occurs either by bud-variation or by variations in seedlings. In the former, a variegated branch is likely to appear on an otherwise perfectly normal plant. Such variegations are easily reproduced by budding, grafting, or cuttings, but generally do not develop again from seeds produced on such branches. On the other hand, when variegation develops in seedlings, the seeds of such plants usually give a number of variegated individuals, even the cotyledons being sometimes affected. In some cases the proportion of variegated plants from seeds is very large and can be increased by selection. As a rule, the form of

spotting or marking is not constant in seedlings, often being very different from the parent. In certain groups of plants, which have for many years been selected on account of the horticultural value of these markings, the variegated condition has become almost a fixed feature of the plant, as in dracenas, caladiums, and codieums. While the plants of these genera are not usually propagated from seeds, still when they are so propagated, a large number of seedlings show more or less variegation.

Darwin and many of the earlier investigators believed that these variations were started in the plant by unfavorable nutritive conditions, and much has been written on the subject as to whether or not variegations should be considered as diseased conditions.

The question as to whether a variegated condition could be transmitted to normal plants by budding and grafting has also been much disputed, but the weight of evidence indicates that in many cases such transmission certainly takes place. This has been thought to indicate the presence of some micro-organism, living either parasitically or symbiotically in the plant, and causing the changes known as variegation.

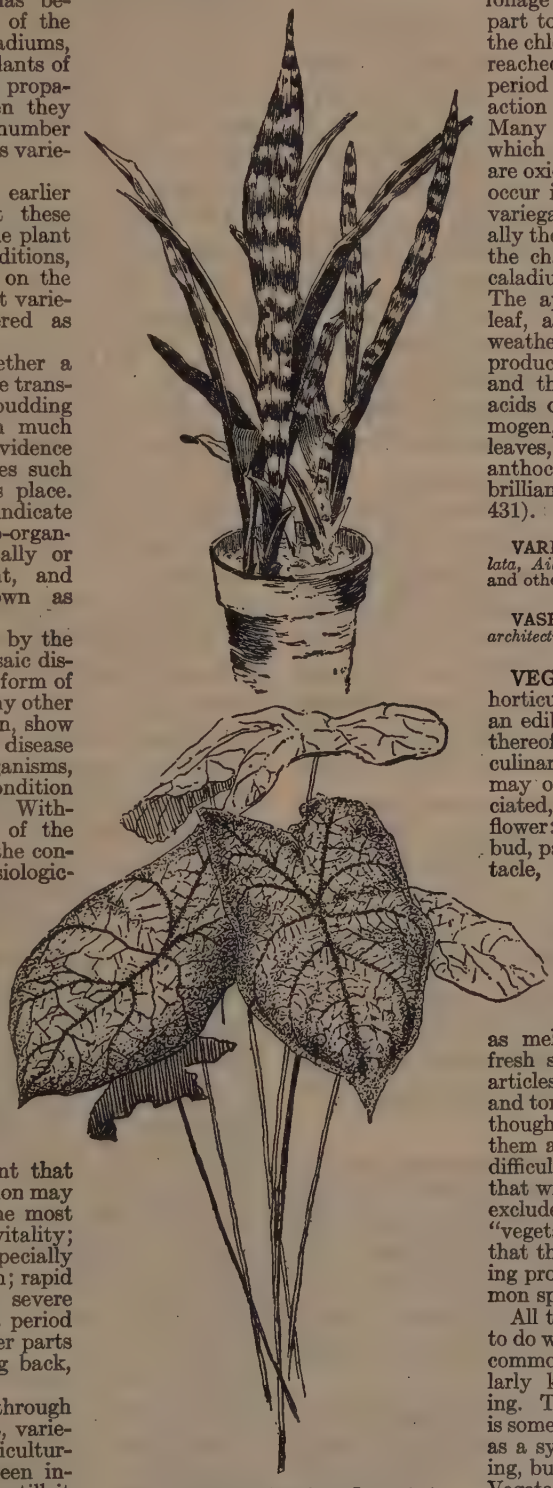
Investigations conducted by the writer on the so-called mosaic disease of tobacco, which is a form of variegation, and also on many other forms of ordinary variegation, show quite conclusively that the disease is not caused by micro-organisms, but is due to a deranged condition of the nutrition of the cells. Without going into the details of the matter, it may be said that the condition is characterized physiologically by a marked increase in the oxidation processes in the cells, caused by the presence of an abnormal amount, or an abnormal activity, of oxidizing ferment in the protoplasm.

These changes must, in most cases, therefore, be considered as pathological in their nature, as the vitality and vigor of the plants are reduced as a result. It is further evident that the initial causes of variegation may be quite diverse, some of the most usual being seed of low vitality; unsuitable nourishment, especially a lack of elaborated nitrogen; rapid growth in very moist soil; severe injury to the roots during a period of rapid growth of the upper parts of the plant; severe cutting back, and the like.

Though started at first through the influence of environment, variegation, when of value horticulturally, has in many cases been increased and fixed by selection till it has become almost a specific character in some groups of plants, and is considered in the botanical description of them.

A word might be said in this connection regarding autumn coloration. The production of color in autumn foliage is, as is well known, due in part to the gradual destruction of the chlorophyl when the leaves have reached maturity and approach the period of death, and in part to the action of acids on anthocyanin. Many of the destructive changes which take place in the chlorophyl are oxidation processes, the same as occur in the cells of highly colored variegated plants, and physiologically they are not very different from the changes occurring in calathea, caladium, codieum, and the like. The approach of maturity in the leaf, and the coming on of cool weather in autumn, stimulates the production of oxidizing ferments, and the action of these and the acids of the cell-sap on the chromogen, or color contents of the leaves, especially the chlorophyl and anthocyanin, causes many of the brilliant colors of autumn foliage (p. 431).

ALBERT F. WOODS.



3907. Kinds of variegation. Sansevieria above and caladium below.

VARNISH TREE: *Kœlreuteria paniculata, Ailanthus altissima, Rhus verniciflua,* and other plants.

VASES: See *Topiary planting and garden architecture,* Vol. 5, p. 2675.

VEGETABLE-GARDENING. In horticultural usage a vegetable is an edible herbaceous plant or part thereof that is commonly used for culinary purposes. The product may or may not be directly associated, in its development, with the flower: the root, stem, leaf, flower-bud, partially developed seed-receptacle, mature seed-receptacle, or seeds (either immature or mature), may constitute the edible part. Some vegetables are edible only after being cooked, others (such as cabbage), are eaten either cooked or raw, while others, as melons, are used only in the fresh state, and are really dessert articles. In some countries, melons and tomatoes are regarded as fruits, though American usage classifies them as vegetables. Although it is difficult to make a general definition that will include all vegetables and exclude none, the use of the term "vegetable" is so well understood that there is little difficulty in making proper application of it in common speech.

All the art and science that has to do with the growing of the plants commonly called vegetables is popularly known as vegetable-gardening. The Latin term, olericulture, is sometimes used in formal writings as a synonym of vegetable-gardening, but has never become popular. Vegetable-gardening is usually considered as a branch of horticulture,

coördinate with pomology (fruit-growing) and floriculture. However, certain vegetables, such as potatoes, when grown in large areas in rotation with general farm crops, are sometimes looked on as agricultural rather than horticultural subjects.

Some of the crops may be classified as horticultural or agricultural depending on the uses for which they are to be employed. For example, beans that are grown for the green pods are horticultural subjects, but if the same varieties were to be grown for the mature seed for selling in the general market, they may be known as agricultural products. In like manner turnips may be horticultural subjects when grown in small areas for home or table use, but agricultural subjects when grown on large areas for stock-feeding.

Vegetable-gardening may be divided into two great categories, depending on the disposition that is to be made of the products; namely, commercial gardening (see page 1997, Vol. IV, the article *Market-Gardening*), of which the purpose is to make money from the industry; and home- or amateur-gardening, in which the purpose is to raise a supply for family use. Commercial vegetable-gardening may be divided further into four fairly well-defined types: market-gardening proper, truck-gardening or truck-farming, forcing (see Vol. III, page 1254), and the growing of vegetables for canning or pickling factories.

Market-gardening proper involves intensive methods of culture, and is most highly developed near large cities. Truck-farming involves the growing of one or a few special vegetable crops, often as an adjunct to a system of general farming. These are usually grown in relatively large areas, and at considerable distance from market. Questions of climate, soil, and shipping facilities largely determine the location of truck-gardening areas. The South produces early vegetables for northern markets; the North produces cool-climate crops for winter storage, such as onions, cabbage, turnips. Sweet corn, tomatoes, and peas for canning purposes, and cucumbers for pickling, are grown where the soil and climate are especially adapted to their culture.

Particular regions have become famous for the production of certain vegetable crops. Some examples are: Eastern Long Island for late cauliflower; Kalamazoo, Michigan, for celery; Rocky Ford, Colorado, and the Imperial Valley, California, for muskmelons; certain areas in Georgia for watermelons; southern Texas for the Bermuda type of onion; Norfolk, Virginia, for spinach, kale, and early potatoes; Ontario for turnips and other root-crops. Long-distance transportation has revolutionized vegetable-gardening in this country (see *Packing*, *Transportation*), and crops which were formerly grown only near market and had a limited season are now shipped across the continent, and may be procured in the same market, from some source, twelve months in the year. Head lettuce is an example.

The practices.

While in commercial vegetable-gardening the location is determined to considerable extent by soil and climate, in the home-garden the climate and the soil are largely beyond the choice of the gardener, since these matters are determined by the location of the homestead. The general effort in the home-garden is to secure products of high quality and to have a more or less continuous supply throughout the season. In market-gardening emphasis is usually placed on a few crops, whereas in home-gardening it is placed on a great variety of crops.

The old-time home vegetable-garden or "kitchen-garden" was generally unsuited to the easy handling of the soil and to the efficient growing of the plants. Ordinarily it was a small confined area in which horse-tools could not be used (Vol. III, page 1738). The rows were short and close together, so that finger-work was necessary. The custom arose of growing crops in small raised beds, probably because such beds are earlier in the spring than those that are level with the ground. With the evolution of modern tillage tools, however, it is now advised that even in the home-garden finger-work be dispensed with as much as possible. Some of the very earliest crops may be grown in raised beds to advantage, but in general it is better to secure earliness by means of glass covers or by ameliorating the entire soil by underdrainage and the incorporation of humus and by judicious tillage. See *Tillage* and *Machinery*. In the home-garden on the farm particularly it is desirable that the rows be long and far enough apart to allow of tillage with horse-tools.

Vegetable-gardeners are usually large users of stable-manure. Near the large cities the manure is bought in carload lots or hauled with four-horse teams, and it is used every year or even two or three times a year. The reason for this frequent and heavy use of manure is the necessity of improving the physical texture of the land so that it will be loose, open, and mellow, be early or "quick," and hold an abundant supply of moisture. In intensive vegetable-gardening there is no "resting" of the land and no green crops to be plowed under. The vegetable matter, therefore, has to be supplied almost entirely by barn-manures. In the larger and less intensive vegetable-growing farther removed from large cities, general agricultural practices can be employed to better advantage, such as rotation and green-manuring. Vegetable-gardeners, especially in the East and South, generally use largely, also, of concentrated fertilizers.

In intensive vegetable-gardening it is important to start many of the crops under glass and to transplant the young plants to the open as soon as settled weather comes. See *Transplanting*. This is particularly true of tomatoes, very early lettuce, sweet potatoes, egg-plants, peppers, and the early crops of celery, cabbage, and cauliflower. In the northern states muskmelons and sometimes watermelons and cucumbers are started under glass, being grown in pots, veneer "dirt bands," or upon inverted sods, whereby they are transferred to the open without disturbing the roots. Formerly the plants were started under hotbed or coldframe structures, but of late years there has been a great increase in the extent of glass-houses or forcing-houses. These are primarily for the purpose of growing certain crops to maturity outside of their normal season in the given locality, but are often used a part of the season for starting plants intended for transplanting. In these structures conditions can be controlled better than in hotbeds, and they are especially valuable for the starting of very early plants in cold weather. However, hotbeds and coldframes are still exceedingly important adjuncts to the vegetable-garden. They are almost indispensable for the reception of early plants that have been started in a greenhouse and require "hardening-off" before transplanting into the open ground. They can be moved when the person shifts to other land, and the space that they occupy can be utilized for outdoor crops later in the season. They are extensively used for starting early plants. Much vegetable-gardening in large cities is prosecuted on rented lands; therefore it may not be profitable to invest in such permanent structures as forcing-houses. The first cost of hotbeds and coldframes is less than that of forcing-houses, and this is often a very important item. For management of glass structures, see *Hotbeds*, *Greenhouse*, *Forcing*.

The seed and variety problem is most complex. A mistake in the selection of a strain or kind may mean inability to meet a market demand either as regards characteristics or season. A round cabbage crowds out a pointed form. As soon as they mature, better varieties crowd out the Earliana tomato. Therefore the gardener must know varieties. Many seedsmen are making sincere efforts to provide good seed, and each

CXV. A market-garden of the modern type near a city; overhead irrigation.

year sees progress. Much remains to be accomplished in study and classification of varieties and types, and in the improvements of methods of seed-breeding and production. These problems are especially difficult because the crops are chiefly annuals, and changes take place with great rapidity. Experiment stations are now taking up this work on a sound scientific basis, a thing that could hardly be said of most early taxonomic studies. They are enjoying the coöperation of seed houses.

There are great numbers of insect and fungous pests that attack the vegetable-garden crops. See article on *Diseases and Insects*. The spray-pump has now come to be a necessary adjunct to any efficient vegetable-garden. However, there are many difficulties beyond the reach of the spray, particularly those that persist year by year in the soil or which attack the roots rather than the tops. For such difficulties, the best treatment is to give rotation so far as possible and to avoid carrying diseased vines back on the land the next year in the manure. Even the club-root of cabbage can be starved out in a few years if cabbages or related plants are not grown on the area.

In its best development vegetable-gardening is essentially an intensive cultivation of the land. Often it is conducted on property that is too high-priced for ordinary farming. Land that demands rent on a valuation of $1,000 an acre is often used for vegetable-gardens; and higher-priced land, held for other uses later, may be used temporarily. There is also intense competition near the large cities. These circumstances force the gardener to utilize his land to the utmost. Therefore, he must keep the land under crop every day in the year when it is possible for plants to live or grow. This results in various systems of succession-cropping and companion-cropping, whereby two or more crops are grown on the land the same season or even at the same time. (For examples of companion-cropping, see *Market-Gardening*.) Market-gardening is usually a business that demands enterprise, close attention to details, and much physical labor. If, with his knowledge of vegetable-growing, the gardener combines good business and executive ability, and an intimate knowledge of market conditions, he should be able, however, to make it a profitable and attractive business. Although the outlay is likely to be large, the returns are direct and quick.

Extent and growth of the industry.

The most recent published statistics of vegetable-gardening in the United States are those of the Thirteenth Census, 1910. According to the report of this census, based on the crop of 1909, the acreage devoted to vegetable production in the United States was 7,073,379 acres, including 3,668,855 acres of potatoes. The total value of all vegetables reported for that year was $418,110,154. Of the total number of farms in the United States, 4,969,540, or 78.1 per cent reported having farm-gardens; 4,261,776 gave the acreage devoted to vegetables and the value of the product. 41,731 farms reporting vegetables to a value of over $500 each, and 4,220,045 farms less than $500 each. "Farms of the former group usually produce vegetables chiefly for sale and make them an important part of their business, while on a large proportion of the other farms vegetables are raised only for home consumption." In 1909, the value of the vegetable crop (including potatoes) in the following states amounted to over 10 per cent of the total value of all crops in the respective states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Michigan, Delaware, Maryland, Virginia, West Virginia, Florida, Colorado, Nevada.

According to the figures, the production of vegetables between 1899 and 1909 increased from $237,000,000 to about $418,000,000. This includes the potato, which is grown partly as a farm crop and partly as a vegetable-garden crop. With this most important commodity omitted, the corresponding figures for the miscellaneous vegetables are $139,000,000 and $251,000,000. The increase in the production of all other horticultural products, including fruit, flowers, nursery products and nuts, is from $152,000,000 to $273,000,000.

A map showing centers of vegetable production in the United States would show changes no less marked. New districts have been established almost without number in all sections of the country. The business is much more evenly distributed throughout the United States than formerly, and the states that have been regarded as great trucking states are no longer holding their preëminence without question. Thus, Illinois and Indiana have become great vegetable states, with the market-gardening for Chicago, trucking in southern Illinois for both Chicago and St. Louis, muckland trucking in the swamplands (see *Muckland-Gardening*, Vol. IV), and production of crops for the cannery. Similar statements might be made of other states. Ten years ago, truck-farming was thought of principally as production of vegetables in the South for shipment North. The advance in the importance of vegetables in the dietary, together with the rapid growth of the more southerly cities, has brought about a marked development in the production of vegetables in northern parts for shipment southward, particularly the cool-season crops for consumption when the gardens of the warmer climates are practically unemployed on account of the heat. The production of cabbage and potatoes in the North for shipment southward has long been a great industry, but of recent years important centers in the growing of cucumbers, peas, beans, and of the muckland crops, celery, lettuce, and onions, have been developed. Improved transportation facilities have made California an important source of supply for eastern markets.

The canning industry as connected with vegetable-gardening has been an important factor in making possible a continuous supply of vegetables throughout the year, and this industry has recently made much progress. Three phases of this industry utilize vegetable-garden crops—factory, farm, and home canning. Factory canning uses the products from a comparatively large acreage of crops on the truck-gardening or general farming scale. Corn, tomatoes, peas, and string beans are extensively handled by canning factories. Farm canning promises to be a means whereby the market-gardener or truck-farmer may turn his crops into greater profit when markets are glutted. Home canning is a means of preserving a supply of perishable vegetable products from one's kitchen-garden for home use.

The insistence of the population on a supply of vegetables through all the months has made possible the construction of greenhouse ranges, many of which are now measured in acres. The crops are lettuce, cucumbers, tomatoes, and radishes in the order named. While the business is not so satisfactory in the autumn months, because of poor growth conditions and on account of light demand, the returns after the first of the year are sufficient to render the business profitable and to justify increases in the areas under glass.

Market-gardening has kept pace with the growth of the cities, although some of the famous centers are declining on account of the great increase in real-estate values. The auto truck is an important factor in making it possible for the gardener to take advantage of the lower interest charges incident to the use of more distant lands.

In the practice of vegetable production, the most conspicuous development has been the introduction of overhead irrigation. Hundreds of acres are now watered in this way. The value of this practice is evident when it is considered that moisture is more often than otherwise the factor which prevents the gardener from reap-

ing returns from improvements which are far more costly than in other lines of agriculture.

The past ten years has seen the beginning of organization among vegetable producers. Coöperative selling is becoming a larger factor in the selling of produce on distant markets, and garden districts not yet ready for coöperative selling are finding material advantage in unified action in matters of the gathering of information as to their methods, in the purchase of supplies, the standardization of packages, the improvement of local market conditions, and of transportation facilities, in overseeing legislation and securing assistance through investigational agencies in the solution of local problems. The Vegetable Growers' Association of America was organized in 1908 and has brought into contact with one another a large group of men from all sections of the country. The New York State Vegetable Growers' Association, formed in 1911, has been the pioneer in state organization. All of these societies, national, state, and local, are finding new fields of usefulness and are each year serving directly an increased proportion of the men in the business, while all find advantage through their promotion of the general welfare.

Education; literature.

For many years a course in vegetable-gardening has been included in the curricula of most of the agricultural colleges of the United States and Canada, and more or less attention has been given to research in vegetable-gardening problems on the part of agricultural experiment stations. However, until within the last few years, both the teaching and research in reference to this subject were in most institutions conducted as incidental matters by some member of the staff whose principal energies were demanded by other horticultural interests. At the present time much more attention than formerly is being given the subject of vegetable-gardening in educational institutions, and many of the agricultural colleges and stations now have one or more men devoting their entire time to vegetable interests. In some of the institutions several courses are offered in vegetable work, including an introductory course, an advanced course in market-gardening, and courses in vegetable-forcing, systematic vegetable crops, and undergraduate research. Provision is also made for graduate work in problems bearing on vegetable-gardening.

Vegetable-gardening is also found to be especially adapted for use as a basis for giving instruction in the fundamental principles of crop production in schools, especially in those having only a limited area of land available for "laboratory" purposes. The simple equipment involved, the possibility of using odd bits of ground, the relatively short time in which results can be expected, and the high value of the product to be derived from a small area, together with its easy adaptation to educational purposes, all render this phase of agriculture especially serviceable in such activities. The work is conducted on special plots laid out for that purpose, and on the home farms and back yards.

There is a large literature devoted to vegetable-gardening, although much of it applies chiefly to amateur or home growing. Leading current books on the general subject of vegetable-gardening are those by Greiner, Green, Henderson, Rawson, Landreth, Bailey, Watts, Lloyd, and Corbett. For California one should consult Wickson's "California Vegetables in Garden and Field," and for the Atlantic South, Rolfs' "Vegetable-Growing in the South for Northern Markets," Oemler's "Truck-Farming at the South," and Rolfs' "Subtropical Vegetable-Gardening." There are many books devoted to special topics, and there are many others which in their time were of great practical value, but which are now chiefly known as recording the history of the epoch in which they were written. Only one American work has been devoted to descriptions of varieties of vegetables, as the works of Downing, Thomas, and others have to varieties of fruits. This work is Fearing Burr's "Field and Garden Vegetables of America," Boston, 1863, and the abridgment of it in 1866, called "Garden Vegetables and How to Cultivate Them." A list of the American vegetable-gardening literature to that date may be found in Bailey's "Principles of Vegetable-Gardening" (1901). See also *Horticulture, Literature of*, Vol. III. Persons who desire a cyclopedic account of vegetables should consult Vilmorin's "Les Plantes Potagères," an English translation of the first edition of which is published in London as "The Vegetable Garden." Odd and little-known vegetables are treated in Paillieux & Bois, "Le Potager d'un Curieux," Paris, 3d ed. 1899.

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Vegetable-growing in California.

It is an interesting fact that although California's horticultural prominence now rests on fruit products, the first attraction to the new state, after the gold discovery, was the wonderful growth of garden vegetables. The reports of immense size, of acreage product and of prices secured, were almost incredible because so much in advance of ordinary standards, but the statements were so fully authenticated that many were drawn to California by them. These horticultural pioneers, however, soon found that immigrants from Asia and the Mediterranean region, by their cheap living and by doing their own work, could cut under American growers who had to employ high-priced labor, and so the latter retired from the field, leaving the opportunity to the frugal and thrifty foreigner. Thus vegetable-growing, from an American point of view, came into disrepute and largely retains such disadvantage at present. The result is that the American largely avoids market-gardening, while Asiatics and South Europeans are thriving on it. There has been a reflection of the same disfavor in the farm growing of vegetables for home use, and our farming population, including the fruit-growers who should know and do better, is largely dependent on alien vegetable peddlers or products of canneries instead of fresh home-grown esculents, which would be cheaper and inexpressibly better than canned or transported supplies.

Fortunately there arose about twenty-five years ago a large industry in growing vegetables for overland shipment and for canning which clothed the plant-cultures involved in this trade with a new dignity and importance attractive to American growers. Cabbage, cauliflower, and celery for eastern shipment, asparagus for canning and for shipment, tomatoes for canning, and the like, have all become large special crops, while some other plants, like lima beans, which are chiefly grown in gardens elsewhere, have become field crops in California covering very large acreage. Such enterprises have enlisted American citizens and changed the popular conception of the dignity and opportunity of vegetable-growing. A measure of this influence, as well as of the extent of the product, may be had in the average annual shipments of green vegetables beyond state lines for several years ending with 1914:

Vegetables	Carloads
Artichokes (Globe)	150
Asparagus	350
Celery	2,500
Cauliflower	1,000
Cabbage	1,000
Potatoes	10,000
Lettuce	300
Tomatoes	2,000
Mixed vegetables	1,000

The canned-vegetable output of 1914 was 2,373,182 cases (each containing twenty-four 2½-pound tins)

divided as follows: asparagus, 800,380; string beans, 81,905; peas, 188,667; tomatoes, 1,183,705; other vegetables, 119,525.

In addition to the foregoing there is the dry-bean product, which reached a total of 3,670,000 bags of 80 pounds each in 1915, and of sugar beets which was 203,200 tons in 1915.

California conditions affecting vegetable-growing are wide and various. Nowhere else perhaps is it more essential that certain things should be done just at the right time and in the right way. If these requirements are fairly met the product is large and fine; if they are neglected the failure is sharp and complete. This fact has given rise to the impression that California is a hard place to grow vegetables, which is not true unless one lacks local knowledge or the nerve to apply it. One of the chief causes of failure is in following seasons and methods which have yielded success under conditions prevailing in the states east of the Sierra Nevada Mountains. If one begins garden-making in the springtime the plants do not secure deep rooting, which is necessary to carry them to success in the dry season, and the garden is likely to be a disappointment. If, on the other hand, all the hardier vegetables are sown in succession from September until February or March, there will be continuous produce through the winter and into the early summer. The chief shipments of vegetables from California are made during the late fall and winter and are taken right from the ground to the cars without protection or storage. Tender vegetables, like corn, beans, tomatoes, and the like, however, can be grown in the winter only in a few frostless places. They must either be pushed to a finish in the fall or sown early in the spring and carried into the dry summer as far as necessary either by natural moist land or by irrigation. There are a few localities, however, where tomatoes will fruit early in the spring from fall plantings, and peppers will live through the winter and bear a second season's crop on the old plants.

The possession of an irrigation supply is the secret of full satisfaction in California vegetable-growing, but a small amount of water, if skilfully applied, will work wonders. Irrigation will enable one to have something crisp and delicious in the garden every day in the year in the California valleys. It is true, however, that much can be done without irrigation by beginning at the opening of the rainy season in September, growing the hardier vegetables while moisture is ample even on the drier lands during the late fall and winter, and keeping the lower lands well plowed and cultivated to prevent evaporation until the tender vegetables can be trusted in the open air, and continuing cultivation assiduously afterward so that moisture can be conserved in the soil as long as possible for them. That this is thoroughly practicable is seen in the fact that the large lima-bean product is grown almost entirely without irrigation from plantings made as late as May and the whole growth of the plant is achieved without a drop of water except that stored in the soil. The same is true of the corn crop; perfect corn can be grown without a drop of rain or irrigation from planting to husking. In such cases, however, the winter rains are retained in the soil by cultivation. If winter growth is made by rainfall, summer growth can be had on the same land by irrigation. In this way irrigation becomes eminently desirable in securing all-the-year growth, which cannot be had by rainfall. With good soil and abundant irrigation it is possible to secure four garden crops in rotation within the year—the hardy plants in the fall and winter months; the tender plants in the spring and summer. Of course the adjustment of all these means to desired ends requires good perception and prompt action, and explains why those who have been accustomed to plant at a fixed date and do little but cut weeds afterward may find it hard to secure the best results in California. And yet the Californian grower has great advantages in his deep rich soil, in freedom from many diseases (which thrive in a humid atmosphere) and in an exceedingly long growing season.

Local adaptations for different vegetables are sometimes quite sharply drawn and selection of lands for large specialty crops must be made with reference to them. The result is that the earliest vegetables come from practically frostless places in the Colorado River region of southeast California; almost all the lima beans are grown on a coast plain from Santa Barbara southward; the celery for eastern shipment is nearly all grown on the peat lands of Orange and San Joaquin counties; the cabbage comes largely fron San Mateo County; asparagus and tomatoes from Alameda County and river islands of Sacramento and San Joaquin counties, and so on. Smaller areas of these products and others not mentioned are more widely scattered, but everywhere the local soil, exposure, and climate are chief considerations.

There is prospect of great increase in all the vegeable products of California. Fresh and dried vegetables enter largely into ocean traffic with distant Pacific ports. Interstate trade is constantly increasing and canned vegetables are contracted in advance to European distributors as well as to dealers in all the Americas.

E. J. WICKSON.

VEGETABLE MARROW: see page 2861. **V. Orange:** *Cucumis Melo* var. *Chito*. **V. Oyster:** *Salsify*. **V. Pomegranate:** *Cucumis Melo* var. *Dudaim*. **V. Sponge:** *Luffa*.

VEÌTCHIA (James Veitch, of Chelsea, famous English nurseryman). *Palmàceæ*. About 4 species of pinnate palms native to the Fiji Isls. and New Hebrides. The genus belongs to that section of the Areca tribe characterized by a parietal ovule which is more or less pendulous and fls. spirally disposed in the branches of the spadix, and is distinguished from Hedyscepe and allied genera by the following characters: sepals of the male fls. chartaceous, connate at base; female fls. much larger than the males. It is doubtful whether any species is now in the trade. *V. Joánnis*, H. Wendl., was cult. early in 1880–90. Lf.-segms. with a wide and rather shallow notch at the apex or obliquely truncate; sheath, petiole and rachis a dark blood-color and covered when young with a gray tomentum interspersed with lanceolate, thin, dark red scales: fr. 2⅓ x 1¼ in., ovoid-ellipsoid, orange, with a red base. G.C. II. 20:205. R.H. 1883, p. 344. Has been cult. in S. Calif. but is tender there. It has been conjectured that *Kentia Van Houttei* advertised in 1895 by American dealers may be a species of Veitchia. The genus is imperfectly known and of minor importance horticulturally.

VELLÒZIA (Velloz, a Portuguese naturalist). *Velloziàceæ;* or *Amaryllidàceæ*. Usually shrubs, sometimes arborescent, adapted to the warmhouse. Sts. fibrous-woody, usually dichotomously branched: lvs. linear, rigid, tufted at the ends of the branches: peduncles 1-fld.: fls. usually white; perianth funnel-shaped; segms. subequal, ovate-lanceolate; stamens 6, sometimes many; ovary clavate, 3-celled; ovules many, superposed: caps. coriaceous, dehiscing at the apex.—About 65 species, Trop. and S. Afr., Madagascar and Brazil. Vellozia is closely related to Barbacenia but distinguished by having more than 6 stamens, whereas Barbacenia has only 6. *V. trichophýlla*, Hemsl. (*V. equisetoìdes*, W. Wats., not Baker. *V. equisetoìdes* var. *trichophýlla*, Baker). Shrub having a thick caudex, 1 ft. or more diam. and short thick primary branches: lvs. numerous, grass-like, scarcely stiff, 3–9 in. long in cult. specimens (often 1–2 ft. long and more rigid in wild specimens), about ½in. wide: peduncles usually in 3's, 1-fld.: fls. reddish lilac, very fragrant; perianth-segms. lanceolate, acute, 1–1½ in. long. E. Trop. Afr. B.M. 7962. G.C. III. 34:425. Very little known in cult.

VELTHEÌMIA (named for the Count of Veltheim, 1741–1801). *Liliàceæ*. Greenhouse and half-hardy tunicate bulbous perennials; spring and summer.

Leaves radical, several, oblong or strap-shaped, rather thick, herbaceous, lower longer than the upper, sheathing the base of the simple leafless scape: fls. showy, pendulous, densely grouped in a terminal raceme or spike; perianth tubular, cylindrical, persistent, lobes 6, very short, tooth-like; stamens 6; ovary sessile or subsessile, oblong, 3-celled: caps. membranous-scarious, the 3 angles strongly dilated and wing-like, loculicidally 3-valved.—Three species, S. Afr. They are easy of cult. and are but little known in Amer.

A. *Lvs. green, 2–3 in. broad.*

viridifòlia, Jacq. Lvs. oblong-lorate, wavy-margined, finally 1 ft. long: scape mottled with purple: raceme very dense, 3–6 in. long, 25–30-fld.: fls. 1¼–1½ in. long, yellow or reddish, with greenish tips. L.B.C. 13:1245. B.M. 501 (as *Aletris capensis*). G.C. III. 49:164. Gn. W. 22:117. G.W. 5, pp. 112, 454.

3908. False hellebore.—*Veratrum viride.* Showing the handsome foliage of early spring when the leaves are about a foot high.

AA. *Lvs. glaucous, 1½ in. broad.*

glaùca, Jacq. Lvs. oblanceolate-lorate, acute, glaucous: scape less stout: fls. "yellow or bright red," according to Baker. B.M. 1091 (fls. white, dotted red toward the tips); 3456 (fls. reddish purple, dotted yellow above). F. Tracy Hubbard.†

VELVET BEAN: *Stizolobium.* **V. Tree:** *Gynura aurantiaca.*

VENÍDIUM (name not explained by its author). *Compósitæ*. Annual or perennial herbs, grown for ornament.

Rays female: receptacle honeycombed, mostly nude: involucral scales in several rows, the outer narrower and herbaceous, inner scarious: achenes glabrous, dorsally 3–5-winged or -ridged, the lateral ridges inflexed, the medial straight, narrower; no hairs from the base of the achene: pappus either none or of 4 very minute, unilateral scales.—Eighteen species, S. Afr., 7 of which are annuals. By Hoffmann (Engler & Prantl, Pflanzenfamilien) united with Arctotis.

The following account of *V. calendulaceum* of the gardens as a garden plant is adapted from Gn. 21, page 405. It is a graceful single-flowered composite which flourishes under the ordinary treatment accorded half-hardy annuals, making a compact rounded mass 2 feet high and 3 feet wide. "There is considerable diversity in its seedlings both as regards habit and the size, shape and shading of its blossoms, and careful selection in seed-saving is needful in order to secure the best forms. It is admirably adapted for cutting, as the flowers open and shut as regularly as when on the plant." This species has also been treated as a greenhouse perennial, continuing to bloom until near midwinter. The flower-heads are fully 2 inches across.

decúrrens, Less. Diffuse canescent perennial, 1–2 ft. long: lvs. mostly lyrate, the terminal lobe ovate or roundish, sinuate-lobed or repand, at first cobwebbed, afterward nude and punctate above, white-tomentose beneath; petiole 2–2½ in. long, amply eared at base, the ear decurrent along the st.—The type does not seem to be cult. but the following variety is offered as a half-hardy garden annual with dark-centered sunflower-like golden yellow heads 1–2½ in. across:

Var. **calendulàceum,** Harvey (*V. calendulàceum,* Less.), differs in having the petioles not eared at the base or with only a small ear. R.H. 1857, p. 123. Gn. 21, p. 405. G. 5:345.—Opinions differ as to its merits, and it is variable in quality. Some consider it coarse and weedy. In pots it does well; for spring bloom, sow in Aug. to Oct. in a frame in light soil and prick off into pots; if well grown it is very free-flowering.

Wilhelm Miller.

VENUS' FLY-TRAP: *Dionæa muscipula.* **V. Hair:** *Adiantum Capillus-Veneris.* **V. Looking-Glass:** *Specularia Speculum.* **V. or Venice Sumach:** *Cotinus Coggygria.*

VERÀTRUM (ancient name of hellebore). *Liliàceæ*. False Hellebore. Hardy perennial herbs grown in the border.

Rhizome stout: sts. erect, stout, leafy base thickened but not truly bulbous: lvs. usually broad, plicate-veined, contracted to a broad sheath: fls. purplish, greenish, or whitish, numerous in a terminal panicle, polygamous; perianth persistent, broadly campanulate or explanate, segms. connate at the base especially in the female fls.; stamens 6; ovary ovoid, apex very shortly 3-lobed: caps. septicidally splitting into 3 carpels.—About 18 species, Eu., Asia, Russia, and N. Amer.

Veratrums are striking habit plants, of easy culture in moist shady positions. In the open sunlight or in dry ground the foliage is liable to burn and decay prematurely. They may be propagated by division or seeds.

A. *Fls. whitish or greenish.*

B. *Perianth-segms. crisped-dentate.*

álbum, Linn. European White Hellebore. A hardy perennial 3–4 ft. high: root short, fleshy: lvs. green, plicate; radical lvs. 1 ft. long, oblong, 5–6 in. wide, firm in texture: panicle 1–2 ft. long, dense: fls. whitish inside, greenish outside; segms. oblong-spatulate, crisped-dentate; pedicels almost none. June, July. Eu., N. Asia.

BB. *Perianth-segms. serrulate or entire.*

víride, Linn. American White Hellebore. Indian Poke. Fig. 3908. A hardy perennial, 2–7 ft. high: root-stock 2–3 in. long: lvs. plicate, acute, the lower oval, about 1 ft. long, the upper gradually smaller: fls. yellowish green; segms. oblong or oblanceolate, ciliate, serrulate; pedicels 1–3 lines long. July. N. Amer.

B.B. 1:408. B.M. 1096 (as *Helonias viride*). Gn. 62, p. 283.

califórnicum, Durand. St. very stout, 3–7 ft. high: lvs. ovate-acute, the upper ones lanceolate but rarely acuminate: perianth-segms. broader than in *V. viride*, obtuse, whitish with a greener base. Colo. and Wyo. to N. Calif. and Ore. G.C. III. 46:395. Gn. 62, p. 411.—Intro. 1883. The long panicle of whitish, bell-shaped, drooping fls. is followed by ornamental frs. or caps.

AA. *Fls. blackish purple.*

nigrum, Linn. A hardy perennial often 2–4 ft. high, somewhat bulbous at the base: lower lvs. oblong, plicate, 1 ft. long, 6–8 in. wide, narrowed at the base; upper lvs. lanceolate: panicle narrow: fls. blackish purple; segms. oblong, obtuse. June. Eu., Asia. B.M. 963. G.W. 2, p. 99; 14, p. 618. F. Tracy Hubbard.†

VERBÁSCUM (old Latin name of the mullein used by Pliny). *Scrophulariàceæ*. Mullein. Hardy biennial herbs, rarely perennial or subshrubs, more or less tomentose or floccose-lanate, sometimes grown in the garden or border for ornament.

Plants usually erect and tall: lvs. all alternate, usually soft, entire, crenulate, sinuate-dentate or pinnatifid: racemes or spikes terminal, simple or branched: fls. yellow, fuscous, purple or red, rarely white; calyx deeply 5-cleft or parted, rarely shortly 5-toothed; corolla-tube about none, explanate-rotate, lobes 5, broad, slightly unequal; stamens 5: caps. globose, oblong or ovoid, septicidally 2-valved.—About 270 species, natives mostly of the Medit. region, widely intro. in other countries. Prop. by means of cuttings or division, although most of the mulleins usually self-sow freely.

The mulleins are very easily cultivated, adapting themselves to almost any soil except a wet cold one. In America the name mullein calls to mind the common weed, *V. Thapsus*, but this same weed if massed in the wild border is a very showy plant and gives a tall columnar effect which is very pleasing when contrasting with looser, more open-growing plants such as larkspur, wild asters, and goldenrods. Another feature of the mulleins which makes them valuable in border planting is the generally predominating gray-green of the foliage, in fact of the whole plant, which contrasts with the bright or dark green foliage about it. The most serious drawback to the mulleins in general is that most of them are biennial and although they reproduce naturally and freely they hybridize so readily that they rarely reproduce true. However, most of the hybrids are as showy as their parents and as a whole they deserve a place in every border of size. Some of the more showy and satisfactory species are *V. olympicum*, *V. phœniceum*, *V. Chaixii*, *V. nigrum*, *V. phlomoides*, *V. pannosum*, and *V. cupreum*, although many others are almost equally as good. In choosing varieties the question of height should be taken into account, as some species grow much taller than others. Nearly all the species will stand any amount of sun although some of them, as *V. phœniceum*, do better in partial shade as the flowers do not open well in strong sunlight.

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KEY TO THE SPECIES.

A. *Anthers of the lower and longer stamens adnate-decurrent.* (*Section I. Thapsus.*)
B. *Fls. clustered.* (*Subsection 1. Euthapsi.*)
C. *Anthers very short-decurrent: corolla concave at the throat*..... 1. **Thapsus**
CC. *Anthers longer adnate-decurrent: corolla flattened out.*
D. *The fls. subsessile.*
E. *Cauline lvs. long-decurrent*... 2. **thapsiforme**
EE. *Cauline lvs. short-decurrent*.. 3. **phlomoides**
DD. *The fls. pedicelled, pedicels about as long as or longer than the calyx.*
E. *Lvs. 1½–2 ft. long*..... 4. **longifolium**
EE. *Lvs. 6–8 in. long*..... 5. **crassifolium**
BB. *Fls. solitary or nearly so.*
C. *Plants woolly.* (*Subsection 2. Spectabiles.*)
D. *Corolla yellow*..... 6. **ovalifolium**
DD. *Corolla bluish or purplish*..... 7. **Wiedemannianum**
CC. *Plants glabrous or glandular-pilose, not woolly.* (*Subsection 3. Blattaria.*)
D. *Pedicels in 2's or 3's*..... 8. **virgatum**
DD. *Pedicels solitary*..... 9. **Blattaria**
AA. *Anthers all kidney-shaped and of about equal size.* (*Section II. Lychnitis.*)
B. *Parts of the infl. as well as the rest of the plant woolly.*
C. *Pedicels shorter than the calyx or nearly wanting.*
D. *Infl. simple or few-branched.* (*Subsection 1. Thapsoidea*).
E. *Fls. solitary*.....10. **niveum**
EE. *Fls. in clusters.*
F. *Filaments violet-bearded*....11. **Boerhaavii**
FF. *Filaments yellowish or white-bearded.*
G. *Base of blade cordate-subauriculate*.....12. **glomeratum**
GG. *Base of blade attenuate.* 13. **simplex**
DD. *Infl. many-branched.*
E. *Fls. clustered; calyx deeply 5-parted.* (*Subsection 2. Glomerata.*)
F. *Filaments white-bearded*...14. **mucronatum**
FF. *Filaments purple-bearded*...15. **sinuatum**
EE. *Fls. solitary or in few-fld. clusters; calyx 5-toothed.* (*Subsection 3. Pyramidata.*)16. **pyramidatum**
CC. *Pedicels as long as or longer than the calyx.* (*Subsection 4. Lychnitidea.*)
D. *Beards of the filaments purple* (*sometimes white in No. 19*).
E. *Infl. simple or nearly so*.....17. **nigrum**
EE. *Infl. many-branched.*
F. *Corolla-lobes nearly rotund.*18 **Chaixii**
FF. *Corolla-lobes obovate*.....19. **pyramidale**
DD. *Beards of the filaments white* (*often purple in No. 19*).
E. *Upper surface of lf. glabrous.* 20. **Lychnitis**
EE. *Upper as well as lower surface of lf. tomentose.*
F. *Margins of lvs. crenate*.....19. **pyramidale**
FF. *Margins of lvs. entire or nearly so.*
G. *Lvs. oblong or elliptic, broader toward the middle*.....21. **pulverulentum**
GG. *Lvs. more or less lanceolate, broader toward the base.*
H. *Calyx-segms. lanceolate*.....22. **songaricum**
HH. *Calyx-segms. narrowly linear-lanceolate*..23. **olympicum**
BB. *Parts of the infl. glabrous or nearly so, the rest of the plant woolly.*
C. *Corolla glabrous: fls. clustered.* (*Subsection 5. Leiantha.*).....24. **leianthum**

cc. *Corolla glandular: fls. solitary or in few-fld. clusters. (Subsection 6. Blattarioidea.)*
D. *Segms. of calyx linear-lanceolate*.....25. **rubiginosum**
DD. *Segms. of calyx elliptical*.....26. **phœniceum**

Section I. Thapsus.

Subsection 1. Euthapsi.

1. Thápsus, Linn. (*V. Blattària,* J. A. Schmidt, not Linn. *V. gigantèum,* Willk. *V. Schràderi,* Mey.). Common Mullein. Fig. 3909. Biennial, 2–6 ft. high, densely yellowish tomentose: radical lvs. oblong, crenulate, petioled; cauline lvs. decurrent from lf. to lf.: fls. yellow, fascicles forming spike; calyx tomentose, lobes lanceolate; corolla flat, concave. Eu., especially N. and Cent., and Cent. Asia, also naturalized in N. Amer. Gn. 28, p. 148.—A familiar weed in woods and uncultivated fields. Hybridizes very readily with other species. There is also a white form of the species. This plant varies considerably in the color and size of its fls., the denseness of its infl., and probably occurs under several trade names in Eu. A first-year rosette in a pot makes an attractive plant (Fig. 3909).

3909. Rosette of mullein.—Verbascum Thapsus.

2. thapsifórme, Schrad. (*V. densiflòrum,* Bertol.). Biennial, about 2–5 ft. high, densely yellowish tomentose: radical lvs. oblong-elliptic or elliptic-lanceolate, crenulate, attenuate to the petiole; cauline lvs. narrowly decurrent from lf. to lf.: fls. in fascicles forming spike, large, yellow; calyx tomentose, segms. lanceolate; corolla rotate, rather flat. Eu. and Cent. Russia. Var. **macrùrum,** Benth. (*V. macrùrum,* Ten.), is white-tomentose and the cauline lvs. are more broadly decurrent. Italy.

3. phlomoìdes, Linn. Biennial, 4–6 ft. high, whitish- or yellowish tomentose: radical lvs. crenulate, elliptic or oblong-lanceolate, attenuate to the petiole; cauline lvs. amplexicaul, usually cordate or very shortly decurrent: fls. yellow, in very short fascicles forming a long raceme; calyx tomentose, segms. triangular-lanceolate; filaments white-woolly. S. E. Eu. and Caucasus. Gn. 40, p. 561; 41, p. 555. Var. **álbum,** Hort., has creamy white fls.—The species has become naturalized in E. N. Amer.

4. longifòlium, Ten. Biennial, 3–4 ft. high, covered with white or yellowish flocculent tomentum: lvs. numerous, densely superposed; lower 1½–2 ft. long, narrowly ovate or oblong-lanceolate, acuminate, base narrowed to a short petiole; upper sessile, base amplexicaul, all undulate: infl. sessile, 1 ft. long, 3½ in. diam., with innumerable short appressed branches: fls. golden yellow, about 1 in. across; calyx stellate-tomentose, segms. lanceolate. S. Eu. B.M. 7707. Var. **pannòsum,** Hort.(*V. pannòsum,* Vis. and Panc.), is more densely tomentose, the infl. is laxer and more branched and the fls. often larger. G. 31:105. Gn. 62, p. 165. Not a good variety botanically.

5. crassifòlium, Hoffm. & Link. Biennial, about 3–4 ft. high, densely yellowish tomentose: lvs. obovate-spatulate, 6–8 in. long, crenulate; cauline long-decurrent: fls. fascicled in a spicate raceme, yellow; corolla flattened; filaments glabrous. Portugal.—Closely allied to and possibly only a variety of *V. thapsiforme.* One of the few species said to thrive well in a light sandy soil.

Subsection 2. Spectabiles.

6. ovalifòlium, Don (*V. formòsum,* Fisch.). Biennial, about 2–3 ft. high, gray-tomentose: lvs. large, ovate, petioled, coarsely and rather double-crenate, cordate, petioled, hoary beneath; upper lvs. cordate-clasping: fls. sessile or nearly so, solitary, large, 1½ in. across, bright yellow, in a spike; calyx densely white-tomentose, segms. broad-lanceolate; filaments orange- or purple-woolly. S. Russia. B.M. 1037. B.R. 558.

7. Wiedemanniànum, Fisch. & Mey. Biennial, 1–3 ft. high, appressed, arachnoid woolly: st. stout, tall, leafy below: lvs. lanuginose; radical oblong or elliptic, 3–5 in. long, crenate or rather entire, attenuate to the petiole; cauline diminutive, oblong, sessile: fls. solitary, in a simple raceme or slightly branched panicle, large, 1¼ in. across, indigo-blue to purplish lilac; calyx densely glandular-hirsute, segms. lanceolate-linear; filaments purple-bearded. Caucasus. G.C. III. 14:785. Gt. 43, p. 76.

Subsection 3. Blattaria.

8. virgàtum, With. (*V. Blattària,* Vell., not Linn. *V. blattarioìdes,* Lam. *V. glàbrum,* Willd. *V. viscìdulum,* Pers.). Biennial, 1½–3½ ft. high, whole plant green, somewhat viscid-hispid or nearly glabrous: lvs. glabrous or glandular-hispid, especially beneath, oblong; lower petioled, dentate or sinuate-pinnatifid; upper sessile, cordate-clasping or shortly decurrent: raceme glandular-hispid; pedicels in 2's or 3's, rarely solitary: fls. yellow, throat violet; filaments violet-woolly. Cosmopolitan.

9. Blattària, Linn. Moth Mullein. Biennial, 8 in. to 4 ft., glabrous and green: sts. usually tall: lvs. oblong or oblong-lanceolate, dentate; lower attenuate to the petiole, undivided or sinuate-pinnatifid; upper sessile, cordate-amplexicaul, acute: raceme very long and lax: fls. rather large, yellow, rarely white, borne on solitary pedicels; calyx glandular, segms. linear-lanceolate; corolla-throat violet: caps. globose, longer than the calyx. Eu., N. Asia.—Distinguished from *V. virgatum,* which it resembles, by the solitary pedicels.

Section II. Lychnitis.

Subsection 1. Thapsoidea.

10. níveum, Ten. Biennial, about 2 ft. high, possibly more, white-tomentose: lvs. ovate-oblong, crenate, undulate; lowest petioled, the others sessile, acuminate, rather spoon-like, shortly half-decurrent, the wings cuneate: raceme simple and very dense: fls. yellow, rarely white, solitary, subsessile; calyx-segms. ovate, acute; filaments white-woolly. S. Italy.

11. Boerhaàvii, Linn. Biennial, about 2 ft. high, snow-white, tomentose-floccose, finally deciduous: st. reddish, leafy: lvs. crenate-dentate; lower ovate, obtuse, petioled; upper cordate-clasping, acute or acuminate: fls. in a long rigid spike-like raceme, yellow, in subsessile fascicles; calyx tomentose and glandular-viscid; segms. lanceolate; corolla violet-spotted at the throat; filaments violet-bearded. Medit. region.

12. glomeràtum, Boiss. Biennial, 4–6 ft. high, densely grayish yellow, ragged, tall and stout: lower lvs. 1 ft. or more long, 3–4 in. broad, subentire, subsessile, oblong-lanceolate, base attenuate; upper lvs. ovate, acuminate from a cordate-subauriculate base: infl. thyrsoid-paniculate: fls. subsessile in 3–4-fld. glomerules, yellow; calyx-segms. lanceolate; corolla strongly tomentose outside; filaments yellowish bearded. Asia Minor.

13. símplex, Labill. Perennial, about 2 ft. high, many-stemmed, base shrubby, densely white or yellowish, ragged: st. leafy below then prolonged into a long (6–12 in.) simple, strongly interrupted, rarely

slightly branched raceme: radical lvs. 1–2 in. long, crenulate, ovate- or oblong-spatulate, very obtuse, long-petioled; cauline lvs. sessile or nearly so, arranged in remote glomerules of 2–5: fls. yellow; calyx white-tomentose, segms. oblong, mucronate; filaments white-bearded. Syria. G.C. III. 36:2.

Subsection 2. Glomerata.

14. mucronàtum, Lam. Biennial, several feet high, densely white, ragged-tomentose: st. erect, crowded, leafy, large-panicled: lvs. thick; radical oblong, crenate, sometimes somewhat lobed and somewhat petioled; cauline lvs. oblong, rather long-decurrent; uppermost suborbiculate, mucronate: glomerules of fls. globose, forming a long virgate, interrupted raceme: fls. subsessile, white; calyx silky-lanate, segms. broad-lanceolate; filaments white-woolly. Asia Minor and Crete.

15. sinuàtum, Linn. Biennial, 2–3 ft. high, more or less densely yellowish or gray-tomentose: radical lvs. oblong-spatulate, subsessile, sinuate-pinnatifid, usually undulate; upper cauline lvs. oblong, acute, entire and short-decurrent: panicle pyramidal; branches elongated, twig-like: fls. yellow, rarely white, in remote glomerules; calyx tomentellous, segms. short-lanceolate; corolla small; filaments purple-woolly. Medit. region and Canary Isls.

Subsection 3. Pyramidata.

16. pyramidàtum, Bieb. Biennial, 2–4 ft. high, tomentose: st. stout: lvs. green above, canescent beneath; radical lvs. large, oblong, base long-narrowed, doubly and obtusely lobed or crenate; upper lvs. sessile, ovate, auriculate-cordate, long-acuminate: panicle pyramidal, sometimes 2 ft. long, canescent; branches finally rather lax: fls. yellow, solitary or in pairs; calyx tomentose, segms. oblong or ovate; corolla large; filaments purple-woolly. Caucasus.

Subsection 4. Lychnitidea.

17. nìgrum, Linn. (*V. Hinkei*, Friv.). Biennial, 2–3 ft. high: st. tall, angled above: lvs. green above, more or less tomentose beneath; lower long-petioled, ovate or oblong, base cordate; uppermost sessile, base rotundate: infl. a simple or slightly branched elongated raceme: fls. small, yellow, in many-fld., lax fascicles; calyx hirsute, segms. lanceolate-subulate; corolla-throat purple; filaments violet-bearded. Eu. and Asia. Gn. 27, p. 173. Var. **álbum,** Hort., has white fls. G. 15:159. Gn. 41, p. 551.

18. Chaìxii, Vill. Biennial, usually about 3 ft. high, whitish tomentose: st. somewhat angled above: lvs. ovate to oblong, green or tomentose below, crenate; lower 3–6 in. long, petioled, base cuneate, more or less crenate or rather incised; upper lvs. sessile; base rotundate: racemes paniculate, fascicled and laxly several-fld.: fls. yellow; calyx-segms. lanceolate-subulate; corolla-lobes nearly rotund, filaments purple-woolly. S. Eu. Gn. 27, p. 172; 78, p. 435. Var. **álbum,** Hort., is a white-fld. form.—This species is said to reach a height of 10 ft. and to act like a true perennial in warm soils. **V. orientàle,** Bieb., is considered the same by some authorities; apparently not in cult. The vars. *semilanàtum*, Hort., and *Freynìànum*, Hort., are really hybrids.

19. pyramidàle, Host. (*V. speciòsum* × *V. orientàle*). Biennial, 3–4 ft. high, white-pilose: lvs. rugose, crenate, acuminate, radical and lower cauline lvs. oblong, broad, upper smaller, strongly canescent: fls. small, collected in glomerules, yellow; calyx densely tomentose; corolla-lobes obovate, red-brown-maculate at base; filaments white or purplish hairy. Austria.—Neither of the parents are in cult. and it is questionable what the material in the trade under this name really is; possibly it is *V. pyramidatum*.

20. Lychnìtis, Linn. Biennial, tomentose: lvs. crenate, green above, slightly hoary or canescent beneath; radical oblong-elliptic, narrowed to the petiole; upper lvs. sessile, lanceolate: infl. paniculate; branches erect-spreading, angled: fls. small, yellow or white; calyx tomentose, segms. lanceolate, acute, tips glabrous; filaments white-woolly. Eu. and Caucasus.

21. pulverulèntum, Vill. Biennial, 3–9 ft. high, densely white-floccose-tomentose: lvs. entire or obsoletely crenate; radical lvs. oblong or elliptic, attenuate to a short petiole; upper lvs. ovate or rotundate, clasping: infl. a pyramidal panicle: fls. yellow, in slightly remote fascicles; calyx densely floccose, segms. linear-lanceolate; corolla small; filaments white-woolly. Eu. Gn. 73, p. 422.

22. songáricum, Schrenck. Biennial, several feet high, white-tomentose: lower lvs. lanceolate, acute, narrowed to the petiole; cauline sessile, oblong, cordate-auriculate; uppermost subrotund, cuspidate: racemes panicled: fls. in fascicles, yellow; calyx-segms. lanceolate; filaments white-bearded. Soongaria.

23. olýmpicum, Boiss. Biennial, 3–5 ft. or more high, densely white-tomentose: lower lvs. usually 6 in. long, oblong-lanceolate or lanceolate, entire, base attenuate; upper lvs. short-lanceolate, acute: panicles pyramidal, the racemes very long, lax; glomerules many-fld.: fls. rather large, about 1 in. across, bright yellow; calyx very tomentose, segms. long and narrowly linear-lanceolate; filaments white-bearded. Greece. G. 13: 669. Gn. 30, p. 213; 31, p. 125; 38, pp. 55, 66; 41, p. 555; 47, p. 147; 70, p. 91; 78, p. 436. Gng. 1:273. J.H. III. 52:119. Gt. 31:1078.

Subsection 5. Leiantha.

24. leiánthum, Benth. Biennial, up to 14 ft. high, covered with a dense white felt: basal lvs. very large, sometimes 4 x 2 ft.; cauline lvs. oblong, crenate, rugose, base decurrent, lax, whitish tomentose on both surfaces: infl. much branched up to 7 x 3½ ft., laxly many-fld.: fls. bright yellow, ¾in. across; calyx-segms. small, oblong-lanceolate, rather obtuse. Asia Minor. G.C. III. 44:171. Gn. 72, p. 509.

Subsection 6. Blattarioidea.

25. rubiginòsum, Waldst. & Kit. Biennial, about 2–3 ft. high: st. glabrous or pubescent above: lvs. green, pubescent beneath, crenate; lower petioled; upper sessile or cordate-clasping: racemes laxly branched, somewhat paniculate; pedicels in 2's or 3's, rarely solitary, twice or many times as long as the calyx: fls. reddish purple; calyx-segms. linear-lanceolate; filaments purple-woolly. S. E. Eu. and Caucasus.—Boissier Flora Orientalis suggest that this is a hybrid between *V. phœniceum* and *V. nigrum*. Var. **ferrugíneum,** Benth. (*V. ferrugíneum*, Mill.), has a long simple raceme and slightly larger and longer-pedicelled fls. than the type. Horticultural form, possibly a hybrid.

26. phœníceum, Linn. (*V. ferrugíneum*, And.). Purple Mullein. Biennial, about 5 ft. high: lvs. glabrous above, short-puberulent beneath; radical rosulate, ovate or oblong-rhomboid, attenuate to the short petiole, obtuse, obtusely crenate or repand; cauline lvs. few, sessile, oblong or lanceolate, acute: fls. purple or red, in a simple slender raceme; calyx glandular, obtuse segms. elliptical; corolla glabrous; filaments purple-woolly. S. E. Eu., Caucasus, and Persia. G. 15:158. Gn. 22, p. 377; 27, p. 173; 41, p. 566. A.G. 13:630. L.B.C. 7:637.—The name *phœniceum* was undoubtedly suggested by the Phœnician purple and not by the habitat. One of the parents of nearly all the hybrids having fls. of purple, violet, rose, pink, and lilac shades. The fls. open poorly in sunshine, preferring damp weather, consequently the locality should be one where only the morning and evening sun strike the

fls. Var. **álbum**, Hort., is a white-fld. form. Gn. 46, p. 519.

V. Caledònia, Hort. (V. hybridum caledonia, Hort.), is a hybrid by some said to have buff fls., by others sulfur-yellow shaded bronze, and by still others rosy drab with a darker center, and by all to be strong-growing and branched.—*V. cùpreum*, Sims (*V.* phœniceum var. cupreum, Benth ex W. Mill. V. ovalifolium × V. phœniceum). Biennial: st. simple: lvs. cordate-ovate, rugose, crenate, lanate beneath: raceme elongated; pedicels rather long, 1-bracted: fls. copper-colored. Garden hybrid. B.M. 1226.—It differs from V. ovalifolium not only in the color of the fls., but also in having pedicelled instead of sessile fls., and 1 subtending bract instead of 3. —*V. Ùbani*, Hort., is offered in the trade.—*V. newyénse*, Hort. (V. Chaixii × V. phlomoides), is offered in the trade as having erect spikes of large yellow fls. with dark centers.

F. Tracy Hubbard.

VERBÈNA (ancient Latin name of the common European vervain, *V. officinalis*). *Verbenàceæ*. Annual or perennial herbs or subshrubs, which are diffuse or sometimes creeping, some of them common flower-garden plants and sometimes grown in the greenhouse.

Leaves opposite or rarely ternately whorled or alternate, dentate or usually incised or dissected, rarely entire: spikes terminal, sometimes densely imbricated, sometimes elongated, slender and remotely fld., sometimes broadly corymbose or paniculate on an erect st., rarely axillary: fls. small or medium-sized, sessile; calyx tubular, 5-ribbed, 5-toothed; corolla-tube straight or incurved, limb spreading, somewhat 2-lipped, lobes 5, oblong or broad, obtuse or retuse; stamens 4, in pairs; ovary entire or very shortly 4-lobed at apex, 4-celled, cells 1-ovuled: fr. separating into 4 narrow pyrenes or nutlets.—About 80–100 species, chiefly natives in Trop. and extra-Trop. Amer. Some of them are unshowy weedy plants in fields and waste grounds in the U. S. and Canada. For the lemon verbena (*V. citriodora*), see *Lippia citriodora*.

Verbenas rank high among plants grown as garden annuals. Their clusters of showy and often fragrant flowers are borne in constant succession from June till frost. They vary from white through lilac and rose to purple and dark purplish blue, with shades of pink and pale yellow. The clusters are about 2 inches across and contain a dozen or more flowers each ⅝ to ⅞ inch across. The plants are grown with ease in any usual garden soil and condition. For general purposes, the plants should be grown from seeds. The plants are set about 1 foot apart each way, although a strong plant in good soil may spread 3 feet or so in the course of the season. Usually the seeds are started indoors, but if sown in the open as soon as the season is settled and warm, flowering plants should be secured in July or early in August. The verbena of gardens is a semi-trailer, the flower-stems not rising more than about a foot or so. It is sometimes used as a ground-cover under gladioli, lilies, and other tall plants, and in the margins of shrubbery plantations. It also makes an excellent window-box subject.

When special colors or named varieties are desired it is necessary to propagate verbenas by cuttings. To propagate a particularly choice variety by cuttings, shorten back the plants about September 1, keep them well watered, and by the end of the month there will be plenty of quick tender growth suitable for cutting. Put the cuttings in the propagating-house or even in flats with soil in bottom and sand on surface. Place the flats in a coldframe, and keep them moist and shaded until the cuttings are rooted. When rooted, transfer to flats in a cool light house until after New Year's. Then pot them, using 2½-inch pots, and allow a temperature of 50° F., which will soon give plenty of material for additional cuttings. Verbenas increased from cuttings tend to flower early, and those propagated in February or March will require at least one pinching. When planting-out in beds for summer bloom, bend the plant over nearly to the horizontal, so that the new growth will spread along the surface of the soil. These shoots will take root quickly, thereby covering the ground. The old method was to peg the plants down.

In propagating general stock, sow the seed in February and pot into 2-inch pots as soon as the seedlings are up an inch. A temperature of 45° to 50° will answer, but they should have full light. There is no place equal to a mild hotbed for young verbenas. About April 15 plunge the pots in a few inches of soil in a mild hotbed. Lift them now and then and rub off the roots which go through the bottom of the pot, in order to check growth and hasten flowering. Customers want to see them in flower before buying, and most of them wait till the end of May. However, verbenas may be planted out early in May, as a slight frost will not injure them.

The evolution of the garden verbenas has taken place in about seventy-five years. Although the history can be made out with considerable clearness, yet the botanical origin of the present florist's race, as to the species involved and the extent to which they have contributed, is not satisfactorily recorded. It is probable that four species have been more or less fused in the race or group known as *Verbena hybrida*,—*V. chamædryfolia*, *V. phlogiflora*, *V. incisa*, and *V. teucrioides*. These species are shown in Fig. 3910. For an historical account of the development of the garden verbenas, see Cowen, "Cyclopedia of American Horticulture," Vol. IV.

It is impossible satisfactorily to classify the hybrid garden verbenas according to their botanical derivation. They are conveniently classed according to color of flowers into: (1) Selfs, or one-colored varieties; (2) Oculatas, or eyed varieties; and (3) Italians, or striped varieties. As to habit they may be divided into: (1) Standards, those of the ordinary loose, spreading growth; and (2) Compactas, which are much reduced in stature and of more condensed form. Verbenas now in cultivation are shown in Figs. 3910, 3911.

Latin trade names probably mostly or entirely belong with the garden or hybrid race of verbenas, such as *compacta*, *coccinea*, *grandiflora*, *monstrosa*, *cærulea*, *candidissima*, *italica*, *auriculæflora*, *striata*.

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A. *Connective of the upper anthers not appendaged.*

B. *Clusters not panicled. Prototypes of the garden verbenas (V. hybrida, Hort. Fig. 3911).*

C. *Fls. scarlet.*

1. **chamædryfòlia,** Juss. Fig. 3910. Characterized by red fls. in flattish clusters, oblong, coarsely scalloped, nearly sessile lvs. and rather stiff pubescence: sts. slender, forking, creeping at base, hirsute: branches somewhat ascending: lvs. oblong or ovate, base broadly cuneate, contracted into the short petiole, crenate or subincisely serrate, serrations often unequal, strigose above, below hairy, especially on nerves: peduncles elongated, ascending: spikes solitary, capitate: bracts lanceolate-subulate, ciliate: calyx hirsute-canescent, sparingly glandular, more than twice as long as the bracts; corolla crimson, limb irregular.—Occurs in two rather distinct forms: var. **Melíndres,** Hort., has oblong to oblong-lanceolate lvs., which are unequally incised-serrate. This form is less hirsute and is more graceful and vigorous. It was the form first intro. to cult. Var. **melindroìdes,** Hort., has shorter, broader lvs. and is more hairy. Different forms occur over S. Brazil, Uruguay, Paraguay, and the whole of the Pampas. B.R. 1184. L.B.C. 16:1514. B.M. 3333. P.M. 1:173. B. 3:129.

CC. *Fls. rose or purple.*

D. *Fl.-clusters oval to oblong: lvs. saw-toothed.*

2. **phlogifiòra,** Cham. (*V. Tweedieàna*, Niven). Fig. 3910. Characterized by rosy or purple fls. in oblong or

oval clusters; resembles No. 1, but has more upright habit, softer pubescence and larger, longer-pointed, distinctly petioled lvs.: sts. ascending: branches rather erect, much subdivided, angled, retrorsely hirsute: lvs. oblong or lanceolate-triangular, acute, base entire, cuneately long-attenuate into the evident petiole, unequally subincised serrate, somewhat venosely rugose, strigose above, below hairy or strigillose pubescent: spikes terminal, pedunculate, many-fld., oval to oblong: bracts short-ovate to subulate-lanceolate: calyx twice as long as bracts, covered with short pubescence interspersed with short capitate glandular hairs. S. Brazil and Uruguay. B.M. 3541. P.M. 4:5. B. 2:60.

DD. *Fl.-clusters flat or convex: lvs. more deeply and sharply cut.*

3. **incìsa,** Hook. Fig. 3910. Rosy or purple-fld. species with lvs. more deeply cut than in the two preceding: whole plant hairy-pubescent; sts. ascending; branches erect: lvs. oblong-triangular, base cuneately truncate or subcordately attenuate into the evident petiole, pinnatifid lobed or deeply serrated and incised, upper lvs. sublanceolate, sessile, incisely pinnatifid: spikes terminal, pedunculate, subternate, flat or convex: bracts ovate: calyx 4 times as long as bracts, short-hairy, sprinkled with glandular hairs; corolla-tube glandular-pubescent, thrice as long as calyx; limb large, rose-purple, paler beneath, obovate lobes deeply emarginate. S. Brazil, Paraguay, and N. Argentina. B.M. 3628.

CCC. *Fls. white.*

4. **teucrioìdes,** Gill. & Hook. Fig. 3910. Characterized by fragrant white fls. in very long clusters: sts. cespitose, rooting at base, ascending, terete, openly and copiously hirsute: lvs. ovate to oblong-triangular, base entire, sessile or nearly so, obtusely serrate, margins revolute, veiny-rugose, glandular-pubescent above, subtomentosely hispidulous on veins below: spikes terminal, solitary, glandular, hairy, lax, 5–9 in. long: bracts subulate-lanceolate, ciliate: calyx nerved, twice as long as bracts; corolla yellowish white or pinkish, long exserted, twisting in age, fragrant. S. Brazil, Uruguay, Argentina, Chile, and Peru. P.M. 5:243. B.M. 3694.

BB. *Clusters panicled.*

5. **venòsa,** Gill. & Hook. Differs from all other cult. kinds by panicled infl. and tuberous roots: herbaceous perennial, 1 ft. high: sts. simple, rhizomatic, creeping at base, ascending, 4-angled, hairy: lvs. rigid, oblong to oblong-lanceolate, the subcuneate base entire and half-clasping, acute at apex, unequally subincisely dentate, the teeth openly acuminate, nerves prominent, hirsute below: spikes in a close terminal panicle, subternate, lateral ones pedunculate, fastigiate and finally cylindrical: bracts subulate, ciliate, often purplish, exceeding the hairy calyx: corolla lilac or bluish purple to nearly sky-blue, very thinly villous without; tubes slender, thrice as long as calyx: fr. 1 line long, copiously fuscous outside, dorsal ridges 5. S. Brazil and Argentina.

3910. Four prototypes of the garden verbenas, drawn from early colored plates. From left to right: V. chamædryfolia, supposed chief parent of the reds; V. phlogiflora and V. incisa, the originals of the rosy and purple colors; and (right) V. teucrioides, a white flower which is probably chiefly, if not wholly, responsible for the fragrance of the hybrid verbenas.

AA. *Connective of the upper anthers furnished with a glandular appendage.*

B. *Fls. violet or rosy purple.*

C. *Bracts half as long as calyx: plant a subshrub.*

6. **tènera,** Spreng. (*V. pulchélla,* Sw., not Hort.). Herbaceous perennial: sts. cespitose, decumbent, rooting; branches slender, 4-angled, ascending, sparsely hairy: lvs. decurrent into the short petiole, 3-parted and again pinnatifid into acute, linear, entire, subrevolute divisions, sprinkled with short hairs: spikes terminal pedunculate: calyx elongated, strigose pubescent or hairy, sprinkled at angles with short stipitate patelliform glands, twice as long as bracts; corolla rose-violet; anther appendages barely exserted, claviculate, subrecurved. S. Brazil and LaPlata region. Var. **Maonéttii,** Hort., by some supposed to be a hybrid between *V. tenera* and *V. incisa* and by others to be a form of *V. tenera,* has rosy pink or carmine fls. rayed with white-margined corolla-lobes. Intro. from Italy and some-

B.M. 3127.—Tubers may be kept indoors over winter, or species prop. by seeds sown in greenhouse in Jan.

times called Italian verbena. The name is variously spelled. Gn. 73, p. 31.

cc. *Bracts about as long as calyx or a little shorter: plant annual.*

7. **erinoïdes,** Lam. (*V. multífida,* Ruiz & Pav. *V. pulchélla,* Hort., in part). Moss Verbena. Annual or perennial: st. strigose hairy or somewhat hirsute, branching, decumbent, rooting; branches ascending: lvs. ovate in outline, cuneate base decurrent into the petiole, deeply 3-parted and the divisions pinnatifid into narrow linear acute lobes, subrevolute on margins,

3911. The common garden verbena.—Sometimes known as V. hybrida. (×1)

strigose especially on nerves: spikes terminal, solitary, pedunculate, soon elongating and relaxing, canescent hairy: bracts lanceolate, acuminate, spreading, one-half as long to as long or longer than the calyx: corolla rather small, shortly exserted, lilac, bearded within; anther appendages exserted, rather short.—Said by Dr. Gillies to be "one of the commonest plants on the Alps of Chile and Mendoza . . . varying extremely in color of flowers, in stature and in degree in which the leaves are cut." In some individuals the fls. are said to be scarlet, in others blue or purple. Forms assignable to this species occur also in the southern states of Brazil. The species is probably a composite one as now recognized. B.R. 1766 (as *V. multifida* var. *contracta*).—Variable species characterized by distinct finely cut foliage and rosy lilac to deep purple fls., but the clusters and individual fls. are too small to make it popular.

bb. *Fls. lilac: plants annual.*

c. *Lvs. twice pinnatifid.*

8. **bipinnatífida,** Nutt. (*V. pulchélla* of some seedsmen. *V. montàna,* Hort., in part). Perennial, prostrate and rooting at base; sts. stout, upright, branched, 6–18 in. high: lvs. rather thick, petioled, 1–2½ in. long, scabrous above, ovate in outline, bipinnately parted or 3-parted into numerous oblong, rather acute lobes 1–3 lines broad: spikes solitary, dense to rather lax, at first capitate, becoming 2–4 in. long in fr.: corolla 5–8 lines long, purple or lilac, limb 4–5 lines broad, lobes emarginate to obcordate; throat of corolla provided with a palisade of short hairs; upper stamens bearing each a small oval to oblong purplish gland. S. D. to Mex., east of the Rockies.—Fls. become bluish purple in drying.

cc. *Lvs. once pinnatifid.*

9. **canadénsis,** Brit. (*Buchnèra canadénsis,* Linn. *V. Aublètia,* Jacq. *V. Aublètia* var. *Drúmmondii,* Lindl. *V. Drúmmondii,* Hort. *V. Lámbertii,* Sims. *V. montàna,* Hort., in part). Fig. 3912. Perennial, pubescent, with rather stiff hairs or glabrate: branches slender and ascending from a sometimes creeping rooting base, 6–18 in. high: lvs. ovate or ovate-oblong in outline, 1–3 in. long, truncate, broadly cuneate or subcordate at base and the petiole more or less margined, incisely lobed and toothed, often deeply 3-cleft: spikes peduncled, dense, short and capitate in early fl., becoming 2–4 in. long in fr.: bracts subulate, mostly shorter than the calyx—these and the calyx densely glandular-pubescent: calyx-teeth unequal, filiform-subulate; corolla 6–10 lines long, from bluish purple or lilac to rosy purple or white, frequently approaching blue in dried specimens; limb ½–¾in. broad, lobes oblong or obovate, emarginate and more or less revolute near the sinuses, throat provided with palisade of short white hairs; upper anthers bearing each a light brown, oblong gland which is barely exserted. Colo. and Mex. eastward across the continent. B.M. 308; 2200. B.R. 294; 1925.—Reported as producing many garden and spontaneous hybrids. Garden forms are of stouter habit, less inclined to root at base: lvs. larger, dark shiny green above, more conspicuously veiny, clusters and individual fls. larger, and the color variation more striking. Many forms have a rich spicy fragrance quite different from that of the hybrid verbenas. On account of the robust healthy nature of *V. canadensis,* it has been frequently recommended in horticultural literature as desirable for hybridizing with the hybrid verbenas to improve their constitution. The cross would probably be too radical for best results. It is to be regretted that this charming species which is thought well of in Eu. should be neglected in its native country.

V. radìcans is listed as an alpine species of trailing habit and with crimson fls., suitable for rock-gardens. The *V. radicans* of botanists (Gill & Hook.) is an Andean species with procumbent rooting sts., glabrous divided lvs. with ultimate segms. very narrow, and lilac-colored fragrant fls. in short head-like spikes.

J. H. Cowen.
L. H. B.†

VERBENA, LEMON: *Lippia.* **V., Sand:** *Abronia.*

VERBESÌNA (probably a meaningless alteration of Verbena). *Compósitæ.* Crownbeard. Annual or perennial herbs, or some tropical species shrubby.

Leaves alternate or opposite, often decurrent: heads corymbose or solitary, of yellow or white fls.; rays sometimes wanting, pistillate or neutral: achenes flattened or those of the rays 3-sided, their margins winged or not;

pappus of 2 (1–3) awns, sometimes with 2 or 3 intermediate scales.—About 50 species, American. About a half dozen hardy perennial verbesinas have slight rank as garden plants, but the competition among yellow-fld. autumn-blooming composites is so great that verbesinas have little chance. They make acceptable wild-garden and back-border subjects.

occidentàlis, Walt. (*V. Siegesbéckia,* Michx. *Phæthùsa occidentàlis,* Brit.). Hardy perennial herb, 4–8 ft. high: lvs. ovate (uppermost oblong-lanceolate), acuminate,

3912. Verbena canadensis; formerly known as V. Aubletia. (×⅛)

serrate, the larger ones 8 in. long, contrasted into a marginal petiole: rays styliferous and usually fertile: awns of pappus not hooked. Dry hillsides, E. U. S.—A robust and rather coarse plant, growing 4–8 ft. high, and suitable only for the wild-gardens and the back row of the hardy border. It is doubtless of the easiest cult. It blooms from Aug. to Oct., and has numerous yellow fls. ½–1 in. across in flattish clusters.

crocàta, Less. A much-branched, hairy perennial with a fleshy 4-winged st.: lvs. opposite, decurrent, irregularly pinnately lobed, the lobes usually ovate and much toothed: fls. in solitary, peduncled heads, not very showy: achenes quite glabrous. Mex.—Offered by Montarioso Nursery at Santa Barbara, otherwise little known. Perhaps not hardy north of Washington.

V. Pùrpusii, T. S. Brandeg. Dwarf: lvs. in a rosette, elliptic, 4–5 in. long: scapes 8–12 in. long, each bearing a solitary fl.-head 1¾–2 in. across; ray-florets deep golden. Mex.—*V. virgínica,* Linn. (Phæthusa virginica, Brit.). VIRGINIA CROWNBEARD. A hairy-stemmed perennial with winged branches and white corymbose-paniculate heads has been offered. It is a wild-garden subject that would be good to naturalize. E. N. Amer. Gt., 47, p. 132.

N. TAYLOR.†

VERNÒNIA (after Wm. Vernon, an English botanist who traveled in North America). *Compósitæ.* IRONWEED. Perennial herbs or in the tropics shrubs and trees.

Leaves alternate, pinnately veined: fls. usually purple or rose, borne in the following species in terminal cymes: heads not glomerate, several to many exclusively tubular-fld.: involucre of dry or partly herbaceous, much-imbricated bracts: corolla regularly 5-cleft into narrow lobes: achenes 8–10-ribbed, with a blunt apex and a cartilaginous, callous base; pappus double (at least in American species).—About 560 species widely scattered about the world, but is possibly most plentiful in S. Amer. The latest monograph is that by H. A. Gleason in Bull. N. Y. Bot. Gard. 4:144–243, 1906. The following species are native of the U. S., and are hardy perennial herbs of attractive appearance, with rather large heads of purple fls. in terminal clusters in late summer or early fall. Vernonias are of easy cult. in any good, rich border, being easily prop. by division. Very satisfactory groupings can be made with vernonias and native asters and goldenrods.

A. *Heads 50–70-fld.*

crinìta, Raf. (*V. arkansàna,* DC.). St. 8–10 ft. high: lvs. linear-lanceolate, 4–12 in. long, alternate-acuminate, glabrous or somewhat pubescent: peduncles not branched: involucre green, the filiform tips often reddish and the pappus often purplish. Plains, Mo., Kans. to Texas. July–Sept. Var. **álba,** Hort., has white fls.

AA. *Heads 15–40-fld.*

B. *Lvs. narrowly linear.*

C. *Plant about 1 ft. high.*

Líndheimeri, Gray & Engelm. St. excessively leafy up to the infl.: lvs. 1½–3 in. long by 1–2 lines wide, white-tomentose, with revolute margins: fls. in a corymbiform cyme. July–Sept. Rocky hills, W. Texas.

CC. *Plant 2–4 ft. high.*

Léttermanii, Engelm. St. fastigiately and cymosely much branched at the summit: lvs. 2–4 in. long, only 1 line wide, much crowded and very numerous; margins not revolute: fl.-heads numerous, ½in. long, 10–14-fld. July–Sept. Sandy soil, Ark.

BB. *Lvs. not narrowly linear.*

C. *Bracts of involucre tipped with slender awns.*

noveboracénsis, Willd. Fig. 3913. St. 3–6 ft.: lvs. oblong to oblong-lanceolate, 3–9 in. long: heads in an open cyme: involucre commonly brownish or dark purplish: fls. deep purple, rarely white. Usually in moist soil. July–Sept.—The only common species of the E. U. S. and often used in the wild-garden.

CC. *Bracts not awned.*

D. *Plant tomentose.*

Báldwinii, Torr. St. 3–7 ft. high: lvs. oblong to ovate-lanceolate, 4–8 in. long, rather numerous: bracts greenish, acute or acuminate, tips spreading or reflexed: fls. purplish, blooming earlier than most species, in July and Aug. Prairies, eastern Mo. to Texas.

DD. *Plant glabrous.*

E. *Lvs. thin.*

altíssima, Nutt. (*V. máxima,* Small). St. 5–10 ft. high: lvs. veiny, lanceolate or lanceolate-oblong, 4–12 in. long, usually long-acuminate and finely serrate: infl. loosely branched and open, the fls. purple: bracts obtuse or merely mucronate-tipped, closely appressed. July–Sept. W. Pa. to Ill., La., and Fla.

EE. *Lvs. thickish.*

fasciculàta, Michx. St. 2–5 ft. high: lvs. somewhat obscurely veined, linear to oblong-lanceolate, 3–6 in. long: heads numerous and crowded on the branches of the cyme, 20–30-fld.: bracts obtuse or some of the upper mucronate-acute, closely appressed. July–Sept. Ohio and Ky. to the Dakotas and south to Texas. Grows on prairies and in moist soil; variable southward.

3913. Isolated specimen clump of ironweed.—Vernonia noveboracensis.

V. Arechavalètæ, André. Glabrous shrub, 3–6 ft. high: lvs. sessile, leathery, linear-lanceolate: fl.-heads reddish violet. Uruguay. —*V. gigantèa*, Hort. Robust: fl.-heads in panicles, carmine or violet-rose.

F. W. Barclay.
N. Taylor.†

VERÓNICA (named in honor of St. Veronica). *Scrophulariàceæ*. Speedwell. Annual and perennial herbs, shrubs, or rarely trees, one group of which, mainly European and American species, are hardy in the North, the other group, New Zealand species, are hardy in California and similar climates and are also somewhat used as greenhouse plants.

Leaves opposite, rarely whorled or rather few; cauline lvs. very rarely alternate; floral lvs. always alternate: fls. disposed in terminal or axillary bracteate racemes, or rarely solitary in the axils of alternate lvs., blue, purple, flesh-colored, or white, never yellow; calyx 4–5-parted, very rarely 3-parted; corolla-tube short, usually very short, limb spreading, 4–5-cleft; stamens 2: caps. compressed or turgid, 2-grooved, loculicidally dehiscent, usually obtuse or emarginate.—About 300 species, mostly natives of the temperate and colder regions, a few in the tropics. Veronica was monographed by Bentham in DC. Prod. 10:458–491 (1846), 158 species being then known. About 200 species are now known, very widely distributed.

All are showy free-flowering plants, used, except the shrubs, as garden perennials or annuals, and are propagated by seeds, the perennials also by division, the shrubs by cuttings in spring or summer. They succeed in any good garden soil in a sunny situation. The lower-growing forms are good rock-plants; the taller are adapted to the herbaceous border. The shrubby forms are greenhouse plants or grown only in warmer parts of the country, particularly California, where they are everblooming, and where they do well along the coast even in exposed places by the sea. The shrubby species are mostly natives of New Zealand. They are well reviewed in The Garden 45, page 506, and 28, page 292. Some of them have enjoyed a considerable popularity in England, where they are generally seen in cool conservatories, but they survive the winters outdoors in the most favored parts of the British Isles. The first hybrid was raised in 1848 by Isaac Anderson-Henry (then Isaac Anderson), a noted hybridizer. This gentleman continued his experiments for several years, using *V. speciosa*, *V. salicifolia*, and *V. elliptica*. His work was continued by others, and most of the hybrid veronicas of today have the parentage above indicated, with the blood of *V. speciosa* generally much in evidence. If a collective name for veronica hybrids is desired, *V. speciosa* var. *hybrida* is the best name for the whole group. Unfortunately all these hybrids are unfit for general cultivation out-of-doors in northern climes, but a hardier race will probably be secured by using *V. Traversii* and its allies, which have been introduced more recently. Some of these are *V. Colensoi*, *V. anomala*, *V. monticola*, and *V. pimeleoides*,—all unknown to the American trade. A third and still hardier group of the New Zealand speedwells is the truly alpine group known as whipcord veronicas. These should be hardy in many northern rockeries. They are unknown in America now. The best of the group is said to be a form of *V. cupressoides*, known to English trade as *V. salicornioides*. Others in cultivation are *V. Hectori*, *V. Armstrongii*, and *V. lycopodioides*. (A. P. Wyman.)

The New Zealand veronicas (Cockayne).

In New Zealand the veronicas comprise a marked feature in the flora, being represented by many shrubby and semi-shrubby kinds. Several of these species are well-known evergreen garden plants in California and parts of Europe. The following comment on the New Zealand veronicas is by L. D. Cockayne, Wellington; and the systematic treatment of these species is also founded on manuscript contributed by him.

Excepting the Tasmanian *V. formosa*, the shrubby species are natives of New Zealand where they occur in all kinds of stations and at all altitudes. In their native land, and in Great Britain and Ireland, they are now widely cultivated, but, unfortunately, none can be considered perfectly hardy in the northern states, though, where the cold of winter does not sink much below 12° F., many of the species should thrive admirably. All can be readily propagated from seeds or cuttings. If the latter are taken from adult plants in the autumn, they will bloom during the succeeding summer, and if bedded out on the rockery are most effective.

The genus in New Zealand contains more than 100 species, while nearly all of these can be subdivided into several distinct varieties. There are also astonishing differences in their growth-forms. Some are trees and others shrubs, which latter are erect or prostrate, compact and ball-like or wide-spreading, densely leafy or

3914. Veronica longifolia var. subsessilis (×¼). No. 6.

the leaves reduced to adpressed scales so that the plant resembles a cypress (the whipcord veronicas). The flowers also differ considerably and may be in small heads, racemes of different length, corymbs, or long branched panicles. The usual color is white, but crimson, lilac, violet, and blue are met with. Usually the leaves are bright green and perhaps glossy, but in some species, and this is a sign of hardiness, they are of a pleasing pale glaucous hue.

The compact shrubby species lend an admirable effect to the garden landscape when massed together on banks, many looking as if trimmed into a ball-like form by the gardener's hand. Most forms tolerate clipping to any extent. Some, especially *V. elliptica*, *V. angustifolia*, and *V. leiophylla*, make excellent evergreen hedges. A small form of the polymorphic *V. buxifolia* can be used as an edging after the manner of the box.

The species are exceedingly difficult to determine and errors abound in garden nomenclature, while unpublished names are frequent. Natural hybrids also occur and this brings in further confusion. Also, there are a number of garden hybrids in cultivation, mostly between *V. speciosa* and its nearer relatives. Much more important for colder countries are the

hybrids due to crossing the more hardy alpine species. So far as American gardens are concerned the following, not yet introduced or rare in cultivation (some of them not here described), would be desirable novelties: *V. Dieffenbachii, V. gigantea, V. Barkeri, V. Lewisii, V. leiophylla, V. Bollonsii, V. anomala, V. vernicosa, V. monticola, V. Menziesii, V. decumbens, V. tetragona, V. Armstrongii, V. propinqua, V. loganioides, V. Lavaudiana,* and *V. Raoulii.* Those desiring more information about the shrubby veronicas should consult Cheeseman's "Manual of the New Zealand Flora," Wellington, 1906, and the subsequent volumes of the "Transactions of the New Zealand Institute."

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KEY TO THE SECTIONS.

A. *Infl. terminal.* (*See also No. 32.*)
B. *Lvs. bearing fl.-shoots alternate* (*annuals*).
Section IV. OMPHALOSPORA. Species 19, 20.
BB. *Lvs. all opposite.*
C. *Corolla-tube lacking or very short.*
Section III. VERONICASTRUM. Species 9–18.
CC. *Corolla-tube long.*
D. *Caps. ovate or oblong.*
Section I. PÆDEROTA. Species 1, 2.
DD. *Caps. suborbicular.*
Section II. PSEUDOLYSIMACHIA. Species 3–8.
AA. *Infl. axillary.*
B. *Plants shrubs, or trees, rarely herbs: caps. turgid.* Section VII. HEBE. Species 41–60.
BB. *Plants herbaceous (base decumbent and often becoming woody): caps. laterally compressed.*
C. *Caps. only slightly compressed.*
Section V. BECCABUNGA. Species 21.
CC. *Caps. strongly compressed and transversely broader.*
Section VI. CHAMÆDRYS. Species 22–40.

Section I. PÆDEROTÆ.

A. *Lower lvs. orbicular*..... 1. **Bonarota**
AA. *Lower lvs. lanceolate*..... 2. **virginica**

1. Bonarôta, Linn. (*V. chamædryfòlia,* Wettst. *Pæderòta Bonaròta,* Linn. *P. chamædryfòlia,* Brign.). Perennial, pilose: sts. 4–6 in. high: lower lvs. orbiculate, scarcely 1 in. long; upper lvs. ovate or lanceolate, serrate or incised: spike globose or oblong, compact, 1–1¾ in. long: fls. blue, about ⅓in. across; calyx-segms. linear-subulate. Italian Alps and Tyrol.

2. virgínica, Linn. (*Leptándra virgínica,* Nutt. *V. verticillàta,* Hort.). CULVER'S ROOT. Erect, simple, somewhat pubescent herb 2–6 ft. tall: lvs. in whorls of 4–6, lanceolate, 2–4 in. long, smooth above, pubescent below, acutely serrate, short-petioled: racemes terminal, erect, long, dense: fls. many, white or pale blue, short-pedicelled: caps. longer than broad, pointed, twice exceeding the calyx. Aug.–Sept. Eastern states. Gn. 79, p. 259.—Free-growing herb. Likes rich soil and much sun. While stiff and coarse, it is bold and stately. Var. **álba,** Hort. (*V. verticillàta* var. *virgínica álba,* Hort.), is offered in the trade as a form growing 4 ft. high, with erect spikes of white fls. Var. **japónica,** Makino (*V. japónica,* Steud. *V. verticillàta* var. *japónica,* Hort.), has pedicelled blue or white fls., the pedicel equaling or exceeding the calyx. Var. **sibírica,** Makino (*V. sibírica,* Linn. *V. verticillàta* var. *sibírica,* Hort.), has sessile or subsessile blue or white fls.; pedicels always shorter than the calyx.

Section II. PSEUDOLYSIMACHIA.

A. *Foliage and st. white-pubescent or white-woolly.*
B. *Base of lvs. cordate*..... 4. **Bachofenii**
BB. *Base of lvs. attenuate*..... 8. **incana**
AA. *Foliage and st. nearly glabrous.*
B. *Lower lvs. pinnatisect*..... 3. **pinnata**
BB. *Lower lvs. merely serrate or crenate.*
C. *Racemes panicled*..... 5. **spuria**
CC. *Racemes solitary or few.*
D. *Lvs. lanceolate*..... 6. **longifolia**
DD. *Lvs. ovate-oblong*..... 7. **spicata**

3. pinnàta, Linn. Strong, upright plant 2–3 ft. high, glabrous or pubescent: lvs. sparse or somewhat clustered, finely cut, the lower pinnate with spreading segms., the upper pinnatifid, thickish, shining, smooth: racemes slender, many-fld., elongated: fls. blue. June, July. Open mountain lands, Russia.

4. Bachofênii, Heuff. Perennial, white-pubescent: sts. several, ascending or erect, 1–2 ft. high: lvs. opposite, petioled, 1–2 x 1 in., cordate-oblong, acute, coarsely serrate: racemes terminal, 1–12, opposite, elongate: fls. blue; calyx-lobes 4, linear, subequal; corolla-tube inflated, lobes broad-lanceolate: caps. small, obcordate, slightly compressed, about equaling the calyx. Hungary.

5. spùria, Linn. (*V. paniculàta,* Linn. *V. augustifòlia,* Fisch., not Bernh. *V. incìsa,* Soland. *V. amethýstina,* Willd.). BASTARD SPEEDWELL. Upright, slender, densely pubescent species 2 ft. high: lvs. mostly opposite or ternate, 1 in. long, linear, acute, serrate-crenate toward the apex, entire below, smooth, narrowed at the base, thickish: racemes numerous, panicled, long, densely many-fld.: fls. blue, pedicelled: caps. nearly round, thick, exceeding the sepals. May, June. G.W. 7, p. 437. Woods, S. E. Eu. and S. Russian Asia.—Becomes weedy late in the season. Var. **élegans,** Voss ex Wyman (*V. élegans,* DC. *V. paniculàta* var. *élegans,* Benth.), has the lvs. pubescent on both surfaces and is more branched than the type. Belgium. Variants of this variety are known in horticulture as *V. élegans* var. *cárnea,* Hort., a form growing 1 ft. high and having spikes of rich pink fls. and the variegated form as *V. élegans cárnea variegàta.*

6. longifòlia, Linn. (*V. marítima,* Linn. *V. hýbrida,* Georgi, not Linn. *V. persicifòlia,* Schott. *V. bracteàta,* Opiz, not Willd.). Strong, leafy, upright, densely growing species 2½ ft. high, with usually a smooth st.: lvs. lanceolate or oblong-acuminate, sharply serrate, lower

opposite, upper more or less verticillate, pubescent below, very acute, 2½–4 in. long: racemes long, erect, spiciform, dense: fls. lilac, numerous: caps. longer than broad, notched, a little exceeding the linear sepals or sometimes exceeded by them. Becomes black in drying. July–Sept. Wet fields, Cent. and E. Eu. and N. Asia.—Much cult. and hybridized. Has several varieties. A fine border plant and the most common species, growing and flowering freely in any good soil. Var. **álba,** Hort. (*V. marítima* var. *álba,* Hort.), grows 1–1½ ft. high: fls. white. Var. **glaùca,** Hort., has glaucous blue foliage: fls. rich purple. Var. **ròsea,** Hort. (*V. ròsea,* Hort. *V. hýbrida ròsea,* Hort. *V. marítima* var. *ròsea,* Hort.), a probable variety with pink fls., 2 ft. high and much branched. Hardy in Mass. Prop. by division and cuttings. Var. **subséssilis,** Miq. (*V. subséssilis,* Hort.). Fig. 3914. More erect, compact and robust than the type, 2–3 ft. high, growing in clumps with numerous side branches and of a good habit: lvs. 2–4 in. long, according to the richness of the soil: spikes longer and fls. larger than of the type and of an intense lustrous blue. Aug.–Oct. Japan. B.M. 6407. R.H. 1881:270. G.C. II. 16:789. J.H. III. 59:253. A good border plant and considered the best speedwell; thrives in deep rich soil in an open position. Var. **villòsa,** Hort. (*V. villòsa,* Schrad. *V. crenulàta,* Hoffm.). A Siberian form with narrower lvs. than the type and large blue fls. Lvs. serrate or doubly notched or incised.

7. **spicàta,** Linn. (*V. crassifòlia,* Wierzb. *V. hýbrida,* Linn.). Ascending or erect, slender sts. 2–4 ft. high, growing from a shortly creeping, almost woody rootstock: lvs. lanceolate, lance-oblong or the lower ovate, opposite or verticillate, crenate, downy, 1½–2 in. long, thick: racemes long, upright, densely many-fld.: fls. pedicelled, clear blue or sometimes pale pink; stamens very long, purple: caps. longer than broad, notched, thick, exceeding the broad hairy sepals. June–Aug. Hilly pastures, Eu. and N. Asia. Gn. 68, p. 55; 78, p. 157. J.H. III. 47:15.—Thrives in an open soil away from shade. Regarded as one of the better border speedwells. Var. **álba,** Hort. (*V. crassifòlia* var. *álba,* Hort.), is said to grow 6–18 in. high and have white fls. Var. **corymbòsa,** Hort., is offered in the trade as a form growing 1 ft. high: fls. pale blue. Var. **nàna,** Hort., is offered as a form 6–9 in. high: fls. blue. Var. **ròsea,** Hort., grows 15–18 in. high: fls. purplish pink, showy. July and early autumn. Var. **supérba,** Hort., is offered in the trade as growing 2 ft. high and having long spikes of violet fls. Var. **variegàta,** Hort., is offered as a form growing 1½ ft. high, with variegated foliage and blue fls.

8. **incàna,** Linn. (*V. cándida,* Hort. *V. neglécta,* Vahl). Strong, upright or ascending, white-woolly plant 12–18 in. high, with many sterile matted branches and fewer fertile erect branches: lvs. opposite, acute, lower oblong, upper lanceolate, 1–3 in. long, white-tomentose: racemes erect, solitary to several, 3–6 in. long: fls. many, blue, short-pedicelled: caps. longer than broad, thick, exceeding the woolly calyx. July–Sept. Fields and mountain regions. N. Asia, and S. W. Eu.—Resembles *V. spicata* in habit. Has a good appearance both in and out of bloom; useful in the rockery, border, or geometrical garden. Var. **candidíssima,** Hort., has lvs. larger and not so hoary as the type: fls. pale blue. Var. **glaùca,** Hort., is offered as a form with silvery foliage and deep blue fls.

Section III. Veronicastrum.

A. *Duration annual: floral lvs. usually about like the lower cauline lvs. (Subsection 4. Annuæ.)*
- B. *Cauline lvs. sessile* ..... 17. **syriaca**
- BB. *Cauline lvs. petioled* ..... 18. **glauca**

AA. *Duration perennial, base usually somewhat woody: floral lvs. usually much smaller than the lower cauline lvs.*
- B. *Habit erect or ascending: raceme usually somewhat elongated. (Subsection 3. Alpinæ.)*
  - C. *Plants 2–6 in. high.*
    - D. *Fls. blue or violet* ..... 14. **alpina**
    - DD. *Fls. rose or white* ..... 16. **repens**
  - CC. *Plants ½–4 ft. high (seldom less than 9 or 10 in.).*
    - D. *Lvs. 1–3 in. or more long* ..... 13. **gentianoides**
    - DD. *Lvs. ¼–½in. long* ..... 15. **serpyllifolia**
- BB. *Habit diffuse, low and much branched: raceme usually much shortened.*
  - C. *Infl. capitate, several-fld. (Subsection 1. Diffusæ.)*
    - D. *Blades linear-spatulate* ..... 10. **cæspitosa**
    - DD. *Blades ovate, orbicular or oblong-spatulate.*
      - E. *Surface of lvs. glabrous* ..... 9. **Nummularia**
      - EE. *Surface of lvs. white-tomentose* ..... 11. **bombycina**
  - CC. *Infl. a very short (in fr. elongated) raceme, few-fld. (Subsection 2. Fruticulosæ.)* ..... 12. **fruticulosa**

Subsection 1. Diffusæ.

9. **Nummulària,** Gouan. Perennial: sts. slender, creeping, becoming somewhat woody, diffusely branched: lowest lvs. scale-like, the others clustered, ovate-orbicular, obtuse, entire, about 2 lines long, rather thick, glabrous: racemes somewhat capitate, pubescent: fls. blue or pink; corolla with the lowest segms. much larger than the others: caps. small, broad, rather glabrous. Pyrenees.

10. **cæspitòsa,** Boiss. Perennial, diffuse, cespitose: sts. 1–3 in. high, densely foliate: lvs. rather thick, about ⅛in. long, clustered, linear-spatulate, obtuse, entire, margin revolute: raceme subsessile, 1–4-fld.: fls. large, rose; calyx lanate, segms. oblong-linear: caps. glabrous, obcordate, transversely broader. Greece, Asia Minor, and Syria.

11. **bombycìna,** Boiss. & Kotschy. Perennial, low, cespitose, forming cushions, appressed white-silky: lvs. very small, about 2 lines long, sessile, ovate or oblong-spatulate: fls. 1–5, terminal, reddish; calyx-teeth oblong, obtuse; corolla more than twice as long as calyx: caps. small, orbicular, tomentose. July. Syria.—In the trade abroad this species is described as having pale lavender fls.

Subsection 2. Fruticulosæ.

12. **fruticulòsa,** Linn. (*V. saxátilis,* Scop.). Perennial or shrubby: sts. diffusely branched, 2–6 in. high, woody at base: lvs. ¼–½in. long, oblong or obovate, entire or subcrenate: raceme lax, short, few-fld., pubescent: fls. blue or flesh-colored: caps. ovate. July. Mountains of Eu. and Greenland. There is a white-fld. form horticulturally known as *V. saxátilis álba* and also a form known in the trade as *V. saxátilis Grièvei.*—Possibly not all material known as *V. saxatilis* belongs here.

Subsection 3. Alpinæ.

13. **gentianoìdes,** Vahl (*V. glàber,* Hort.). Erect, slender, tufted species 6–24 in. high, from creeping roots: lvs. obovate or oblong, some lanceolate or linear, thickish, entire or small crenate, smooth, 1–3 in. long; root-lvs. more or less in rosettes; upper lvs. bract-like, smaller and narrower: raceme elongated, leafy, many-fld., hairy: fls. pale blue, with darker streaks, on long pedicels: caps. nearly round, slightly notched, exceeding the calyx. Wet alpine fields, S. E. Eu. B.M. 1002.—A hardy species in any soil or location, shade-enduring though not necessarily shade-loving, blooming early. Prop. by division. Forms a mat and makes a good ground-cover for bare spots in midsummer; also a valuable border plant. One of the earliest. Var. **álba,** Hort., is a white-fld. form. Var. **fòliis variegàtis,** Hort.,

see var. *variegata*. Var. **pállida**, Hort., is offered in the trade as a variety with pale porcelain-blue fls. Var. **pallidiflòra**, Hort., is a trade name, perhaps the same as var. *pallida*. Var. **stenophýlla**, Hort., is a narrow-lvd. form. Var. **variegàta**, Hort., is offered in the trade as having lvs. variegated with creamy white. G.M. 54:575.

14. **alpìna**, Linn. A slender delicate plant growing from a creeping stock, branching at the base, becoming ascending or upright, the fl.-st. often solitary, 2–6 in. high: lvs. opposite, occasionally alternate, subsessile, elliptic or oblong, entire or dentate, about ½–1 in. long, of varying size, the lowest small, orbicular: raceme short, spiciform, dense: fls. small, blue or violet: caps. ¼in. long, oblong, longer than broad, hairy, exceeding the calyx. Mountains of Eu., Cent. and N. Asia, and alpine and arctic regions in Amer. B.M. 2975.—Adapted to the rock-garden. It blackens when dried.

15. **serpyllifòlia**, Linn. (*V. alpéstris*, Hort.). St. Paul's Speedwell. Slender, ascending, nearly smooth plant, growing irregularly in clumps 2–4 ft. high, the base prostrate and rooting: lvs. ovate or oblong, crenate, ¼–½in. long, smooth, variable: racemes loose, with conspicuous bracts: fls. pedicelled, whitish or pale blue with deeper stripes: caps. wider than long, obtusely notched, exceeding or equal to the sepals. May–July. Roadsides and fields, Asia, Eu., N. Afr., N. and S. Amer.

16. **rèpens**, DC. Prostrate, slender, compact plant growing in dense masses: lvs. ¼–½in. long, ovate, slightly crenate, shining green and moss-like: racemes slender, few-fld.: fls. rose or nearly white, with a trace of blue: caps. broader than long, deeply notched, exceeding the sepals. May. Corsica.—Hardy in Mass. and intro. in Calif. Allied to *V. serpyllifolia* but dwarfer and more prostrate. Grows in the sun. Will cover the ground where grass does not grow, forming a sod in a short time; prefers moist corners but thrives on a moderately dry soil. Var. **álba**, Hort., is a white-fld. form.

Subsection 4. Annuæ.

17. **syrìaca**, Roem. & Schult. (*V. pedunculàta*, Labill., not Vahl). Ascending, diffusely branched pubescent annual, 6–12 in. high: lvs. ovate or ovate-lanceolate, incised or dentate, smooth; lower petiolate, upper subsessile, ½in. long: raceme terminal, slender, 4–6 in. long: fls. blue, with thread-like pedicels ½in. long: caps. broader than long, notched two-thirds of its length, exceeding the sepals. June. S. W. Asia. R.H. 1897, p. 311. F.S. 12:1259. Var. **flòre-álbo**, Hort., is a white-fld. form.

18. **glaùca**, Sibth. & Smith. Annual, suberect, branched; branches opposite, pubescent: lvs. ½–¾in. long, short-petioled, broadly ovate, obtuse, crenate-dentate; floral lvs. bract-like, 2–3-lobed: fls. ¾in. across, bright blue, throat white; calyx pubescent, segms. unequal, in pairs, elliptical: caps. suborbicular, retusely truncate. Greece. B.M. 7759.

Section IV. Omphalospora.

A. *Calyx-segms. ovate-lanceolate*.....19. **Tournefortii**
AA. *Calyx-segms. oblong-elliptic*.....20. **filiformis**

Subsection Agrestes.

19. **Tournefórtii**, C. C. Gmel. (*V. Búxbaumii*, Tenore). Prostrate annual, with elongated slender pubescent sts., the lower branching and often rooting: lvs. ovate, subcordate, coarsely crenate-serrate, pubescent, shortly petioled, ¾in. long, the lower opposite, the upper alternate and similar: racemes axillary: fls. small, blue, scattering, on long pedicels, of long duration: caps. broader than long, very widely notched, exceeded by the sepals. April–Sept. Fields, Cent. and S. Eu., Asia and naturalized in N. Amer. F. 1846, p. 112.

20. **filifórmis**, Smith. Annual or perennial, cespitose, dwarf, slightly papillose-pubescent: branches numerous, filiform, elongated, prostrate and rooting: lvs. small, ovate or orbiculate, obtuse, subcrenate, subcordate, somewhat petioled: fls. on filiform axillary pedicels, blue; calyx-segms. elliptic: caps. ciliate, orbicular-obcordate, acute angled, 2-lobed to the middle. Asia Minor. G. 37:99.

Section V. Beccabunga.

21. **Michaùxii**, Lam. Perennial, 4–5 ft. tall, everywhere pubescent: sts. erect, or ascending from rooting bases: lvs. ovate, crenate-dentate, lower and those of the sterile branches petioled, the others clasping: racemes few, rather dense, from the upper axils: fls. pale blue (drying reddish); calyx-segms. oblong, acute: caps. ovate-orbicular, turgid and glandular. Persia.

Section VI. Chamædrys.

A. *Calyx 5-parted.* (*See also No. 40.*) *The species of this group are closely allied and often hard to distinguish.* (*Subsection 1. Pentasepalæ.*)
B. *Lvs. bipinnatifid.*
C. *Base of caps. rotundate*.....27. **filifolia**
CC. *Base of caps. cuneate*.....26. **multifida**
BB. *Lvs. at most lobed, pinnatisect or even pinnatifid.*
C. *Caps. cuneate at base.*
D. *Blade pinnatifid*.....26. **multifida**
DD. *Blade at most incised-dentate*...22. **orientalis**
CC. *Caps. rotundate at base.*
D. *The lvs. often pinnatifid, when not so narrowly elongate-lanceolate*.....25. **austriaca**
DD. *The lvs. not lobed or pinnatifid, ovate to broadly lanceolate.*
E. *Margin of blade sharply serrate*.....23. **latifolia**
EE. *Margin of blade crenate or bluntly dentate*.....24. **Teucrium**
AA. *Calyx 4-parted (occasionally 5-parted in No. 40).*
B. *Racemes few-fld.: pedicels twice to many times longer than the calyx.* (*Subsection 5. Petrææ.*)
C. *Fls. solitary*.....40. **canescens**
CC. *Fls. racemose.*
D. *Color of fls. white.*
E. *Lvs. ¼–½in. long, serrate*...38. **Lyallii**
EE. *Lvs. 1/10–¼in. long, 1–2 teeth on each side*.....39. **Bidwillii**
DD. *Color of fls. blue.*
E. *Sts. crisply pubescent: caps. glandular-hirsute*.....36. **petræa**
EE. *Sts. glabrous or minutely white-puberulent: caps. glabrous.*
F. *Calyx-segms. broadly lanceolate*.....35. **Baumgartenii**
FF. *Calyx-segms. elliptic oblong*.....37. **telephiifolia**
BB. *Racemes many-fld.: pedicels shorter or only slightly longer than the calyx.*
C. *Infl. strict, almost spike-like.* (*Subsection 2. Strictifloræ.*)
D. *The racemes alternate*.....30. **Allionii**
DD. *The racemes opposite.*
E. *Cauline lvs. obovate-spatulate, rather narrow, often pinnatifid, ½–¾in. long*.....28. **pectinata**
EE. *Cauline lvs. elliptic-oblong, rather broad, never pinnatifid, usually about 1 in. or more long*.....29. **officinalis**
CC. *Infl. lax and spreading.*
D. *Caps. longer than broad.* (*Subsection 3. Multifloræ.*).....31. **Chamædrys**
DD. *Caps. broader than long.* (*Subsection 4. Scutellatæ.*)
E. *Raceme solitary* (*said to be terminal*).....32. **pirolæformis**
EE. *Racemes several.*
F. *Lvs. broadly ovate*.....33. **montana**
FF. *Lvs. linear-lanceolate*.....34. **scutellata**

Subsection 1. PENTASEPALÆ.

22. **orientàlis,** Mill. Perennial, shortly and crisply pubescent, rarely glabrate: sts. from woody rhizomes, decumbent or prostrate: lvs. sessile, short, lower cuneate-oblong or lanceolate, dentate-incised, rarely entire; upper usually narrower, lanceolate: racemes 2–4, from the upper axils, secund: fls. flesh-colored or pale blue; calyx-segms. 4 or 5, linear-lanceolate, very unequal: caps. glandular-pubescent, obcordate or truncate. July. Asia Minor and Persia. L.B.C. 5:419. Var. **tenuifòlia,** Boiss. (*V. taùrica,* Willd.), has narrowly linear lvs., with the margins sometimes somewhat revolute, entire, rarely acutely few-toothed. S. Armenia and Persia. L.B.C. 10:911.

23. **latifòlia,** Linn. (*V. urticæfòlia,* Linn.). Perennial, sparsely and crisply hirsute: sts. erect: lvs. sessile, ovate, sharply serrate, base often cordate; upper long-acuminate: racemes opposite, laxly paniculate: fls. light blue or reddish; calyx-segms. minute, lanceolate, rather acute: caps. orbicular, base rotundate. Eu.—Horticultural material under this name is apt to be a broad-lvd. form of *V. Teucrium.*

24. **Teûcrium,** Linn. (*V. dentàta,* F. W. Schmidt. *V. nítida,* Hort., ex Poir., not Ehrh.). Perennial, pubescent: sts. numerous, ascending, up to 20 in. high: lvs. ovate to linear-lanceolate, nearly entire, crenate to even bluntly dentate-incised, mostly sessile: racemes opposite, elongated: fls. large, blue, rarely rose or white; calyx-segms. oblong-linear to lanceolate: caps. obovate, base rotundate. Cent. and S. Eu. and Cent. Asia.—Variable. Var. **latifòlia,** Hort. (*V. latifòlia,* Hort., not Linn.), has broader lvs. Range of the type. Var. **prostràta,** Hort. (var. *dùbia,* Hort. *V. prostràta,* Linn.), has a more prostrate habit, only the tips of the sts. upright. Minor forms of this variety are known in the trade as *V. prostràta* var. *álba,* Hort., with white fls.; *V. prostràta* var. *pygmæa,* Hort., is a small form. G.W. 8, p. 2. *V. prostràta* var. *satureiæfòlia,* Hort. (*V. satureiæfòlia,* Poit. & Turp.), has light blue fls. B.M. 3683. *V. rupéstris,* Hort., is quite possibly referable to var. *prostrata.*

25. **austrìaca,** Linn. (*V. multífida,* Jacq., not Linn. *V. orientàlis,* Willd., not Mill. *V. prénja,* G. Beck). Perennial, 1–2 ft. high, pubescent: sts. erect, rarely ascending: lvs. sessile, ovate in outline, pinnatisect, segms. oblong with their base narrowed or linear, entire or incised: racemes 2–4, from the upper axils, elongated, many-fld.: fls. large, blue; calyx-teeth 5, rarely 4, linear, strongly unequal: caps. hirsute, obovate-obcordate. S. E. Eu. and Asia Minor. Var. **angustifòlia,** Benth. (*V. angustifòlia,* Bernh.), is a form with linear-subulate lf.-segms. Caucasus region.—Material offered in the trade as *V. angustifolia* should also be compared with *V. spuria* and *V. scutellata.*

26. **multífida,** Linn. Perennial, shortly and crisply pubescent: sts. decumbent and indurated at base or diffuse: lvs. sessile, pinnatisect in linear, entire or dentate segms.: racemes 2–4, axillary: fls. flesh-colored or pale blue; calyx-segms. strongly unequal: caps. glabrous or short-glandular, transversely broader. June, July. Asia and Asia Minor. B.M. 1679.—Probably not common in cult. and some at least of the material so named is probably *V. austriaca.*

27. **filifòlia,** Lipsky. Sts. several, ascending or erect, 6–12 in. high, crisply pubescent: lvs. sessile, bipinnatifid, divisions long, slender almost filiform: racemes 4–8, opposite, lax-fld.: fls. white, blue-veined, large; calyx-lobes 4, almost equal, nearly linear, acute: caps. shorter than the calyx, strongly flattened, obcordate, transversely broader. Caucasus.—Near *V. multifida.*

Subsection 2. STRICTIFLORÆ.

28. **pectinàta,** Linn. Prostrate, white-pubescent, hairy, spreading plant rooting at the nodes, the ascending branches producing single elongated racemes: lvs. obovate or spatulate, sometimes pinnatifid, crenate, narrow at the base, sessile, pubescent, ½in. long: racemes elongated, many-fld.: lower bracts like lvs.: fls. deep blue with a white center: caps. large, longer than broad, notched, pubescent, thick, exceeding the sepals. May, June. Dry, shady hills. Asia Minor.—Suitable to dry spots in a rock-garden. Grows in almost any soil and position. Var. **ròsea,** Hort., has numerous small spikes of rose fls.

29. **officinàlis,** Linn. (*V. Alliònii,* F. W. Schmidt, not Vill.). COMMON SPEEDWELL. FLUELLEN. GROUND-HELE. Prostrate, leafy native with a pubescent st. rooting at the nodes, slender, 6–18 in. long: lvs. elliptic, oblong or broadly oblong, ½–1 in. and more long, hairy, serrate at base, evergreen, retaining color where most exposed: racemes slender, densely many-fld.: fls. pale blue, rarely pink, sessile: caps. broader than long, wedge-shaped, broadly notched, hairy, exceeding the hairy sepals. May–July. Forests and mountains of Eu. and N. Amer.—Grows under trees and in shade where no grass will grow, covering the ground with a permanent sod. Spreads rapidly and is easily grown. Prop. by cuttings.

30. **Alliònii,** Vill. Perennial, glabrous or slightly minutely puberulent: st. prostrate, rooting at the base: lvs. very short-petioled, obovate-elliptic or oblong, obtusely serrulate, base usually cuneate: raceme densely spicate; pedicels very short: fls. violet; calyx-segms. 4, lanceolate-linear, rather acute; corolla-lobes lanceolate: caps. obcordate, acute, puberulent. S. Eu.

Subsection 3. MULTIFLORÆ.

31. **Chamædrys,** Linn. (*V. pedunculàta,* Vahl. *V. pulchélla,* Salisb.). GERMANDER SPEEDWELL. ANGEL'S EYES. BIRD'S EYES. Slender, compact, pubescent species 12–18 in. high, densely ascending from a creeping base: lvs. broadly ovate, sometimes narrower, subsessile, crenate or incised, rounded or cordate at base, hairy, thick, 1½ in. long: racemes 3–6 in. long: fls. large, blue, long-pedicelled: caps. longer than broad, widely notched, exceeded by the sepals. May, June. Woods and roadsides, N. and Cent. Eu., Caucasus, Syria, and Canaries. Adventive in this country.—A good border plant.

Subsection 4. SCUTELLATÆ.

32. **pirolæfórmis,** Franch. Perennial: sts. short, pilose below: lvs. nearly all clustered, petiolate, very broadly ovate, obovate or spatulate, crenate: raceme terminal, solitary, laxly many-fld.: fls. rose or pale violet; calyx-lobes glandular, ovate-oblong, obtuse: caps. rhomboid, broader than long. China.

33. **montàna,** Linn. MOUNTAIN SPEEDWELL. Slender, trailing, hairy plant, 12–18 in. long, rooting from the st.: lvs. ovate, petioled, coarsely crenate, hairy, sparse: racemes slender, few-fld.: fls. whitish, striped with purple-blue, on long pedicels: caps. large, broader than long, slightly notched, exceeding the hairy sepals. May, June. Moist woods, Temp. Eu.

34. **scutellàta,** Linn. (*V. angustifòlia,* S. F. Gray, not Bernh.). Perennial, 6–18 in. high, weak, glabrous or rarely puberulent: sts. slender: lvs. sessile, linear-lanceolate, acute, remotely and minutely denticulate: racemes filiform, flexuous, few-fld.: fls. whitish, bluish or flesh-color; calyx-segms. oblong: caps. much wider than long, plano-compressed, 2-lobed. N. temperate regions.—Material offered in the trade as *V. angustifolia* should also be compared with *V. austriaca* and *V. spuria.*

Subsection 5. PETRÆÆ.

35. **Baumgártenii,** Roem. & Schult. (*V. petræa,* Baumg., not Stev.). Perennial, 3–5 in. high, possibly more, glabrous or minutely white-puberulent: sts.

slender, ascending: lowest lvs. minute; middle 6 lines long, ovate or oblong, somewhat dentate; upper lanceolate, narrowed at base: fls. blue; calyx-segms. broadly lanceolate: caps. emarginate, glabrous. S. Hungary.—The material offered in the trade as *V. petræa* may belong here.

36. **petræa,** Stev. Perennial, cespitose, 4–5 in. high, minutely and crisply pubescent: sts. dwarf, diffuse and ascending: lvs. 6–10 lines long, oblong or elliptic from a cuneate, subsessile base, few-toothed; upper lvs. sometimes entire: racemes axillary, solitary; peduncles rather long: fls. large and blue; calyx-segms. broad-oblong: caps. glandular-hirsute, 2-lobed, transversely broader, base rotund, apex retuse. Caucasus.—The material offered in the trade under this name may be *V. Baumgartenii.*

37. **telephiifòlia,** Vahl. Perennial, creeping or tufted, glabrous, glaucous: branches diffuse, filiform but rather hard and fragile, rooting: lvs. fleshy, bluish green, small, 2–3 lines long, obovate-spatulate or oblong, short-petioled: peduncles axillary, solitary, ending in a short

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raceme: fls. blue; calyx-segms. elliptic-oblong: caps. glabrous, 2-lobed, transversely broader, base rotundate. Armenia.

38. **Lyallii,** Hook. f. Perennial: sts. slender, prostrate and rooting, 3–18 in. long, diffusely branched; branches terete, usually pubescent: lvs. short-petioled, ¼–½in. long, broadly ovate, almost orbicular or oblong-ovate, obtuse or subacute, with 2–3 coarse blunt serratures to a side, thick and coriaceous: racemes several, few or many-fld., near the ends of the branches, sometimes lateral: fls. white with pink veins, ⅓in. across; calyx deeply 4-parted, segms. ovate-oblong, ciliolate: caps. broadly obovate-oblong, turgid, 2-lobed. New Zeal.

39. **Bidwillii,** Hook. Perennial, about 3 in. high: sts. slender, prostrate and rooting, much branched, woody at base, 3–12 in. long; branches creeping, often matted, glabrous or pubescent: lvs. short-petioled or almost sessile, minute not more than ¼in. long, broadly oblong or ovate with 1 or 2 deep notches on each side or entire, coriaceous: peduncles axillary, slender, erect, 3–9 in. high, few- or many-fld.: fls. white, calyx-segms. 4, ovate or oblong, obtuse: caps. broadly oblong. June. New Zeal.

40. **canéscens,** T. Kirk. Perennial, small creeping and rooting herb with intricately branched sts. 1–4 in. long, often forming broad matted patches, hispid with grayish white hairs: lvs. minute, short-petioled or nearly sessile, obtuse, entire, both surfaces hispid: fls. solitary and axillary, pale blue (rich blue according to the trade); calyx 4–5-parted, segms. linear-oblong; corolla 4-lobed, lobes oblong: caps. small, broadly oblong, slightly compressed. Late-flowering. New Zeal.

Section VII. Hebe.

A. *Lvs. strictly scale-like, connate and appressed. (See also No. 54 which has somewhat scale-like but recurved spreading lvs.)*
B. *The lvs. densely imbricated* ..... 59. **Hectori**
BB. *The lvs. in distant pairs* ..... 60. **cupressoides**
AA. *Lvs. not strictly scale-like and appressed. (No. 54 has somewhat scale-like but recurved spreading lvs.)*
B. *Margin of lvs. coarsely serrate* ..... 58. **Hulkeana**
BB. *Margin of lvs. entire or minutely incised.*
C. *Blades more than 2 in. long (occasionally less in No. 42).*
D. *Apex of lvs. obtuse* ..... 41. **speciosa**
DD. *Apex of lvs. acute or acutish.*
E. *Caps. thrice length of calyx* ... 44. **macrocarpa**
EE. *Caps. twice or less length of calyx.*
F. *Fls. ½in. across* ..... 45. **amabilis**
FF. *Fls. ⅛–⅙in. across.*
G. *Calyx-segms. narrow-oblong: fls. ⅛–⅙in. diam.* ..... 42. **macroura**
GG. *Calyx-segms. lanceolate or ovate-lanceolate to ovate-oblong: fls. ⅙in. diam.* ..... 43. **salicifolia**
CC. *Blades rarely more than 1 in. long.*
D. *Shrubs erect, more than 2 ft. high.*
E. *Racemes corymbosely branched.*
F. *Calyx 3- rarely 4-parted* ... 46. **diosmifolia**
FF. *Calyx 5-parted* ..... 47. **formosa**
EE. *Racemes simple or even spicate.*
F. *Lvs. glaucous* ..... 52. **glaucophylla**
FF. *Lvs. green.*
G. *The lvs. glossy: fls. in a spike* ..... 51. **buxifolia**
GG. *The lvs. not glossy.*
H. *Apex of lvs. obtuse, red-margined* ..... 49. **Balfouriana**
HH. *Apex of lvs. acute.*
I. *Fls. ½in. diam.* ..... 48. **elliptica**
II. *Fls. ¼in. diam.* ..... 50. **Traversii**
DD. *Shrubs decumbent, less than 1 ft. high.*
E. *Lvs. glaucous.*
F. *Color of fls. white* ..... 56. **pinguifolia**
FF. *Color of fls. blue* ..... 57. **glaucocærulea**
EE. *Lvs. green.*
F. *The blades flat* ..... 53. **chathamica**
FF. *The blades recurved.*
G. *Blades broadly obovate oblong* ..... 54. **epacridea**
GG. *Blades ovate-lanceolate* .. 55. **loganioides**

41. **speciòsa,** R. Cunn. Stout half-hardy shrub, 2–5 ft. high, with stout, spreading leafy branches and crimson-purple fls.: lvs. 2–4 in. long, obovate or obovate-oblong, subsessile, dark green, thick, smooth, glossy, entire, rounded at apex: racemes axillary and opposite near tips of branches, stout, dense-fld.: fls. large, ⅓in. diam., purple-crimson: caps. more than twice as long as the calyx. Summer. New Zeal. B.M. 4057. F.S. 1:19. R.H. 1844:60. H.U. 6, p. 349. Var. **corymbífera,** Hort., is offered in the trade as growing 2 ft. high with rosy fls. Var. **rùbra,** Hort., is offered in the trade. Var. **variegàta,** Hort., is offered as a form growing 6 ft. high with large lvs. variegated with creamy white: fls. light blue. Probably really the variegated form of *V. Andersonii.* Intro. into S. Calif.—**V. imperiàlis,** Hort. (*V. speciòsa* var. *imperiàlis,* Boncharlat), seems to be merely a garden name for the true species. F.S. 22:

2317. *V. speciosa* hybridizes freely and there are several garden hybrids of which the best known is **V. Andersonii,** Lindl. & Paxt. (*V. salicifòlia* × *V. speciòsa. V. speciòsa* var. *Andersonii,* Hort. *V. Hendersonii,* Hort.), Fig. 3915, is grown in the greenhouse and is also used as a bedding plant. It grows 18 in. high: lvs. oblong, sessile, entire, thickish: racemes axillary: fls. bluish violet. F.S. 7:658. J.F. 1:103. G.W. 5, p. 20. Var. **variegàta,** Hort., has the foliage variegated with creamy white. G.L. 18:77. Gn. W. 23:829.

42. **macroùra,** Hook. f. Shrub, 1–5 ft. high, much branched, glabrous: lvs. sessile or nearly so, 1–3 in., usually more than 2 in. long, obovate-oblong to obovate-lanceolate or linear-oblong, acute, hardly coriaceous, glabrous or nearly so: racemes 2–4 in. long, longer than the lvs., very densely many-fld.: fls. small, white or pale bluish white; calyx deeply 4-parted, segms. narrow-oblong, finely pubescent, ciliolate: caps. densely crowded, usually pendulous, small, ovate, compressed. New Zeal. G. 37:307.

43. **salicifòlia,** Forst. f. A collective species containing many distinct varieties. The most common form is a moderately hardy much-branched shrub attaining at times a height of 10 ft.: lvs. lanceolate, 2–6 in. long, acute, entire or slightly toothed near apex, rather thin, pale green, glabrous: racemes slender, many-fld., 3–10 in. long: fls. small, numerous, frequently tinged lilac, sweet-scented: caps. almost twice as long as calyx. Midsummer. New Zeal. B.R. 32:2. Gn. 26, p. 107; 28, p. 293; 34, p. 349. G. 37:308. G.M. 52:258. Gt. 57, p. 189. Var. **Kirkii,** Cheesem. (*V. Kirkii,* J. B. Armstg.). Shrub, 6–12 ft. high; branches stout, dark brown: lvs. smaller, ¾–1½ in. long, oblong or oblong lanceolate, leathery: racemes 4–8 in. long: fls. white, ¼in. across: caps. broadly ovate, acute, hoary-pubescent. New Zeal. **V. gigantèa,** Cockayne, confined to the Chatham Isls., a tree 40 ft. high, is closely related to *V. salicifolia* but is less hardy. **V. rotundàta,** T. Kirk, another allied species, has much broader lvs. and handsome violet-purple fls. There is a fine variegated form of *V. salicifolia* only recently brought into cult. in New Zeal. *V. salicifolia* readily hybridizes with its allies and various hybrids exist but there is no uniformity in their names. **V. cárnea,** J. B. Armstg., with rose-colored fls. has probably the above species as a parent.

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44. **macrocárpa,** Vahl. A half-hardy species with many forms allied closely to *V. salicifolia* but readily distinguished by the generally narrower, thicker, smoother, darker green lvs., the larger white fls. and the much larger caps., thrice as long as the calyx. Late spring. Frequently in poor clay soil. New Zeal. Gn. 78, p. 7.—**V. latisèpala,** T. Kirk, is a handsome plant differing from the above in its deep violet fls., broad calyx-lobes and secund caps.

45. **amábilis,** Cheesem. Tall shrub related to *V. macrocarpa* but differing in its broader, shorter lvs., laxer racemes and acute calyx-segms. Summer. Near seashore mixed with other shrubs. New Zeal. Var. **blánda,** Cheesem., has shorter lvs. and denser, shorter racemes than the type.

46. **diosmifòlia,** R. Cunn. Shrub, usually 2–5 ft. high, but reaching a height of 15 ft.; branches glabrous or puberulous: lvs. short-petioled, ½–1 in. long, linear-oblong or oblong-lanceolate to elliptic-oblong, acute, entire or minutely incised, coriaceous, dark green above, paler beneath: racemes about 1 in. long, corymbosely branched: fls. white or pale lavender-blue, about ¼in. across; calyx usually 3-parted, rarely 4-parted; corolla 4-lobed: caps. ovoid, turgid. New Zeal. B.M. 7539. Gn. 43, p. 519.

47. **formòsa,** R. Br. Evergreen corymbosely branched shrub, 2–4 ft. high, practically glabrous: lvs. rather crowded, oval-oblong or lanceolate, entire or very rarely obscurely toothed, thick: fls. pale lilac, in short racemes in the upper axils; calyx deeply 5-parted: caps. oblong, acute or obtuse, turgid. July. Tasmania. B.M. 4512. J.F. 1:3.

48. **ellíptica,** Forst. f. (*V. decussàta,* Ait.). Half-hardy, much-branched shrub, or even small tree, 5–20 ft. high. There are several distinct varieties; the most common in cult. is about 8 ft. high: lvs. petiolate, elliptic-oblong, ½–1 in. long, apiculate, truncate at base, pale green, rather thick, margins edged with white pubescence, midrib prominent beneath: racemes near tips of branches, short, 1–1½ in. long, laxly 4–12-fld.: fls. large, blue for a brief period, then white, sweet-scented: caps. twice as long as calyx. Late summer. Seacoast on rock or on ground mixed with other shrubs. Subantarctic S. Amer., Lord Auckland and Campbell Isls. and New Zeal. B.M. 242. J.H. III. 52:38.—**V. Lèwisii,** J. B. Armstg., a desirable half-hardy, late-blooming species is related to the above and may be a hybrid. It has larger lvs., dense-fld. racemes 2–2½ in. long and very large white fls.

49. **Balfouriàna,** Hook. f. Erect, glabrous shrub, 3 ft. high: lvs. subsessile, ⅛–¾in. long, elliptic-ovate, subacute or obtuse, margins red-brown: racemes 2–3 in. long, many-fld.: fls. pale violet-blue, calyx-segms. acute: caps. one-third longer than calyx-segms. or less. B.M. 7556.—Raised in the Royal Botanic Garden, Edinburgh, from seed sent from New Zeal. but it has not been found growing wild as yet, nor is it cult. in New Zeal.

50. **Tráversii,** Hook. f. Fig. 3916. Shrub of dense habit forming a globose mass of leafy, slender sts. 3–4 ft. diam.: lvs. ½–1 in. long, elliptic-oblong to linear-oblong, green, leathery, acute: racemes near tips of branches, 1–3 in. long, generally tapering: fls. white, calyx-segms. broadly ovate or oblong: caps. twice length of calyx. Midsummer. New Zeal. B.M. 6390. Gn. 32, p. 217; 66, p. 391. G.C. III. 53:172. G. 10:375. G.L. 25:139. G.M. 45:84; 53:630. G.W. 12, p. 161.—**V. monticola,** J. F. Armstg., includes a number of distinct plants much resembling forms of the above, but their lvs. are frequently obtuse and racemes much shorter. Gn. 43, p. 522. **V. lævis,** Benth., is similar to *V. monticola* but it differs in its corymbosely-branched infl. **V. subalpìna,** Cockayne, has softer, brighter green lvs., shorter racemes and corolla-tube. It also blooms earlier than *V. Traversii.*

51. **buxifòlia,** Benth. Under this name are included many most distinct plants, but all possess green, glossy, acute, thick, petiolate lvs., truncate at the base and keeled beneath, which in one form are golden variegated when young, sessile fls. in spikes ¼–1 in. long and lf.-like bracts as long as or longer than the calyx. Var. **odòra,** T. Kirk (var. *pàtens,* Cheesem.), is perfectly globular in form. Var. **prostràta,** Cockayne, is quite prostrate with rooting branches.—Another form, not yet named, is erect, 2–3 ft. high, and sparingly branched. Late summer. New Zeal. **V. anômala,** J. B. Armstg., distinguished from *V. buxifolia* var. *odora* by its sometimes 3-lobed corolla and its narrower lvs. with purplish tips is nevertheless a most distinct and handsome plant. B.M. 7360.

52. **glaucophýlla,** Cockayne (*V. Colénsoi* var. *glaùca,* Hort.). Closely related to *V. Traversii* but at once distinguished by the small, narrow, not keeled, glaucous lvs., slender tapering racemes of white fls., short corolla-tube hairy within and pubescent ovary. Summer. Dry montane and subalpine stations, New Zeal.

—There are several forms of this striking fairly hardy shrub quite distinct for garden purposes, one of which is known as *V. Colénsoi* var. *glaùca nàna*, Hort. The species is unrelated to *V. Colensoi*, Hook. f., a plant not yet in cult., which has the fls. in corymbs (B.M. 7296).

53. **cháthamica,** Buch. A rather tender polymorphic species, the forms of which are distinguished by the trailing habit, flexible branches, elliptic or elliptic-oblong, rather fleshy, pale green, often more or less pubescent lvs. and short, dense, obtuse racemes of violet fls. Late summer. Chatham Isls. G.C. III. 26:354.

54. **epacrídea,** Hook. f. Prostrate, almost hardy shrub of straggling habit: lvs. closely quadrifariously imbricated, opposite pairs united at base, spreading, recurved, ⅛–¼in. long, broadly obovate-oblong, leathery, concave, glabrous, keeled, rounded or subacute at apex: fls. small, white, in dense terminal ovoid heads. Early summer. Mountains, New Zeal. **V. Haàstii,** Hook. f., is closely related to the above but is a larger plant with the lvs. more fleshy and not recurved or keeled. Both are admirable rock-garden plants of a most distinct appearance.

55. **loganioìdes,** J. B. Armstg. Dwarf shrub, 6–14 in. high: sts. woody, decumbent at base, erect above; branches grayish white-pubescent or almost villous: lvs. decussate, sessile, ⅛–⅙in. long, ovate-lanceolate, acute, entire or with 1 or 2 small teeth, dull green, keeled, leathery: racemes forming a small corymb-like head: fls. ¼in. across, white or white with pink veins; calyx deeply 4-parted, segms. ovate-oblong, ciliolate: caps. elliptical-oblong, didymous, turgid. New Zeal. B.M. 7404.—A species of doubtful systematic position, by some placed in section Hebe, by others in what corresponds to section Chamædrys.

56. **pinguifòlia,** Hook. f. (*V. carnósula*, Hort., not Hook. f.). Branches stout, more or less decumbent, ringed with lf.-scars: lvs. imbricating to erect-patent, sessile, narrow-oblong to almost orbicular, ¼–½in. long, glabrous, usually thick, glaucous, generally margined red: spikes crowded near tips of branches, short, stout, dense-fld.: fls. white, ovary pubescent. Summer. Mountains, to 7,000 ft., New Zeal. B.M. 6587.—A fairly hardy polymorphic species containing many most distinct plants admirably suited for rockeries. The forms with larger almost orbicular lvs. are generally termed *V. carnosula* in gardens, but this species, distinguished by its glabrous ovary and acute caps., is probably not in cult. **V. amplexicaùlis,** J. F. Armstg., is an extremely striking allied plant readily distinguished by its far-spreading branches and cordate, semi-amplexicaul lvs. nearly 1 in. long. B.M. 7370. **V. decúmbens,** J. B. Armstg., is of similar habit to *V. pinguifolia* but the lvs. are green, though similarly margined red.

57. **glaûco-cærùlea,** J. C. Armstg. Suberect, fairly hardy shrub, about 1 ft. high: lvs. elliptic, acute, ⅓in. long, rather thick, intensely glaucous both surfaces, not keeled, margined red: spikes few-fld., rachis strongly pubescent: fls. ¼in. diam., bluish lilac. Midsummer. Dry ground, New Zeal. **V. pimeleoìdes,** Hook. f., is somewhat similar to the above but is more slender, the lvs. narrower and paler, the spikes longer, the rachis much less hairy and the fls. pale lilac. Var. **minor,** Hook. f., is only 1–4 in. high and its fls. are darker and bluer.

58. **Hulkeàna,** F. v. M. Extremely showy, moderately hardy, lilac-fld. species readily distinguished by its shining, coarsely serrate, ovate lvs., 1–2 in. long, and terminal panicles slender, erect, laxly branched, 1–3 ft. high: lvs. in distant pairs, 1–2 in. long, ovate to oblong, obtuse or acute, coarsely serrate, dark green, glossy, rather fleshy: panicle 6–12 in. long by 2–6 in. broad: fls. very numerous, small, sessile, pale soft lilac: caps. small, oblong, twice length of calyx. Rock-faces from the coast-line to 3,000 ft., New Zeal. B.M. 5484. G.C. III. 38:242; 48:444. Gn. 64, p. 115; 77, p. 134. G.M. 47:389; 55:195. R.H. 1906:40. **V. Fairfièldii,** Hook. f., is said to be a hybrid between the above and *V. Lavaudiana*. It is a smaller, stouter plant with smaller lvs., 1 in. long, the margins crenate-dentate and reddish, and the panicle is shorter and broader. B.M. 7323. Gn.W. 5:709 (as *V. fairfieldiensis*). **V. Lavaudiàna,** Raoul, is a handsome shrub 6–9 in. high with broadly obovate or obovate-spatulate lvs., their margins crenate-serrate and margined with red and short spikes arranged in a many-fld. corymb 2 in. diam.: fls. pink in the bud but finally white. B.M. 7210. G.C. III. 9:784.

59. **Héctori,** Hook. f. Stout fairly hardy shrub 6–30 in. high: st. terete, closely marked by old lf.-scars: lvs. densely imbricating, opposite pairs united to middle forming a ring surrounding the branch, broadly orbicular-oblong, ⅛₀–⅛in. long, obtuse, smooth, shining, puberulous on margin: fls. crowded at tips of branches, forming small, ovate, terminal heads, small, white. Mountains 3,000–6,000 ft., New Zeal., chiefly in the southwest.—Other allied whipcord veronicas are: **V. tetragòna,** Hook., branches obtusely 4-angled, lvs. obtuse, keeled; **V. lycopodioìdes,** Hook. f., branches acutely 4-angled, lvs. narrowed into a blunt point; **V. Armstrongii,** Kirk, branches flabellate, terete, lvs. subacute, fls. pale lilac; **V. salicornioìdes,** Hook. f., branches terete, lvs. united to much above middle, subtruncate, fls. white. **V. propínqua,** Cheesem. (*V. cupressoìdes* var. *variábilis*, N. E. Br.), was for many years cult. in gardens under the name of *V. salicornioìdes* but it is semi-decumbent with slender branches about ⅛₀in. diam. and minute lvs.

60. **cupressoìdes,** Hook. f. Quite distinct from any other of the whipcord species: a shrub of globose form, 4–6 ft. high: branches numerous, very slender, ⅛₀in. diam., green, clothed with decussate cypress-like scale-like lvs. in distant pairs, much shorter than the internodes and about ⅛₀in. long: fls. in small terminal heads, small, lilac: caps. obovoid. Summer. Mountains, 2,000–3,500 ft., New Zeal. B.M. 7348. G.C. III. 3:20, 21; 9:38.

V. amàna, Hort., not Bieb., is described as growing 1 ft. high, flowering early: fls. rosy, in neat spikes. The true V. amœna is apparently not in cult.—*V. angustifòlia* var. *ròsea*, Hort., is offered in the trade as shrubby with fls. bright rose in spikes; not determinable botanically as the specific name angustifolia has been used for several different forms.—*V. bachofénsis*, Hort., is offered in the trade as growing 4 ft. high: fls. dark blue in long slender spikes; possibly the same as V. Bachofenii.—*V. Bachofèri*, Hort., is offered as growing 1 ft. high, of close habit with lavender-blue fls.; possibly the same as V. Bachofenii.—*V. circæoìdes*, Don, is offered in the trade, but is not now included in any of the Swiss botanies. The material passing under this name in the trade may be described as follows: Low, trailing perennial, growing in a dense mass: lvs. lanceolate, crenate toward the apex, small, dark green, numerous: racemes many, 6 in. high: fls. small, dark blue. May, June. Considered one of the best. Valuable as a ground-cover, as a rock-plant, or at the front of an herbaceous border.—*V. cœlestinum*, Hort., is offered in the trade as very dwarf and spreading, with pale blue fls. Var. *corymbòsa*, Hort. ex Don, is a nomen nudum, but material growing less than 9 in. high, with dense glomerate heads of dark blue fls. is offered in the trade under this name.—*V. edinénsis*=V. Hectori×V. pimelioides.—*V. elegantissima*, Hort., is a trade name.—*V. Fórrestii*, Diels. Perennial, 6–15 in. high: sts. decumbent, creeping, branched and stoloniferous at base: lvs. petioled, narrowly ovate or oblong, ⅜–¾in. long, glabrous, paler and often purplish beneath: racemes terminal or axillary: fls. reddish; sepals oblong or lanceolate-oblong, glandular-puberulent; corolla pilose at throat: caps. obliquely rhomboid. Mountains of W. Yunnan, China.—*V. Gìrdwoòdii*, Hort., is a trade name.—*V. Guthrieàna*, Hort., is a garden hybrid, said to grow 9 in. high: fls. blue.—*V. herbàcea*, Hort., is offered in the trade as having narrow foliage and starry blue fls.—*V. Koenitzeri*, Hort., is a trade name.—*V. Lindsayi*, Hort., is offered in the trade as having large trusses of pink fls.—*V. meldénsis*, Hort., is a trade name.—*V. myrtifòlia*=V. Balfouriana×V. salicifolia.—*V. Prínglei*, Hort., is offered in the trade as having loose tufts of pale blue fls.—*V. rupéstris*, Hort., is probably V. Teucrium var. prostrata. The name rupestris has been used for various forms; that of Salisbury applies to V. fruticulosa, that of Tardent to a plant from S. Russia, the description of which is not available.—*V. rupéstris* of the trade has axillary, many-fld. racemes. It is a low plant with woody horizontal st. and erect flowering branches 4 or 5 in. high with strict racemes of purplish fls. borne in June and a 4-parted calyx. The caps. is obcordate. This plant has been offered by Rochester nurserymen ever since 1894 and was cult. at Harvard Botanic Garden as far back as 1883. Lvs. narrowly oblong, entire or serrate, ½–1 in. long: calyx-segms. strongly unequal: pedicels longer than calyx: st. pubescent: lvs. sparsely ciliate, short-petioled. Gn. 78, p. 161. Var. *álba*, Hort., has white fls. Var. *pállida*,

Hort., is offered as a pretty trailing species with masses of lilac-blue fls.—*V. umbilicàta spinòsa*, Hort., is a trade name.—*V. utriculàta*, Hort., is a trade name.—*V. Veitchii*, Hort., is a horticultural name. G.M. 54:801.—*V. verbenàcea*, Hort., is unknown botanically, but has been offered by Rochester nurserymen since 1894 as a form with lvs. short-petioled, narrowly elliptic, serrate in the upper half: racemes lateral: fls. blue.—*V. verbenifòlia fòliis variegàtis*, Hort., is a trade name.—*V. Wáldsteinii*, Hort., is offered in the trade as having spikes of blue fls. appearing in very late summer.—*V. Whittallii*, Hort., is offered in the trade as having dense hillocks of dark green foliage and spikes of pale blue fls. F. TRACY HUBBARD.†

VERSCHAFFÉLTIA (Ambroise Verschaffelt, 1825–1886, distinguished Belgian horticulturist; founded L'Illustration Horticole at Ghent in 1854 and introduced many choice plants, particularly palms and other foliage plants). *Palmàceæ*, tribe *Arèceæ*. A tall palm, spinose throughout or at length spineless.

Trunks slender, ringed, arising from above-ground roots: lvs. terminal, recurved; blade oblong or cuneate-obovate, bifid, plicate-nerved, usually laciniate nearly to the rachis; segms. incised; midrib and nerves strong, scaly; petiole half-cylindrical; sheath long, scaly, deeply split: spadix 3–6 ft. long, paniculately branched, long-peduncled, recurved, scaly, its rachis long, and branches and branchlets spreading, slender: spathes 2 or 3, long, sheathing, the lower persistent, the upper deciduous: fls. very small: fr. globose, smooth, 1 in. long.—A genus of only 1 species from the Seychelles. Cult. as in Latania.

spléndida, H. Wendl. Caudex 80 ft. high, 6–12 in. diam., very spiny when young, with many aërial roots: lvs. 5–8 ft. long; petiole 6–12 in. long, pale green; sheath 2½–3½ ft. long, white-granular; blade cuneate-obovate, bright green, 4–7 ft. long, 3–5 ft. wide, bifid, deeply incised on the edges. I.H. 12:430; 43, p. 31. F.R. 2:483. R.H. 1869, p. 148. A.G. 22:649.

V. melanochætes, H. Wendl.=Roscheria.
WILHELM MILLER.

VERVAIN: *Verbena*.

VESICÀRIA (Latin, *bladder*, referring to the shape of the pods). *Cruciferæ*. Branched annual or perennial herbs, treated as annuals in the garden: lvs. entire, sinuate or pinnatifid: racemes without bracts: fls. large, rarely small, yellow or purple, variable in form; sepals similar at base or the lateral somewhat saccate: silique globose or inflated, 1–2-celled, many-seeded, valves swollen.—About 20 species, widely distributed. The annual species are prop. by seeds, the perennial by division.

sinuàta, Poir. Lvs. softly tomentose, oblong-lanceolate, narrowed toward the base, sinuate-dentate or subentire. Spain.—According to DeCandolle the petals finally become whitish. Both seeds and plants of *V. sinuata* are offered by American dealers, but the plant is not generally known. DeCandolle says it is an annual or biennial, while Koch says it is perennial or subshrubby. In the American trade it is considered an early-flowering yellow annual, about 1 ft. high, blooming in May and June. F. TRACY HUBBARD.†

VETCH: *Vicia*. **V., Crown:** *Coronilla*. **V., Milk:** *Astragalus*.

VETIVÈRIA (*Vetiver*, the Tamil vernacular name). *Gramíneæ*. Aromatic perennials with long panicles of numerous slender racemes: spikelets awnless, in pairs, one sessile and perfect, the other pedicelled and staminate, the sessile spikelet bearing minute spines.—Species 1, with 1 or 2 varieties. **V. zizanioides**, Nash (*Andropògon squarròsus*, of authors, not Linn. *A. muricàtus*, Retz. *V. arundinàcea*, Griseb.). Fig. 3917. E. Indies, escaped from cult. in the American tropics and in the S. U. S. The rhizome is very aromatic. This is the Khas Khas or Khus Khus grass of India, the vitivert used in perfumery and the *Radix Anatheri* or *R. Vetiveriæ* of the apothecaries. It has been used in medicines and perfumes from prehistoric times. In India the plant is used to make screens, called "Vesaries," which, when kept wet and placed in a current of air, cools and perfumes the atmosphere. The rhizome when laid away among them is said to keep clothing free from moths. For history of this grass, see Kew Bull. Misc. Inform. No. 8, 1906. A. S. HITCHCOCK.

3917. Vetiveria zizanioides. (×⅓)

VIBÚRNUM (the ancient Latin name). *Caprifoliàceæ*. Ornamental woody plants grown for their attractive flowers, fruits, and foliage.

Deciduous or sometimes evergreen shrubs, rarely small trees, with opposite stipulate or exstipulate lvs.: fls. small, in terminal paniculate or mostly umbel-like cymes; calyx with 5 minute teeth; corolla rotate or campanulate, rarely tubular; stamens 5; ovary usually 1-loculed: fr. a drupe with a 1-seeded, usually compressed stone. In several species the marginal fls. of the cymes are sterile and radiate; such are *V. macrocephalum*, *V. tomentosum*, *V. Opulus*, *V. americanum*, *V. Sargentii*, and *V. alnifolium*, and of the 3 first-named garden forms are known with all fls. sterile and enlarged.—About 120 species in N. and Cent. Amer. and in the Old World from Eu. and N. Afr. to E. Asia, distributed as far south as Java. For a key to the 65 species known from E. Asia, see Rehder, The Viburnums of Eastern Asia, in Sargent, Trees and Shrubs, 2:105–116.

The viburnums are upright mostly rather large shrubs or sometimes small trees with usually medium-sized deciduous or evergreen foliage and white or sometimes pinkish flowers in showy flat clusters or sometimes in panicles, followed by berry-like subglobose to oblong, red, dark blue, or black fruits. The viburnums rank among the most valuable ornamental shrubs. Besides showy flowers and decorative fruits they possess handsome foliage which mostly assumes a bright fall coloring. The plants are of good compact habit. Most of the deciduous species are hardy North, but *V. macrocephalum* var. *sterile* and *V. obovatum* are tender; also *V. tomentosum*, *V. Wrightii*, *V. theiferum*, *V. cotinifolium*, *V. nudum*, and *V. dilatatum* are not quite hardy farther north than New England. Of the evergreen species, *V. rhytidophyllum* is the hardiest and at the same time one of the most distinct and handsomest species of the genus, with its bold foliage and the large clusters of flowers and fruits; it is hardy as far north as Massachusetts in favorable positions; also *V. japonicum* stands several degrees of frost, but cannot be relied on north of Philadelphia; *V. odoratissimum* and *V. suspensum* are still tenderer. The viburnums are well suited for borders of shrubberies or planting along roads, and the more showy ones are handsome as single specimens on the lawn. They are mostly medium-sized shrubs, 5–10 feet high, but *V. Lentago*, *V. prunifolium*, and *V. rufidulum* sometimes grow into small trees, 30 feet high, while *V. acerifolium* hardly reaches 5 feet. The most decorative in fruit are *V. Opulus*, *V. dilatatum*, and *V. Wrightii*, with scarlet or red berries which remain a long time on the branches. Besides the snowball forms, *V. dilatatum*, *V. tomentosum*, *V. Sieboldii*, *V. prunifolium*, *V. rufidulum*, *V. venosum*, and *V. denta-*

tum are very handsome in bloom. Varieties with all the flowers of the cymes sterile and enlarged are known in the case of *V. Opulus*, *V. tomentosum*, and *V. macrocephalum*, the common, the Japanese and the Chinese snowballs; all these are very showy. One of the most charming in bloom is *V. Carlesii* on account of its rather large pink-and-white and deliciously fragrant flowers which appear in dense clusters early in spring before or with the leaves; almost all other species bloom after the leaves. The foliage of most species turns purple or red in fall, that of *V. Opulus*, *V. americanum*, and *V. acerifolium* being especially brilliant. *V. dilatatum* assumes a dull yellow color. *V. macrocephalum* and *V. Sieboldii* keep the bright green of their foliage until late in autumn. The viburnums are not very particular as to soil and position, but most of them prefer a rather moist and sunny situation. Some, as *V. acerifolium*, *V. Lantana*, *V. dilatatum*, *V. Tinus*, *V. pubescens*, and *V. prunifolium*, grow well in drier places, while *V. alnifolium* and *V. pauciflorum* require shade and a porous soil of constant moisture. *V. acerifolium* does well under the shade of trees in rocky and rather dry soil. *V. Tinus* is often grown in pots and thrives in any good loamy and sandy soil. With a little heat it may be forced into bloom at any time in the winter; if not intended for forcing, it requires during the winter a temperature only a little above the freezing-point and even an occasional slight frost will not hurt it. The common and the Japanese snowball are also sometimes forced and require the same treatment in forcing as other hardy shrubs.

Propagation is by seeds sown in fall or stratified; also by greenwood cuttings under glass, especiallly *V. tomentosum*, *V. macrocephalum*, *V. venosum*, *V. cassinoides*, and the evergreen species; *V. dentatum* and *V. Opulus* and its allies grow readily from hardwood cuttings and all species can be increased by layers; grafting is also sometimes practised, and *V. Opulus*, *V. dentatum*, and *V. Lantana* are used as stock.

3918. Viburnum Sieboldii. (×⅔)

The familiar snowball is seriously attacked by aphids. Fortunately its place can be taken by a Japanese species that is even more satisfactory. (Fig. 3923.) The berries of its fertile type, *V. tomentosum*, are a brilliant scarlet, changing to black. The foliage of this snowball is also remarkably beautiful. The leaves are olive-green with brownish purple or bronzy margins, and their plicate character makes them very distinct and attractive. The bush is entirely free from insect pests. The single and double forms of the Japanese species differ as shown in Figs. 3922 and 3923. Unfortunately these "single" and "double" forms have been confused in many nurseries, and only the trained eye can tell them apart in the nursery row. The double or snowball type is, of course, the one destined to the greater popularity, though the single form is a shrub of great value, especially for large estates and parks. The double form is known to nurseries as *V. plicatum*, but its proper name is *V. tomentosum* var. *plenum*. While it is hardy in New England, it is not a shrub that can be transplanted as easily as many other species. Hence it should be transplanted every second year in the nursery until it is sold. The double form may be propagated by cuttings of half-ripened wood in close frames, or by layers, which in some soils would better remain two years. French nurserymen propagate it by layering. The layers seem to suffer from winter and, to be on the safe side, it is best to cover them well with moss or leaves when the ground is somewhat frozen, so that the frost may be kept in until spring. The clusters are about as big as oranges and pure white. They are in great demand for Decoration Day in New York. The single form, unlike the double, is easily transplanted. It is also readily propagated by layers or cuttings. Both kinds are hardy in the North and make compact bushes 6 to 8 feet high.

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lævigatum, 6, 25.
lanceatum, 18.
Lantana, 15.
lantanoides, 17.
latifolium, 1, 5.
Laurustinus, 4.
Lentago, 9.
longifolium, 25.
lucidum, 4.
macrocephalum, 12.
macrophyllum, 19.
Mariesii, 18.
molle, 25, 26, 27.
multratum, 16.
nanum, 31.
nepalense, 25.
nitidum, 7.
nudum, 7, 8.
obovatum, 6.
odoratissimum, 3.
opuloides, 32.
Opulus, 31, 32.
Oxycoccus, 32.
parvifolium, 18.
pauciflorum, 30.
plenum, 18.
plicatum, 18.
præcox, 17.
prunifolium, 9, 10, 11.
pubescens, 28.
purpureum, 4.
pyrifolium, 9, 11.
rectangulum, 20.
reticulatum, 1.
rhytidophyllum, 13.
rigidum, 5.
rosaceum, 31.
roseum, 31.
rotundifolium, 18.
rufidulum, 10.
rufo-tomentosum, 10
rugosum, 5, 15.
Sandankwa, 2.
Sargentii, 33.
scabrellum, 26.
semitomentosum, 26.
Sieboldii, 1.
squamatum, 8.
sterile, 12, 31.
strictum, 4, 5.
suspensum, 2.
theiferum, 23.
Tinus, 4, 5.
tomentosum, 18.
trilobum, 32.
variegatum, 1, 4.
venosum, 25.
Vetteri, 9.
virgatum, 4.
Wrightii, 22.
xanthocarpum, 31.

KEY TO THE SPECIES.

A. *Lvs. penninerved, not lobed.*
  B. *Cymes paniculate, broadly pyramidal or semi-globose.*
    C. *Foliage deciduous*..... 1. **Sieboldii**
    CC. *Foliage evergreen.*
      D. *Corolla with cylindrical tube*.... 2. **suspensum**
      DD. *Corolla rotate-campanulate*..... 3. **odoratissi-**
  BB. *Cymes umbel-like, flat (except in the snowball forms. See Nos. 12, 16, 28.)* **[mum**
    C. *Secondary veins curving and anastomosing before reaching the margin: margin entire or finely serrate.*
      D. *Branches and lvs. glabrous, hirsute, or scurfy.*
        E. *Foliage persistent, entire.*
          F. *Branches and lvs. glabrous or slightly pubescent*.... 4. **Tinus**
          FF. *Branches and lvs. hirsute*.. 5. **rigidum**
        EE. *Foliage deciduous or half-evergreen.*
          F. *Lvs. entire or slightly undulate-dentate.*
            G. *Cymes sessile: lvs. small.* 6. **obovatum**
            GG. *Cymes peduncled.*

VIBURNUM

HH. *Peduncle shorter than the cyme: lvs. remotely denticulate...* 8. **cassinoides**

FF. *Lvs. finely and sharply serrate: cymes sessile, subtended by the upper lvs.*

G. *Petioles mostly with wavy, rather broad margin.....* 9. **Lentago**

GG. *Petioles without or with narrow, not wavy margin.*

H. *Winter buds and petioles rusty-pubescent.* 10. **rufidulum**

HH. *Winter buds and petioles not rusty-pubescent.....* 11. **prunifolium**

DD. *Branches and lvs. stellate-pubescent: winter buds naked.*

E. *Lvs. deciduous, dull green above: marginal or all fls. sterile.....* 12. **macrocephalum**

EE. *Lvs. persistent, lustrous and wrinkled above, 3–7 in. long: fls. all fertile.....* 13. **rhytidophyllum**

CC. *Secondary veins prominent, ending in the points of the teeth.*

D. *Winter buds naked: lvs. with usually numerous small teeth.*

E. *Corolla with cylindric tube, fragrant.....* 14. **Carlesii**

EE. *Corolla rotate campanulate.*

F. *Cymes with all the fls. fertile.*

G. *Rays of cymes usually 7: cymes flat.....* 15. **Lantana**

GG. *Rays of cymes usually 5: cymes somewhat convex.....* 16. **cotinifolium**

FF. *Cymes with the marginal fls. sterile and enlarged...* 17. **alnifolium**

DD. *Winter buds protected by scales: teeth rather coarse, usually less than 25 on each side.*

E. *Petioles without stipules.*

F. *Cymes with the marginal fls. sterile and enlarged...* 18. **tomentosum**

FF. *Cymes with all fls. fertile and alike.*

G. *Fr. red: lvs. rounded or broadly cuneate at the base.*

H. *Foliage evergreen, glabrous.....* 19. **japonicum**

HH. *Foliage deciduous.*

I. *Lvs. 3-nerved at the base, with 3–4 pairs of veins....* 20. **fœtidum**

II. *Lvs. penninerved with 5 or more pairs of veins.*

J. *Both surfaces of lvs. pubescent.* 21. **dilatatum**

JJ. *Both surfaces of lvs. glabrous or nearly so.*

K. *Lvs. broadly obovate or broadly ovate: stamens usually longer than the corolla.....* 22. **Wrightii**

KK. *Lvs. oblong-ovate: stamens usually shorter than corolla.....* 23. **theiferum**

GG. *Fr. bluish black: lvs. cordate or rounded at the base.*

H. *Branches and lvs. glabrous.....* 24. **dentatum**

HH. *Branches and lvs. beneath pubescent.*

I. *Infl. slightly pubescent: lvs. with 6–8 pairs of prominent veins.....* 25. **venosum**

II. *Infl. densely pubescent: lvs. with 4–6 pairs of veins.....* 26. **scabrellum**

EE. *Petioles with stipules.*

F. *Bark exfoliating: lvs. broadly ovate, 3–5 in. long, long-petioled.....* 27. **molle**

FF. *Bark close: lvs. ovate, 1½–3 in. long, usually short-petioled.....* 28. **pubescens**

AA. *Lvs. palmately 3–5-nerved, usually 3-lobed, slender-petioled.*

B. *Fls. all perfect.*

C. *Habit strictly upright: fr. purplish black.....* 29. **acerifolium**

CC. *Habit straggling: fr. scarlet.....* 30. **pauciflorum**

BB. *Fls. marginal, sterile, radiant.*

C. *Anthers yellow: bark of sts. thin.*

D. *Petiole with a narrow groove and large disk-like glands: lvs. pubescent beneath.....* 31. **Opulus**

DD. *Petiole with a broad shallow groove and small glands: lvs. glabrous beneath.....* 32. **americanum**

CC. *Anthers purple, rarely yellow: bark of sts. thick, corky: the upper lvs. with elongated and usually entire middle lobe.....* 33. **Sargentii**

1. **Sièboldii,** Miq. Fig. 3918. Deciduous shrub, attaining 10 ft., with stout branches, pubescent when young: lvs. oval to oblong-obovate, coarsely crenate-serrate except toward the base, acute, dark green and shining above, paler and stellate-pubescent beneath, 3–6 in. long: fls. white, rotate-campanulate, in panicles 2½–4 in. broad: fr. oblong, changing from pink to bluish black. May, June. Japan. G.F. 2:559 (adapted in Fig. 3918). S.I.F. 1:86. F.E. 23:345.—Hardy shrub of vigorous growth with handsome dark green foliage, large for the genus, exhaling a disagreeable odor when bruised. The frs. drop soon after ripening. It is known in some nurseries as *V. japonicum*, *V. latifolium*, or *V. japonicum latifolium*. Var. **reticulàtum,** Rehd. (*V. reticulàtum*, Hort.). Smaller in every part: lvs. of lighter green, less pubescent: half-hardy. Var. **variegàtum,** Hort. Lvs. variegated with white.

2. **suspénsum,** Lindl. (*V. Sandánkwa*, Hassk.). Evergreen shrub, attaining 6 ft., with slender warty branches: lvs. oval to oval-oblong, acute or obtusish, usually remotely crenate-serrate toward the apex, shining and dark green above, paler beneath, glabrous, 2–4 in. long: fls. white, tinged pink, in dense semi-globose panicles becoming 1½ in. high; corolla ½in. long, with cylindric tube twice as long as limb: fr. red, subglobose. June, July. Liu-kiu Isl. B.M. 6172.—Tender.

3. **odoratíssimum,** Ker (*V. Awabúcki* and *V. Awafùki*, Hort.). Evergreen upright shrub, attaining 10 ft., with stout warty branches, glabrous: lvs. elliptic to elliptic-oblong, acute, remotely serrate toward the apex or entire, shining and bright green above, paler beneath, glabrous, 3–6 in. long: fls. pure white, fragrant, in broadly pyramidal panicles 4 in. high; corolla rotate-campanulate: fr. red, changing to black. May, June. India to S. China and Japan. B.R. 456. S.I.F. 1:88.—Tender.

4. **Tìnus,** Linn. (*V. Laurustìnus*, Hort. *Tìnus laurifòlius*, Borckh.). LAURUSTINUS (or LAURESTINUS). Bushy, 10 ft., with glabrous or somewhat hairy branches: lvs. ovate-oblong or oblong, acute, dark green, shining and glabrous above, pubescent beneath usually only on the veins, 2–3 in. long: fls. white or pinkish white, slightly fragrant: cymes somewhat convex, 2–3 in. broad: fr. ovoid, black, rather dry. May–

CXVI. Viburnum tomentosum.

Aug., or in the greenhouse in early spring and winter. Medit. region. B.M. 38. Gn. 70, p. 113; 77, p. 601. Gn.W. 18:297.—Handsome free-flowering shrub, often cult. as a pot-plant N. Var. **Froèbelii**, Nichols. Compact form with light green lvs. and pure white fls. Var. **hírtum**, Ait. Lvs. pubescent beneath and ciliate. Var. **lûcidum**, Ait. (*V. lùcidum*, Mill. *V. grandiflòrum*, Hort.). Lvs. and cymes larger, more tender and not adapted for forcing. Gn. 15, p. 196. Gt. 5:192. Var. **purpûreum**, Hort. Lvs. suffused with a dull purple tinge. Var. **stríctum**, Loud., not Ait. Of erect and fastigiate habit. Var. **virgàtum**, Ait. Lvs. oblong-lanceolate, pubescent on the margin and on the veins beneath. Var. **variegàtum**, Hort. Lvs. variegated.

5. **rígidum**, Vent. (*V. rugòsum*, Pers. *V. latifòlium*, Hort. *V. Tinus* var. *stríctum*, Ait.). Shrub, attaining 6 ft., with spreading hirsute branches: lvs. broadly ovate to ovate-oblong, acute or obtusish, pubescent on both sides when young, almost glabrous above at length and wrinkled, 3–6 in. long: fls. pure white: cymes large, 3–4 in. broad: fr. oval, bluish black. May–July. Canary Isls. B.R. 376. L.B.C. 9:859. B.M. 2082. A.G. 14:456.—Less handsome and less free-flowering than the preceding species.

6. **obovàtum**, Walt. (*V. lævigàtum*, Ait.). Shrub, attaining 8 ft., with spreading branches: lvs. almost sessile, obovate to oblanceolate, obtuse or retuse, coriaceous, glossy, entire or obscurely crenate toward the apex, ½–1½ in. long: fls. white, in sessile cymes 1–2 in. broad: fr. oval, black. April–June. Va. to Fla. L.B.C. 15:1496.—Tender.

7. **nùdum**, Linn. (*V. nùdum* var. *Clàytonii*, Torr. & Gray). Upright shrub, sometimes attaining 15 ft.: lvs. oval to obovate or oval-lanceolate, acute or obtuse, usually entire and somewhat revolute or obscurely crenulate, thickish, scurfy on both sides when young, glabrous above at length: fls. white or yellowish white: cymes rather long-peduncled, 3–5 in. broad: fr. globose, pink at first, changing to dark blue. June, July. Long Island to Fla., west to Ky. and La. B.M. 2281.—Not quite hardy N. Var. **nítidum**, Zabel (var. *angustifòlium*, Torr. & Gray. *V. nítidum*, Ait. *V. ánglicum*, Hort.). Lvs. smaller and narrower, more shining above and firmer.

3919. Viburnum cassinoides. (×½)

8. **cassinoìdes**, Linn. (*V. nùdum* var. *cassinoìdes*, Torr. & Gray. *V. squamàtum*, Willd.). Withe-Rod. Appalachian Tea. Fig. 3919. Upright shrub, 2–6, occasionally 12 ft. high: lvs. oval to ovate to oblong, acute or bluntly acuminate, usually obscurely dentate, almost glabrous, rather thick, dull green above, 1–3 in. long: fls. and fr. almost like those of the preceding species, but peduncle shorter, usually shorter than cyme; blooming a little earlier. June, July. Newfoundland to Man. and Minn., south to N. C. G.F. 9:305 (adapted in Fig. 3919). M. D. G. 1904:85, 86. Em. 2:411 (as *V. nudum*).—A good shrub for borders of shrubberies; hardy.

3920. Viburnum Lentago. (×⅓)

9. **Lentàgo, Linn.** Sheep-Berry. Nanny-Berry. Fig. 3920. Shrub or small tree, attaining 30 ft., with slender branches: winter buds long-pointed: petioles mostly with wavy margin: lvs. ovate, acuminate, glabrous or scurfy at the veins beneath, 2–4 in. long: fls. white: cymes sessile, 2–5 in. broad: fr. oval, bluish black, with bloom. May, June. Hudson Bay to Man., south to Ga. and Miss. S.S. 5:223, 224.—Hardy, large, often arborescent shrub, keeping its lvs. until spring. Sometimes as *V. prunifolium* and *V. pyrifolium* in gardens. A garden hybrid, originated in Germany, is *V. Vétteri*, Zabel (*V. Lentago* × *V. nudum*), similar in habit to this species but the cymes on short peduncles over ½in. long.

10. **rufídulum**, Raf. (*V. prunifòlium* var. *ferrugíneum*, Torr. & Gray. *V. ferrugíneum* and *V. rùfotomentòsum*, Small). Large shrub or small tree, attaining 25 ft. or more, with rather stout branches: winter buds scarcely pointed, obtuse, rusty-pubescent: petioles often with narrow margin, rusty-tomentose: lvs. elliptic to obovate, usually obtuse, glabrous and shining above, rusty-pubescent on the veins beneath, 2–4 in. long: fls. pure white: cymes 3–5 in. broad: fr. oval, dark blue, glaucous, ½in. long. April–June, later than the following species. Va. to Fla., west to Ill. and Texas. S.S. 5:225 (as *V. prunifolium*, partly).—Handsome arborescent shrub with dark green shining foliage, showy fls. and decorative fr.; has proved hardy at the Arnold Arboretum, Boston.

11. **prunifòlium**, Linn. (*V. pyrifòlium*, Poir.). Black Haw. Stag-Bush. Shrub or small tree, attaining 15 ft., with spreading, rather stout branches: winter buds short-pointed, glabrous or reddish, pubescent: lvs. broadly oval to ovate, acute, or obtuse, glabrous or nearly so, 1–3 in. long; petioles often with narrow margin, glabrous: fls. pure white: cymes sessile, 2–4 in. broad: fr. oval to subglobose, bluish black and glaucous, little over ⅓in. long. April–June. Conn. to Fla., west to Mich. and Texas. A.F. 12:1100. Gng. 5:310. M.D.G. 1901:628. F.E. 17:701.

12. **macrocéphalum**, Fortune. Shrub, attaining 12 ft. and occasionally more, with spreading branches: lvs. short-petioled, oval to ovate-oblong, rounded at base, acute, denticulate, almost glabrous and dark green above, stellate-pubescent beneath, 2–4 in. long: fls. yellowish white, in peduncled cymes, 3–5 in. across, with the mar-

ginal fls. sterile and radiant. May, June. China. Gn. 79, p. 336. Var. **Keteleèri,** Nichols. (*V. Keteleèri,* Carr.). The wild form with only the marginal fls. sterile and enlarged; has proved hardy at the Arnold Arboretum. R.H. 1863, p. 270. Gn. 45, p. 423. Var. **stérile,** Dipp. (*V. Fórtunei,* Hort.). CHINESE SNOWBALL. All the fls. sterile, forming a subglobose ball, sometimes 7 or 8 in. across. B.R. 33:43. F.S. 3:263, 264. R.H. 1858, p. 350. Gn. 34, p. 348; 45, p. 422; 56, p. 82; 71, p. 142. G.C. III. 25: suppl. June 3; 30:332. F.S.R. 2, p. 205. A.F. 16:1547. G. 1:61; 35:381 (as *V. macrophyllum*). A very showy variety, but less hardy than the type.

13. **rhytidophýllum,** Hemsl. Evergreen shrub, to 10 ft., with stout upright branches; branchlets densely stellate-tomentose: lvs. thick, ovate-oblong to oblong-lanceolate, acute or obtuse, rounded or subcordate at the base, dark green, glabrous and lustrous and deeply wrinkled above, covered with a thick gray or yellowish tomentum beneath and reticulate, entire or indistinctly denticulate, 3–7½ in. long: fls. yellowish white, ¼in. across, in terminal cymes 4–8 in. across formed in autumn and expanding the following spring: fr. ovoid, ⅓in. long, first red, finally changing to shining black. May, June; fr. in Sept., Oct. Cent. and W. China. B.M. 8382. S.T.S. 2:118. G.C. III. 39:418; 42:220. Gn. 78, p. 283. J.H.S. 28:63; 33:187 (fig. 103). R.H. 1911, p. 229. M.D.G. 1912:29. M.D. 1912:201. G. 32:63, 645; 37:228.—One of the most striking viburnums on account of its large evergreen foliage; particularly handsome in autumn with its large clusters of fr. changing from red to shining black. It has proved fairly hardy at the Arnold Arboretum, and in W. N. Y., though the lvs. suffer more or less in exposed situations.

14. **Cárlesii,** Hemsl. Much-branched spreading shrub, to 4 ft.: young branchlets stellate-tomentose: lvs. broadly ovate or oval, acute, usually rounded at the base, irregularly toothed, dull green and pubescent above, pale and stellate-tomentose beneath, 1–3½ in. long; petiole ¼–⅓in. long: fls. salver-shaped, about ⅓in. long and the limb about as much across, changing from pinkish to white, fragrant, in dense terminal subglobose cymes 2–3 in. across, appearing with the lvs.; stamens included, inserted about the middle; filaments shorter than anthers. April, May. Korea. B.M. 8114. G.C. III. 32:261; 43:346; 45:340. Gn. 62, p. 168; 69, p. 279; 72, p. 242; 78, p. 413. G. 30:223. F.E. 31:332.

3921. Viburnum alnifolium. (×½)

J.H. III. 64:126. R.B. 33, p. 356. M.D.G. 1902:271; 1907:380; 1912:493. M.D. 1912, p. 196.—One of the most charming viburnums, opening its deliciously fragrant pink-and-white fls. early in spring with the unfolding lvs.; it has proved hardy at the Arnold Arboretum. A closely related species which has been

3922. Viburnum tomentosum. (×½)

confused with *V. Carlesii* is **V. bitchuiénse,** Makino. A slenderer, more straggling shrub: lvs. smaller, usually obtuse and often subcordate: fls. in smaller cymes; anthers inserted near the base; filaments longer than anthers. Japan. Less handsome than *V. Carlesii.*

15. **Lantàna,** Linn. WAYFARING TREE. Upright shrub or sometimes small tree, attaining 20 ft.: young branches scurfy-pubescent: lvs. ovate or oblong-ovate, usually cordate at base, acute or obtuse, sparingly stellate-pubescent and wrinkled above, tomentose beneath, denticulate, 2–4 in. long: fls. white: cymes dense, 2–3 in. broad, with usually 7 rays: fr. ovoid-oblong, bright red, changing to almost black. May, June. Eu., W. Asia. A.G. 18:453 and F.E. 9:593 (as *V. lantanoides*). H.W. 3, p. 131. Gn. 61, p. 324.—Hardy shrub, especially for drier situations and limestone soil. Var. **rugòsum,** Hort. With larger and very wrinkled lvs. and larger cymes. There are a number of other varieties, including some with variegated lvs.

16. **cotinifòlium,** D. Don (*V. multràtum,* C. Koch). Shrub, attaining 6 ft., with spreading branches, tomentose when young: lvs. orbicular-ovate to ovate, cordate or rounded at the base, usually obtuse, crenulate-dentate or almost entire, wrinkled above and nearly glabrous at length, tomentose beneath, 2–5 in. long: fls. white, tinged with pink, in cymes 2–3 in. broad, with usually 5 rays; corolla rather larger, funnelform-campanulate, tube longer than limbs: fr. ovoid-oblong, red, changing to black. May, June. N. W. Himalayas. B.R. 1650. G.F. 5:245. G.W. 13, p. 141. G. 37:229.—Not quite hardy N., requiring protection near Boston.

17. **alnifòlium,** Marsh. (*V. lantanoìdes,* Michx.). HOBBLE-BUSH. AMERICAN WAYFARING TREE. Fig. 3921. Low shrub, sometimes 10 ft. high, with wide-spreading, often procumbent branches, scurfy-pubescent when young: lvs. orbicular or broadly ovate, cordate at the base, short-acuminate or acute, irregularly serrulate, minutely pubescent or almost glabrous

above, scurfy pubescent beneath, 3–8 in. broad: fls. white: cymes sessile, 3–5 in. broad; marginal fls. enlarged and sterile, long-pedicelled: fr. ovoid-oblong, dark purple. May, June. New Bruns. and Mich. to N. C. G.F. 2:535 (adapted in Fig. 3921).—Handsome shrub, with very large foliage, assuming a deep claret-red in fall. Var. **præcox,** Hesse. Said to bloom about 3 weeks earlier than the type. M.D. 1912, p. 370. G.W. 16, p. 495.

18. **tomentòsum,** Thunb. (*V. plicàtum,* Miq.). Fig. 3922. Strong-growing shrub, attaining 8 ft., with spreading branches, tomentose when young: lvs. broadly ovate to oblong-ovate, sometimes obovate, acute or abruptly acuminate, dentate-serrate, dark green and almost glabrous above, stellate-pubescent beneath, sometimes only on the veins, 1½–4 in. long: cymes 2–3 in. broad, long-peduncled; sterile fls. long-pedicelled: fr. ovoid, red, changing to bluish black. June. China, Japan. S.Z. 1:38. S.I.F. 1:86. G.C. III. 36:234. G. 25:424; 26:265. R.H. 1910, pp. 382, 383. Gt. 54, p. 114. G.W. 3, p. 287. G.F. 4:594 (adapted in Fig. 3922), 595. A.F. 12:1101. F.E. 18:461. Gng. 5:311. M.D.G. 1898:400. S.H. 2:502.—A beautiful hardy shrub, with handsome foliage and showy fls.; the frs. too, are decorative, especially before they change to black. In some nurseries erroneously named *V. japonicum.* Var. **parvifòlium,** Rehd. (*V. tomentòsum* var. *cuspidàtum,* Maxim. *V. plicàtum* var. *parvifòlium,* Miq.). Lvs. elliptic to oblong, abruptly long-acuminate, 1–2 in. long. Of slow growth and blooming sparingly. Var. **lanceàtum,** Rehd. Similar to the preceding variety, but lvs. narrower, lanceolate on the shoots, and gradually acuminate, more pubescent beneath: infl. smaller with fewer sterile fls. Var. **Marièsii,** Veitch. Differs little or not at all from the type. J.H.S. 27, p. 863 (fig. 195). G. 33:493, 631; 37:227. R.B. 30, p. 186. Var. **plènum,** Rehd. (*V. plicàtum* var. *plènum,* Miq. *V. tomentòsum* var. *plicàtum,* Maxim. *V. plicàtum,* Thunb.). Japanese Snowball. Fig. 3923. All fls. sterile, forming large, globose balls 2½–3 in. across. G.C. III. 29:72; 30:321. Gn. 59, p. 113; 61, p. 261; 70, p. 27; 71, pp. 163, 319; 73, p. 7; 75, p. 347; 78, pp. 427, 472. G. 21:287. F.E. 18:677. F.S. 3:278. B.R. 33:51. A.G. 18:357. Gng. 1:263. V. 6:294. M.D.G. 1898:401. S.H. 2:503, 505. Var. **rotundifòlium,** Hort. Much like the preceding variety, but lvs. broader and blooming about 2 weeks earlier. There is also a variegated form. F.E. 31:715.

19. **japónicum,** Spreng. (*V. macrophýllum,* Blume). Evergreen upright shrub, to 6 ft., with glabrous branches: lvs. broadly or rhombic-ovate to oblong-ovate, acute or shortly acuminate, remotely dentate except at the base, 3–6 in. long: fls. in short-peduncled, glabrous cymes 2–4 in. broad: fr. globose, red. June. Japan.—Handsome large-lvd. shrub, but not hardy N.

20. **fœtidum,** Wall. (*V. ceanothoìdes,* C. W. Wright). Upright shrub with spreading branches, to 10 ft.: branchlets stellate-pubescent: lvs. obovate to rhombic- or obovate-oblong, acute or acutish, rarely short-acuminate, cuneate at the base, sinuately toothed above the middle, 3-nerved at the base and with 1 or 2 pairs more of lateral veins, glabrous above, pubescent on the veins beneath, 1–2½ in. long; petiole ¼–⅓in. long: fls. white, in cymes 2–4 in. across on lateral spreading branchlets: fr. scarlet, ovoid, ¼in. long. June. Himalayas, S. W. China. Var. **rectángulum,** Rehd. (*V. rectángulum,* Graebn.). Shrub, to 12 ft., with spreading, often pendulous branches: lvs. oblong-obovate to lanceolate, acuminate, remotely dentate or denticulate, usually nearly glabrous, 1½–3 in. long: cymes on slender, lateral branchlets often spreading at right angles. W. China.

21. **dilatàtum,** Thunb. Fig. 3924. Upright bushy shrub, attaining 10 ft., with the branches hirsute when young: lvs. roundish or broadly ovate or obovate, usually abruptly short-pointed, coarsely toothed, pubescent on both sides, 2–5 in. long: fls. pure white, in short-stalked cymes, 3–6 in. broad; corolla pubescent outside: fr. ovate, scarlet, ⅓in. long. May, June. China, Japan. B.M. 6215. S.I.F. 1:87. G.F. 4:150 (adapted in Fig. 3924). M.D.G. 1899:241, 242. A.F. 15:123.—Handsome hardy free-flowering shrub, especially decorative with its numerous scarlet frs. remaining a long time on the branches.

22. **Wrìghtii,** Miq. Upright shrub, to 10 ft. high, with the branches almost glabrous: lvs. almost orbicular or broadly obovate to ovate, abruptly acuminate, coarsely dentate, almost glabrous except on the veins beneath, 3–5 in. long: fls. rather large, white, in usually short-stalked, 2–4-in.-broad cymes; corolla glabrous outside; stamens longer than the corolla: fr. globose, red. May, June. Japan. S.T.S. 1:19.—Hardy shrub, similar to the preceding, but of less dense habit, with larger frs.

3923. Viburnum tomentosum var. plenum.—Japanese snowball. (×⅛)

in nodding cymes. Var. **Héssei,** Rehd. (*V. Héssei,* Koehne). Of dwarfer dense habit: lvs. broadly ovate, with fewer shallower teeth: cymes, fls., and frs. smaller: stamens as long as corolla.

23. **theiferum,** Rehd. Upright shrub, to 12 ft.: branchlets glabrous: lvs. ovate-oblong, acuminate, rounded at the base, remotely denticulate, dark green and glabrous above, glabrous beneath except silky hairs on the veins, 3–5 in. long; petiole about ½in. long: fls. in cymes, 1–1½ in. across; calyx purple; stamens shorter or as long as corolla: fr. red, ovoid, ⅓in. long. May, June: fr. in Oct. Cent. and W. China. S.T.S. 2:121.—Strong-growing shrub with handsome large foliage and ornamental bright red frs. in autumn. It has proved fairly hardy at the Arnold Arboretum, only the tips of young branches being sometimes killed back.

24. **dentàtum,** Linn. Arrow-Wood. Upright bushy shrub, attaining 15 ft., with glabrous branches: lvs. rather long-petioled, orbicular to ovate, acute or shortly acuminate, coarsely dentate, glabrous or pubescent only in the axils of the veins beneath, 1½–3 in.

long: fls. in long-peduncled, glabrous cymes 2–3 in. broad: fr. subglobose, bluish black, glaucous. May, June; fr. in Oct. New Bruns. to Minn., south to Ga. G.F. 10:332. Em. 2:414.—Handsome native shrub, thriving best in moist soil.

3924. Viburnum dilatatum. (×½)

25. **venòsum,** Brit. (*V. mólle,* Auth., not Michx. *V. Hancedànum,* Dipp., not Maxim. *V. nepalénse,* Hort.). Fig. 3925. Shrub, to 8 ft., with grayish brown branches; young branchlets stellate-pubescent: lvs. ovate to orbicular, coarsely and sharply dentate, glabrous or nearly so above, stellate-pubescent beneath, particularly on the veins, 2–5 in. long, with prominent veins beneath; petioles ¼–¾in. long, pubescent: cyme long-stalked, slightly pubescent, 2½–4 in. across: fr. globose or globose-ovoid, ¼in. long, bluish black. June, July; fr. in Sept. Mass. to Va. S.T.S. 1:43. G.F. 4:29 (adapted in Fig. 3925). M.D.G. 1891:267. Var. **Cánbyi,** Rehd. (*V. lævigàtum,* Hort., not Ait.). Lvs. thinner, less pubescent beneath, larger and broader, the pair below the infl. often 2–3 in. broad: cymes larger. Del. to Pa. M.D.G. 1904:217 (habit). This is a very handsome variety on account of its larger bright green lvs. and larger cymes. Var. **longifòlium,** Rehd. (*V. dentàtum* var. *longifòlium,* Dipp.). Lvs. narrower and longer, generally ovate-oblong, pubescent on both sides, more densely beneath: infl. glabrous or pubescent. Blooms several weeks before the type.

26. **scabréllum,** Chapm. (*V. dentàtum* var. *semitomentòsum,* Michx. *V. mólle,* American Auth., not Michx.). Shrub, to 6 ft.: branches reddish brown; branchlets rough with stellate pubescence: lvs. ovate, rarely broadly ovate, acute or acuminate, remotely dentate with broad shallow teeth, or crenately dentate, glabrous or slightly pubescent above, stellate-pubescent beneath, 1½–4 in. long: cymes rather densely stellate-pubescent: fr. globose-ovoid, ⅓in. long, bluish black. June; fr. in Sept., Oct. Pa. to Fla. and Texas. B.B. (ed. 2) 3:271.—Has proved not quite hardy at the Arnold Arboretum.

27. **mólle,** Michx. (*V. Demetriònis,* Deane & Rob.). Shrub, to 12 ft.: bark separating in thin flakes: lvs. orbicular or broadly ovate, cordate, shortly acuminate, coarsely dentate, pubescent beneath or almost glabrous, 2½–4½ in. long: cymes long-peduncled, puberulous, about 2½ in. broad: fr. oblong, almost ½in. long, bluish black. May; fr. in Aug. Ky., Mo., Iowa. B.B. (ed. 2) 3:272.—Has proved hardy at the Arnold Arboretum.

28. **pubéscens,** Pursh. Fig. 3926. Bushy shrub, 3–6 ft. high, with slender, upright branches: lvs. oval to ovate, rounded or cordate at base, acute or acuminate, coarsely dentate, almost glabrous above, pubescent beneath, 1½–2½ in. long: cymes short-peduncled, dense, 1½–2½ in. broad: stamens exceeding the corolla about one-half: fr. oval, almost black, slightly flattened. June, July. Que. to Ga., west to Man. and Ill. G.F. 3:125 (adapted in Fig. 3926). A.F. 12:1101. Gng. 5:311. M.D.G. 1903:404.—Handsome shrub of compact habit. Var. **affine,** Rehd. (*V. affine,* Bush). Lvs. nearly glabrous; petioles ¼–½in. long, sometimes shorter. Mo.

29. **acerifòlium,** Linn. Dockmackie. Shrub, attaining 5 ft., with slender, upright branches: lvs. orbicular or ovate, 3-lobed, with acute or acuminate lobes, coarsely dentate-serrate, pubescent or at length almost glabrous, 2–5 in. long: fls. yellowish white: cymes long-peduncled, terminal, 1½–3 in. broad: fr. almost black, ovoid. May, June. New Bruns. to Minn., south to N. C. Em. 2:414.—It grows fairly well in drier situations under trees. The foliage assumes a handsome dark purple fall color. Var. **glabréscens,** Rehd. Lvs. glabrous or nearly so beneath even while young. N. C.

30. **pauciflòrum,** Raf. Straggling shrub, attaining 5 ft.: lvs. orbicular to oval, coarsely dentate, with 3 short lobes above the middle or often without, glabrous or slightly pubescent beneath when young, 2–3½ in. long: cymes few-fld., small, on lateral, short usually 2-lvd. branchlets: fr. scarlet, subglobose. June. Lab. to Alaska, south to Vt. and Colo. in the mountains. G.F. 3:5.—It does not usually succeed well in cult.; requires shade and moist porous soil.

31. **Ópulus,** Linn. European Cranberry-Bush. Shrub, attaining 12 ft., with rather smooth light gray branches and sts.: lvs. broadly ovate, 3-lobed, with coarsely dentate-serrate, acuminate lobes, pubescent beneath, 2–4 in. long; petioles with narrow groove and large disk-like glands: fls. white, in peduncled cymes, 3–4 in. broad: fr. subglobose to oval, scarlet. May,

3925. Viburnum venosum. (×½)

June; fr. in Aug. Eu., N. Afr., N. Asia. H.W. 3, p. 131. R.F.G. 17:1171. S.B.F. 4:639. Var. **nànum,** Jacq. A very dwarf, compact, small-lvd. form; flowers but very rarely. Var. **stérile,** DC. (*V. ròseum* and *V. rosàceum,* Hort.). Guelder Rose. Snowball. Fig. 3927. All fls. sterile, forming large, globose heads.

Gng. 1:9. Gn. 56, p. 83; 76, p. 35. F.E. 15:319; 20:313. G.W. 6, p. 159.—This is a very showy variety, but it lacks the decorative frs. Var. **xanthocárpum,** Spaeth. Fr. yellow. There are also variegated forms of the type and of the sterile variety.

32. **americànum,** Mill. (*V. Ópulus* var. *americànum,* Ait. *V. trílobum,* Marsh. *V. opuloìdes,* Muhl. *V. edùle,* Pursh. *V. Oxycóccus,* Pursh). CRANBERRY BUSH. HIGH CRANBERRY. Fig. 3928. Closely allied to the preceding species, but habit more open and spreading: lvs. with coarsely toothed or nearly entire lobes, pilose on the veins beneath or nearly glabrous, 2–5 in. long; petiole with shallow groove and small, usually stalked glands: cymes with shorter peduncles; stamens somewhat shorter. May, June: fr. in Aug., Sept. B.B. (ed. 2) 3:270 (as *V. Opulus*). New Bruns. to Brit. Col., south to N. J. and Ore.—Handsome native shrub, very decorative in fr., which begins to color by the end of July, remains on the branches and keeps its bright scarlet color until the following spring. The berries are not eaten by birds.

33. **Sárgentii,** Koehne. Similar to the preceding, of more upright, denser habit: bark of sts. darker, fissured and somewhat corky, young branchlets with prominent lenticels: lvs. of thicker texture, pubescent beneath, the upper lvs. with much elongated and usually entire middle lobe and small, short, spreading lateral lobes; petioles with large glands: sterile fls. larger, sometimes to 1¼ in. across; anthers purple, rarely yellow: fr. globose, in usually upright cymes. N. China, Japan. S.I.F. 2:73. S.T.S. 1:42. M.D.G. 1904:329.—Intro. under the name *V. Opulus* from Pekin. It does not seem to fruit as profusely as *V. Opulus,* but is handsomer in bloom and of more compact habit. Var. **calvéscens,** Rehd. Lvs. glabrous or nearly so beneath.

V. betulifòlium, Batal. Allied to V. Wrightii. Lvs. ovate to rhombic-ovate, coarsely serrate, glabrous except a few hairs on the veins beneath, 1½–3 in. long; petioles about ½in. with small stipules: infl. 2–4 in. across: stamens longer than corolla: fr. red. Cent. and W. China. S.T.S. 2:147.—*V. bracteàtum,* Rehd. Allied to V. pubescens. Lvs. orbicular-ovate, obtusely sinuate-dentate, pubescent on the veins beneath, 2–5 in. long; petioles about ¾in. long, stipulate: infl. 1½–3 in. across, with conspicuous bracts: fr. ovoid, bluish black. Ga. S.T.S. 1:68. Hardy at the Arnold Arboretum. —*V. buddleifòlium,* C. H. Wright. Allied to V. Lantana. Densely stellate-tomentose: lvs. oblong-lanceolate, pubescent above, grayish tomentose beneath, 3–6 in. long: infl. dense, about 3 in. across: fr. ovoid, black. Cent. China.—*V. burejàticum,* Regel & Herder (*V. burejànum,* Herder). Allied to V. Lantana. Lvs. short-petioled, oval or ovate, acute or obtuse, denticulate, with anastomosing veins, sparingly pubescent beneath, 1½–3 in. long: infl. dense, 1½–2 in. across: fr. ovoid, bluish black. N. China, Manchuria. Gt. 11:384.—*V. cinnamomifòlium,* Rehd. Allied to V. Tinus. Evergreen: lvs. elliptic-oblong, 3-nerved, nearly entire, glabrous, 3–5 in. long: infl. loose, 5–7 in. across: fr. ovoid, ⅓in. long, shining bluish black. W. China. S.T.S. 2:114.—*V. cordifòlium,* Wall. Closely related to V. alnifolium, but without radiant fls.: cymes loose, 2–6 in. across: fertile fls. larger: lvs. usually narrower. Himalayas, W. China. S.T.S. 2:138.—*V. coriàceum,* Blume=V. cylindricum.—*V. crassifòlium,* Rehd. Hardy evergreen species: lvs. deep green, slightly toothed around margins: fls. white, with 5 prominent anthers, chocolate-colored. China.—*V. cylíndricum,* Hamilt. (V. coriaceum, Blume). Evergreen shrub or tree, to 50 ft., glabrous: lvs. oval to oblong, acuminate, usually remotely toothed above the middle, 3–8 in. long: infl. 2–4 in. across, rather dense: fls. white or pinkish, tubular, ⅓in. long; stamens exserted: fr. black, ovoid. Himalayas, W. China. G.C. III. 52:371. S.T.S. 2:143.—*V. dahùricum,* Pall.=V. mongolicum.—*V. dasyánthum,* Rehd. Allied to V. Wrightii. Lvs. ovate to oblong, acuminate, nearly glabrous, 2–5 in. long: infl. lax, 3–4 in. across; pedicels, ovary, and outside of corolla villous: fr. red. Cent. China. S.T.S. 2:149.—*V. Dàvidii,* Franch. Allied to V. Tinus. Evergreen, compact shrub, to 3 ft.: lvs. elliptic to elliptic-obovate, short-acuminate, 3-nerved, 2–6 in. long: infl. dense, 2–3 in. across: fr. blue, ovoid, ¼in. long. W. China. R.H. 1913, p. 375. J.H.S. 38, p. 63 (fig. 44). G.M. 55:273.—*V. densiflòrum,* Chapm. Closely allied to V. acerifolium. Lower: lvs. smaller, 1–2 in., with mostly shorter lobes or none: cymes denser. W. Fla.—*V. ellípticum,* Hook. Shrub, attaining 5 ft., allied to V. acerifolium, but lvs. not lobed, oval to elliptic-oblong: fr. oblong-oval, almost ½in. long. Wash. to Calif.—*V. eròsum,* Thunb. Allied to V. Wrightii. Lvs. oblong-ovate or oblong-obovate, pubescent on the veins beneath, 2–3½ in. long; petioles short, stipulate: cymes long-peduncled, loose, 2½–3 in. across: fr. red. Japan. G.F. 9:85.—*V. frágrans,* Bunge. Allied to V. suspensum. Lvs. deciduous, obovate-oblong, sharply dentate, glabrous beneath: panicles with or before the lvs., about 1½ in. long: corolla salver-shaped, nearly ½in. long, fragrant, white, pinkish in bud. N. China. Recently intro. and hardiness not yet tested, but probably fairly hardy as far north as Mass.; very floriferous and in bloom apparently one of the handsomest viburnums.—*V. furcàtum,* Blume. Closely related to V. alnifolium, but of more upright habit and stamens shorter than corolla: seed with the ventral furrow more open and broader. Japan. S.I.F. 2:74. S.T.S. 2:119.—*V. Harryànum,* Rehd. Evergreen: lvs. orbicular to obovate or broadly oval, glabrous, ¼–1 in. long: cymes 1–1½ in. across: fr. black. W. China. Very distinct in its small privet-like foliage.—*V. Hénryi,* Hemsl. Allied to V. Sieboldii. Evergreen, to 10 ft.: lvs. elliptic-oblong to oblong-obovate, acuminate, glabrous or nearly so, shallowly serrulate, 2–5 in. long: panicles broadly pyramidal, 2–4 in. long: fr ovoid, ⅓in. long, first red, then black. Cent. China. B.M. 8393. S.T.S. 2:116. G.C. III. 48:264, 265; 60:193. R.B. 35, p. 296. Tender.—*V. hupehénse,* Rehd. Allied to V. Wrightii. Lvs. broadly ovate, acuminate, dentate, slightly pubescent above, more densely below, 2–3 in. long; petiole stipulate: cymes stellate-pubescent: fr. ovoid, dark red. Cent. China. Hardy at the Arnold Arboretum.—*V. ichangénse,* Rehd. (V. erosum var. ichangense, Hemsl.). Allied to V. Wrightii. Lvs. short-petioled, ovate to ovate-lanceolate, acuminate, dentate, rough above, pubescent beneath, 1½–2½ in. long; petiole ¼in. long or less, stipulate: cymes slender-stalked, 1–2 in. across: fr. ovoid, red. Cent. and W. China. S.T.S. 2:150.—*V. kansuénse,* Batal. Allied to V. Opulus. Lvs. slender-stalked, ovate in outline, deeply 3–5-lobed, with coarsely toothed acuminate lobes, hairy on the veins, 1–2 in. long: cymes 1–1½ in. across without sterile fls.: fr. red. W. China. A graceful shrub very distinct in its small deeply lobed lvs.—*V.*

3926. Viburnum pubescens. (×½)

3927. Snowball.—Viburnum Opulus var. sterile. All the fertile flowers are changed to sterile, showy ones. (×¼)

lobophýllum, Graebn. Allied to V. Wrightii. Lvs. orbicular-ovate to broadly obovate, abruptly acuminate, coarsely toothed, glabrous or hairy on the veins beneath, 2–4 in. long: cymes 2–4 in. across; stamens longer than the corolla: fr. red. W. China. G.C. III. 60:197. S.T.S. 2:147.—*V. mongólicum*, Rehd. (V. dahuricum, Pall.). Shrub, to 6 ft.: lvs. broadly ovate to oval, crenate-denticulate, stellate-pubescent beneath, 1½–2¼ in. long: fls. salver-shaped, in short panicles: fr. finally black. Dahuria to N. W. China. Possibly not in cult.; the plant figured as V. dahuricum in horticultural literature is not this species.—*V. orientàle*, Pall. Allied to V. acerifolium: shrub, attaining 4 ft.: lvs. with simple, not fascicled hairs on the veins beneath and not glandular dotted beneath: fr. red. June, July. W. Asia. Gt. 17:567.—*V. phlebótrichum*, Sieb. & Zucc. Allied to V. Wrightii. Lvs. short-petioled, ovate to elliptic-ovate, acuminate, glabrous, except hairy on the veins beneath, 1½–2½ in. long: cymes slender-stalked, nodding, loose, 1–1½ in. across: calyx and pedicels purple: fr. ovoid, red. Japan. S.T.S. 2:120. S.I.F. 2:73.—*V. propínquum*, Hemsl. Allied to V. Tinus. Evergreen: lvs. elliptic to elliptic-oblong or ovate-lanceolate, acuminate, 3-nerved, remotely denticulate, glabrous, 1½–3½ in. long: cymes

3928. Viburnum americanum. *a*, **Single form of the common snowball as it grows in the wild;** *b*, **fruits.** (×¼)

1½–2½ in. across, glabrous: fr. globose-ovoid, bluish black. Cent. and W. China. S.T.S. 2:115.—*V. sympodiàle*, Graebn. Closely related to V. alnifolium. Lvs. narrower, ovate to elliptic-ovate, more finely serrulate and usually rounded at the base, 3–5 in. long: cymes 2½–3½ in. across: fr. purple. Cent. and W. China. S.T.S. 2:139.—*V. urceolàtum*, Sieb. & Zucc. Low straggling shrub: lvs. slender-petioled, ovate-lanceolate, crenate-serrulate, glabrous, 2½–5 in. long: fls. tubular, scarcely ⅛in. long, in slender-stalked cymes 1½–2½ in. across: fr. ovoid, black. Japan. S.T.S. 2:141. Recently intro.; one of the least ornamental in bloom.—*V. útile*, Hemsl. Evergreen shrub, to 6 ft.: lvs. elliptic-ovate to ovate-oblong, obtusish, entire, lustrous above, densely whitish tomentose beneath, 1–3 in. long: cymes stalked, dense, 2–3 in. across: fr. bluish black, ovoid, ¼in. long. B.M. 8174. S.T.S. 2:142. G. 35:380. R.B. 35, p. 280.—*V. Veitchii*, C. H. Wright. Allied to V. Lantana. Shrub, to 5 ft.: young branchlets and petioles stellate-tomentose: lvs. ovate, acuminate, cordate at the base, remotely dentate, stellate-tomentose beneath, slightly stellate-pubescent above, 3–5 in. long: cymes 4–5 in. across, stellate-tomentose: fr. red, finally black. Cent. China.

ALFRED REHDER.

VÍCIA (classical Latin name). VETCH. TARE. *Leguminosæ*. Mostly weedy or insignificant-looking plants, but a few are grown for the bright flowers, others of late for green-manure crops (see *Cover-crops*), and one (*V. Faba*) is a garden bean.

Herbs, mostly climbing, with pinnate foliage, closely allied to Lathyrus, Pisum, and Lens, but differing in minute floral characters: wings adhering to the keel; style very slender, with beard or hairs all around the upper part or only at the apex: pod flat, 2- to many-seeded, 2-valved, and dehiscent, the seeds either globular or flattish; stamens diadelphous (9 and 1): fls. mostly blue or violet, sometimes yellowish or white.—About 150 species widely spread in the northern hemisphere and some in S. Amer. About two dozen species occur in N. Amer., some of the species intro. The species are mostly cool-season plants of easy cult. The interest in the vetches in this country is mostly for their value as soil-covers and for foliage. *V. sativa* and *V. villosa* are the important species at present for agricultural purposes, and *V. Cracca*, *V. Gerardii*, and *V. fulgens* are sometimes used as ornamentals. For literature, see Farmers' Bulls. Nos. 515 and 529, Bur. Pl. Ind. Circ. No. 15, and U. S. Dept. Agric. Circ. No. 45.

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A. *Pods 1–1½ in. broad with spongy septæ between the seeds; seeds oblong, funiculus attached at the end: st. thick, erect, 4-angled: lfts. without tendrils.*

1. **Fàba,** Linn. (*Fàba vulgàris*, Moench. *F. satìva*, Bernh.). BROAD BEAN. WINDSOR BEAN. ENGLISH DWARF BEAN. HORSE BEAN. Figs. 478, 479, Vol. I. Strong erect annual, 2–4 ft., glabrous or nearly so, very leafy: lfts. 2–6, the lower ones not opposite on the rachis, the terminal one wanting or represented by a rudimentary tendril, oval to elliptic and obtuse or mucronate-pointed: fls. in the axils, dull white and with a large blue-black spot: pods large and thick, from 2 or 3 in. even to 18 in. long, the seeds large and often flat. Probably native to N. Afr. and S. W. Asia. R.F.G. 22:238.—Much grown in the Old World, but the hot dry summers prevent its cult. in most parts of the U. S. It is grown successfully in parts of Canada, particularly in the maritime provinces, and also in Calif. as a winter vegetable or green-manure crop. The plant is grown mostly for cattle-feeding in the U. S. but the beans are extensively used in Eu., both full grown and immature, for human food. This bean has been cult. from prehistoric times and its nativity is in doubt. The plant is hardy and seeds should be sown early, when the season is cool. The unripe seeds are reported to have caused cases of poisoning, but little is known as to the conditions of the poison production.

AA. *Pods rarely over ⅔in. broad, without spongy septæ; seeds nearly spherical, funiculus attached at the side: st. slender.*

B. *Infl. very short-stalked or sessile: fls. medium to large, often 1–2 in the lf.-axis.*

C. *Stipules very large, mostly toothed; lvs. with 1–3 pairs of lfts.: plants annual.*

2. **narbonénsis,** Linn. FRENCH OR NARBONNE VETCH. Annual, pubescent, dark green: st. stout, erect or ascending, 4-angled, 2–4 ft. tall: lower lvs. with a single pair of lfts. without tendrils, upper with 2–3 pairs of lfts. and branching tendrils; lfts. ½–2 in. long, ⅜–1½ in. broad, somewhat fleshy, oval to elliptic or cuneate at base, entire or rarely few-toothed above: infl. 1–2 (rarely 5) -fld.: fls. stalked, ½–¾in. long; calyx-teeth unequal, banner lilac to purple or bluish, wings and keel bluish: pod broadly linear to rhombic-linear, 2–2½ in. long, ⅜in. broad, compressed; seeds brown, $\frac{5}{16}$in. diam. S. Eu., cult. for forage. R.F.G. 22:241.—Not very hardy and turns black under severe summer heat. Best adapted to the N. W. Pacific coast. It has no advantage over common vetch and the seed cost is much greater.

CC. *Stipules small; lvs. with numerous pairs of lfts.* (*V. oroboides has often only 2 hairs.*)

D. *Banner distinctly pubescent without: plants annual.*

3. **pannónica,** Crantz. Annual, shortly soft to shaggy pubescent: sts. 2 to several, prostrate to ascending or climbing, rarely unbranched, 4–20 in. long: lvs. short-petioled to nearly sessile, the lower with 4, the upper with often 8 pairs of lfts. and mostly short tendrils; lfts. very short-petioled, linear to oblong: infl. very short-stalked, 2–4 (rarely 1) -fld.: fls. ½–⅝in. long, pedicel much shorter than the calyx; corolla about 3 times longer than the calyx, yellowish to purple: pod about 1¼ in. long, ⅜in. broad, 2–8 (mostly 3–5) -seeded; seed ⅛in. diam., velvety black. S. and S. E Eu. R.F.G. 22:243.

DD. *Banner glabrous or with few scattered hairs.*

E. *Plants perennial: lvs. without tendrils; lfts. few.*

F. *Lvs., lower with 1–2, upper with 4–6 pairs of lfts.: fls. single, purple-violet.*

4. pyrenàica, Pourr. Perennial, glabrous or nearly so: sts. 4–12 in. long, prostrate or ascending, angular: lower lvs. with only 1–2 pairs of lfts., the upper with 4–6 pairs of lfts. and unbranched or rarely 2–3-branched tendrils: fls. solitary, large; calyx sparingly pubescent; corolla purple-violet: pod broadly linear, glabrous; seed smooth, brown, mottled. S. W. France.

3929. Vicia americana. (×⅓)

FF. *Lvs. with only 1–3 pairs of lfts.: plant resembling a Lathyrus.*

5. oroboìdes, Wulf. (*Òrobus lathyroìdes,* Sibth. & Smith). Perennial, glabrous or sparingly pubescent: sts. mostly erect and unbranched, 2–3 ft. tall: lvs. short-petioled, with 1–3 pairs of lfts., ending in a sharp point, without tendrils; lfts. ovate, elliptic to oblong: infl. sessile, mostly 3–7-fld.: fls. ½–¾in. long, short-pedicelled; calyx-teeth equaling or shorter than the tube; corolla yellowish white to golden: pod linear-oblong, 1–1½ in. long; seed nearly spherical, brown, ⅛in. diam. S. E. Eu. R.F.G. 22:258. B.M. 2098.

EE. *Plants annual or biennial: fls. violet to bluish: lvs. with tendrils; lfts. many, small.*

F. *Lfts. oblong, oval or obovate.*

6. sativa, Linn. Common Vetch or Tare. Annual or biennial, not surviving the winter in the N., more or less pubescent, 2–3 ft. high: lfts. 7 pairs or less, elliptic, oblong or oblanceolate, mostly truncate and apiculate at the top, the tendril part of the lf. extended: fls. usually 2 in. each axil, about 1 in. long, purplish: pods 2–3 in. long when mature. Eu., and naturalized in some parts of the U. S. R.F.G. 22:248. B.B. 2:2621. —Much cult. abroad as a forage plant; in this country grown for similar purposes and also somewhat as a cover-crop for orchards. Best adapted to S. E. U. S. and the Pacific coast as a winter crop for green manure or sown with oats, wheat, rye, or barley for hay. As a spring crop it succeeds only where the summers are fairly cool. Not much injured by a temperature of 10° F. but zero weather results in much winter-killing. The name winter vetch is more commonly applied to winter strains of *V. sativa* in Eu. Seeds sometimes used for making flour. Var. **álba,** Beck (*V. álba,* Moench). Fls. white or whitish: seeds mostly whitish to gray. Var. **macrocárpa,** Moris. Fls. 1⅛–1¼ in. long: seed compressed, ⅛–$\frac{3}{16}$in. diam.

FF. *Lfts., except of the lower lvs., linear or linear-oblong.*

7. angustifòlia, Linn. Annual, glabrous or pubescent: sts. slender, 1–2 ft. long: lvs. short-petioled or nearly sessile with 4–8 pairs of lfts. and an unbranched or 2–3-branched tendril; lfts. linear, lanceolate or oblanceolate, up to 1½ in. long and ⅛in. wide: fls. purple, ½–¾in. long: pod glabrous, 1–2 in. long. Eu. R.F.G. 22:250. B.B. 2:2622.—Naturalized and established from Nova Scotia to Fla. The seeds mature earlier than those of *V. sativa.* In some parts of the S. it often makes up a considerable portion of the hay.

BB. *Infl. distinctly, mostly long-stalked, few- to many-fld.*

C. *Fls. ½in. long or longer: infl. mostly many-fld.*

D. *Lfts. ovate to oblong, never linear to lanceolate, few.*

E. *Pairs of lfts. 10–15.*

8. gigantèa, Hook. Perennial, pubescent, high-climbing: lfts. 10–15 pairs, narrow-oblong, obtuse and mucronulate: fls. about ½in. long, pale purple, in 7–18-fld. racemes. Calif. and N.—Has been offered by dealers in native plants.

EE. *Pairs of lfts. 4–9.*

F. *Color of fls. nearly white: infl. mostly 8–20-fld.*

9. caroliniàna, Walt. Carolina Vetch. Perennial, nearly or quite glabrous: lfts. oblong to linear-oblong, usually obtuse or emarginate: fls. nearly white, ½in. or less long, in several to many-fld. loose racemes. Minn. and Kans. eastward. B.B. 2:2616.—Has been offered.

FF. *Color of fls. blue to purple: infl. mostly 6–14-fld.*

G. *Shape of lfts. elliptic-oblong, truncate or retuse at the apex.*

10. americàna, Muhl. American Vetch. Fig. 3929. Perennial, trailing or climbing, 3 ft. long, nearly or quite glabrous: lfts. 8–14, elliptic to oblong, obtuse or sometimes emarginate at the apex: fls. purplish, about ¾in. long, in few-fld. loose racemes: pods 1–1¼ in. long; seed brown, ⅛in. diam. Moist lands across the continent and as far south as Ky. B.B. 2:2614.—Has been offered by dealers in native plants.

GG. *Shape of lfts. ovate, obtuse at the apex.*

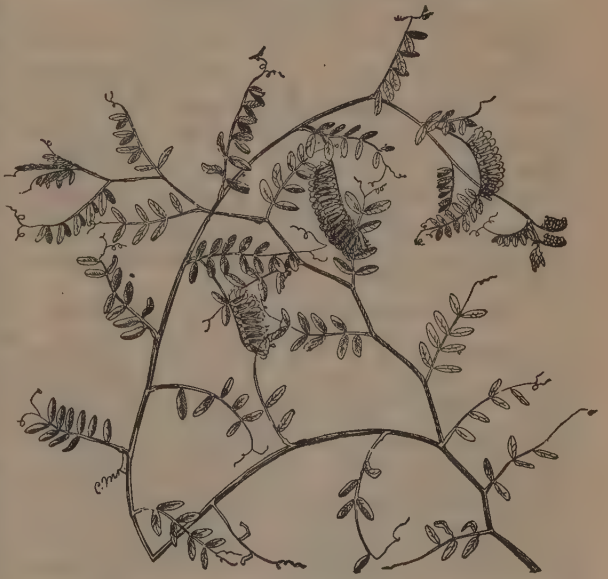
11. dumetòrum, Linn. Annual, glabrous: st. 1½–8 ft. long, trailing or climbing: lfts. 8–10, ovate to oblong: infl. 2- or mostly 6–14-fld.: fls. ½–¾in. long; calyx with very unequal large triangular teeth; corolla purple becoming dirty reddish yellow to greenish: pod oblong to oblong-linear, 1½–2 in. long and about ⅜in. broad; seed spherical, about ¼in. diam., dark brown. Eu. R.F.G. 22:253.—Cult. for forage in Germany.

DD. *Lfts. linear to lanceolate, numerous.*

E. *Limb of the banner as long as or longer than its claw.*

F. *Color of fls. red or nearly scarlet and purple-striped.*

12. fúlgens, Batt. Scarlet Vetch. Annual, 3–5 ft., pubescent: lfts. 8–12 pairs, oblong or lance-linear,



3930. Vicia villosa, the hairy vetch. (×⅓)

mucronate: fls. small, red or nearly scarlet and purple-striped, in a compact raceme or spike. Algeria.—Adapted only to the Pacific and Gulf states. Usually of poor seed habits, but quite drought-resistant from spring sowings.

FF. *Color of fls. purplish or violet.*

13. **Crácca,** Linn. Perennial, usually pubescent: lfts. 9–12 pairs, thin, linear to oblong, mucronate: fls. purplish, about ½in. long, in a rather dense raceme. Across the continent and south to Ky.; also in Eu. and Asia. R.F.G. 22:230. B.B. 2:2613. Var. **Gerárdii,** Gaud. (*V. Gerárdii,* All.). Described as a hardy annual: pubescent: lfts. numerous, narrow-oblong, very obtuse but with a short mucro.: fls. violet, small, in short racemes. S. Eu. R.F.G. 22:233.—Offered by seedsmen as a fl.-garden subject.

EE. *Limb of banner not over half as long as its claw.*

F. *Pod glabrous.*

G. *Plant with thick, shaggy pubescence: fls. up to 1 in. long.*

14. **villòsa,** Roth. Hairy, Sand or Russian Vetch. Fig. 3930. Annual or biennial (sometimes perennial?), enduring the winters in the N., villous-pubescent: lfts. 5–10 pairs, elliptic-oblong, rounded at the tip but usually ending in a very minute point: fls. violet-blue, in long 1-sided axillary about 30-fld. racemes. Eu., Asia. R.F.G. 22:234.—Now considerably used as a cover-crop. More hardy than *V. sativa* but the pods shatter more easily and the seeds are smaller. In N. Italy it can be cut early enough to produce a crop of millet the same season.

GG. *Plant with short appressed pubescence: fls. only up to ⅜in. long.*

15. **dasycárpa,** Ten. Annual or sometimes perennial, slightly pubescent: st. slender, angled, climbing to prostrate: lvs. nearly sessile; lfts. about 10 pairs, oblong-ovate to linear or lanceolate: infl. short-pedicelled: fls. few to many, whitish below, blue-violet above, becoming blue with age: pod ⅞–1¼ in. long, ⅜in. broad; seeds rather large, purplish brown. Eu. R.F.G. 22:235.—As hardy as *V. villosa* and matures earlier than *V. sativa.* Produces good seed crops. Naturalized in W. Ore.

FF. *Pod pubescent: plant with thick shaggy pubescence: fls. whitish below, purplish above.*

16. **atropurpùrea,** Desf. Purple Vetch. Annual, resembling *V. villosa* in habit, sometimes with soft whitish pubescence: st. 8–30 in. long, angular, prostrate or climbing: lvs. with 5–8 pairs of lfts. with branched tendrils; lfts. oblong-linear to almost linear, apex pointed: infl. 2–12-fld.: fls. about ⅝in. long; corolla whitish below, purplish above: pod broadly linear to rhombic-linear, 1–1½ in. long, ⅓–½in. broad, pubescent; seeds somewhat roundish, somewhat compressed, black. S. Eu. R.F.G. 22:239. B.R. 871.—Of good seed habits. Best adapted to the Pacific and Gulf coasts and produces excellent yields from spring plantings in semi-arid regions.

CC. *Fls. ⅜in. long or less: infl. 2–4-few-fld.: plants annual.*

17. **Ervília,** Willd. (*Érvum Ervília,* Linn.). Bitter Vetch. Annual, pubescent: st. erect, angular: lvs. with 8–12 pairs of lfts. without tendrils; lfts. oblong-linear to linear: infl. 2–4-fld.; corolla rose-colored, veined: pod broadly linear, smooth, yellowish; seed smooth, reddish brown. Eu. R.F.G. 22:261.—Extensively grown in Asiatic Turkey and seed shipped in large quantities to England and other countries for stock feed, especially sheep. Yields about 30 lbs. of seed to the acre. Plants not readily eaten by livestock but it has been found to be an excellent winter green-manure crop in Calif.

P. L. Ricker.

VICTÒRIA (in honor of Queen Victoria). *Nymphæàceæ.* Royal Water-Lily. The great water-lily of the Amazon, sometimes grown in large aquaria.

This remarkable aquatic genus may be recognized by its huge round floating lvs. often 6 ft. or more in diam., with the margin turned up at right angles to the water surface to a height of 3–8 in., making a basin-like object. Fls. (12–18 in. across) nocturnal, opening on two successive days about 5 P.M. and remaining open until the middle of the following morning; the first evening the inner floral lvs. remain loosely closed over the stigma, the fl. is creamy white, and exhales a delicious fragrance somewhat like pineapple; the second evening the floral lvs. spread wide open, and the color changes to pink or red; ovary inferior, densely prickly, and surmounted by a short broad tube, on the sides and summit of which the floral lvs. are situated; sepals 4; petals 50–70, obtuse, oblong-ovate to sublinear, rather thin and delicate in texture; staminodia about 20; stamens 150–200, linear-lanceolate; paracarpels about 25, forming a ring of thick fleshy bodies between the stamens and the styles; carpels 30–40; stigma forming a broad basin-like depression, 2–2½ in. wide, in the midst of the fl., with a central conical continuation of the floral axis, the basin filled with fluid on the first evening of opening; carpellary styles broad and fleshy in the lower part, produced upward to a fleshy subulate incurved process about ½in. long: in fr. all of the floral lvs. have decayed away, leaving the basal tube of the torus at the top of a great prickly berry, half the size of one's head; seeds greenish or brownish black, about the size of a pea.—The genus is represented by 2 well-defined species, inhabiting still waters of S. Amer. from British Guiana to Argentina.

In its native haunts victoria grows in 4 to 6 feet of water, in great patches miles in extent, and is perennial. The tuberous rhizome stands erect in the mud, where it is anchored by innumerable spongy roots which spring from the bases of the leaves in groups of ten to thirty or forty. The tuber may be as much as 6 inches in diameter and 2 feet long. It decays below as it grows above. The leaves are arranged in 7 to 18 order, the flowers being extra-axillary. Each leaf after the first seedling leaf has a broadly ovate fused pair of stipules, these organs serving to protect the apex of the stem. The petioles and peduncles are terete, 1 to 2 inches in diameter, covered with stout fleshy prickles, and traversed internally by four large, and a number of smaller air-canals. The petioles attain to a length much greater than the depth of the water, so that the leaves can adjust themselves to changes of the water-level, though Banks states that they may be completely submerged in times of flood. The gigantic leaves are covered beneath with a close network of prickly veins, the larger of which project an inch or more from the leaf-surface, the tissues are full of air-spaces and -canals, thus buoying up the mass of cellular matter. Besides many stomata on the upper surface of the leaf, which open into the air-chambers of the mesophyll, there are countless tiny depressions, in each of which one can see with a hand-lens that the leaf is perforated with a fine hole; these holes were called by Planchon "stomatodes" (F.S. 6:249). He considered them to be useful as air-holes to let out gases which, rising from the water or mud, might be caught in the deep meshes of the netted veins on the under side of the leaf. It is also to be noted that, in spite of the cup-like form of the leaves, water from rain or other sources does not remain on the surface; it doubtless runs down at once through the tiny perforations. This would be an indispensable protection against fungi and algæ, and for the function of assimilation.

A single leaf, by its buoyancy, may sustain a weight of 150 or 200 pounds. Gurney at Tower Grove Park, St. Louis, covers the leaf with a large round quilted pad, then lays on an equally large frame of thin wooden

slats, and on this a person can readily stand, as if in a boat. Not the least remarkable feature of these leaves is their rate of growth. Caspary found the maximum growth in length to be about 1 inch an hour when the leaf is just expanding; the surface increases 4 or 5 square feet in twenty-four hours, and a plant will produce in twenty-one to twenty-five weeks 600 or 700 square feet of leaf-surface. A great development of heat has been observed in the opening flowers of victoria. About 8 P.M., when the anthers are shedding their pollen (in second-day flowers), the stamens may reach and maintain a temperature 10° F. above that of the surrounding air.

Though doubtless known to Spanish traders and missionaries, and certainly of use to savages as food in

3931. Victoria regia, the giant water-lily of the Amazon.

early times, victoria was first noticed botanically by Haenke in Bolivia about 1801; but he died in the Philippines without recording his discovery. Bonpland, the companion of Humboldt, also saw it near Corrientes, Argentina, in 1819, and in 1825 sent seeds and a full description to Mirbel at Paris. In 1832 Poeppig found it on the Amazon, and gave the first published account of it in Froriep's "Notizen" in November of that year, under the name of *Euryale amazonica*. D'Orbigny saw the plant in 1827 at Corrientes, collected specimens, and sent them with drawings to the Museum of Natural History at Paris. In 1833 he saw it again in Bolivia, and several years later published accounts of his find. Robert H. Schomburgk, finding it again in 1836 on the Berbice River in British Guiana, sent home specimens and figures from which Lindley in 1837 (published in 1838) established the genus Victoria and described the species *V. regia*. This name has settled on the northern species, while the one found at Corrientes was named in 1840, by d'Orbigny, *V. Cruziana* in honor of General Santa Cruz, of Bolivia.

The struggle to bring the "queen of water-lilies" into captivity began with Schomburgk. He removed living plants from inland lakes and bayous to Georgetown, British Guiana, but they soon died. In 1846 Bridges obtained seed in the Bolivia locality, province of Moscos, and sent them in a jar of wet clay to England. Out of twenty-five seeds obtained at Kew, three germinated and grew vigorously as small seedlings until October, but died in December. In 1848 dry seeds were sent to England from the Essequibo River, along with rhizomes, the latter in Wardian cases; the rhizomes rotted, and the seeds refused to germinate. In 1849 an expedition from Georgetown succeeded in bringing back thirty-five living plants, but these all died. Finally some seeds were sent to Kew from the Demerara River in bottles of fresh water, by two English physicians, Rodie and Luckie. The first sending arrived February 28, 1849, and on November 8 a plant flowered at Chatsworth; the blossom was appropriately presented to Queen Victoria. From this stock *Victoria regia* was distributed to gardens in Europe, Asia, and America. Van Houtte of Ghent first flowered it on the continent, and Caleb Cope, of Philadelphia, was the earliest successful cultivator in this country. His gardener was the late Thomas Meehan. The first flower opened August 21, 1851. In 1852 John F. Allen, of Salem, Massachusetts, had a plant from seed of Mr. Cope's growing. This plant lived through four summers and matured over 200 flowers.

The next notable importation of seed was sent by Edward S. Rand, Jr., from Para, Brazil, to Mr. Sturtevant, then at Bordentown, N. J. The resulting plants flowered in 1886 and, proving to be slightly different from the former type, were called *V. regia* var. *Randii*. It is doubtless the same form that was described by Planchon as *V. amazonica*, and retained with grave doubts by Caspary. In 1894 Mr. Tricker received from Europe seed of quite another species, which was provisionally named *V. regia* var. *Trickeri*. It is much more amenable to out-of-door culture than the older type, and has received a well-deserved popularity. Specimens grown at Kew from seeds sent by Tricker were regarded simply as garden forms of *V. regia*. Later investigation by Tricker and the writer brought out the fact that the stock came originally from Corrientes, Argentina, and that the plant is truly

the *V. Cruziana* of d'Orbigny. Its far southern habitat (27° south) explains its hardiness. At Riverton, New Jersey, seeds that have wintered in an open pond produce plants which flower by the end of August. The large starchy seeds of this species are used as food in Paraguay under the name of *Mais del Agua*, "water-corn." The form of victoria originally introduced from British Guiana had leaves entirely flat until the plant attained considerable size; then a low rim appeared. The leaf was deeply purple-colored beneath. *V. Cruziana* differs markedly from this. *V. regia* var. *Randii* approaches the latter; and Malme's recently described *V. Cruziana* forma *mattogrossensis* approaches *V. regia* in several details. Apparently the two species grade into one another in Matto Grosso, where the tributaries of the Amazon and the Parana rivers interlace.

For much interesting information on Victoria, see Hooker, "Botanical Magazine" 4275–4278; Planchon, "Flore des Serres" 6:193–224; Caspary in "Flora Brasiliensis" 4, part 2, page 143 ff. In 1854 John Fisk Allen published in Boston a quarto work (pages 21 by 27 inches) with colored plates, entitled: "Victoria regia, or the great water-lily of America. With a brief account of its discovery and introduction into cultivation: with illustrations by William Sharp, from specimens grown at Salem, Massachusetts, U. S. A."

règia, Lindl. Fig. 3931. Lvs. sparingly pubescent beneath, margins of lvs. of diam. above 40 in., turned up 2–4 in. high: fls. becoming dull crimson the second evening; sepals prickly almost or quite to the tips: prickles of the ovary about ⅜in. (10–11 mm.) long: seed elliptic-globose, nearly ½in. long, less in diam. (7–8 mm. long, 5½–6 mm. diam.); raphe indistinct; operculum elliptic-orbicular, with the micropyle at its center and hilum at the margin. British Guiana. B.M. 4275 (poor); 4276–78 (incorrect in some details). F.S. 6:595–604. Kerner, Natural History of Plants, pl. xi. Tricker, Water Garden, pls. 1, 2; pp. 21, 35. Caspary, Fl. Brasil. 4, pt. 2, pl. 38, fig. 15 (seed). Var. **Rândii,** Hort., has rim of lf. 5–6 in. high, and under side of lf. deeper red: fl. turning to deep crimson on second day. This is the form commonly cult. in American gardens now as *V. regia.* Amazon and its tributaries. A.G. 18:469. Intro. by Sturtevant in 1886.

Cruziàna, d'Orbigny (known in cult. as *V. règia* var. *Trickeri,* and *V. Trickeri*). Lvs. densely villous beneath, upturned margins green, 6–8 in. high: fls. becoming deep red-pink the second evening; sepals prickly only at base, smooth above: prickles of ovary over ½in. (15–16 mm.) long, crowded: seed subglobose, about ⅓in. (7½–9 mm.) diam.; raphe stout; operculum elongate-ovate, with hilum and micropyle equidistant from the margin. Parana River and tributaries, Paraguay. Tricker, Water Garden, pl. 1; pp. 51, 55. Caspary, Fl. Brasil. 4, pt. 2, pl. 38, fig. 16 (seed). Gn.M. 1:267. A.G. 19:449. F.E. 10:suppl. Feb. 12 (1898).—Intro. by Wm. Tricker in 1894. Forma **mattogrossénsis,** Malme, has low rim on lf. seed very large (8–10 mm. diam.) with broadly oval operculum: sepals either smooth or spiny. Corumba, state of Matto Grosso, Brazil. Acta Hort. Bot. Bergiani, 4:pls. 1–4 (1907).

HENRY S. CONARD.

Cultivation of victorias.

At first *V. regia* was cultivated at a great expense in conservatories and tanks built especially for the purpose. Then it was grown in artificially heated ponds in the open air. The victoria is largely grown in private and public gardens throughout the United States at the present time, together with tropical nympheas, and in some cases without artificial heat, but this method of culture is uncertain and often unsatisfactory. *V. Cruziana* is by far the best kind for out-of-door culture. Moreover, it can be grown where *V. regia* fails to grow, as it revels in a temperature of only 75° to 80°. Its introduction has been of great interest. It has stimulated the culture of aquatic plants in the United States, also in Europe where it is now largely grown.

The *Victoria regia* is now considered of easy culture. Its requirements are heat, light, and a rich mellow loam in abundance. The seed should be sown in February and March. The temperature of the water should range between 85° to 90° F. The seed may be planted in pots or seed-pans and placed in shallow water. A tank 8 to 12 inches deep, having a metal lining, copper preferred, is very serviceable for seedlings and young plants. Where sufficient heat is not attained from the heating pipes, an addition can be made by the use of an oil-lamp. It is altogether unnecessary and unnatural to file or chip the seed to assist or hasten germination. The seedlings will appear in about twenty days, though occasionally a few may appear in ten days. These should be potted off singly into 2½-inch pots, using fine loamy soil. The water temperature for the young plants should be the same as directed for the seed-pots. As soon as the young plants acquire their first floating leaf they will doubtless be benefited by repotting. From the very beginning, as sprouted seeds, they should be kept steadily growing, repotting at intervals, until they are planted out in their summer quarters. As the young plants advance they will require more space, so that the leaves are not crowded and overlap each other.

To raise plants of *V. Cruziana* (*V. Trickeri*) is altogether a different matter. The seed will not germinate in a high temperature; 65° to 70° is sufficient. The seed may be sown in February, but there is great uncertainty as to how long one must wait for the seedlings to appear, and also as to what percentage of seeds will germinate. As soon as the seedlings appear they should be treated like seedlings of *V. regia,* except as to temperature, which should be kept as above stated for seedlings and small plants, and as the season advances may be raised to 75° to 80°. The rationality of the cool treatment here advocated is borne out by the fact that early in June quantities of seedlings appear in the pond in the open where a plant has grown the preceding season, the seed having remained in the pond during the winter. Planting in summer quarters may be done early in June or whenever it is safe to plant out tender nympheas, that is, when the pond is not artificially heated. When it is desired to plant out in unheated ponds it is not safe to plant before the middle or latter end of June. The conditions of the weather, earliness or lateness of the season, locality, and the like, must all be taken into account.

The best results are to be obtained from an artificially heated pond, or pits in the pond specially constructed to start the victorias, these pits to be heated by hot water or steam and covered with frames and sashes. By this method plants may be set in their summer quarters early in May and heat applied until the middle of June, or rather a temperature of 85° maintained until the advent of summer weather.

Very gratifying results are obtained when the victoria is grown under glass, as it is thus grown in several places in the United States, notably at Schenley Park, Pittsburgh, and Allegheny Park; also at "Greystone," the estate of Samuel Untermyer, Yonkers, New York, also at many notable gardens in Europe. Plants grown under glass usually attain to larger dimensions, as they are protected against climatic changes and the elements, besides enjoying more of a tropical atmosphere. There is more than one disadvantage, however. Setting aside the costly construction, labor, and so on, it is by no means inviting even on a warm day to spend many minutes in such a structure. Compare this with a natural pond and its surroundings and a cool shady seat where these gorgeous plants may be viewed at leisure.

Whether grown indoors or out, these plants are only

annuals, and seedlings are of necessity raised every spring. They form no tubers as do the tender nymphaeas, or rootstock as do the hardy nymphaeas.

Few, if any, insects are troublesome on these plants. The worst is the black-fly or aphis. The use of insecticides should not be resorted to, as they are most likely to damage the foliage. The safest remedy is to introduce a colony or two of the well-known "lady bug." They and their larvæ will soon clear off all the aphides without any injury to the plant. WM. TRICKER.

VÍGNA (Dominic Vigni, Paduan commentator on Theophrastus in the seventeenth century). *Leguminòsæ.* Herbs grown mostly for the seeds and fodder; the cowpea group.

The usual cultivated species of Vigna are annual bean-like rambling vines with 3 rhomboid-ovate stalked lfts., the lateral ones unequal-sided, the petioles long:

3932. Vigna strobilophora. (×½)

fls. bean-like, white, pale to violet-purple and pale yellow, borne 2 or 3 together on the summit of a long axillary peduncle: pods slender, straight, or slightly curved, a few inches to 3½ ft. long; seeds small, nearly round to kidney-shaped, bean-like, white or dark, self-colored or variously mottled, usually with a different color about the eye.—Species 60 or more, tropical. The species show great variation in stature and growth-habit, and particularly in the color of the seeds. The genus may be distinguished from Phaseolus by the fact that the keel is bent inward at right angles but is not coiled. Vigna resembles Dolichos in having a similar keel but differs from it in the form and position of the stigma. In the former species this is lateral, occupying a position just beneath the apex of the style and above the line of pubescence which extends up the inner face of this organ. Just opposite the stigma the apex of the style is bent backward and prolonged into a beak. The stigma in Dolichos, on the other hand, is terminal or merely oblique. The prolonged beak of the style is also absent. Vigna may be further distinguished from Dolichos in the shorter petioles of the first pair of aërial lvs. In Vigna these are about ¼in. long or shorter, whereas in Dolichos they are 1 in. long or longer.

Three species of Vigna are in common cultivation: the cowpea, *V. sinensis;* the catjang, *V. Catjang;* and the asparagus bean, *V. sesquipedalis.* The asparagus bean (*V. sesquipedalis*) can be used as a forage plant for stock, or the green pods may be cooked as a snap bean since they are more tender and brittle than those of the cowpea or catjang. This species is little grown, however, due to a lack of productivity, except as a curiosity or novelty. The nomenclature of the cultivated varieties of the cowpea and catjang is almost hopelessly confused. Piper enumerates 220 agricultural varieties of the former and 50 of the latter. Formerly the name cowpea was restricted to the buff-colored or clay-pea, but it is now commonly used generically; it is an Americanism. Common generic terms now in use in the South are "black-eyed pea" and "corn-field pea." While the cowpea and the catjang are now employed mostly for animal food and green-manuring, the pea itself is a good human food and has been so used for many years. For table use the peas are best gathered when the pods first begin to change color; however, they are most extensively used from the dry ripe pods. As long ago as 1855 an excellent essay on cowpeas was written by Edmund Ruffin ("Essays and Notes on Agriculture," Richmond, 1855). Piper (Bulletin No. 229, Bureau of Plant Industry, United States Department of Agriculture) describes these three species as follows:

sesquipedàlis, W. F. Wight (*Dòlichos sesquipedàlis,* Linn.). Seeds elongated kidney-form, 8–12 mm. (⅛–½in.) long, their thickness much less than their breadth; pods pendent, much elongated, 1–3 ft. long, fleshy and brittle, becoming more or less inflated, flabby and pale in color before ripening, and shrinking about the widely separated seeds when dry. S. Asia.

Cátjang, Walp. Seeds small, usually oblong or cylindric and but slightly kidney-shaped, 5–6 mm. (⅕–¼in.) long, nearly or quite as thick as broad; pods small, not at all flabby or inflated when green, mostly 3–5 in. long, erect or ascending when green, remaining so when dry or at length becoming spreading or even deflexed. Probably S. Asia.

sinénsis, Endl. Seeds mostly 6–9 mm. (¼–⅜in.) long, varying from subreniform to subglobose; pods 8–12 in. long, early becoming pendent, not at all flabby or inflated when green. Probably Cent. Afr.

Some species of Vigna are useful for ornament. *V. strobilóphora,* Robs., from Mex. (Fig. 3932), is said by Pringle (G.F. 7:155, from which Fig. 3932 is reduced) to have abundant fls. that rival those of the wisteria in beauty. It is a twining woody vine climbing to tops of trees and shrubs: st. slender and flexuous, pubescent: lfts. 3, ovate, acuminate, entire, rounded at base, 2½ in. long: fls. in dense axillary peduncled racemes, blue-purple, standard orbicular, slightly retuse, with 2 small appendages at base; bracts large, closely imbricated. *V. vexillàta,* Benth. (*Phasèolus vexillàtus,* Linn.), widely spread in the tropics and warm parts of Old World, is intro. in S. Calif.: woody perennial with pink fls., the rootstock tuberous, hairy: lfts. usually ovate-lanceolate to narrow-lanceolate, entire, 2–4 in. long: fls. 2–4 in a cluster on summit of peduncle; standard nearly 1 in. across, reflexed: pod 3–4 in. long, nearly cylindrical. GEO. F. FREEMAN.

VIGUIÈRA (Dr. A. Viguier, botanist of Montpellier, France). *Compósitæ.* About 60 or 70 species of herbaceous or somewhat shrubby plants, found in the warmer parts of the world, especially Amer. The following is a native of Low. Calif. and is offered in S. Calif., but is little known otherwise. It is a tall bushy

plant with silvery foliage and small yellow fls. like single sunflowers, but borne in ample corymbs. Rays fertile, or more often sterile, in wild plants sometimes wanting; pappus of 2 chaffy awns: achenes usually pubescent. The plant blooms both winter and summer.

tomentòsa, Gray. Shrub or branching subshrubs: lvs. opposite, subcordate, serrate, tomentose on both sides, 3–5 in. long: heads corymbose: achenes villous, with 2 long awns and many small scales.

N. Taylor.†

VILLAGE IMPROVEMENT: *Planting*, Vol. V, p. 2658.

VILLARÈSIA (named for Matthias Villarez, a Spanish botanist). *Icacinàceæ*. Evergreen tall climbing trees or shrubs, adapted to the warmhouse: lvs. alternate, oblong, entire or spinulose-dentate, thick, leathery, shiny: cymes small, head-like, arranged in axillary or terminal racemose panicles or racemes: fls. white, hermaphrodite or polygamous; calyx 5-parted; petals 5, ribbed inside; stamens 5, disk inconspicuous; ovary 1-celled: drupe ellipsoid.—About 13–15 species, distributed in the islands of the Pacific, Trop. Austral., Indian Archipelago, and Brazil and Chile.

grandiflòra, Fisch. Tree, smooth with subangular branches: lvs. sparse, petioled, coriaceous, ovate-lanceolate, narrowed toward the base, apex acuminate, greenish above, paler beneath: panicles terminal, clustered: fls. sessile, small, white; calyx tubular-campanulate, lobes 5, ovate; petals 5, spreading, lanceolate. Brazil. Gt. 6:181.

mucronàta, Ruiz & Pav. (*Ilex gongónha*, Mart.). Tree, usually 40 ft. high, rarely 50–60 ft.: lvs. short-petioled, ovate or elliptic-oblong, apex spinulose, leathery, dark green, shining above, paler and dull beneath: fls. 5-merous, in solitary shortly pubescent thyrses, terminal or in the upper axils, yellowish white; sepals wide elliptic or nearly orbicular; petals elliptic-oblong; ovary by abortion 1-celled: drupe ovoid. Chile. B.M. 8376. —Prop. by cuttings. Rare in cult.

F. Tracy Hubbard.

VILLÁRSIA (named for Dominique Villars, 1745–1814). *Gentianàceæ*. Marsh-loving herbs, suitable for greenhouse cult.: sts. simple and leafless or somewhat branched and few-lvd.: lvs. radical, long-petioled, entire or irregularly sinuate-dentate: cymes usually many-fld., sometimes laxly paniculate, sometimes corymbosely congested or capitate and involucrate: fls. yellow or white; calyx 5-parted or deeply 5-cleft, segms. lanceolate; corolla broadly campanulate or rather rotate; stamens 5: caps. 1-celled, subglobose, apex 4-valved.—About 10 species, S. Afr. and Austral. *V. renifórmis*, R. Br. (*Menyánthes exaltàta*, Sims. *M. sarmentòsa*, Sims). From 6 in. to 3 ft. high: lvs. in a dense tuft on long petioles, ovate, orbicular or reniform, more or less cordate, entire or slightly sinuate-dentate, mostly 1–2 in. long: fls. yellow; corolla ¾–1 in. across, lobes copiously fringed or bearded at the base inside. Austral. B.M. 1029; 1328. R.H. 1909, p. 125.

VIMINÀRIA (Latin, *vimen*, a slender twig or withe, alluding to the branches). *Leguminòsæ*. Shrub, with rush-like branches, adapted to greenhouse cult.: lvs. alternate, reduced to long filiform petioles or rarely 1–3-foliate: fls. small, orange-yellow, arranged in terminal racemes; calyx-teeth short, equal; petals rather long-clawed, standard suborbicular, wings oblong, keel incurved, equaling the wings; stamens free; ovary subsessile, 2-ovuled: pod sessile, ovoid-oblong, rather indehiscent.—One species, Austral., little known to horticulturists.

denudàta, Smith. The name Leafless Rush-Broom has been proposed for this. Leafless yellow-fld. shrub, attaining 10–20 ft., formerly cult. in European greenhouses as a small tender shrub: lvs. 3–8 in. long: pod 2–3 lines long. Austral. B.M. 1190. P.M. 14:123.—Offered in S. Calif.

F. W. Barclay.

VÍNCA (*pervinca*, old Latin name of periwinkle, used by Pliny). *Apocynàceæ*. Erect or procumbent or trailing herbs or subshrubs, some used for bloom in the flower-garden, others for decorative foliage in the greenhouse and in window-boxes and others for permanent ground-cover out-of-doors.

Leaves opposite: fls. axillary, solitary, rather large; calyx 5-parted, not glandular, lobes narrow, acuminate; corolla salver-shaped, tube cylindrical, lobes 5, large, twisted, overlapping to the left; stamens included, above the middle of the tube; disk none; ovary 2 distinct carpels, glabrous: follicles 2, erect or divergent, narrowly cylindrical.—About 12 species, Medit. region, Trop. Amer., India, and Madagascar.

3933. Vinca minor, the common periwinkle, or running myrtle. (Natural size)

One of the commonest and best plants for covering the ground in deep shade, especially under trees and in cemeteries, is *V. minor*. It is a hardy trailing plant with shining evergreen foliage and blue salver-shaped five-lobed flowers about an inch across, appearing in spring or early summer. It forms a dense carpet to the exclusion of other herbs. It thrives best in moist half-shaded positions, but will grow in the deepest shade even in poor soil, especially if it is stony. It is a capital plant for clothing steep banks, covering rocks, and carpeting groves. It can be planted successfully on a large scale any time from spring to fall during mild or

rainy weather. It is propagated by division or by cuttings, as seeds very rarely mature. The periwinkle will live in city yards under trees where grass will not thrive. *V. minor* is the commonest and perhaps most variable species. Varieties with white, purple, and double flowers are kept in most nurseries, as also a form with variegated foliage. *V. major* is larger in all its parts than the common periwinkle and not so hardy. It is well known to florists. A variegated form of it is seen in nearly every veranda-box in the country. *V. rosea* is a tender plant of erect habit which is used chiefly for summer bedding. It grows about a foot high and has rosy purple or white flowers with or without a reddish eye, and often 2 inches across. The plants bloom continuously from the time they are set out until frost. It can be grown in large masses for public parks with somewhat less expense than geraniums. Mr. Stromback, head gardener of Lincoln Park, Chicago, has recorded his experience with *V. rosea* in Florist's Review 1:141 as follows: "The seed is sown in January or February in flats of sandy soil in a temperature of 65° to 70°. When the seedlings show the second leaf, they are pricked out about an inch apart in trays of the same soil, and when the little plants have five or six leaves they are potted into 2-inch rose-pots, and later shifted to 3-inch pots. The majority are bedded out from the 3-inch pots. The soil of the bed should be a sandy loam if possible, and the plants will not do well in a very heavy soil. In bedding, set the plants about a foot apart. They require more water than a geranium, and when the bed is watered it should be given a good soaking and then let alone for a few days. The plants require no trimming." The amateur will find *V. rosea* a satisfactory window-plant that can be grown with little trouble from seeds started as late as April, but of course such plants will not bloom as early as the bedding stock propagated in January or February. *V. rosea* is the largest-flowered vinca, and it seeds freely. (Wilhelm Miller.)

A. *Plants trailing, herbaceous, hardy or nearly so, only the short flowering sts. ascending: fls. mostly blue or white.*

B. *Foliage evergreen.*

C. *Lvs. ovate or oblong-ovate: corolla-lobes wedge-shaped; calyx glabrous.*

mìnor, Linn. Common Periwinkle. Blue, Running, or Trailing Myrtle. Fig. 3933. Hardy evergreen, trailing herb: fl.-sts. erect, sometimes nearly a foot high: lvs. ovate, oblong-ovate, or elliptic-lanceolate, not more than 1½ in. long, glabrous, petiole very short with 2 glands at the top: fls. lilac-blue; calyx-lobes lanceolate, rather obtuse; corolla-lobes cuneate, obtuse and truncate. Eu. G. 2:64.—Common in all country gardens and running wild in cemeteries and shady places. Some of the horticultural varieties are: Var. **álba,** Hort., which has single white fls. Var. **álba plèna,** Hort., with double white fls. Var. **álba variegàta,** Hort., is a form with variegated lvs. and single white fls. Var. **argéntea variegàta,** Hort., has the lvs. silvery variegated. Var. **atropurpùrea compácta,** Hort., has single dark purple fls. Var. **aùrea,** Hort., has been in the trade, a form with golden foliage. F.E. 33:479. Var. **aùrea variegàta,** Hort., has golden variegated lvs. Var. **cærùlea,** Hort. (*V. cærùlea,* Hort. *V. cærùlea mìnor,* Hort.), is a form with bright blue, single fls. There is also a form known as *V. cærùlea argéntea marginàta,* Hort., which has the lvs. margined with silvery white. Var. **flòre-plèno,** Hort., probably the same as var. *plena.* Var. **plèna,** Hort., has double fls., otherwise like the type. Var. **purpùrea plèna,** Hort., has double purple fls. Gn. 50:102. Var. **ròsea,** Hort., has single rosy fls. Var. **ròsea fl.-pl.** Hort., is like the last but double-fld. Var. **variegàta,** Hort., is a variegated-lvd., blue-fld. form offered in the trade. *V. elegantíssima álba,* Hort., and also "The Bride," a form with white fls. which are pink-centered belong to this species.

CC. *Lvs. subcordate-ovate: corolla-lobes obovate.*

diffórmis, Pourr. Subshrub, evergreen and dwarf: branches prostrate and leafy; flowering shoots ascending: lvs. ovate, base rounded or shortly cuneate, apex acutish or obtuse, 1¼–2¾ x 1–1¾in., glabrous, petioled: fls. solitary in the uppermost axils, 1 in. or more across, pale lilac-blue; sepals linear; corolla-segms. obliquely obovate. S. Eu., N. Afr. B.M. 8506.—Rare in cult.

màjor, Linn. Sterile sts. reclining; flowering sts. rather erect: lvs. subcordate-ovate, rather obtuse, ciliate, shining, 2–3 x 1–2 in.: fls. blue; calyx-lobes narrowly linear, ciliate; corolla-lobes obovate, very obtuse. Eu.—This species is larger throughout than *V. minor.* It is much used, especially the variegated forms, for veranda-boxes and hanging-baskets. Var. **elegantíssima,** Hort., is a showy form with the lvs. margined and blotched with yellowish white. Common form among the florists and easily prop. by cuttings. Var. **reticulàta,** Hort., is offered in the trade. Var. **variegàta,** Hort., is offered in the trade. G. 27:330.

3934. Vinca rosea. (× nearly ½)

BB. *Foliage deciduous or less evergreen.*

herbàcea, Waldst. & Kit. Hardy trailing glabrous herb, which usually loses its lvs. in winter: lvs. elliptical or lanceolate, rather obtuse, margins revolute; petiole very short: fls. more purple than the other species; calyx-lobes narrowly lanceolate, acuminate; corolla-lobes obovate, oblong-obtuse. E. Eu., Asia Minor. B.M. 2002. B.R. 301.

AA. *Plants erect, subshrub, tender: fls. rosy or white.*

ròsea, Linn. Madagascar Periwinkle. Fig. 3934. Tender erect everblooming plant, somewhat shrubby at the base: lvs. oblong, narrowed at base, veiny; petiole glandular at the base: fls. with a very small orifice, rosy purple or white, the latter with or without a reddish eye; calyx-lobes linear, corolla-lobes dimidiate-obovate, mucronulate. Cosmopolitan in the tropics. Gn. 36, p. 455; 43, p. 389. V. 13:49; 16:49. B.M. 248. F.R. 1:141. G. 11:197; 14:333; 37:205.—This is commonly called the "Madagascar periwinkle," but *V. rosea* is probably not native to the Old World, while the only species of Vinca that is really native to Madagascar, viz., *V. lancea,* is not in cult. The plant is sometimes called "Cape periwinkle" and "old maid." The three main types should be known as *V. rosea, V. rosea* var. *alba, V. rosea* var. *oculata,* the latter being a white fl. with pink or red center. As a matter of fact, these appear in American catalogues as *V. alba, V. alba pura, V. alba nova, V. oculata,* and *V. varius,* the last being a trade name for seed of mixed varieties. Var. **delicàta,** Hort., is a trade name.

V. acutíloba, Hort., is a trade name for a white-fld. form, closely related to V. major.

F. Tracy Hubbard.†

VINCETÓXICUM (compound meaning *to conquer* or *subdue poison,* alluding to supposed virtues). *Asclepiadàceæ.* By some combined with Cynanchum (which see), but differing in anthers having only short scarious tips and bearing horizontal rather than suspended pollinia. There are about 75 species, all in Amer., mostly

in warm or tropical parts: they are twining or trailing woody or perennial herbaceous vines, with opposite cordate simple lvs. and small greenish or purplish fls.: corolla campanulate or rotate, deeply 5-cleft and the parts sometimes reflexed; crown small, mostly ring-like or cup-like and thereby differing from the awned crown-lobes of Gonolobus (Definition of Gonolobus, p. 1356, to be amended): follicles thick, pointed, muricate or ribbed or both. Several species are native in the U. S. from Pa. and Va. southward, but apparently they are not in cult. The mosquito plant or cruel plant, sometimes named in this genus, is here treated as *Cynanchum acuminatifolium*.

VINES: *Planting*, Vol. V. (Index p. 2657.)

VIOLA (classical name). *Violàceæ*. VIOLET. PANSY. Usually perennial herbs with attractive spring or early summer bloom, and well adapted for colonizing in grounds and one species for forcing; in the pansy group, many species are handsome winter annuals or biennials; and in the Andes and the Sandwich Islands, and in southern Europe shrubby species occur, but they are scarcely cultivated. See *Violet*.

Either stemless, bearing lvs. and 1-fld. scapes from the crown of the rootstock, or stemmed with manifest internodes between the lvs., from the axils of which arise 1-fld. peduncles: fls. usually of two kinds, those of spring with showy petals (Fig. 3935) and those of summer with petals rudimentary or lacking—fls. never opening but self-pollinated within the closed calyx (cleistogamous). (Fig. 3936.) The showy fls. of spring are 5-merous as to sepals, petals, and stamens, irregular and novel in structure as though contrived to prevent self-pollination; sepals nearly similar, persistent on the fr.; the lower petal of the nodding fl. spurred, the other 4 in 2 unlike pairs, the petals in each pair symmetrically alike; stamens short and included, the anthers more or less coherent in a ring about the style, 2 of them with nectar-bearing appendages projecting backward into the spur: fr. a caps. with several (up to 60) obovate seeds; caps. when ripe splitting into 3 boat-shaped valves with thick rigid keels; as the thin sides of the valve dry and contract the seeds within are more and more pinched, until they fly out, one or two at a time, to a distance often of 9 ft.: later cleistogamous fls. in some of the stemless species not growing in wet ground are borne on short horizontal peduncles concealed under soil and leaf-mold until the seeds are ripe, when the peduncle lengthens and lifts the caps. into the air, where it scatters its seeds as did the earlier caps. (Fig. 3936.) See Rhodora, vol. vi, plate 50, for cleistogamous fls. and frs. of 6 other species.—Probably 300 species widely distributed in the N. and S. Temp. zones of both the Old World and the New, of which about 80 species are native to N. Amer. north of Mex.

3935. Structure of the flower of Viola papilionacea.

The classification of the wild violets into species was for many years a perplexing task, because students of the genus failed to recognize the fact that all closely allied species freely hybridize in nature. But in 1900 the important discoveries of Mendel became generally known to biologists, and gave rise to the new science of genetics. With a better understanding of the laws of inheritance that determine the characters of offspring from unlike parents, it is practicable in a genus like Viola to discover what forms are proper species and what are hybrids or the offspring of hybrids. Some of the tests employed by the specialist in Viola may be briefly indicated as follows: (1) The hybrid is notably intermediate in its characters between two well-known species found in the same vicinity. (2) The hybrid usually shows great impairment of fertility, 50 to 100 per cent of the ovules being aborted, but a marked increase in vegetative vigor. (3) The pollen-grains of

3936. The two kinds of violet flowers,—the common showy flowers at the right (natural size), and the cleistogamous flower at a, its immature pod at b (×½).—Viola papilionacea.

most hybrids are seen under the microscope to be largely shriveled and functionally impotent. (4) The hybrid is found to be unstable in sexual reproduction; that is, the offspring of the self-fertilized hybrid are more or less unlike the parent and unlike each other; the offspring of pure species are not thus unlike.

By experimental cultures extending over twelve years, the writer has ascertained the existence of about eighty spontaneous hybrids among the violets of eastern North America—that is, more hybrids than there are pure species. In Wilhelm Becker's systematic treatise on the violets of Europe (published in 1910), eighty-three hybrids are reported among the one hundred and two species there recognized. Any reader caring for the details of the work on American violets will find a dozen or more papers in Rhodora and in the Bulletin of the Torrey Botanical Club (1904–1913); see also Science, June, 1907, and American Naturalist, April, 1910.

Violets are easily grown if an effort is made to imitate the conditions under which they naturally occur. They usually require abundant moisture and partial shade, and a light covering of fallen leaves or evergreen boughs in winter. The habitats are various: some are wood species, others from bogs or borders of springs and brooks; still others, especially in the western United States, inhabit dry plains, remaining dormant during the drought of summer. They are propagated readily by division if the plant is fairly large, and in some nine of the American species by runners. Sometimes seeds are used, but not commonly. However, species of the northeastern United States germinate readily in April, if fresh seed is sown in autumn in boxes and exposed, covered with burlap, to the freezing cold of winter. Many species, that grow mostly to single stems in the wild, make large clumps under favorable conditions in the garden (Fig. 3942). But few of the native violets are grown to any extent as garden plants. *V. pedata*, the bird's-foot violet, a most attractive species, is

sometimes cultivated, as is the hardy grower, *V. papilionacea* (Fig. 3936). A partial albino of this, the petals white with a large blue center, is grown in southern gardens as "the confederate violet." It has been published as *V. Priceana*, the type coming from Bowling Green, Kentucky; but it is perfectly hardy in the North, and multiplies abundantly. Many hybrids of *V. sororia* and of *V. pedatifida* are also hardy, some with violet flowers, others with white flowers, often fifty or more blooming at once in a large clump.

No attempt is made here to describe all the native species, as they are so numerous and so rarely horticultural subjects. For any desired information regarding them the reader is referred to the most recent editions of Gray's "Manual," of Britton & Brown's "Illustrated Flora," or of Small's "Flora of the Southeastern United States," the treatment of Viola in all three works being by the present writer. However, as a matter of record, a list of those that are or have been offered in the trade is here given, and references made to illustrations found in horticultural magazines. With the recent critical studies of Viola, it is found that two or more species were sometimes comprised under a single name; it is therefore difficult, in some cases, to determine what plant may be in cultivation under one of the older names. It is now considered that the European *V. canina* is not indigenous in America; probably the plant listed under that name is *V. conspersa*.

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A. *Species of exotic origin, comprising the florist's violets and the pansy.*

B. *Plant stemless, the peduncles arising directly from the base or crown.*

C. *Style truncate at apex.*

1. **hederàcea,** Labill. (*Erpètion reniforme*, Sweet. *E. hederàceum*, *E. petiolàre*, and *E. spathulàtum*, Don). AUSTRALIAN VIOLET. Tufted, and creeping by stolons, glabrous or pubescent: lvs. reniform or orbicular or spatulate, small, entire or toothed, usually not equaling the scapes: fls. small, usually blue, sometimes white, the spur almost none. Austral. G. 35:35.—Offered in S. Calif.

CC. *Style terminating in a slender hooked beak.*

2. **odoràta,** Linn. SWEET VIOLET. Fig. 3937; also Figs. 3947–49. Tufted, somewhat pubescent, producing long prostrate stolons flowering the second year: rootstock short: lvs. cordate-ovate to reniform, obtusely serrate; stipules ovate-lanceolate, acuminate, the fringed border usually not glandular: fls. deep violet, rarely rose or white, fragrant, the spur nearly or quite straight and obtuse. Eu., Afr., and Asia.—It runs into many forms varying in stature, size of fls. and color. There are double-fld. forms. It is the parent of florists' violets. Fig. 3937, from G.C. III. 21:248, represents var. *sulfurea*, "reported to be a native of the south of France, and bears dull sulphur-coloured flowers." *V. californica* of gardeners on the Pacific coast is only the sweet violet of Eu. For cult., see *Violet*.

3. **cyànea,** Celak. Stemless, stoloniferous: lvs. broadly cordate-ovate, crenate, bright green, glabrate and shining after flowering; stipules lanceolate, long-acuminate, fimbriate: pedicels 2–4 lines long, about equaling or slightly shorter than the petioles after flowering; sepals oblong, obtuse, with short appendages which are rotundate and appressed to the pedicel; corolla medium-sized; petals sky-blue-white below the middle, lower petal emarginate, the others about as long, scarcely emarginate; spur conical, rather straight; ovary short-conoid, very smooth. Eu.

Var. **perfimbriàta,** Borb. (*V. bosnàna*, Wiesb. *V. rùssica*, Hort.). Stolons short, rather thick: lvs. broadly cordate-ovate, vivid green, at flowering-time glabrous and shining; stipules lanceolate, long-acuminate, long-fringed, nearly glabrous: fls. less fragrant than in *V. odorata;* petals a cornflower-blue above the middle, white below. Lower Austria and southeastward. G. 36:362.

4. **álba,** Bess. Stolons long, ascending, appearing in spring and sometimes bearing fls. the same season: lvs. nearly triangular, cordate, with deep and broad

3937. Viola odorata. (×⅔)

sinus, obtuse; stipules lanceolate, long-acuminate, with glandular fringe: fls. fragrant, usually white, but sometimes in various shades of violet and rose. Cent. and S. Eu.

BB. *Plants with evident sts., more or less branching, the peduncles arising some distance above the ground or crown.*

C. *Style slender throughout.*

5. **silvéstris,** Reichb. (*V. silvática*, Fries). Sts. reclining and ascending, glabrous or slightly pubescent: lvs. deeply cordate or nearly reniform, short-pointed or obtuse; stipules linear-lanceolate, fringed-toothed, several times shorter than the petiole: sepals lanceolate, acuminate; petals oblong, narrow, not overlapping. Widely distributed in Eu. G.W. 13:73.

6. **elàtior,** Fries. Sts. tall and straight: lvs. lanceolate from a rounded or cordate base, when young with appressed pubescence; the middle stipules as long or

longer than the petiole, the upper much surpassing it: corolla large, pale blue. Cent. Eu. and southeastward.

CC. *Style much enlarged upward into a globose hollow summit.*

7. **calcaràta,** Linn. (*V. valdèria,* Huter). Rootstock producing filiform creeping branches: st. simple, 4 in. high: lvs. ovate, or the upper oblong to lanceolate, crenate; stipules nearly or quite pinnately divided: spur as long as the large violet corolla. Alpine region of Cent. Eu. G.W. 12:709. Gn. 62, p. 97.

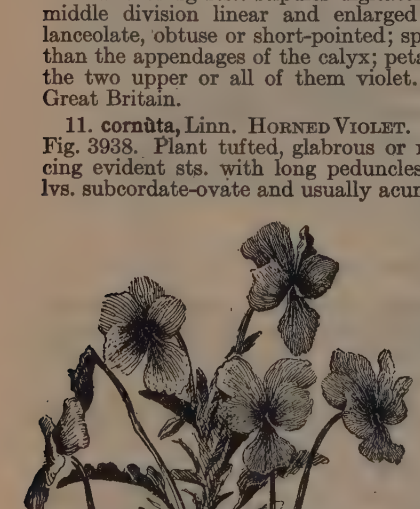
3938. Viola cornuta. (×⅓)

8. **grácilis,** Sibth. & Smith (*V. olýmpica,* Boiss.). One of the *V. calcarata* group, and by some authors included in that species: entire plant hairy, internodes more or less elongated, 1 ft. high: lvs. oblong and narrowed to petiole, or broad-ovate to nearly rotund and abruptly contracted below, somewhat obtuse at apex, the margin crenate; stipules pinnately parted: fls. medium size, the petals violet or yellow; sepals oblong-lanceolate, acute, shorter than petals; spur exceeding calyx appendages. Macedonia to Asia Minor.

9. **Munbyàna,** Boiss. & Reut. Another of the *V. calcarata* kind: plant about 1 ft. high, with long internodes, very short-pubescent: lvs. cordate-ovate, obtuse, crenate, glabrous or the margin ciliate, the upper ones somewhat acute; stipules pinnatifid: fls. 1–3, the petals violet or yellow; sepals lanceolate; spur straight, attenuate at the end, about twice longer than the calyx. Algeria.

10. **lûtea,** Huds. Plant persisting by filiform prostrate branching sts.: stipules digitately much divided, middle division linear and enlarged: sepals oblong-lanceolate, obtuse or short-pointed; spur hardly longer than the appendages of the calyx; petals yellow, rarely the two upper or all of them violet. Cent. Eu. and Great Britain.

11. **cornùta,** Linn. Horned Violet. Bedding Pansy. Fig. 3938. Plant tufted, glabrous or nearly so, producing evident sts. with long peduncles in the lf.-axils: lvs. subcordate-ovate and usually acuminate, crenately serrate; stipules triangular, large, coarsely dentate: fls. normally violet, the petals obovate-obtuse, standing well apart, the spur slender, acute, shorter than the petals. Spain and the Pyrenees. B.M. 791. G. 32:417. Gn. 73, p. 385.—Frequently seen in gardens and much prized for its large bright fls. Good for spring bloom. Hardy. There are several colors. Var. **álba,** Hort. Gn. 78, p. 449. Var. **purpùrea,** Hort. G.M. 52: 886. Var. **Papílio,** Hort. (Fig. 3939) has very large fls., violet in color, with small dark eye. Var. **admirábilis,** Hort., a garden group of various colors, is probably a hybrid offshoot of this species. *Manne Queen* is a form of this species.



3939. Viola cornuta var. Papilio. (×⅓)

12. **trícolor,** Linn. Pansy. Heartsease. Fig. 3940; also Figs. 2748, 2749. Glabrous or nearly so, the sts. becoming long and branched: basal lvs. cordate or round-cordate, those of the st. becoming ovate-oblong or lanceolate, all stalked and crenate-dentate; stipules large, pinnately parted toward the base: fls. large, usually about three colors represented (except in high-bred self varieties), the spur usually twice as long as the appendages of the calyx. Eu. G.Z. 27:1. R.B. 38:137.—When strayed from cult., the fls. become small and lose the markings characteristic of the high-bred pansies. A small-fld. field form, becoming common, is the European *V. arvénsis,* Murray. A similar but more delicate species, distinguished by petals longer than the calyx, **V. Rafinésquii,** Greene (*V. trícolor* var. *arvénsis,* American Auth., not DC.), is indigenous to the U. S. from N. J., southward and westward to Texas and Colo. For cult., see *Pansy*

AA. *Species native in the U. S. and Canada, not domesticated but sometimes planted from the wild.*

B. *Plants stemless.*

C. *Petals normally violet or purplish.*

D. *Lvs. more or less dissected.*

3940. Viola tricolor. (×⅓)

13. **pedàta,** Linn. Bird-Foot Violet. Rootstock short and erect: plant glabrous: lvs. pedately 3–5-parted or -cleft, the segms. usually 2–4-cleft or -toothed near the apex: petals all beardless. Sandy soil, Mass. and Minn. to Fla.; a handsome species. G.Z. 11:144. Gn. 65, p. 383. G. 13:373; 22:68.—In the typical form the 2 upper petals are dark violet, the 3 lower pale lilac; the concolorous form is by far the more common. A form with petals nearly white is known as var. **álba.**

14. **palmàta,** Linn. Fig. 3941. Rootstock stout, usually oblique rather than erect: first lvs. in spring sometimes less divided but later lvs. palmately 5–11-lobed or -parted, middle segm. largest, all of them variously toothed or cleft: fls. violet-purple, about ½–1 in. across; lateral petals bearded; sepals rather blunt, ovate-lanceolate; produces cleistogamous fls. on prostrate peduncles. Woodlands, Mass. to Minn. and to Fla.

15. **pedatífida,** Don. Rootstock short and erect: lvs. palmately multifid, primarily 3-parted or -divided, each segm. again 3-cleft or -parted into linear subdivisions, these often further cut into 2–4 lobes: fls. showy, violet, on scapes surpassing the lvs.; produces cleistogamous fls. with yellowish caps. on erect peduncles. Prairies, Ohio northwestward and southwestward.

DD. *Lvs. lanceolate or oblong-lanceolate.*

16. **sagittàta,** Ait. A small species, with erect short rootstock, usually glabrous: mature normal lvs. lanceolate or oblong-lanceolate, hastately or sagittately toothed

or incised at the base; earlier and later lvs. more deltoid and often only crenate at base: fls. violet-purple; sepals narrow-lanceolate, acute. Banks and fields, Mass. to Minn. and southward.

DDD. *Lvs. cordate-ovate to cordate-reniform.*

17. **papilionàcea,** Pursh (*V. cucullàta* of older Manuals). Figs. 3935–6, 3942. Commonest and most variable violet in the N. E. U. S. A robust plant, with a strong branching horizontal rootstalk, 3–6 in. high: lvs. deltoid-ovate to cordate-ovate, not lobed, bluntish, serrate, the long petiole somewhat pubescent: fls. normally deep violet but white or greenish yellow in the center; outer sepals ovate-lanceolate; petals narrow; spurred petal often narrow and boat-shaped; cleistogamous fls. usually underground but caps. erect. **V. Priceàna,** Pollard, is probably a form of this, with white blue-centered fls. Ky. See remarks on p. 3473. —Besides albinos there are striped and pied forms now in the trade known as vars. **striàta, pícta,** and **variegàta,** Hort. All forms are easily colonized in the garden. G.M. 57:313. G. 3:323 (both as *V. cucullata*). Gt. 1:194.

18. **soròria,** Willd. Much like No. 17, but petioles and lower surface of lvs. villous-pubescent: a sturdy grower, in pubescence, shape of lf., and color of fl. resembling the European *V. odorata,* whence named by Willdenow in 1806 the "sister violet." (Latin *soror,* a sister.) Woods and moist meadows and about buildings, Que. to Minn. and southward.

3941. Viola palmata. (×½)

19. **pratincola,** Greene. A prairie species of the Middle West, from Ind. to Minn. and Colo.; like *V. papilionacea,* but less robust, and often united with that species: petals violet-purple but of a lighter shade than in No. 17, the petals broadly obovate.

20. **septentrionàlis,** Greene. Scapes and lvs. more or less hirsutulous: lvs. ovate to reniform, cordate at base, somewhat attenuate but blunt at the apex, crenate-toothed and ciliate, the petioles slender: fls. large, of a rich violet-purple (rarely white or whitish); 3 lowest petals villous at base; sepals ovate and usually obtuse; cleistogamous fls. on ascending peduncles. Newf. and westward along the Canadian border, to Brit. Col. and southward to Conn.—Albino forms, varying all the way to pure white, occur in New England.

21. **nephrophýlla,** Greene (*V. cognàta,* Greene). Nearly or quite glabrous: lvs. orbicular to somewhat reniform, crenate-serrate, obtuse, the later ones broadly cordate: fls. large, deep violet, on long peduncles; spurred petal villous, the lateral ones densely bearded; sepals ovate to lanceolate, obtuse; cleistogamous fls. erect. Cold mossy bogs and borders of streams and lakes, Newf. to Brit. Col., south to N. W. Conn. and N. Wis., and in high mountains to New Mex. and Cent. Calif.

22. **Sélkirkii,** Pursh. A very distinct small species with pale violet beardless petals, the spur long and much enlarged toward the rounded end: glabrous except for minute spreading hairs on the upper surface of the lf.-blades: lvs. thin, ovate to nearly orbicular, deeply cordate with a narrow sinus, crenate: sepals lanceolate or ovate-lanceolate, usually acute; cleistogamous fls. erect or ascending. Shaded ravines and cold mountain forests, New Bruns. to Brit. Col., south in the Alleghanies to Pa. and in the Rocky Mts. to Colo., and north to Greenland; also in N. Eu.

CC. *Petals always white.*

D. *Lvs. lanceolate or narrower.*

23. **lanceolàta,** Linn. Small glabrous species, with erect habit: lvs. lanceolate or elliptical, obscurely crenulate, gradually narrowed into a margined more or less colored petiole: fls. white, but the 3 lower petals with purplish veins, all usually beardless; sepals lanceolate; cleistogamous fls. erect. Open moist places, Nova Scotia to Minn. and southward. — A distinct and interesting species.

3942. Clump of common blue violet of the eastern states.—Viola papilionacea.

DD. *Lvs. ovate, with either narrowed or rounded base.*

24. **primulifòlia,** Linn. Usually glabrous but sometimes pubescent: lvs. oblong to ovate, usually rounded at the base or cuneate, obscurely crenate-serrate, the petioles often manifestly winged above: fls. white with purplish veins, on peduncles exceeding the lvs.; sepals lanceolate, acuminate; 3 lower petals beardless or slightly bearded; cleistogamous fls. on shortish erect peduncles. Open moist ground, New Bruns. to Fla. and La.

DDD. *Lvs. cordate.*

25. **pállens,** Brainerd. Small neat species, for the most part glabrous, stoloniferous: lvs. broadly ovate or cordate-orbicular, sometimes only ½in. wide, but usually 1½–2 in., crenate-serrate, obtuse: fls. faintly fragrant, white; lateral petals usually with small tuft of hairs, the upper ones broadly obovate. Springy land and along cold brooks, Que. and southward,

3943. Viola blanda. (×1)

especially in the mountains to S. C. and Tenn.—The plant formerly known by many as *V. blanda,* and still often confused.

26. **blánda,** Willd. Fig. 3943. A northern species extending southward in the mountains to N. Ga., has acuminate lvs. somewhat hairy on the upper surface, and narrow strongly reflexed petals. Probably not in cult.

DDDD. *Lvs. kidney-shaped.*

27. **renifòlia,** Gray. Pubescent to nearly glabrous: rootstock in mature plants mostly stout and scaly: mature lvs. of summer reniform, distantly crenate-serrate, rounded at the summit: fls. white; petals beardless, the 3 lower ones veined or tinged brownish; sepals narrow-lanceolate; cleistogamous fls. purple, on horizontal peduncles: stolons absent. Arbor-vitæ swamps and cold woods, Newf. to the Mackenzie River, and southward in the Alleghany and Rocky Mts.

3944. Viola rostrata. (×½)

CCC. *Petals yellow.*

28. **rotundifòlia,** Michx. Plant with long and stout scaly rootstocks, and making short stolons: lvs. in midsummer oval, 2–4 in. wide, thick and prostrate, crenate, fls. bright yellow, with brown lines on the 3 lower petals; lateral petals bearded; cleistogamous fls. on deflexed peduncles. Cold woods in the mountains from Maine to N. Ga.

BB. *Plants with evident sts.*

C. *Species eastern, or found east of the 100th meridian.*

D. *Petals yellow.*

29. **Núttallii,** Pursh. Pubescent or nearly glabrous, with a deep stout rootstock: early lvs. and fls. from near the crown, the later fls. cleistogamous and on long peduncles: lvs. oblong-lanceolate, tapering into margined petioles, obtuse at apex, crenate-dentate or entire: fls. yellow, the petals beardless or with slight beards; sepals lanceolate or linear. From the Rocky Mts. eastward to Dak. and Mo.

30. **eriocárpa,** Schw. (*V. scabriúscula,* Schw.). Essentially glabrous or sparingly pubescent, the sts. ascending: root-lvs. usually 1–3, long-petioled, ovate to reniform, the base cordate or truncate, the apex usually rounded; st.-lvs. all on upper half of st., broad-ovate, subcordate, apex acuminate: fls. yellow, the lateral petals bearded; sepals narrowly lanceolate. Low woods, Nova Scotia to Man. and far southward.

31. **pubéscens,** Ait. Markedly soft-pubescent: sts. 8–12 in. high, stout, often only one: root-lvs. usually wanting; st.-lvs. near the top, short-petioled, broad-ovate to reniform, the base cordate or truncate, crenate-dentate, somewhat short-pointed; stipules large: fls. bright yellow; lateral petals bearded; spur short; sepals narrow-lanceolate. Dry rich woods, Nova Scotia to N. D. and to Va. and Mo.

DD. *Petals white inside with bright yellow base.*

32. **rugulòsa,** Greene (*V. Rýdbergii,* Greene). Plants widely spreading from long underground stolons: first lvs. broad and densely pubescent underneath, long-petioled, cordate-reniform and abruptly acuminate: fls. sometimes tinged with violet. Minn. and westward to Colo. and Brit. Col.

33. **canadénsis,** Linn. Plants without stolons, glabrous or very nearly so: lvs. broad-ovate, cordate, at apex acute or acuminate, serrate, the stipules sharp-lanceolate: fls. solitary from the axils of the st.-lvs., white inside with yellow center, the outside more or less tinged with violet, the 3 lower petals with darker lines, the lateral petals bearded; sepals subulate. Woods, New Bruns. to Sask. and Rocky Mts., to Ala. and Ariz.

DDD. *Petals a uniform white or cream-color.*

34. **striàta,** Ait. Plants cespitose, often 2 ft. high at maturity in summer, the sts. angular and leafy: lvs. nearly or quite glabrous, ovate to orbicular, cordate, mostly acuminate, closely crenate-serrate; stipules large and fimbriate: fls. white or cream-colored, long-stalked; sepals linear-lanceolate and ciliolate; spur thick and blunt. Shady places, N. Y. to Minn., Ga. and Mo.

DDDD. *Petals usually violet-blue.*

35. **conspérsa,** Reichb. (*V. canìna* var. *Mùhlenbergii,* Gray). Plant glabrous, 3–6 in. high, with oblique often much-branched rootstock: lower lvs. cordate-orbicular, obtuse, crenate-serrate, not large (¾–1½ in. wide); upper lvs. rather smaller and somewhat acuminate: fls. many, pale violet (running to white), overtopping the foliage; lateral petals bearded; spur 2–4 lines long; sepals acute. Que. to Minn. and Ga., in low or shaded places.

36. **rostràta,** Pursh. Fig. 3944. Glabrous or nearly so, 4–8 in. high, the sts. often numerous and plant forming a small clump: lvs. orbicular to broad-ovate, cordate, the upper ones acute, all serrate: fls. lilac with darker spots; petals beardless; spur long (⅛–½in.) and slender; cleistogamous fls. later on short axillary peduncles. A distinct and attractive species, in open woods and on hillsides, Que. to Mich. and southward.

3945. Viola Sheltonii. (×½)

CC. *Species western, found only west of the 100th meridian.*

D. *Lvs. not dissected: petals yellow inside, the 2 upper madder-brown outside.*

37. **sarmentòsa,** Douglas. Prostrate plants with thickened rootstocks and numerous long leafy runners: lvs. small, roundish cordate, deep green above but often rusty beneath, closely crenate, shorter than the peduncles: fls. light yellow, the lower petal somewhat purple-veined; spur short and broad. Along the Pacific coast.

38. **pedunculàta,** Torr. & Gray. Sts. ascending, often 2 ft. long, bearing normally in each lf.-axil as the st. develops a large (1 in. across) orange-yellow fl. on a peduncle 2–5 in. long: rootstock thick and deep: lvs. round-ovate, the base usually truncate, coarsely crenate; stipules leafy: petals purple-veined inside, the lateral ones bearded. W. Calif., where often cult.; handsome.

3946. Viola Beckwithii. (×½)

39. **glabélla,** Nutt. Sts. erect but usually weak, leafy only above: rootstock horizontal, more or less branching: lvs. cordate-reniform, glabrous or only puberulent, the lower ones on elongated petioles; stipules small: fls. bright yellow and somewhat purple-veined; lateral petals bearded; spur short and sac-like. Moist or shady places; widely distributed in the mountains of the N. W. and along the Pacific coast.

DD. *Lvs. more or less 3–9-lobed or -parted.*

40. **lobàta,** Benth. St. long and mostly naked at the base, the plant either glabrous or finely pubescent: rootstock erect: lvs. reniform to broad-cuneate, palmately cleft into 5–9 narrow lobes and the central lobe toothed: fls. yellow, the upper petals brownish purple on the outside. Calif. and S. W. Ore.

DDD. *Lvs. compoundly dissected into numerous small lobes: sts. leafy from the base.*

E. *Lateral petals beardless.*

41. **Shéltonii,** Torr. Fig. 3945 (adapted from Pacific R. R. Report). Nearly or quite glabrous: lvs. orbicular-reniform to cordate, 3-divided, the divisions 3-parted, lobed and cleft into narrow segms., not exceeding the peduncles: upper petals brownish, the 3 lower pale yellow. N. W. Colo. and N. E. Calif.

EE. *Lateral petals bearded, the 2 upper deep violet.*

42. **Béckwithii,** Torr. & Gray. Fig. 3946 (adapted from Pacific R. R. Report). Plant pubescent or puberulent: lvs. palmately about 3 times 3-parted into very narrow lobes, about equaling the peduncles: 3 lower petals pale violet, the fls. thus closely resembling those of *V. pedata*. Utah to N. E. Calif. and Ore.

43. **Hállii,** Gray. Plant glabrous; rootstock deep: lvs. 3-divided, the divisions 3–5-cleft, the segms. narrow; stipules leafy: fls. violet and yellow, the 2 upper petals dark violet and the 3 lower petals yellow or cream-colored; lateral petals bearded at base. N. W. Calif. and W. Ore.

44. **trinervàta,** Howell. Plant glabrous: ultimate segms. of the lf. lanceolate or ovate-lanceolate, tapering to an acute callous apex, thick and firm, prominently 3-ribbed: upper petals dark blue, the lower ones pale blue to whitish with a yellow base. Cent. and S. Wash.

EZRA BRAINERD.

VIOLET. One of the choicest of fragrant garden flowers. See *Viola*.

Comparatively few changes have taken place in the commercial cultivation of the violet within the past decade. The industry is more or less stabilized, and while there has been a tendency to increased planting of the single varieties, on the whole there has been no marked growth in the actual area under cultivation. The violet still offers some unique opportunities for the untrained lover of plants for the reason that it may be grown at less expense and with fewer and more simple houses and frames than almost any other of the major florist crops. While the violet readily responds to good treatment and to clean and healthy surroundings, its status is still relatively low owing to the fact that the risks of production are great, and this seems to develop a tendency toward carelessness on the part of those who take up the work as a business.

The cultivated varieties of the florist's violet are limited in number and probably all have been derived from the common sweet violet, *Viola odorata*, widely distributed over Europe and Asia. So far as known, no true varieties of the violet, either single or double, have originated in America. Of the double varieties and strains the most widely planted in this country are the Marie Louise (Fig. 3947) in its several forms, including Farquhar and Imperial; Lady Hume Campbell, Neapolitan (Fig. 3948), De Parme, Swanley White (Fig. 3949), and Madame Millet. For all practical purposes the culture of the double violet is confined to the Marie Louise, a true mauve in color, and the Campbell, a light mauve. The Neapolitan is a somewhat hardy type, but its color is too light for the market. The single varieties are coming to be important in the trade, and in the South and West are taking the place of the double sorts. South of Philadelphia, and north of Richmond, Virginia, the growing of any of the doubles is more or less risky, and it is in this territory and the Pacific coast that the singles are becoming so popular. The principal varieties are the Princess of Wales, Admiral Avellan, La France, California, and Baron Rothschild. The last is a promising variety, being a very free bloomer and a good keeper. The habit of this plant is compact and the foliage is of good texture, shape, and color.

3947. Violet, Marie Louise. (×1)

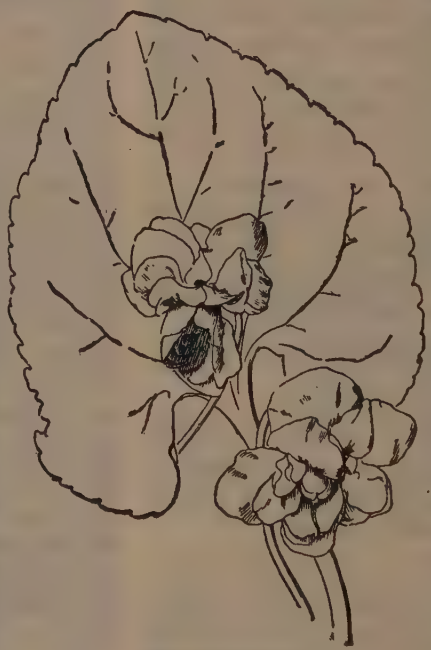
Violets will grow and thrive in almost any good garden soil. The soil that will grow good strawberries or potatoes should, with proper care, grow good violets. Under such intensive cultivation as must necessarily be given the violet, it is important to give strict attention to soil preparation. Sod from an old pasture makes excellent soil for the crop, but care should be taken that it is not too heavy. A moderately sandy loam sod is

best. This should preferably be cut in the fall and composted with well-decomposed stable-manure. Many growers use cow-manure, but no particular advantage has been observed in this material so far as the vigor of the crop is concerned. It is more difficult to secure and is not so easily handled; hence ordinary well-decomposed stable-manure is preferred. About one part manure should be used to four parts of soil, and a little extra work in thoroughly incorporating the manure with the soil always pays well. Some of the best growers make up the heaps by bringing the soil and manure together by means of wheelbarrows and then mixing by shoveling over the pile, as is done for concrete-mixing. When there are large quantities of soil to be mixed, the hauling can of course be done with wagons or carts. A one-horse cart makes a very convenient means of bringing the materials together. Before putting the soil into the houses or frames it should be turned and mixed again and for about every two or three thousand plants use a 200-pound bag of powdered quicklime. The lime may be sprinkled on the heap from time to time as the mixing takes place.

3948. Neapolitan. (×1)

For all practical purposes the commercial cultivation of the violet is limited to growing in houses except in the South and far West, where for the most part they are grown in the open or in coldframes. There is still considerable growing done in frames, but there are so many inconveniences involved in this work that most of the frame culture has been abandoned for the cheaper forms of houses. Gradually, also, the method of growing the plants in the open field and later covering with frames is being abandoned. The violet is subject to so many diseases and troubles which are materially influenced by weather conditions that it is important to have control over at least the moisture conditions the greater part of the year. In house culture the crop is preferably grown in solid beds (Fig. 3950). Experience has shown that better and more flowers are secured by this method than by growing on benches. Then, again, there is the advantage of the long life of the solid beds and the lessened expense of the general work. Care should be taken not to have the beds too wide, otherwise it will be difficult to reach all parts of them from the walks. The best growers practise changing the soil each year. At least 5 inches of fresh soil should be put in before the young plants are set out. The time of planting varies somewhat in different parts of the country. Usually the flowers are not much in demand after the middle of April, so that in practically all the violet-growing sections preparations may begin at this time for clearing the houses and getting ready for the new crop. The plants, having been properly prepared, as will be described later, should be set 8 or 9 inches apart in rows 10 inches apart. This is the distance for the doubles. For the singles they are usually planted about 12 inches apart in the rows, the rows being from 12 to 18 inches apart. Most of the single varieties now under cultivation may be planted closer than this, say from 10 to 12 inches apart. After the plants are put out it is necessary that they should be carefully watered and all weeds in the beds kept down. It is desirable to keep the temperature as low as possible in summer. To this end the houses should be shaded. It is desirable to give plenty of fresh air, but care should be taken to have the top ventilators so arranged that the plants may be protected from rain. The violet requires considerable water, but no very rigid rules can be laid down as to the amount required. Every effort should be put forth to keep the plants in good growing condition without over-saturation of the soil. Early in summer the runners will begin to appear and these must be cut off as rapidly as the plants can be gone over conveniently. The object is to secure a good strong healthy compact plant and to induce free growth at all times, as with such strong free-growing plants developed by October 1 all the conditions will be at hand for the production of long-stemmed, good-colored flowers.

The violet may be propagated in a number of ways. One of the common practices is to divide the crown. This is usually done in spring after the flowering season is over. The plant is lifted and the soil shaken off, and then it may be readily pulled apart and the small plants either set in beds or flats. This method has objections because a great many plants or crowns so separated are hard and woody, and they will refuse to grow into good vigorous healthy crowns. A second and more desirable method is carefully to select young and vigorous offshoots and root these in the ordinary way in sand. Following the second method the young plants can be secured from time to time during the late winter without disturbing the main plants. If proper care is exercised and good selection made, another good supply of stock may be readily available early in March, and selections may be made from these for the planting, which is performed the latter part of May.



3949. Swanley. (×1)

Comparatively little attention has been given to proper houses for violet-culture. Almost any kind of house is believed to be suitable, hence the crop has not had the advantages that more favored ones like the rose and carnation have had. Any good type of well-lighted, well-ventilated house will suffice. For beginners and those who have not a large amount of capital to invest, one of the most economical and satisfactory houses is an ordinary even-span type, 12 feet wide. The height of such house from the bottom of the walk to the ridge is 7 feet. The height of the side from the top of the plate to bottom of gutter is 20 inches. The walls can be easily boarded up with rough lumber and then covered with rustic siding. One walk 14 inches wide is made through the center of the house. This gives two beds, each 5 feet 5 inches wide. Such beds are a little wide for conveniently reaching the plants from

the walk, but by means of a board to be hooked onto the heating pipes, all plants may be conveniently reached. Coldframes for violet-culture are simple in construction. They are of the usual type, being 6 feet wide, 12 inches high in front, and 16 to 18 inches high at the back. Ordinary 3 by 6 sash may be used. These frames may be made any length in locations where the soil is porous and well drained; the frames may be lower than the surrounding soil. This gives some advantages in winter although it is back-breaking work at any time properly to care for the plants and pick the flowers in such frames.

In sections where the climate is comparatively mild, violets may be planted directly in the open ground and the frames, which may be movable ones, may be set over the plants about the middle of September. Violet houses do not need much heat, merely enough in fact to keep out the frost. The tendency is to overheat and there are probably more good crops spoiled by too much rather than too little heat. Hot water is usually depended on for heating both houses and frames. For the average houses a boiler capacity of 1,200 to 1,500 square feet will be required for every 10,000 plants. With the present cost of materials and labor it is safe to figure the cost of a plain style of house such as already described at about 50 cents a plant. A house 12 feet wide and 100 feet long will hold about 2,000 plants and should cost complete from $850 to $1,000.

Marketing is one of the most important factors connected with commercial violet-growing and is seldom understood in all its details. The grower should be thoroughly familiar with the many needs and requirements of the market and be able to supply these demands, for upon his ability to do this depends largely his success or failure from a financial standpoint. Violets are prized chiefly for their delicate perfume, and as this diminishes in proportion to the length of time they are picked, the best market, other things being equal, is the one which requires the least possible delay between picking the flowers and placing them in the hands of the customer.

The crop may be disposed of at retail or wholesale or through a commission merchant. Each method has its advantages and disadvantages, and in deciding

3950. Growing violets in solid beds.

which one to adopt the grower must be guided by existing conditions. He must in any event have a thorough knowledge of the requirements of the market as regards quality of the flowers, size, shape, and arrangement of the bunch, and should at all times exercise the utmost care in picking, packing, and shipping, so that the flowers may reach the customer in the best and most attractive condition. The kind of bunch varies from year to year, and each large city is likely to have its own style. The various styles are wonderfully exacting in their requirements and great skill is required to bunch the flowers properly.

The cultivated violets are subject to a number of diseases, each of which is characterized by one or more distinct symptoms. The principal diseases are as follows, their destructiveness being in the order in which they are discussed:

Spot disease (*Alternaria violæ*) (Fig. 3951), also called leaf-spot, leaf-rust, and smallpox, is the most widespread and destructive known in America. It attacks principally the foliage, normally producing definite circular whitish spots, frequently with concentric rings, of a darker shade, very often with a light central portion resembling the bite or sting of an insect. *Cercospora violæ*. *Phyllosticta violæ*, *Septoria violæ*, and the like, produce spots very similar in outline and appearance to those caused by *Alternaria violæ*, but only under conditions peculiarly favorable to these fungi do they cause any serious loss.

3951. Violet spot disease.

Root-rot (*Thielavia basicola*) is very troublesome and destructive in some localities, especially to young plants that are transplanted during hot dry weather. It causes the browning or blackening of the parts attacked and the final death of the plant.

Wet-rot (*Botrytis sp.*) attacks leaves, petioles, flower-stalks, and flowers, causing a moist or soft rot. It is sometimes very destructive, especially with large plants growing in a damp stagnant atmosphere, where there is insufficient ventilation and light.

Leaf-fading or yellowing is induced by a variety of conditions, but as yet little that is definite has been ascertained regarding its cause.

It is difficult to exterminate any of the diseases named after they once gain a foothold. However, they can be held in check and often entirely prevented by selecting and propagating exclusively from strong vigorous disease-resistant plants, and by keeping them in the best possible growing condition. Careful attention must be given to watering, cultivation, and ventilation, and the dead and dying leaves and all runners should be destroyed as fast as they appear.

Although violets are attacked by a number of insects and other related enemies, only a few do sufficient injury to warrant discussion here.

Aphides (*Aphis sp.* and *Rhopalosiphum violæ*) are generally known as the green and the black aphis or the green- and black-fly. They cause the young growing parts to curl and twist, resulting in a stunted ill-formed plant. They work their way into the young, unopened flower-buds, and, thrusting their bills through the overlapping petals, feed on the juice. Each puncture produces a greenish white blotch on the petal, and the flower becomes dwarfed, distorted, and worthless for market. Aphides can be easily controlled by fumigating with hydrocyanic acid gas, and this is now in general use. To each cubic foot of space in the house or frame use .15 gram of 98 per cent cyanide of potash for double varieties and .10 gram for single varieties. Handle the cyanide and gas with utmost care, as both

are very poisonous. Divide the total amount of cyanide into as many equal parts as there are jars used, which latter should be one for every 50 to 75 lineal feet of a house 12 to 18 feet wide. Put each part into a two-pound manilla paper bag and this into a second bag. Attach each package to a string or wire so arranged as to allow it to be lowered from the outside of the house into its respective jar. Pour into each jar an amount of water about equal to the bulk of cyanide in the bag, add commercial sulfuric acid until steam is evolved, then from the outside lower the bags into the jars beneath. Fumigate double varieties thirty minutes and single varieties twenty minutes, after which open ventilators from outside, leaving them open at least sixty minutes before entering the house. Aphides may also be combated by using tobacco in some one of its many forms, but tobacco is likely to weaken the leaves and make them more liable to the attack of fungi, and on this account is very objectionable.

Red-spider (*Tetranychus telarius*) lives on the under surface of the leaves, and, when present in sufficient number, causes considerable damage. It is widely distributed on a great variety of plants, and when established in the violet-house is most difficult to combat. It can be held in check, and often the plants may be kept entirely free from it, by frequent syringing with clear water under a pressure of twenty to thirty pounds to the square inch. Care must be taken to syringe early in the morning and on bright days, so that the plants may dry off before night. Neglect may be the means of inducing disease.

Eel-worms, or nematodes, are sometimes very injurious to the violet. A common species attacks the roots, producing galls and distortions that check the growth of the plants. These may be controlled by judicious soil selection, the freezing of the soil in winter and the use of good clean grass sod. A very destructive nematode, *Apheleuchus olesistus*, that appeared in this country twelve or fifteen years ago, is rapidly becoming one of the serious enemies of the violet. This nematode attacks the crown-buds, causing the plants to "go blind." Rigid selection of stock is the only remedy. Every "blind" crown plant should be taken out and destroyed. Extreme care should be exercised in bringing in new stock. Nearly all imported plants are more or less affected with the pest. The bud nematode does more injury in this country than abroad. This may be due to the fact that while the pest has been imported, its enemies have not been brought in. Some very promising investigations are now being made by N. A. Cobb, of the Bureau of Plant Industry, United States Department of Agriculture, of a race of predaceous nematodes which destroy immense numbers of the harmful kinds.

In some parts of the country the larvæ of gall-fly (*Diplosis violicola*), violet sawfly (*Emphytus canadensis*), greenhouse leaf-tyer (*Phlyctænia rubigalis*), and several species of cutworms (*Agrotis et al.*) injure the plants to some extent by feeding on the foliage. Fumigating with hydrocyanic acid gas is the best means of combating them.

Under certain conditions slugs, snails, sowbugs, and the like, do considerable damage, especially to the flowers. They also can be controlled by the hydrocyanic acid gas treatment.

B. T. Galloway.
P. H. Dorsett.

VIOLET, AFRICAN: *Saintpaulia.* **V. Damask or Dame's:** *Hesperis matronalis,* **V., Dog's-Tooth:** *Erythronium.* **V., Water:** *Hottonia.*

VIRGÍLIA (named for the poet Virgil). *Leguminòsæ.* Tree sometimes grown in the greenhouse: lvs. pinnately compound; lfts. small, without stipels; stipules narrow, caducous: fls. rose-purple, in short terminal racemes; calyx 2-lipped, upper 2-toothed, lower 3-toothed; petals long-clawed; standard recurved, orbicular; wings ovate, falcate, keel shorter than the wings, beaked; stamens free; ovary sessile: pod linear, plano-compressed, leathery, 2-valved. One species, S. Afr. *V. capénsis,* Lam. (*Podalýria capénsis,* Andr.). Tree: lvs. with 6–10 pairs of lfts. which are linear-oblong, mucronate, the young ones silky on both sides, the old ones glabrous and glossy above: fls. rosy purple, ½in. long; calyx silky, widely campanulate. S. Afr. B.M. 1590.

V. lùtea, Michx.=Cladrastis lutea.

VIRGINIA COWSLIP: *Mertensia virginica.* **V. Creeper:** *Parthenocissus quinquefolia.* **V. Stock:** *Malcomia.*

VIRGIN'S BOWER: *Clematis.*

VISCÀRIA: *Lychnis.*

VÍSCUM (the old Latin name used by Virgil and Pliny). *Loranthàceæ.* Mistletoe. Parasitic shrubs which grow on trees and are well known to all on account of their use at Christmas. The lvs. are sometimes flat and rather thick, sometimes reduced to minute teeth or scales: fls. diœcious or monœcious at the axils or nodes: berry 1-seeded, naked or crowned with the perianth. About 70 species, natives of the temperate and warmer regions. Two species deserve mention: *V. álbum,* Linn. Common Mistletoe (of Eu.). Yellowish green, glabrous shrub, 1–4 ft. high: lvs. opposite or in whorls of 3, 1–3 in. long, obovate-lanceolate, obtuse, 5–7-nerved: fr. white, nearly ½in. diam., ovoid or globose, viscid. Eu. and Temp. Asia. *V. cruciàtum,* Sieber. Resembles *V. album* in habit, foliage, and infl., but the lvs. are very pale yellow-green and 3-nerved: berries red-brown, larger and long-pedicelled. Spain, N. E. Afr., and Syria. B.M. 7828. See also *Loranthus* and *Phoradendron.*

VÍSNEA (after a Lisbon merchant). *Ternstræmiàceæ.* Evergreen tree with the habit and infl. of Eurya, sometimes grown in the warmhouse: fls. small, subsessile; sepals 5, strongly imbricated, bases somewhat connate; petals 5, imbricate, bases connate; stamens numerous, adhering to the corolla at the very base; ovary 3-celled: fr. an indehiscent berry, included in the enlarged and fleshy calyx.—One species, Canary Isls., little known in cult.

Mocanèra, Linn. f. Tender evergreen shrub, 6–9 ft. high, of compact habit and with dark green, shining leathery foliage: lvs. short-petioled, ovate-lanceolate, serrate: fls. solitary, white, pendulous. Canaries.—It is a large evergreen shrub or small tree resembling in a general way a tea plant or camellia. The specific name Mocanera was given by the younger Linnæus because the fr. was supposed to be the "mocan" of the aborigines which was made into a kind of sirup and used to a considerable extent. The fls. are only ⅜ inch across, not very numerous and much shorter than the lvs., but they are very sweet-scented. It has been offered in S. Calif.

F. Tracy Hubbard.†

VITELLÀRIA: *Lucuma.*

VÎTEX (ancient Latin name for this or a similar shrub). *Verbenàceæ.* Ornamental woody plants chiefly grown for their white, blue, or yellowish flowers produced in terminal spikes or panicles.

Deciduous or evergreen shrubs or trees: lvs. opposite, digitate, with 3–7, rarely with 1 lft.: fls. in often panicled, few- to many-fld. cymes; calyx campanulate, usually 5-toothed; corolla tubular-funnelform, with 5-lobed, oblique and slightly 2-lipped limb; stamens 4, 2 longer and 2 shorter ones: fr. a small drupe, with a 4-celled stone.—About 60 species are known, distributed through the subtropical and tropical regions of both hemispheres, few in the temperate regions. Some species, particularly *V. altissima* and *V. leucoxylon,* in S. Asia are important timber trees.

CXVII. Victoria and nymphæa in a good setting.

The two species most often cultivated are shrubs or small trees with deciduous digitate leaves and lilac-blue or white flowers in terminal spikes or loose panicles appearing in summer and autumn. The hardiest seems to be *V. Negundo* var. *incisa*, which stands most ordinary winters as far north as Massachusetts. *V. Agnus-castus* is hardy as far north as New York, in sheltered positions. These species are particularly valuable for their late-appearing flowers. They grow in almost any kind of soil and prefer rather dry sunny situations. Most of the species are inhabitants of tropical and subtropical regions and only a few can be cultivated outdoors in warmer temperate regions. None of these tender kinds seems to be in cultivation in this country; in the Old World they are sometimes cultivated as greenhouse plants. They thrive in a sandy compost of peat and loam. Propagated by seeds sown in spring and by greenwood cuttings under glass; also by layers.

3952. Vitex Negundo var. incisa. (×⅓)

Ágnus-cástus, Linn. CHASTE-TREE. HEMP-TREE. MONK'S PEPPER-TREE. Shrub or small tree, with a strong aromatic odor, grayish tomentose: lvs. long-stalked; lfts. 5–7, lanceolate, acuminate, narrowed at the base into a short stalk, entire or with few coarse teeth, grayish-tomentose beneath, the middle one 3–4 in. long: the fls. in dense, sessile clusters, forming terminal, often panicled spikes 5–7 in. long; corolla usually pale or lilac, grayish outside, ⅓in. long; stamens and style exserted. July–Sept. S. Eu., W. Asia. Mn. 2, p. 44. G.C. III. 51:52. Var. **álba,** Rehd. (*V. albiflòra*, Hort. *Ágnus-cástus vulgàris álba*, Carr.). Fls. white.

Negúndo, Linn. Shrub or small tree with quadrangular branchlets: lfts. usually 5, or occasionally 3, stalked, elliptic-ovate to lanceolate, acuminate, serrate or entire, grayish tomentulose beneath, 1½–4 in. long: fls. lilac or lavender, small, scarcely ¼in. long, stalked, in rather loose clusters forming slender spikes usually crowded into loose terminal panicles 5–8 in. long; stamens and style slightly exserted. China, India. Tender. Var. **incisa,** Clarke (*V. incìsa*, Lam. *V. lacinìata*, Hort.). Fig. 3952. Lfts. incisely serrate or almost pinnatifid, ¾–3 in. long; the more extreme form with deeply pinnatifid lfts. and narrow remote segms. may be distinguished as f. *multífida*, Rehd. (*Ágnus-cástus incìsa* var. *multífida*, Carr.). July–Aug. N. China, Mongolia. B.M. 364 (as *V. Negundo*). This variety is much hardier than the type; it is less showy in bloom than the preceding species, but a graceful shrub of loose and open habit, with handsome foliage.

V. ilicifòlia, A. Rich. Lvs. simple, short-stalked, oval, spiny-toothed: fls. in long-stalked, axillary, many-fld. cymes. Cuba.—*V. Lindenii*, Hook. f. Lfts. 3–5, elliptic or elliptic-obovate, glabrous fls. pale violet, in few-fld., axillary, long-stalked heads. Colombia. B.M. 6230.—*V. lùcens*, T. Kirk (V. littoralis, A. Cunn.). Tree, to 60 ft., producing valuable hardwood: lvs. long-stalked; lfts. 3–5, elliptic, almost acuminate, glabrous: fls. in axillary panicles, abundant, dull red, 2-lipped. New Zeal.—*V. trifòlia*, Linn. Lfts. usually 3, obovate or obovate-oblong, obtuse, entire: fls. blue, in terminal panicles. S. Asia. Polynesia. Var. *unifoliolàta*, Schauer. With a solitary short-stalked lft.

ALFRED REHDER.

VÌTIS (classical Latin name). VINE. GRAPE. *Vitàceæ* or *Ampelìdeæ*. Tendril-climbers (some members of the genus Cissus erect) grown as ornamental vines but particularly for the edible fruits or grapes.

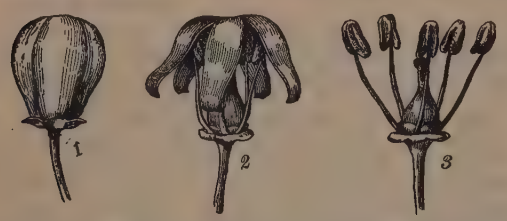
The genus is variously defined, but if Cissus is excluded it is distinguished as follows (Gray): Plants climbing by the prehension and coiling of naked-tipped tendrils: fls. polygamo-dicœcious (i. e., some individuals perfect and fertile, others sterile with at most only a rudimentary ovary), 5-merous; corolla calyptrately caducous—the petals in anthesis cast off from the base while cohering by their tips (Fig. 3954); hypogynous disk of 5 nectariferous glands alternate with stamens; style short and thick, or conical: berry pulpy; seeds pyriform, with contracted beak-like base.—A widespread genus of the northern hemisphere, most abundant in temperate countries. In its stricter limitations, the genus includes less than 60 known species, but some authors unite Cissus and Ampelopsis with it, when it includes some 250 species. The standard monographer (Planchon, DC. Monogr. Phaner. 5), refers 30 or more species to Vitis in the main account and in the addendum, and more than 200 to Cissus. N. Amer. is particularly rich in Vitis, not only in number of species but in the widespread distribution and the abundance of the plants. From the native species have been developed the outdoor grapes of this country except those of Calif. and the extreme S. W. (which are *Vitis vinifera*). For an account of the evolution of these native cultural varieties, see Bailey, Sketch of the Evolution of Our Native Fruits; Hedrick's Grapes of New York, a notable volume issued by the N. Y. Agric. Exp. Sta.; also Munson, Foundations of American Grape Culture, 1909. For a sketch of Vitis and similar plants as ornamental vines, with illustrations, see Veitch, Journ. Roy. Hort. Soc. 28 (1903–4). For cult., and control of insects and diseases, see *Grape*. For recent studies in lf. variation and in pollen sterility, see M. J. Dorsey, Proc. Amer. Breeders' Assoc., vol. 7 (1912), and Bull. No. 144, Minn. Exp. Sta. (1914).

Many of the species of Vitis are excellent ornamental plants, when it is desired to cover arbors, porches, or trees; a number of the recently introduced oriental

3953. Vitis.—Forms of leaf on the same vine.

species (some of them properly referable to Ampelopsis and Parthenocissus) seem to be particularly interesting for such use. All of them are readily grown from seeds, and most of them from hardwood cuttings. Only a few of the native species are regularly in the trade; but with the possible exception of *V. Treleasei* they have been offered for sale to experiment stations and amateurs by the late T. V. Munson, of Texas, a well-known authority on both the botany and horticulture

of the grape. The popular interest in these species is primarily pomological; for, although the fruit may not be directly useful, the species give promise of development through hybridization and plant-breeding, and some of them afford useful stocks on which to graft kinds that do not resist the phylloxera or root-louse. The following discussion includes all the species native



3954. Grape flowers, enlarged. *1*, shows the bud; *2*, shows the petals or "cap" falling; *3*, shows the flower in full bloom, the petals having been cast off. In all the flowers the minute calyx is seen, and in *2* and *3* the disk is shown inside the base of the stamens.

to North America north of Mexico; it is adapted from the writer's account in Gray's "Synoptical Flora," vol. 1, 420–430. These American grapes are very difficult to distinguish in many cases; hence the subjoined descriptions are full, to bring out the contrasting characters. Some of the best recent systematic writing on American Vitis is from French sources, since the American species have come into prominence in France as phylloxera-resisting stocks for the wine grape. See, for example, the works of Millardet, and Viala and Ravaz; also "Ampélographie Universelle," by Viala and Vermorel. Many of the species listed in the trade under Vitis will be found in the genera Ampelopsis, Parthenocissus, and Cissus.

The grape-vines of eastern Asia, although apparently not yielding fruit of value, are interesting as ornamental vines, and some of them are likely to come into prominence for their good foliage and brilliant autumn coloring. They are little known with us as yet. *V. Coignetiæ* and *V. amurensis* are hardy in the northern states. Those tender at the Arnold Arboretum and more or less killed back in winter are *V. Davidii*, *V. flexuosa*, *V. Romanetii*, *V. pulchra*, *V. reticulata*, *V. Piasezkii*, and *V. pentagona*.

Vitis species are of easy culture for ornament, and probably all of them propagate by hardwood cuttings, although layering may be easier with some species. Even species that are tender in any locality often make very attractive new growths each year if the roots are not injured. Attention must be given to fungous diseases.

In southern California and other southern parts, a number of evergreen species now attain more or less prominence, particularly "the evergreen grape-vine" or *V. capensis*. These plants are mostly species of Cissus (which see, page 775), which is separated from Vitis by the mostly four-merous flowers with separate expanding petals and different disk, the plants often fleshy and sometimes erect rather than climbing. The evergreen set in cultivation more or less prominently in this country comprises *Cissus antarctica* (*V. Baudiniana*), page 776; *C. capensis* (*V. capensis*); *C. gongylodes* (*V. pterophora*), page 776; *C. hypoglauca* (*V. hypoglauca*); *C. oblonga* (*V. oblonga*); *C. quadrangularis* (*V. quadrangularis*); *C. rhombifolia* (*V. rhombifolia*); *Vitis Romanetii* (*V. rutilans*); *Cissus striata* (*V. sempervirens*), page 776. The standard English authorities combine Cissus and Vitis, but continental as well as American authors incline to keep them distinct. Several of the species properly referred to Cissus are described in the present account (Nos. 1–5), not having found their place regularly under Cissus in Vol. II.

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I. *Species of Cissus grown under the name of Vitis, to be added to those described on pages 775 and 776, Vol. II.*

A. *Plant fleshy, with winged sts.*

1. C. quadrangulàris, Planch. (*Vitis quadrangulàris*, Linn.). An odd succulent with 4-winged sts. much constricted at the nodes, climbing, mostly glabrous, often nearly leafless, looking like a spineless cereus: lvs. varying from ovate and not lobed to cordate or reniform and deeply 3-lobed, the middle part sometimes lobed, the sinuses open and rounded, margins denticulate: fls. in small short-peduncled compound lateral cymes, the calyx 1 line long, the petals 4 and greenish; stamens 4, with short filaments: berries nearly globose, red, 1-seeded, size of pea, acrid. Trop. Afr., Arabia, India, Moluccas.—Sts. said to be eaten by natives in Ceylon.

AA. *Plant little or not at all fleshy: sts. sometimes angled but not winged.*

2. C. capénsis, Willd. (*Vitis capénsis*, Thunb. *Rhoicissus capénsis*, Planch.). Fig. 3955. Evergreen Grape-Vine of southern Calif., now much planted there: strong climbing vine, with globular ground tubers to 6 or 8 in. diam., terete striate sts. and young parts reddish hairy: lvs. long-stalked, simple, thickish,

3955. Vitis capensis (preferably known as Cissus capensis), an evergreen species prized in southern California. (×½)

nearly orbicular to reniform, 3-nerved, obtusely 5-angled, the margin repand-dentate, with ovate stipules: infl. thyrse-like, tomentose, with long peduncles, the fls. woolly, with 5 triangular-ovate petals and 5 stamens, the ovary hirsute and style short: fr. globular, red-black and glossy, usually 2-seeded, about ½in. diam., said to be excellent for sirups, jellies, and for stewing. S. Afr.—Tubers reported as making wholesome fodder for cattle.

3. **C. hypoglaùca,** Gray (*Vìtis hypoglaùca,* Muell.). Foliage handsome and persistent, dark green above and glaucous beneath; lfts. usually 5, obovate to elliptic, acuminate, stalked, entire or toothed toward the apex: fls. yellowish: fr. nearly globular. Austral.

4. **C. rhombifòlia,** Planch. (*Vìtis rhombifòlia,* Vahl). Scandent evergreen, the branches angled but not winged: lvs. 3-foliolate, petioled; lfts. all long-petiolulate, serrate, glabrous above, the lateral ones oblique and somewhat cordate, the middle one ovate to rhomb-ovate: fls. many in lf.-opposed clusters, the calyx and petals pubescent. W. Indies, S. Amer.

5. **C. oblónga,** Planch. (*Vìtis oblónga,* Benth.). Erect tree-like evergreen species, the branches with a few tendrils, glabrous or the young shoots minutely tomentose: lvs. simple, broad-oblong to ovate-oblong, obtuse, about 1–2 in. long, entire, obscurely 3-nerved: fr. ovoid, small, 1–2-seeded, in short-peduncled cymes. Austral.—Allied to *C. antarctica.*

II. *Species of Vitis, or true grapes: plants yielding the grapes of commerce, but some of them grown for arbors and for ornament.*

A. *Bark bearing prominent lenticels, never shredding: nodes without diaphragms: tendrils simple: fl.-clusters small and not much elongated: seeds oval and oblong, without a distinct stipe-like beak. (Muscadinia; separated as a genus by Small.)*
B. *Berries large (½in. or more diam.), musky-tasted: lvs. firm or dense in texture, prominently pointed* ..... 6. **rotundifolia**
BB. *Berries half smaller, acid: lvs. thin, not prominently pointed* ..... 7. **Munsoniana**
AA. *Bark without distinct lenticels, on the old wood separating in long thin strips and fibers: nodes provided with diaphragms: tendrils forked: fl.-clusters mostly large and elongated: seeds pyriform. (Euvitis.)*
B. *The wine-grape, grown extensively in Calif. as well as in Eu., and also in glass graperies: skin and pulp mostly firmly adhering in the ripe fr.* 8. **vinifera**
BB. *The grapes of more modern domestication or intro. representing the commercial kinds in N. Amer. outside the Calif. region, and exotic species grown for ornament: skin of the mature berry usually separating freely from the pulp.*
C. *Sts. stiff-hairy or bristly, or prickly. (Spinovitis.)*
D. *Lvs. becoming glabrous beneath: sts. glabrous and prickly* ..... 9. **Davidii**
DD. *Lvs. floccose or loosely pubescent beneath: sts. glandular-bristly and pubescent* ..... 10. **Romanetii**
CC. *Sts. glabrous or pubescent, not aculeate or armed.*
D. *Vitis species of N. Amer., some of them giving rise to pomological races and the others of botanical interest. (Nos. 11–32).*
E. *Class of green-lvd. grapes, mostly marked at maturity by absence of prominent white, rusty, or blue tomentum or scurf or conspicuous bloom on the lvs. beneath (under surface sometimes thinly pubescent, or minute patches of floccose wool in the axils of the veins, or perhaps even cobwebby): foliage mostly thin: tendrils intermittent, i. e., every third joint bearing no tendrils (or infl.). V. cinerea and V. arizonica are partial exceptions and might be looked for in* EE *(Nos. 11–23).*
F. *Group of vulpina-like grapes, characterized by thin light or bright green mostly glossy lvs. (which are generally glabrous below at maturity except perhaps in the axils of the veins and in V. Champinii, with a long or at least a prominent point and usually long and large sharp teeth or the edges even jagged.*
G. *Lvs. broader than long, with truncate-oblique base. (V. Treleasei might be sought here.)* ..... 11 **rupestris**
GG. *Lvs. ovate in outline, with a mostly well-marked basal sinus.*
H. *Diaphragm (in the nodes) thin: young shoots not red: lvs. not deeply lobed.*
I. *Lf.-margin not lobed or only obscurely so, the teeth small or else not elongated* ..... 12. **monticola**
13. **Champinii**
II. *Lf.-margin tending to be prominently lobed above, the teeth usually long.*
J. *Young parts pubescent or floccose* ..... 14. **Longii**
JJ. *Young parts nearly or quite glabrous.*
K. *Tendrils prominent and persisting* ..... 15. **vulpina**
KK. *Tendrils small and deciduous* ..... 16. **Treleasei**
HH. *Diaphragm very thick and strong: young shoots bright red: lvs. often strongly lobed.* 17. **rubra**
FF. *Group of cordifolia-like grapes, with thickish and dull-colored or grayish green lvs. often holding some close dull pubescence below at maturity and the shoots and lvs. nearly always more or less pubescent when young, the teeth mostly short, the point mostly rectangular and conspicuous.*
G. *Plant strong and climbing, with stout persistent tendrils.*
H. *Young shoots terete or slender, and glabrous or very soon becoming so* ..... 18. **cordifolia**
HH. *Young shoots angled, and covered the first year with tomentum or wool.*
I. *Under surface of lvs. glabrous or essentially so at maturity.*
J. *Blade of lf. lustrous or glossy when full grown* ..... 19. **Berlandieri**
JJ. *Blade of lf. dull* ..... 20. **Baileyana**
II. *Under surface of lvs. grayish pubescent* ..... 21. **cinerea**
GG. *Plant scarcely climbing, the tendrils perishing when failing to find support* ..... 22. **arizonica**
FFF. *Group of orbicular-scallop-lvd. species of the Pacific coast* ..... 23. **californica**
EE. *Class of colored-lvd. grapes, marked by thick or at least firm foliage, the lvs. prominently rusty or white-tomentose or glaucous-blue. V. cinerea, V. arizonica, and possibly V. californica might be sought here; and late-gathered forms of V. bicolor might be looked for in* E.

F. *Lvs. only flocculent or cobwebby or glaucous below when fully grown (i. e. not covered with thick, dense, felt-like tomentum, except sometimes in V. Doaniana).*
G. *Ends of the growing shoots and the under surface of the lvs. whitish or gray: the white-tipped grapes.*
H. *Grape of S. Calif., with thick diaphragms and short-pointed lvs.*.....24. **Girdiana**
HH. *Grape of Okla.-Texas region, with thin diaphragms and prominently pointed lvs.*.....25. **Doaniana**
GG. *Ends of shoots (except in V. bicolor), and the unfolding lvs. distinctly rusty-colored, and the mature lvs. either rusty or bluish beneath (or sometimes becoming green in V. bicolor): the æstivalian grapes.*
H. *Growths usually prominently floccose or tomentose*.....26. **caribæa**
HH. *Growths pubescent or becoming nearly or quite glabrous.*
I. *Under surface of lvs. mostly glaucous-blue*.....27. **bicolor**
II. *Under surface not glaucous-blue (except in variety of No. 29).*
J. *Berries small, ⅓in. or less through: eastern*.....28. **æstivalis**
JJ. *Berries larger: western*.....29. **Linsecomii**
FF. *Lvs. densely tomentose or felt-like beneath throughout the season, the covering white or rusty white.*
G. *Tendrils intermittent (every third joint lacking tendril or fl.-cluster).*
H. *Tomentum on under surface of lvs. white*.....30. **candicans**
HH. *Tomentum on under surface rusty*.....31. **Simpsonii**
GG. *Tendrils continuous (at every node a tendril or fl.-cluster)*....32. **Labrusca**
DD. *Vitis species of E. Asia, somewhat intro. for ornament, mostly recently, and as yet little known in this country: mostly with lf.-resemblance to N. American species.*
E. *Lvs. divided or compound on some of the shoots*.....33. **Piasezkii**
EE. *Lvs. undivided or variously lobed.*
F. *Sts. glabrous at maturity*.....34. **reticulata**
35. **flexuosa**
FF. *Sts. pubescent, tomentose, or floccose.*
G. *Lobes of lvs. usually manifest*....36. **amurensis**
37. **Thunbergii**
GG. *Lobes of lvs. wanting or not marked.*
H. *Base of lf. truncate or only obscurely cordate*.....38. **pentagona**
39. **pulchra**
HH. *Base of lf. cordate*.....40. **Coignetiæ**
41. **lanata**

6. rotundifòlia, Michx. (*V. muscadìna, V. angulàta, V. verrucòsa, V. peltàta, Muscadìnia rotundifòlia,* Small). MUSCADINE. SOUTHERN FOX GRAPE. BULLACE, BULLIT, or BULL GRAPE. Fig. 1708, Vol. III. Vine with hard warty wood, running even 60–100 ft. over bushes and trees, in the shade often sending down dichotomous aërial roots: lvs. rather small to medium (2–6 in. long), dense in texture and glabrous both sides (sometimes pubescent along the veins beneath), cordate-ovate and not lobed, mostly with a prominent and sometimes an acuminate point (but somewhat contracted above the termination of the 2 main side veins), the under surface finely reticulated between the veins, the teeth and the apex angular, coarse and acute, the basal sinus shallow, broad and edentate; petiole slender and (like the young growth) fine-scurfy, about the length of the lf.-blade: tendrils (or fl.-clusters) discontinuous, every third node being bare: fr.-bearing clusters smaller than the sterile ones, and ripening from 3–20 grapes in a nearly globular bunch: berries falling from the clusters when ripe, spherical or nearly so and large (½–1 in. diam.), with very thick and tough skin and a tough musky flesh, dull purple in color without bloom (in the Scuppernong variety silvery amber-green), ripe in summer and early autumn; seeds ¼–⅜in. long, shaped something like a coffee berry. River banks, swamps, and rich woodlands and thickets, S. Del. to N. Fla. and west to Mo., Kans., Texas, and Mex. For a recent pomological account of the Muscadine grapes, see Husmann, Farmers' Bull. No. 709, U. S. Dept. Agric. (1916); for a treatise on Muscadine grape-sirup, consult Dearing, Farmers' Bull. No. 758 (1916).

3956. Vitis vinifera. (×¼)

7. Munsoniàna, Simpson (*Muscadìnia Munsoniàna,* Small). MUSTANG GRAPE of Fla. BIRD, EVERBEARING, or EVERLASTING GRAPE. Very slender grower, preferring to run on the ground or over low bushes, more nearly evergreen than the last, flowering more or less continuously: lvs. smaller, thinner, and more shining, more nearly circular in outline and less prominently pointed, the teeth broader in proportion to the blade and more open or spreading: clusters larger and more thyrse-like: berries a half smaller than in the last and often more numerous, shining black, with a more tender pulp, acid juice, no muskiness, and thinner skin; seeds half smaller than in the last. Dry woods and sands, Fla. at Jacksonville, Lake City, and southward, apparently the only grape on the reef keys; also in the Bahamas.—Difficult to distinguish from *V. rotundifolia* in herbarium specimens, but distinct in the field. The plant often bears fls. and both green and ripe fr. into Dec.

8. vinífera, Linn. WINE GRAPE. EUROPEAN GRAPE. Fig. 3956. Young growth smooth or floccose, the plant

not so high-climbing as most American species: tendrils intermittent: lvs. mostly thinnish, rounded, with a deep sinus and the basal lobes usually overlapping, tomentose or glabrous beneath, the margins coarsely notched or jagged: clusters large and long, the berries usually oval or oblong, although many varieties are globular-fruited. Probably native to the Caspian or Caucasus region and W. India. Cult. from the earliest times, and the grape of history; now greatly varied. The hothouse grapes, as Black Hamburg, Barbarossa, are of this species; also the vineyard grapes of Calif. Not hardy in the northern states and very subject to phylloxera (root-louse) and mildew. Regel, a Russian botanist, considered the wine grape to be a hybrid of 2 species that he characterized as *V. Labrusca* and *V. vulpina*, but this view is not accepted. Var. **apiifòlia**, Loud. (*V. laciniòsa*, Linn. *V. vinífera* var. *laciniòsa*, Dipp.), has the lvs. cut into 5 much-cleft segms: ornamental: known as "parsley vine," and "ciotat." Gn. 54, p. 425.

9. **Dàvidii**, Föex (*Spinovìtis Dàvidii*, Romanet. *Vìtis Davidiàna*, Dipp. *V. armàta*, Diels & Gilg. *V. vinífera* var. *Dàvidii*, Hort.). Sts. and petioles armed with straight or slightly recurved prickles, glabrous: tendrils interrupted: lvs. long-petioled, large, paper-like, somewhat glaucous and becoming glabrous beneath, broadly ovate, obscurely angled, the base cordate, the apex acuminate and acute, the margin lightly repand-apiculate-serrate: thyrse peduncled, long-conical, usually surpassing the lf., the fls. very early: fr. rather large, globose, black. China.—Old branches prickly.

Var. **cyanocárpa**, Sarg. (*V. armàta* var. *cyanocárpa*, Gagnep. *V. armàta* var. *Veìtchii*, Hort.). Less prickly, the growing shoots bare: fr. bluish: perhaps a hybrid. China.

10. **Romanétii**, Romanet (*V. rùtilans*, Carr.). Petioles and young sts. floccose-pubescent and bearing spreading gland-bearing purplish hairs or bristles; sts. becoming nearly glabrous the second year: tendrils interrupted: lvs. large, cordate-orbicular and obscurely angled-3-lobed, coarsely crenate-dentate, at maturity nearly or quite glabrous above, below more or less floccose-pubescent at least on the nerves: thyrse peduncled, elongated-conical, surpassing the lvs.: fr. black, edible, the seeds globose-ovoid. China. R.H. 1890:444.

11. **rupéstris**, Scheele. Sand, Sugar, Rock, Bush, Currant, or Mountain Grape. Shrub, 2–6 ft. high, or sometimes slightly climbing, the tendrils few or even none, diaphragms plane and rather thin: lvs. reniform to reniform-ovate (about 3–4 in. wide and two-thirds as long), rather thick, smooth and glabrous on both surfaces at maturity, marked by a characteristic light glaucescent tint, the sides turned up so as to expose much of the under surface, the base only rarely cut into a well-marked sinus, the margins very coarsely angle-toothed, the boldly rounded top bearing a short, abrupt point and sometimes 2 lateral teeth enlarged and suggesting lobes: stamens in fertile fls. recurved laterally or rarely ascending, those in the sterile fls. ascending: cluster small, slender, open and branched: berries small (¼–½ in. diam.), purple-black and somewhat glaucous, pleasant-tasted, ripe in late summer; seeds small and broad. Sandy banks, low hills, and mountains, S. Pa. to Tenn., Ind., Mo., Okla., and S. W. Texas. Var. **dissécta**, Eggert, is a form with more ovate lvs. and very long teeth, and a strong tendency toward irregular lobing. Mo.

12. **montícola**, Buckl. (*V. texàna*, Munson. *V. Foexeàna*, Planch). Sweet Mountain Grape. Fig. 3957. A slender trailing or climbing plant (reaching 20–30 ft. in height, with very long and slender branches, the young growth angled and floccose (sometimes glabrous), the diaphragms plane and rather thin: lvs. small and thin (rarely reaching 4 in. in width and generally from 2–3 in. high), cordate-ovate to triangular-ovate, with the basal sinus ranging from nearly truncate oblique to normally inverted U-shaped, rather dark green but glossy above and grayish green below, when young more or less pubescent or even arachnoid below, the blade either prominently notched on either upper margin or almost lobed, the point acute and often prolonged, margins irregularly notched with smaller teeth than in *V. rupestris:* clusters short and broad, much branched: berries medium or small (averaging about ½in. diam.), black or light-colored, seedy, sweet; seeds large (about ¼in. long) and broad. Limestone hills in S. W. Texas.—This species has been the subject of much misunderstanding.

13. **Champinii**, Planch. Probably a hybrid of *V. rupestris* or *V. Berlandieri* and *V. candicans*, bearing medium to large reniform or reniform-cordate lvs. which are variously pubescent or cobwebby but become glabrous, the growing tips mostly white-tomentose: berries very large and excellent. S. W. Texas. A.G. 12:579.—In some places associated with *V. candicans*, *V. Berlandieri*, and *V. monticola* only, and in others with the above and *V. rupestris*. Often composing dense thickets in the wild.

3957. Vitis monticola. (×⅓)

14. **Lóngii**, Prince (*V. Solònis*, Planch. *V. nuèvo-mexicàna*, Lemm.). Differs from vigorous forms of *V. vulpina* in having floccose or pubescent young growth: lvs. decidedly more circular in outline, with more angular teeth and duller in color, often distinctly pubescent beneath: stamens in fertile fls. short and weak and laterally reflexed, those in sterile fls. long and strong: seeds larger. W. Okla., N. W. Texas, New Mex. and S. Colo.—Regarded by French authors as a hybrid, the species *V. rupestris*, *V. vulpina*, *V. candicans*, and *V. cordifolia* having been suggested as its probable parents; but Munson thinks that it has "a well-characterized specific make-up of its own." It is variable in character. In most of its forms it would be taken for a compound of *V. rupestris* and *V. vulpina*, but the latter species is not known to occur in most of its range. It was very likely originally a hybrid between *V. rupestris* (which it sometimes closely resembles in herbarium specimens except for its woolliness) and some tomentose species (possibly with *V. arizonica* or *V. Doaniana*), but it is now so widely distributed and grows so far removed from its supposed parents and occurs in such great quantity in certain areas, that for taxonomic purposes it must be kept distinct. It is not unlikely that it has originated at different places as the product of unlike hybridizations. Late French writers designate the jagged-lvd. forms as *V. Solonis*, and the dentate forms as *V. nuevo-mexicana*. This interesting grape was

found about fifty years ago by Engelmann in the Botanic Garden of Berlin under the name of *Vitis Solonis*, without history. Engelmann guesses (Bushberg Cat. ed. 3, 18) the name to be a corruption of "Long's." It is probable that the plant was sent to European gardens as *Vitis Longii*—very likely from Prince's nursery—and the name was misread on the label. The original name, which was duly published by Prince with description, may now be restored.

Var. **microspérma,** Bailey (*V. Solònis* var. *microspérma*, Munson), is a very vigorous and small-seeded form, which is very resistant to drought. Red River, N. Texas.

15. **vulpìna,** Linn. (*V. ripària*, Michx. *V. odoratissima*, Donn. *V. odoràta*, Hort. *V. illinoénsis* and *V. missouriénsis*, Prince? *V. cordifòlia* var. *ripària*, Gray). Riverbank or Frost Grape. Fig. 3958. A vigorous tall-climbing plant, with a bright green cast to the foliage, normally glabrous young shoots, large stipules, and plane very thin diaphragms: lvs. thin, medium to large, cordate-ovate, with a broad but usually an evident sinus, mostly showing a tendency (which is sometimes pronounced) to 3 lobes, generally glabrous and bright green below, but the veins and their angles often pubescent, the margins variously deeply and irregularly toothed and sometimes cut, the teeth and the long point prominently acute: fertile fls. bearing reclining or curved stamens, and the sterile ones long and erect or ascending stamens: clusters medium to large, on short peduncles, branched (often very compound), the fls. sweet-scented: berries small (less than ½in. diam.), purple-black with a heavy blue bloom, sour and usually austere, generally ripening late (even after frost); seeds rather small and distinctly pyriform. Nova Scotia and New Bruns. to Man., Kans., and Colo. and south to W. Va., Mo. and Texas. B.M. 2429. —The commonest grape in the northern states west of New England, abundant along streams. Variable in the flavor and maturity of the fr. Forms with petioles and under surfaces of lvs. pubescent sometimes occur. It apparently hybridizes with *V. Labrusca* eastward, the hybrid being known by the tomentose young shoots and unfolding lvs., and the darker foliage, which is marked with rusty tomentum along the veins of the less jagged lvs.

3958. Vitis vulpina. (×½)

3959. Vitis rubra form (×⅛)

Var. **præcox,** Bailey, is the June Grape of Mo., the little sweet frs. ripening in July.

16. **Trelèasei,** Munson. Plant shrubby and much branched, climbing little, the small and mostly short (generally shorter than the lvs.) tendrils deciduous the first year unless finding support, internodes short, the diaphragms twice thicker (about $\frac{1}{16}$in.) than in *V. vulpina* and shallow-biconcave: stipules less than one-fourth as large as in *V. vulpina:* lvs. large and green, very broad-ovate or even reniform-ovate (often wider than long), thin, glabrous and shining on both surfaces, the basal sinus very broad and open and making no distinct angle with the petiole, the margin unequally notch-toothed (not jagged as in *V. vulpina*) and indistinctly 3-lobed, the apex much shorter than in *V. vulpina:* fertile fls. with very short, recurved stamens, sterile with ascending stamens: cluster small (2–3 in. long): berries ⅛in. or less thick, black with a thin bloom, ripening 3 weeks later than *V. vulpina* when grown in the same place, thin-skinned; pulp juicy and sweet; seeds small. Brewster Co., S. W. Texas and New Mex. to Bradshaw Mts., Ariz.—Little known, and possibly a dry-country form of *V. vulpina*. In habit it suggests *V. arizonica* var. *glabra*, from which it is distinguished, among other things, by its earlier flowering and larger lvs. with coarser teeth and less pointed apex.

17. **rùbra,** Michx. (*V. monospérma*, Michx.). Red or Cat Grape. Fig. 3959. A slender but strong-growing vine, with small long-jointed angled red glabrous herb-like shoots and red petioles: lvs. small to medium, ovate-acuminate, dark green and glossy, sometimes indistinctly pubescent on the nerves below, the sinus obtuse, the blade either nearly continuous in outline or (commonly) prominently lobed or even parted, coarsely notched: stamens in the sterile fls. long and erect: clusters loose and long-peduncled, branched, the fls. opening very late: berries small and late (¼–⅜ in. diam.),

black without bloom, with little juice and commonly containing but a single seed, which is large and broad. Ill. and Mo. to Texas; known mostly along the Wabash River and along the Mississippi in the latitude of St. Louis. G.F. 2:341 (repeated in Fig. 3959).—A handsome plant. *V. palmata*, Vahl, founded on Virginian specimens, is probably *V. vulpina*, although it is sometimes made to replace the name *V. rubra*.

18. **cordifòlia,** Michx. True Frost Grape. Chicken, Raccoon, or Winter Grape. One of the most vigorous of American vines, climbing to the tops of the tallest trees, and sometimes making a trunk 1–2 ft. diam.: diaphragms thick and strong: lvs. long-cordate, triangular-cordate with rounded base, or cordate-ovate, undivided but sometimes very indistinctly 3-lobed or 3-angled, the basal sinus rather deep and narrow, the margin with large acute teeth of different sizes and the point long and acute, the upper surface glossy and the lower bright green and either becoming perfectly glabrous or bearing a little close and fine inconspicuous grayish pubescence on the veins; petioles long: stamens erect in the sterile fls. and short reflexed-curved in the fertile ones: clusters long and very many-flowered, most of the pedicels branched or at least bearing a cluster of fls.: berries numerous and small (about ⅜in. diam.), in a loose bunch, black and only very slightly glaucous, late and persistent, with a thick skin and little pulp, becoming edible after frost; seeds medium and broad. In thickets and along streams from Pa. (and probably S. N. Y.) to E. Kans., Fla., and Texas.

Var. **fœtida,** Engelm., has fetidly aromatic berries, and grows in the Mississippi Valley.

Var. **sempérvirens,** Munson. A glossy-lvd. form holding its foliage very late: lvs. sometimes suggesting forms of *V. rubra*, deltoid with a truncate base: clusters small, the fr. ripening later than in the type. S. Fla.

Var. **Hélleri,** Bailey (*V. Hélleri*, Small). Lvs. more circular (i. e., lacking the long point), and the teeth round-obtuse and ending in a short mucro. Kerr Co., S. Texas, 1,600–2,000 ft.

19. **Berlandièri,** Planch. Mountain, Spanish, Fall, or Winter Grape. Fig. 3960. A stocky moderately climbing vine, with mostly short internodes and rather thick diaphragms: lvs. medium large, broadly cordate-ovate or cordate-orbicular (frequently as broad as long), glabrous and glossy above, covered at first with gray pubescence below but becoming glabrous and even glossy except on the veins, the sinus mostly inverted-U-shaped in outline but often acute at the point of insertion of the petiole, the margin distinctly angled above or shortly 3-lobed and marked by rather large, open, notch-like acute teeth of varying size, the apex mostly pronounced and triangular-pointed: stamens long and ascending in the sterile fls., laterally recurved in the fertile ones: clusters compact and compound, mostly strongly shouldered, bearing numerous medium to small (½in. or less diam.), purple and slightly glaucous very late berries which are juicy and pleasant-tasted; seed (frequently only 1) medium to small. Limestone soils along streams and hills, S. W. Texas and Mex.—Well marked by the gray-veined under surface of the lvs.

20. **Baileyàna,** Munson. 'Possum Grape. Less vigorous climber than *V. cordifolia*, rather slender, with short internodes and very many short side shoots: lvs. frequently smaller, the larger ones shortly but distinctly 3-lobed (lobes mostly pointed and much spreading), bright green but not shining above, gray below and pubescent at maturity only on the veins, the point only rarely prolonged and often muticous, the teeth comparatively small and notch-like and not prominently acute, sinus more open; petioles shorter and often pubescent: floral organs very small, the stamens reflexed in the fertile fls.: pedicels short, making the bunch very compact: berries about the size of *V. cordifolia*, black and nearly or quite bloomless, late; seed small and notched on top. Mountain valleys, 800–3,000 ft. altitude, S. W. Va. and adjacent W. Va. and W. N. C., Tenn., and N. Ga.; also at common levels in the uplands of W. Cent. Ga.—The eastern counterpart of *V. Berlandieri*.

21. **cinèrea,** Engelm. Sweet Winter Grape. Fig. 3961. Climbing high, with medium to long internodes and thick and strong diaphragms: lvs. large, broadly cordate-ovate to triangular-cordate-ovate (generally longer than broad), the sinus mostly wide and obtuse,

3960. Vitis Berlandieri. (×⅓)

the margin small-notched (teeth much smaller than in *V. Berlandieri*) or sometimes almost entire, mostly distinctly and divaricately 3-angled or shortly 3-lobed toward the apex, the triangular apex large and prominent, the upper surface cobwebby when young but becoming dull dark green (not glossy), the under surface remaining ash-gray or dun-gray, webby-pubescent: stamens in sterile fls. long, slender, and ascending, in the fertile ones short and laterally recurved: cluster mostly loose and often straggling, containing many small black berries, these only slightly, if at all glaucous, ripening very late, and after frost becoming sweet and pleasant; seeds small to medium. Along streams, mostly in limy soils, Cent. Ill. to Kans. and Texas; also N. Fla., also in Mex.—Readily distinguished from *V. æstivalis* by the triangular-topped sharply 3-lobed ash-gray lvs. and the gray tomentum of the young growth.

Var. **floridàna,** Munson (*V. austrìna*, Small). Growing tips rusty-tomentose. as are sometimes the veins on

the under sides of the lvs.: cluster longer-peduncled and more compound. Manatee Co., Fla.; and apparently also in Ark.; possibly a compound with *V. æstivalis*, but the lvs. have the characteristic shape of *V. cinerea*. Not to be confounded with any form of *V. caribæa*, because of the lobed triangular-topped lvs. and much larger teeth.

Var. **canéscens,** Bailey. A form with rounded or heart-like lvs., the upper half of the lf. lacking the triangular and 3-lobed shape of the type. St. Louis, Mo., and S. Ill. to Texas.

22. **arizónica,** Engelm. (*V. arizonénsis,* Parry). Cañon Grape. Plant weak, much branched, with short internodes and thick diaphragms, branchlets angled: lvs. mostly small, cordate-ovate and with a prominent triangular-pointed apex, the sinus broad or the base of the blade even truncate, the teeth many and small and pointed or mucronate, the margin either continuous or very indistinctly 3-lobed (or sometimes prominently lobed on young growths), the lvs. and shoots white-woolly when young, but becoming nearly glabrous with age: stamens ascending in sterile fls. and recurved in the fertile ones: bunches small and compound, not greatly, if at all, exceeding the lvs., bearing 20–40 small black berries of pleasant taste; seeds 2–3, medium size. Along river banks, W. Texas to New Mex. and Ariz., mostly south of the 35th parallel, to S. E. Calif. and N. Mex.

Var. **glàbra,** Munson. Plant glabrous, with glossy and mostly thinner and larger lvs. In mountain gulches, with the species and ranging northward into S. Utah. Distinguished from *V. monticola* by its triangular-pointed and small-toothed lvs. Perhaps a form of *V. Treleasii.*

23. **californica,** Benth. Fig. 3962. A vigorous species, tall-climbing on trees but making bushy clumps when not finding support, the nodes large and diaphragms rather thin: lvs. mostly round-reniform (the broader ones the shape of a horse's hoof-print), rather thin, either glabrous and glossy or (more commonly) cottony-canescent until half grown and usually remaining plainly pubescent below, the sinus ranging from very narrow and deep to broad and open, the margins varying (on the same vine) from finely blunt-toothed to coarsely scallop-toothed (the latter a characteristic feature), the upper portion of the blade either perfectly continuous and rounded or sometimes indistinctly 3-lobed and terminating in a very short apex: bunches medium, mostly long-peduncled and forked, the numerous small berries glaucous-white, seedy and dry but of fair flavor; seed large (¼–$\frac{5}{16}$in. long), prominently pyriform. Along streams in Cent. and N. Calif. and S. Ore.—Lvs. becoming handsomely colored and mottled in autumn. Very susceptible to mildew.

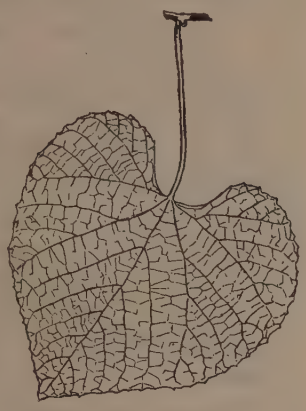
3961. Vitis cinerea. (×⅓)

24. **Girdiàna,** Munson. Valley Grape. Southern California Grape. Strong climbing vine, with thick diaphragms: lvs. medium to large and rather thin, broadly cordate-ovate, with a rather deep and narrow sinus and nearly continuous or obscurely 3-lobed outline (sometimes markedly 3-lobed on young shoots), the teeth many and small and acute, the apex short-triangular or almost none, the under surface remaining closely ashy-tomentose: clusters large and very compound, each one dividing into 3 or 4 nearly equal sections, which are in turn shouldered and thyrse-like: berries small, black and slightly glaucous, the skin thin but tough, pulp finally becoming sweet; seeds medium in size, pyriform. S. Calif., south of the 36th parallel. —Differs from *V. californica* in the more pubescent shoots and foliage, smaller and sharp teeth, decompound clusters, smaller less glaucous berries, and smaller seeds. Shoots of *V. californica* often bear lvs. with small and mutic-ous teeth, and such specimens without the fl.-clusters are difficult to distinguish from this species. Some of the forms which have been referred to *V. Girdiana* are apparently hybrids with the wine grape, *V. vinifera;* the plant is imperfectly understood and its merits as a species are yet to be determined. It bears the name of H. H. Gird, of Calif.

3962. Vitis californica. (×⅓)

25. **Doaniàna,** Munson. Plant vigorous, climbing high or remaining bushy if failing to find support, with short internodes and rather thin diaphragms: lvs. bluish green in cast, mostly large, thick, and firm, cordate-ovate or round-ovate in outline, bearing a prominent triangular apex, the sinus either deep or shallow, the margins with very large, angular, notch-like teeth and more or less prominent lobes, the under surface usually remaining densely pubescent and the upper surface more or less floccose: cluster medium to small,

bearing large (⅝in. and less diam.), black, glaucous berries of excellent quality; seeds large (¼–⅜in. long), distinctly pyriform. Chiefly in N. W. Texas, but ranging from Greer Co., Okla., to beyond the Pecos River in New Mex. G.F. 9:455.—The species varies greatly in pubescence, some specimens being very nearly glabrous at maturity and others densely white-tomentose. The plant would pass as a hybrid of *V. vulpina* and *V. candicans*, except that these species do not often occur in its range. It bears the name of Judge J. Doan, of Wilbarger Co., Texas. It gives promise as a parent of pomological grapes. The Arnold Arboretum reports it as "a fast-growing plant and appears to be perfectly at home in New England. The leaves are large, thick and firm, and rather pale bluish green in color. The fruit, which grows in small clusters, is blue covered with a pale bloom and of fair quality."



3963. Vitis caribæa. (×¼)

26. caribæa, DC. Fig. 3963. Climbing, with flocculent-woolly (or rarely almost glabrous) and striate shoots: tendrils rarely continuous: lvs. cordate-ovate or even broader and mostly acuminate-pointed, sometimes obscurely angled above (but never lobed except now and then on young shoots), becoming glabrous above but generally remaining rufous-tomentose below, the margins set with very small, mucro-tipped sinuate teeth: cluster long and long-peduncled, generally large and very compound: berry small and globose, purple; seed obovate, grooved on the dorsal side. A widely distributed and variable species in the American tropics, running into white-lvd. forms (as in *V. Blancoi*, Munson). Although supposed to occur from Fla. to Texas, Munson is "unable to discover the slightest traces of this species in the U. S.;" he considers the Fla. plants to be hybrids of other species, or forms of *V. cinerea*. The species is considered to be promising for the development of a pomological grape for the tropics (F. S. Earle, Journ. Heredity, Dec., 1915).

3964. Vitis bicolor. (×⅓)

V. rufotomentòsa, Small, differs in having the lf.-blades usually distinctly lobed and the margins coarsely toothed, rusty-tomentose on nerves beneath: sandy soil, Fla to La.

27. bícolor, Le Conte (*V. argentifòlia*, Munson) Blue Grape, or Summer Grape of the N. Fig. 3964. A strong high-climbing vine, with mostly long internodes and thick diaphragms, the young growth and canes generally perfectly glabrous and mostly (but not always) glaucous-blue: tendrils and petioles very long: lvs. large, round-cordate-ovate in outline, glabrous and dull above and very heavily glaucous-blue below, but losing the bloom and becoming dull green very late in the season, those on the young growth deeply 3-5-lobed and on the older growths shallowly 3-lobed, the basal sinus running from deep to shallow, the margins mostly shallow-toothed or sinuate-toothed (at least not so prominently notch-toothed as in *V. æstivalis*): cluster mostly long and nearly simple (sometimes forked), generally with a long or prominent peduncle: the purple and densely glaucous berries of medium size (½in. or less diam.), sour but pleasant-tasted when ripe (just before frost); seeds rather small. Abundant northward along streams and on banks, there taking the place of *V. æstivalis*. Ranges from New England and Ill. to the mountains of W. N. C. and to W. Tenn. —Well distinguished from *V. æstivalis* (at least in its northern forms) by the absence of rufous tomentum, the blue-glaucous small-toothed lvs. and long petioles and tendrils. It has been misunderstood because it loses its glaucous character in autumn; an excellent species as a covering for arbors and trellises.

28. æstivàlis, Michx. (*V. Nórtoni*, Prince. *V. Labrúsca* var. *æstivàlis*, Regel. *V. bracteàta* and *V. araneòsus*, Le Conte). Summer, Bunch, or Pigeon Grape. Strong tall-climbing vine, with medium short internodes, thick diaphragms, and often pubescent petioles: lvs. mostly large, thinnish at first but becoming rather thick, ovate-cordate to round-cordate in outline, the sinus either deep (the basal lobes often overlapping) or broad and open, the limb always lobed or prominently angled, the lobes either 3 or 5, in the latter case the lobal sinuses usually enlarged and rounded at the extremity, the apex of the lf. broadly and often obtusely triangular, the upper surface dull and becoming glabrous and the under surface retaining a covering of copious rusty or red-brown pubescence which clings to the veins and draws together in many small, tufty masses: stamens in fertile fls. reflexed and laterally bent: clusters mostly long and long-peduncled, not greatly branched or even nearly simple (mostly interrupted when in flower), bearing small (⅓in. or less diam.), black, glaucous berries, which have a tough skin and a pulp ranging from dryish and astringent to juicy and sweet; seeds 2–4, medium size (¼in. or less long). S. N. Y. to Cent. Fla. and westward to the Mississippi and Missouri rivers.—A marked type readily distinguished from other species by the reddish fuzz of the under side of the lvs.

Var. **Bourquiniàna,** Bailey (*V. Bourquiniàna*, Munson). A domestic offshoot, represented in such cult. varieties as Herbemont and Le Noir, differing from *V. æstivalis* in its mostly thinner lvs. which (like the young shoots) are only slightly red-brown below, the pubescence mostly cinerous or dun-colored or the under surface sometimes blue-green: berries large and juicy, black or amber-colored.—A mixed type, much cult S. It is probably exotic, but may have been modified

by hybridization. Probably to be associated botanically with *V. vinifera*.

29. **Línsecomii,** Buckl. (*V. diversifòlia*, Prince. *V. æstivàlis* var. *Lincecumii*, Munson). Post-Oak. Pine-Wood, or Turkey Grape. More stocky than *V. æstivalis*, climbing high upon trees but forming a bushy clump when not finding support: lvs. densely tomentose or velvety below: berries large (⅛–¾in. diam.), black and glaucous, mostly palatable; seeds mostly much larger than in *V. æstivalis* (often ⅜in. long). High post-oak (*Quercus stellata*) lands, S. W. Mo. to Texas and E. La.—Munson distinguishes it from *V. æstivalis* by larger berries and seeds, larger lvs. which are bluish in the var. *glauca*, greater endurance of drought. A promising species for the pomologist. It bears the name of Dr. Gideon Lincecum, and is often written *V. Lincecumii*, but if such original spellings as Wisteria, Zanthoriza, Gleditsia, Stewartia and many others are to be retained, consistency requires that we hold to Buckley's original spelling, *V. Linsecomii*.

Var. **glaùca,** Munson (*V. æstivàlis* var. *glaùca*, Bailey). Lvs. and mature wood glaucous-blue on the body beneath, but the veins rusty: berries and seeds larger. S. W. Mo. to N. Texas.—Much like *V. bicolor*, but lvs. thicker and more pubescent below, and tips of shoots rusty-tomentose: berries larger and the clusters strongly shouldered.

30. **cándicans,** Engelm. (*V. mustangénsis*, Buckl.). Mustang Grape. Plant strong and high-climbing, with densely woolly young growth (which is generally rusty-tipped), and very thick diaphragms: lvs. medium in size and more or less poplar-like, ranging from reniform-ovate to cordate-ovate or triangular-ovate, dull above but very densely white-tomentose below and on the petioles, the basal sinus very broad and open or usually none whatever (the base of the lf. then nearly truncate), deeply 5–7-lobed (with enlarging rounded sinuses) on the strong shoots and more or less indistinctly lobed or only angled on the normal growths, the margins wavy or sinuate-toothed: stamens in the sterile fls. long and strong, those in the fertile fls. very short and laterally reflexed: cluster small, mostly branched, bearing 12–20 large (¾in. or less diam.) purple or light-colored or even whitish berries, which have a thick skin and a very disagreeable fiery flavor; seeds large, pyriform. W. Ark., Okla., N. Texas, mostly on limestone soils.

Var. **coriàcea,** Bailey (*V. coriàcea*, Shuttlew.). Leather-Leaf or Calloosa Grape. Fig. 3965. Differs from the species chiefly in bearing much smaller (about ⅓in. diam.) thinner-skinned and more edible grapes with mostly smaller seeds, and perhaps a less tendency to very deep lobing in the lvs. on young shoots and possibly rather more marked rustiness on the young growths. Fla. chiefly southward, in which range various Texan plants reappear.—The more agreeable quality of the fr. is perhaps the result of a more equable and moister climate.

31. **Símpsonii,** Munson. Distinguished by mostly much-cut lvs. on the young shoots and comparatively thin, large, and large-toothed ones on the main shoots, rusty white tomentum below and very prominently brown-tomentose young growths—the character of the lvs. and tomentum varying widely, the foliage sometimes becoming almost blue-green below. Fla.—This is perhaps a hybrid of *V. æstivalis* and *V. candicans* var. *coriacea*. Some forms of it are very like *V. Labrusca*, and might be mistaken for that species. Its botanical position is yet to be determined.

32. **Labrúsca,** Linn. (*V. Blándii*, Prince). Fox Grape. Skunk Grape. Fig. 1705, Vol. III. A strong vine, climbing high on thickets and trees: young shoots tawny or fuscous, with much scurfy down: lvs. large and thick, strongly veined (especially beneath), broadly cordate-ovate, mostly obscurely 3-lobed toward the top (on strong growths the sinuses sometimes extending a third or even half the depth of the blade, and rounded and edentate at the bottom) or sometimes nearly continuous in outline and almost deltoid-ovate, the petiolar sinus mostly shallow and very open (ranging to narrow and half or more the length of the petiole), the margins shallowly scallop-toothed with mucro-pointed teeth (or sometimes almost entire), and the apex and lobes acute, the upper surface dull green and becoming glabrous but the lower surface densely covered with a tawny white, dun-colored or red-brown tomentum: stamens long and erect in the sterile fls. and (in wild forms) short and recurved in the fertile ones: raceme short (berries usually less than 20 in wild types), generally simple or very nearly so, in anthesis about the length of the peduncle: berries large and nearly spherical, ranging from purple-black (the common color) to red-brown and amber-green, generally falling from the pedicel when ripe, variable in taste but mostly sweetish musky and sometimes slightly astringent, the skin thick and tough; seeds very large and thick. Cent. New England and southward in the Alleghany region and highlands to W. Cent. Ga. Not known to occur west of E. N. Y. in the N., but occurs in S. Ind. and Tenn.—The parent of the greater part of American cult. grapes (probably largely through hybridization). It is often confounded with *V. æstivalis* in the S., from which it is distinguished by the habitually continuous tendrils, the more felt-like lvs. which are not floccose, and especially by the small-toothed lvs., very short clusters, and large berries and seeds.

33. **Piasézkii,** Maxim. (*Ampelópsis Davidiàna*, Mott.). A species with variable foliage: dicœcious: young branches, petioles, and under surface of lvs.

3965. Vitis candicans var. coriacea. (×⅓)

rufous-pubescent: lvs. membranaceous, ternate; lfts. petiolulate, the central one rhomboid and more or less lobed and acuminate, the lateral ones obliquely ovate and acute, all of them incised-serrate: cymes many-fid., becoming forking and exceeding the petiole: fls. small, with calyptrate petals. W. China. **V. Pagnúccii,** Romanet, differs only in being more glabrescent; probably not distinct.—The foliage of this species-group is said to turn bronze-colored in autumn. The lvs. are very variable, sometimes trifoliolate and undivided on the same branch. *V. sinénsis*, Hort., appears to belong here.

34. reticulàta, Pampanini (*V. Wilsonæ*, Veitch). Scandent shrub with glabrous branches: lvs. ovate-cordate, subreniform, about 3 in. diam., base cordate-truncate, apex very shortly acuminate, margin entire or inconspicuously 3-lobed, glabrous above, cobwebby on the nerves beneath: infl. racemose: fls. in glomerules, minute: fr. black, but glaucous-pruinose, up to ½in. diam. China. G.C. III. 46:236.—Promising.

35. flexuòsa, Thunb. Sts. slender and usually flexuose, glabrous at maturity, the new ones more or less rufous-tomentose: lvs. petiolate, cordate-ovate or triangular-ovate, entire or angular-3-lobed, short-cuspidate, unequally dentate, at maturity glabrous above and more or less hairy or floccose beneath (at least on the veins): fl.-cluster peduncled and branching: fr. very small, 2–3-seeded. China, Korea, Japan. Var. **parvifòlia,** Gagnep. (*V. parvifòlia*, Roxbg. *V. flexuòsa* var. *Wilsonii*, Veitch), is a small-lvd. form, cult. for the color of the lvs., which are purple beneath and bronzy with metallic luster above. China.

36. amurénsis, Rupr. (*V. vulpìna* var. *amurénsis*, Regel). A hardy species, well known to botanists but little planted although found in growing collections: sts. obscurely angled and striate, the young shoots loosely floccose or webby, later glabrous or nearly so: lvs. green above and beneath, nearly or quite glabrous, cordate-orbicular, some of them more or less 3–5-lobed, apiculate-dentate: fl.-cluster slender-peduncled: fr. small (about ⅛in. diam.), 2–3-seeded. Manchuria, Amoor region. Gn. 54, p. 425. G.Z. 12:160.—It has very ornamental purple-tinted lvs. in autumn.

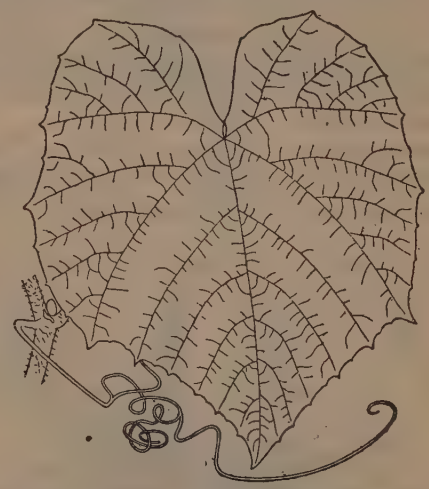
37. Thúnbergii, Sieb. & Zucc. (*V. Sièboldii*, Hort.). A variable species resembling *V. Labrusca:* sts. angled, these and other parts rusty-tomentose: lvs. glabrous above, tomentose or pubescent on the nerves beneath, cordate, 3–5-lobed or deeply cut, unequally mucronate-dentate: fl.-cluster shorter than lvs. or about equaling them: fr. very small (⅛–½in. long), 2–3-seeded, purplish black. China, Japan. B.M. 8558.—It is the E. Asian representative of *V. Labrusca*. The plant sometimes cult. under this name is probably *V. pentagona*. A form of *V. Coignetiæ* passes as *V. Thunbergii* in England.

38. pentagòna, Diels & Gilg. Climbing, the tendrils interrupted: sts. and lvs. reddish gray-tomentose: lvs. long-petioled, the blade membranaceous, ovate, usually 5-angled, the base truncate or shallowly emarginate, the apex acute, the margin repand and minutely denticulate, lightly pubescent on nerves above but reddish tomentose beneath: thyrse elongated. China. —Allied to *V. lanata*. It appears to have been distributed in cult. as *V. Thunbergii*. Var. **béllula,** Rehd. & Wilson. Lvs. much smaller, 1–2 in. long: very similar to *V. flexuosa* var. *parvifolia*, but lvs. tomentose beneath.

39. púlchra, Rehd. Described as a handsome plant with simple more or less obscurely 3-lobed lvs. coarsely serrate, 7–8 in. long and 9–10 in. broad, much like those of *V. Coignetiæ*, villous beneath, the young shoots crimson, the foliage becoming glossy bronze-green and purplish beneath and later deep green. Sts. sparsely floccose, glabrescent, purplish: lvs. ovate to broad-ovate, acuminate, the base shallow cordate or truncate (only rarely deeply cordate), coarsely and unequally toothed, glabrous and somewhat shining above. China or Japan.—Described from plants cult. at the Arnold Arboretum, where it is not quite hardy.

40. Coignétiæ, Pulliat. Fig. 3966. Very strong-growing vine, covering trees and arbors with a thatch of heavy showy foliage: branches floccose-tomentose when young: tendrils intermittent: lvs. cordate-orbicular, with 3–5 lobe-like points, the margins shallowly apiculate-toothed, dull above, thickly gray-pubescent beneath: thyrse stalked, short: fr. globular, about ⅓in. diam., practically inedible, although said to be eaten after being frozen by the Japanese. N. Japan. Gn. 49, p. 48; 50, p. 449; 63, p. 209. G. 22:523. R.H. 1898, pp. 426–8. G.C. III. 22:305 (adapted in Fig. 3966).—One of the best of all strong-growing vines, and hardy in the northern states; at Chicago recommended as the best vine for large effects. Its foliage becomes brilliant scarlet in the fall, whence it has been called the "crimson glory vine." In general appearance it much resembles *Vitis Labrusca*. In cult. it has been confused with *V. Thunbergii*. It grows readily from imported seeds; it can also be prop. by layering and by grafting on other stocks Named for Mme. Coignet, of Lyons, France.

41. lanàta, Roxbg. A tropical or warm-temperate variable species, probably not hardy in this country outside the southern parts: sts. and infl. more or less pubescent or tomentose: lvs. 3–6 in. or more long (sometimes very large), sometimes nearly glabrous but



3966. Vitis Coignetiæ.

usually soft-pubescent or tomentose beneath, membranaceous, cordate-ovate, short-acuminate, not lobed: fls. small and green, in a paniculate cyme, the petals rarely separating at the top: fr. purple, size of large pea, 4-seeded. Himalaya to China.

V. ácida, Chapm.=Cissus acida.—*V. aconitifòlia*, Hort.=Ampelopsis.—*V. antárctica*, Benth.=Cissus.—*V. Bainesii*, Hook. (Cissus Bainesii, Planch., and by him referred to C. Currori). A most remarkable species, the trunk being condensed into a turnip-like body a few inches diam.: lvs. mostly compound, the 3 lfts. dentate, lvs. all borne on short, succulent branches: tendrils none: fls. greenish, in clusters usually raised above the lvs. S. Afr. B.M. 5472.—*V. Baudiniàna*, Brouss.=Cissus, antarctica.—*V. betulifòlia*, Diels & Gilg. Sts. sparsely white-floccose: tendrils interrupted: lvs. small and membranaceous, becoming glabrous above, tomentose beneath, ovate-cordate and acute, not lobed or only obscurely so, the margin crenate-serrate. China.—*V. bipinnàta*, Torr. & Gray=Ampelopsis.—*V. cantoniénsis*, Seem.=Ampelopsis. —*V. capreolàta*, Don=Tetrastigma serrulatum.—*V. Delavayàna*, Franch., *V. Delavàyi*, Hort.=Ampelopsis.—*V. élegans*, C. Koch= Ampelopsis heterophylla var.—*V. gongylòdes*, Baker=Cissus.—*V. Henryàna*, Hemsl.=Parthenocissus.—*V. heterophýlla*, Thunb.= Ampelopsis.—*V. himalayàna*, Laws., and var. *rubrifòlia*, Hort.= Parthenocissus, p. 2479.—*V. incónstans*, Miq.=Parthenocissus tricuspidata.—*V. japónica*, Thunb.=Cissus.—*V. levoides*, Maxim. =Ampelopsis, p. 278.—*V. Lindenii*, Hort.=Cissus, p. 776.—*V. megalophýlla*, Veitch=Ampelopsis.—*V. obtécta*, Wall.=Tetrastigma.—*V. orientàlis*, Boiss.=Ampelopsis.—*V. pteróphora*, Baker =Cissus.—*V. rèpens*, Veitch=Ampelopsis micans.—*V. rubrifòlia*, Lév. & Van.=Parthenocissus himalayana var.—*V. semicordàta*, Wall., is Parthenocissus semicordata, Planch. (P. himalayana var. semicordata, Laws.). Self-clinging plant: lfts. 3–5, ovate, tapering to summit, the young parts hispid-pubescent. Himalaya.—*V. sempérvirens*, Hort.=Cissus striata.—*V. serjaniæfòlia*, Maxim.= Ampelopsis japonica.—*V. Thómsonii*, Laws.=Parthenocissus. p. 2479.—*V. tiliæfòlia*, HBK. Mexico, recently intro. for trial: said to have a very sour fr. but useful for jellies: by Planchon referred to V. caribæa.—*V. Titànea*, Hort., described as a vigorous species from Japan: lvs. dark green, with rounded lobes: berries black, in small bunches.—*V. tricuspidàta*, Lynch=Parthenocissus tricuspidata.—*V. variegàta*, Hort., is likely to be Ampelopsis

heterophylla var.—*V. Voinieriàna*, Balt. Climbing, the tendrils spiral, red-rusty: lvs. persistent, coriaceous, long-stalked, digitate with usually 5 elliptical coarsely dentate lfts. which are glabrous above and bright green: fls. in axillary short-peduncled cymes, hermaphrodite; sepals 4, oval, shorter than the 4 oval-lanceolate separate petals: carpels woolly, with a short 4-lobed style, the 2 carpels biovulate. Tonkin. R.H. 1902, pp. 56, 57. R.B. 28:3. Genus doubtful.—*V. vomerénsis*, Hort., "observed in a Nice villa garden:" robust, sts. brown-felted: lvs. large and leathery, deeply cut into fine lobes, brown-tomentose, deep olive-green at maturity.

L. H. B.

VITTADÍNIA (Dr. C. Vittadini, an Austrian who wrote on fungi, 1826–1842). *Compósitæ.* Herbs with a thick caudex, or branching subshrubs.

Leaves alternate, entire or variously cut: heads rather small, with a yellow disk and white or blue rays, terminal, solitary or in loose leafy corymbs: involucre of several rows: rays pistillate, numerous, crowded, in more than one row: achenes narrow, compressed or flat, with or without ribs on the faces; pappus of numerous, often unequal capillary bristles.—About 14 species, natives of Austral., New Zeal., S. Amer., and Hawaiian Isls. The genus is closely related to Erigeron, differing in habit and in the appendages of the style-branches, those of Erigeron being short, while those of Vittadinia are awl-shaped. For *V. triloba*, Hort., not DC., see *Erigeron mucronatus.*

austràlis, A. Rich. (*V. triloba*, DC., not Hort.). Herbaceous plant of uncertain duration, 1 ft. high or less, tomentose: lvs. obovate or spatulate to linear-cuneate, entire or coarsely 3-toothed or lobed: heads

3967. Vittaria filifolia.

solitary: rays narrow: said to be revolute (which may apply only to dried specimens). G.W. 11, p. 129. Austral., Tasmania.—There are botanical varieties.

V. tricolor, Hort., is apparently V. australis, A. Rich.

Wilhelm Miller.

VITTÀRIA (Latin, a *fillet* or *head-band* or *? vitta*, a *line*). *Polypodiàceæ.* A genus of about 40 species of tropical ferns mostly with narrow cord-like lvs. growing pendent from trees: sporangia borne in 2 lines along the margins. **V. lineàta**, Swartz, Old Man's Beard, is a tropical American species which is found as far north as Cent. Fla., where it grows on the cabbage palmetto. Rare in cult. and interesting only as an oddity. **V. filifòlia**, Fée. Fig. 3967. A small species, 10–12 in., which is representative in appearance and habit of most of the species; sometimes found in choice collections. Trop. Amer.

L. M. Underwood.

VOANDZÈIA (from a native name). *Leguminòsæ.* One species, *V. subterrànea*, Thouars, cult. widely by the natives of Cent. Afr. for its underground peanut-like seeds. It is a prostrate herb with a creeping pubescent rhizome from which arise slender-stalked compound lvs.: lfts. 3, oblong or lanceolate, 3 in. or less long, with minute obtuse stipels: fls. yellow, ¼ or ⅛in. long, papilionaceous, 1–3 on flexuous peduncles; calyx very small; standard obovate; wings equaling standard, oblanceolate; keel boat-shaped, not beaked; stamens diadelphous: fr. a tuber-like roundish pod, about ½in. or more long, with 1 or 2 small seeds; the peduncle elongates after flowering and the ovary is buried in the earth, where the fr. ripens; seeds globose-ellipsoidal, about ⅖–⅗in. long, yellow-mottled. Until very recently the plant has been unknown in a wild state, but it has now been found natively in Nigeria and German Adamaua (see Kew Bull. 1912, p. 213; and in this article the plant is distinguished from *Kerstingiella geocarpa*, page 1737, another underground legume widely cult. in Trop. Afr.). Voandzeia appears not to have been intro. in this country.

L. H. B.

VOCHÍSIA (*Vochy* is the name of one of the species in Guiana). *Vochysiàceæ.* Glabrous or tomentose usually resinous trees, frequently tall shrubs, occasionally grown in the warmhouse: lvs. decussately opposite or verticillate, usually leathery; stipules small, subulate: fls. rather large, yellow, odorous, in elongated composite racemes or panicles; pedicels 2-bracted; sepals 5, connate at base, lateral and anterior very short, posterior largest, usually spurred; petals 1–3, linear or spatulate, anterior commonly larger than the others; stamen 1, fertile; ovary 3-celled: caps. leathery or woody, 3-celled, loculicidally 3-valved.—About 60 species, natives of Brazil, Guiana, E. Peru, and Colombia. The spelling Vochysia is later.

V. ferruginea, Mart. (V. tomentosa, DC.). Tree, 25 ft. or more high: lvs. oval-oblong, long-acuminate, attenuate at base, glabrous above, ferrugineous-tomentose beneath: fls. in terminal racemes, which are loose and slightly nodding. Guiana.—*V. guianénsis*, Aubl. Tree, 12 ft. or more high: lvs. obovate-oblong, shortly acuminate, glabrous on both surfaces: fls. in simple racemes, which are erect, terminal and dense-fld.; spur spreading. Guiana.

VOLKAMÈRIA: *Clerodendron.*

VOLUTARÉLLA (diminutive of *Volutaria*). Syn., *Amberbòa.* *Compósitæ.* Erect or divaricately diffuse villous or glabrous annual herbs, sparingly grown in Calif.: lvs. alternate, erose-dentate or remotely pinnatifid: heads heterogamous, outer fls. 1-row, neuter, disk-fls. fertile; involucre ovoid or globose; bracts in many rows, imbricate; corolla purplish, violet, or blue, regular tube slender and very short, limb cylindrical, deeply 5-lobed: achenes obovoid or oblong, prominently 10–15-ribbed. About 7 species, Medit. region, W. Asia, and India. This genus is treated as a part of Centaurea by Hoffmann in Engler and Prantl, Pflanzenfamilien IV, pt. 5. *V. muricàta*, Benth. & Hook. f. (*Amberbòa muricàta*, DC.). St. erect, 1–2 ft. high: basal lvs. lanceolate, attenuate to the petiole; cauline sessile, middle ones auricled, upper and lowest not auricled, linear- or oblong-lanceolate: fls. purple. Spain and Morocco.

According to the Brussel's Congress, Amberboa is placed in the list of "nomina conservanda," and if this ruling is followed, the species above mentioned will retake the name *A. muricata*, DC.

VOUÀPA (native name in Guiana). *Leguminòsæ.* Unarmed trees, rarely cult.: lvs. abruptly or somewhat odd-pinnately-compound; lfts. sometimes 1 or few-paired, sometimes many-paired; stipules leafy or inconspicuous: fls. yellow, red, or white, small or medium-sized, in terminal and axillary simple racemes or shortly fascicled-paniculate; calyx-tube bearing a disk, short-turbinate, rarely narrow, segms. 4; petals, uppermost clawed, 2–4, lower small, scale-like or none;

perfect stamens 3; ovary stipitate, 3- to many-ovuled: pod obliquely orbiculate, ovate-oblong or falcate, plano-compressed, leathery, 2-valved. About 45 species, Trop. Amer. and Trop. Afr. This is the oldest generic name, but the name Macrolobium is retained by the list of "nomina conservanda" accepted at Vienna. *Macrolòbium bifòlium*, Pers. (*M. Vuàpa*, J. F. Gmel. *Vouàpa bifòlia*, Aubl.). Tree, about 10 ft. high: lfts. sessile, ovate, acuminate, oblique: fls. violet; calyx-lobes spreading; stamens nearly equaling the corolla. Guiana.

VRIÈSIA (named for Dr. W. de Vriese, of Amsterdam). *Bromeliàceæ*. Often spelled *Vriesea*, but not so spelled by Lindley, who founded the genus. Tropical American stiff-leaved plants, with mostly distichous spikes bearing large and showy bracts. According to Mez (DC. Monogr. Phaner. 9), 84 species are to be referred to this genus. They are very like tillandsias, with which they are united by Bentham & Hooker and others. The chief technical difference is the presence in Vriesia of 2 ligules or a single cleft or emarginate ligule on the inside of the base of petals. Culturally, vriesias are like tillandsias. They run to forms with marbled and banded lvs. Several species have been intro. in recent years, and many garden hybrids have been produced. Few kinds are offered in the American trade, and only these kinds are described here. For other kinds, see the monographs of Baker and Mez; also the accounts from time to time in horticultural publications. For cult., see *Tillandsia*.

A. *Stamens longer than the petals.*

B. *Infl. branched.*

Saùndersii, Morr. (*Tillándsia Saùndersii*, C. Koch. *Encholírium Saùndersii*, André). About 1½ ft. high when in bloom: lvs. many, in a rosette, rather short, strongly recurving, grayish and somewhat white-dotted above, spotted with red-brown beneath: fls. in a branched open infl., sulfur-yellow, cylindrical in form. Brazil. I.H. 20:132.

BB. *Infl. simple.*

C. *Bracts of infl. strongly imbricate.*

speciòsa, Hook. (*Tillándsia splèndens*, Hort. *T. pícta*, Hort. *T. zebrìna*, Hort., in part). Fig. 3968.

3968. Vriesia speciosa.

Strong-growing plant, with broad, strong, arching-ascending lvs. 1 ft. or more long, which are bright green and marked with dark brown transverse bands: spike with densely imbricated bright red acuminate bracts, the scape spotted: fls. exserted, yellowish white. Guiana. B.M. 4382. F.S. 2:107; 6, p. 162. R.H. 1846: 41. F.W. 1874:33 (as *V. brachystachys*).—One of the best and most showy species. A robust form is var. **màjor,** Hort. See supplementary list below for additional note on *V. zebrina*.

3969. Vriesia carinata.

carinàta, Wawra (*V. brachýstachys*, Regel. *Tillándsia carinàta*, Baker). Fig. 3969. Lvs. rosulate, about 6 in. long, the base sheathing, mucronate at the tip, somewhat glaucous, not spotted: spike with wide-spreading nearly divaricate acuminate bracts which are scarlet at the base and yellowish green at the end: fls. protruding, pale yellow. Brazil. B.M. 6014.

CC. *Bracts of infl. remote, not imbricate.*

guttàta, Lind. & André (*Tillándsia guttàta*, Baker). Lvs. rosulate, erect-arching, short and rather broad, mucronate, olive-green with irregular spots of brown-purple: bracts farinose, rose-colored, the scape slender: fls. yellow. Brazil. I.H. 22:200.

psittacìna, Lindl. (*Tillándsia psittacìna*, Hook.). About 1 ft. high when in bloom: lvs. rosulate, 6–10 in. long, dilated at the base, yellowish green: fls. large, yellow with green tips, scattered on a distichous spike, the bracts red at the base and yellow at the top. Brazil. B.R. 29:10, where the genus is founded. B.M. 2841. R.H. 1855:221.—A showy species when in bloom.

AA. *Stamens shorter than the petals.*

B. *Lvs. not barred, mottled, or tessellated.*

heliconioìdes, Lindl. (*V. béllula*, Hort. *Tillándsia heliconioìdes*, HBK.). Dwarf and tufted, with many rosulate recurving or arching lanceolate lvs. (about 12 in. long) which are bright green above and purple-tinged beneath: scape overtopping the foliage, simple and erect, with wide-spreading distichous boat-shaped bracts that are light red at the base and greenish at the tip, showy: fls. white. Colombia. I.H. 30:490. G.C. II. 21:140.

BB. *Lvs. tessellated (marked in small checkerwork) or minutely variegated.*

tessellàta, Morr. (*Tillándsia tessellàta*, Lind.). Lvs. short and rather broad, rosulate, dilated at base, short-pointed, rather stiff, channeled, tessellated with green and yellow: infl. paniculate, the greenish bracts remote: fls. yellow. Brazil. I.H. 21:179. R.H. 1889, p. 573.

fenestràlis, Lind. & André (*Tillándsia fenestràlis*, Hook. f.). Robust, densely tufted, the lvs. stout (1–2 ft.

long) and recurved, brown-tipped, with many dark green veins and cross veins: infl. a simple stout spike 1½ ft. long and bearing green-spotted bracts: fls. pale yellow. Brazil. B.M. 6898. I.H. 22:215.

BBB. *Lvs. marked with strong transverse bands.*

hieroglýphica, Morr. (*Tillándsia hieroglýphica,* Bull.). Fig. 3970. Lvs. many, rosulate, stout, recurved, short-acute, very strongly and irregularly marked and banded with dark green above and brown-purple beneath: infl. paniculate, the bracts broadly elliptic-ovate, the fls. yellowish. Brazil. I.H. 31:514; 42, p. 318. R.H. 1891:400. Gn. 37, p. 244 (adapted in Fig. 3970).—A very striking and showy plant. Sometimes known as a Massangea.

V. Blòkii, Hort. (Tillandsia Blokii, Hort.). Infl. crimson, pinnately paniculate, 4–5 ft. tall; floral bracts ovate: fls. in 2 rows, 4 in. long; petals yellow, linear, about 4 in. long. S. Amer. B.M. 8192. G.C. III. 45:358.—*V. fúlgida,* Hort., has been catalogued in this country. It is a garden hybrid (V. incurvata ×V. Duvalii). It has short green lvs. and an exserted simple spike with distichous bright red imbricated bracts. I.H. 35:67.—*V. glaucophýlla,* Hook., is Tillandsia fasciculata.—*V. Leopoldìana*=V. splendens ×V. Malzinei. Gt. 54:1539.—*V. musàica*=Guzmannia.—*V. regìna,* Ant. Lvs. very long-acute: infl. large; bracts elliptic-ovate, rounded at apex: fls. dirty yellow. Brazil.—*V. Rex.* Hybrid. R.H. 1907:570.—*V. zebrìna,* Hort., is sometimes V. splendens and sometimes Cryptanthus zonatus.

L. H. B.

VULNERÀRIA: *Anthyllis.*

VUYLSTEKEÀRA, a multigeneric orchid hybrid embracing Cochlioda, Miltonia, and Odontoglossum. It bears the name of Charles Vuylsteke, of Ghent, Belgium, and the name is conformable with Adamara, Linneara, Lowiara, Wilsonara. Only two species or species-forms (very recent) are recorded, the first of which has been in doubt as to parentage. These are *V. insignis,* Hort., recorded (G.C. III. 56:14) as a hybrid of *Miltonioda Bleuana* and *Odontioda Charlesworthii,* bearing cream-white fls. with brownish spots; and *V. Hyeanà,* Hort., a hybrid between *Odontonia Lairesseæ* and *Cochlioda Noezliana,* with fls. 2 in. across with a cinnabar tint suffusing the greater part of the surface of the sepals and petals after the color of *C. Noezliana,* but with the form of fl. approaching *O. Lairesseæ* especially in the center of the labellum, which is white tinged rose-color, and the base having a crest of yellow ridges on a red ground in front of which is a large shining brownish yellow raised blotch similar to that in *Miltonia Warscewiczii.*

3970. Vriesia hieroglyphica.

W

WAHLENBÉRGIA (named after Georg Wahlenberg, 1780–1851, Swedish botanist). Including *Edraiánthus* (*Hedræanthus*). *Campanulàceæ*. Annual or perennial herbs, base of the stems sometimes woody, used as greenhouse and border plants, mostly the latter.

Leaves alternate, rarely opposite: infl. usually irregularly centrifugal; peduncles terminal, lateral or axillary, solitary or rarely paniculate: fls. usually blue and nodding; calyx-tube adnate, hemispherical, turbinate or obconical-oblong, limb 5-parted, very rarely 3–4-merous; corolla campanulate, funnel-shaped, tubular or rather rotate, 5-cleft, very rarely 3–4-cleft; ovary inferior or semi-superior, 2–5-celled: caps. erect, loculicidally 5-valved.—About 110 species, Eu., Medit. region, S. Afr., and Trop. Amer. This treatment includes Edraianthus, which is often kept as a distinct genus. The species are used mostly as rock-garden plants, and receive the treatment given campanulas.

A. *Plants with clustered tubers.*

tuberòsa, Hook. f. Glabrous, with clustered, aboveground tubers: sts. slender, erect, 6–24 in. high, branched and leafy: lvs. about 1 in. long, linear, acute or obtuse, dentate, 1-nerved: fls. in a terminal panicle, white, red-purple-veined; calyx-lobes linear, spreading; corolla campanulate, lobes short and recurved. Island of Juan Fernandez. B.M. 6155. G.Z. 21, p. 217.

3971. Wahlenbergia serpyllifolia. (×½)

AA. *Plants without clustered tubers.*

B. *Lvs. basal clustered, narrow: plants perennial. (Section Edraiantha.)*

C. *Fls. solitary on the peduncles.*

serpyllifòlia, G. Beck (*Campánula serpyllifòlia,* Vis. *Edraiánthus serpyllifòlius,* A. DC.). Fig. 3971. Sts. cespitose, procumbent, glabrous: lvs. oblong-lanceolate, obtuse, ciliate: fls. solitary, on sts. about 2 in. high, deep purple; calyx-tube ovoid, rather glabrous, lobes ovate-lanceolate; corolla campanulate. Dalmatia. G.C. III. 45:243. G. 36:143. Gn. 75, p. 103. Var. **dinàrica,** Hort. (*W. dinàrica,* Hort.), has narrow silvery lvs. and blue fls. G.M. 58:285. Var. **màjor,** Hort., is slightly larger than the type. Gn. 78, p. 338.

CC. *Fls. several to numerous on the peduncles.*

dalmática, A. DC. (*Edraiánthus dalmáticus,* A. DC.). Sts. ascending or erect, about 3 in. high, glabrous: lvs. linear-lanceolate, entire, hairy-ciliate, 1–2 in. long: fls. in a terminal 6–10-fid. head, blue; calyx-tube rather pilose, lobes triangular; corolla-lobes acute. Dalmatia. G. 36:142.

Pumílio, A. DC. (*Edraiánthus Pumílio,* A. DC.). Cespitose: sts. very short, leafy: lvs. linear, entire. about ½in. long, glabrous beneath, pilose above: fls. numerous, azure-blue; calyx-tube obconical, glabrous, lobes lf.-like; corolla-lobes ovate, acute. Dalmatia. G.C. III. 53:59. G.W. 15, p. 345.

BB. *Lvs. alternate or opposite and narrow, scattered along the sts.: plants usually annual.*

C. *Blades nearly rotund.*

hederàcea, Reichb. Sts. filiform, creeping or ascending, branched, 4–10 in. long: lvs. long-petioled, cordate, obtuse, 5–7-angled, nearly rotund, about ½in. diam.: fls. few, terminal, pale blue-lilac; calyx glabrous, tube hemispherical, lobes linear-subulate; corolla-lobes ovate, acute. Eu.

CC. *Blades linear to lanceolate or narrowly obovate.*

grácilis, Schrad. (*W. vincæflòra,* Decne.). Sts. simple or branched, 6–12 in. high, erect or somewhat decum bent: lvs. alternate or subopposite, linear-lanceolate, sinuate-dentate, about ½in. long: peduncles terminal or axillary: fls. blue; calyx rather glabrous, tube ovoid, lobes acuminate; corolla-lobes ovate, acute. Tropical and south temperate regions of the Old World. G.C. III. 52:215.

saxícola, A. DC. Sts. short, tufted, 1 in. or more long: lvs. clustered, petioled, obovate or spatulate to almost linear, ½–1 in. long: scapes 1-fld., 2–6 in. high: fls. white, veined with blue; calyx glabrous, lobes narrow-triangular; corolla-tube purplish outside, lobes oblong, broadly deltoid, acute. Tasmania. G.37:21. Gn. 65, p. 269.

W. gentianoides, Hort., is offered in the trade as a rock-plant growing a foot high, with erect wiry sts. and bright blue fls.—*W. grandiflòra,* Schrad., is Platycodon grandiflorum.

F. Tracy Hubbard.

WÀITZIA (F. A. C. Waitz, born 1768, at Schaumburg, Germany, state physician to the Dutch at Samarang, Java; wrote on Javanese plants). *Compósitæ.* Includes one of the rarer "everlasting flowers," a half-hardy annual which bears flat-topped clusters of yellow flower-heads, with a golden disk.

Mostly annuals: lvs. alternate, linear or nearly so: fl.-heads in terminal corymbs or rarely in oblong leafy racemes: involucre various in outline, the bracts overlapping in many rows, all colored and petal-like: receptacle flat, without scales: anthers provided with tails of very small size: achenes somewhat compressed, glabrous or papillose, terminating in a slender beak; pappus of capillary bristles usually cohering at the base, simple, barbellate or plumose.—Seven species from Austral. The genus is distinguished from Helipterum and Helichrysum by the beaked achenes.

grandiflòra, Naudin. Half-hardy everlasting or "immortelle," annual, exceeding 18 in. height: lvs. lanceolate, long-acuminate, sessile, green above, slightly villous beneath, prominent midrib beneath: fls. yellow, in terminal corymbs; clusters about 5 in. across, and heads 2 in. across, the showy part being the involucral bracts, which are arranged in 4 or 5 series, and are petal-like in character but of stiffer texture than ordinary petals. F. 1865:41, where it was originally described.—Probably the most desirable of the genus.

It seems to have replaced *W. aurea*, Steetz, the favorite of a former generation, being larger-fld., more robust, and rather easier of cult. WILHELM MILLER.

WAKE ROBIN: In England, *Arum maculatum;* in America, *Trillium.*

3972. Yellow or barren strawberry.—Waldsteinia fragarioides. (×½)

WALDSTEÌNIA (named after Franz Adam, Count of Waldstein-Wartenburg, born 1759 at Vienna; wrote with Kitaibel an illustrated work on rare plants of Hungary; died 1823). *Rosàceæ.* Creeping herbs with the habit of Fragaria, perennial and hardy, used in the border as an edging and on rockeries.

Leaves mainly radical, 3–5-lobed or -divided: fls. small, yellow, borne on bracted scapes; calyx-tube inversely conical, limb 5-cleft, with 5 often minute and deciduous bractlets; petals 5; stamens many, inserted into the throat of the calyx: achenes 2–6, minutely hairy.—About 5 species, Cent. and E. Eu., N. Asia, and Temp. E. N. Amer. Of simple cult.

The yellow or barren strawberry, *W. fragarioides*, is a little plant that looks much like a slender strawberry but it has yellow flowers and bears no edible fruit. It is a hardy North American tufted perennial herb, about 4 inches high, with glossy leaves composed of three wedge-shaped leaflets, and five-petaled flowers less than ½ inch across. It comes with the first rush of spring, and continues to bloom until summer. There is little satisfaction in growing only a few plants of this wild flower. The plant is appropriate to the rockery, where every effort should be made to induce it to form a large mat. Masses of the yellow strawberry have been used with good effect for edging shrubbery borders, and the plant is listed in the trade.

fragarioìdes, Tratt. Fig. 3972. Pubescent or nearly glabrous: lfts. dentate or crenate except at the base, 1–2 in. long: scapes corymbosely 3–8-fld.: achenes 4–6. May, June. Woods and shaded hillsides, New England to Minn. and Ind., along the Alleghanies to Ga. B.B. 2:218. R.H. 1890, p. 510. B.M. 1567 and L.B.C. 5:408 (both as *Dalibarda fragarioides*).

sibírica, Tratt. (*W. trifòlia*, Rochel. *W. trifoliàta*, Steud.). Sts. creeping, pilose, leafy at their tip: lvs. erect, alternate, petioled, ternate; lfts. very short-petioluled, obovate, base cuneiform, entire; stipules none: scapes 1 or several, axillary, 3–5-fld.: fls. hermaphrodite, nodding, white; calyx-lobes ovate; petals spreading, subrotund. Siberia. J.H. III. 45:217.

lobàta, Torr. & Gray. Foliage slightly hairy; lvs. cordate, 3-lobed, the lobes crenate with mucronulate teeth; petioles slender, longer than blades: scapes about as long as lvs.: sepals triangular-lanceolate, acute; petals narrowly oblong or elliptic: achenes usually 2, densely pubescent. S. W. Ga. F. TRACY HUBBARD†.

WALKING-LEAF FERN: *Camptosorus.*

WALKS, PATHS, AND DRIVEWAYS. That gardens and grounds may be reached at all times in any weather, walks are introduced to afford dry comfortable routes. They should be laid out to conform to and emphasize the garden design. However, too much gravel or a too complicated system will mar the purpose and scale of the garden and detract from its charm. It is necessary, therefore, that the paths be kept in proportion by adopting various widths according to the amount of travel expected and the importance of certain lines in the design. Principal lines or "axes" of the design may be emphasized by widths of 6 to 14 feet; secondary by 4 to 8 feet; minor, 2½ to 4 feet. It may be added that straight paths should be wider proportionately than curving ones. Paths may also be maintained in scale by use of different materials, using stone or brick for the principal ones; gravel, tanbark, or stepping-stones for secondary; grass for the least important. The color of path material also influences the garden appearance, and the simpler the garden character the less pronounced should be its path-colors. Turf is the least and cement the most conspicuous of materials.

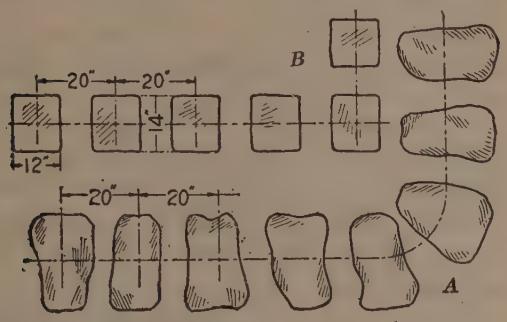
Grass paths should be designed for unusual wear, and a depth of at least a foot of well under-drained soil provided. Many simple gardens have turf paths only, but these are at a disadvantage in wet weather or dew. If the wear is more than grass will stand, or the garden lines need more emphasis, stepping-stones may be introduced in the grass. (Fig. 3973.)

Stepping-stone paths are simplest made of native rock of irregular shapes (Fig. 3974); more refined if of native rock, hammer-dressed; and still more refined if of regular blocks, slate, flag, or cement, (12 by 12 inches) square, or (12 by 24 inches) rectangular (Fig. 3974). The stones should be set 20 inches apart,

3973. A good garden walk.

center to center, well bedded in earth, and level with the sod.

Tanbark paths, grass-bordered, are a degree more pronounced. The tanbark should be spread 2 inches thick over a bottom of 6 to 12 inches of broken stone or cinders. If the path is of such importance to the



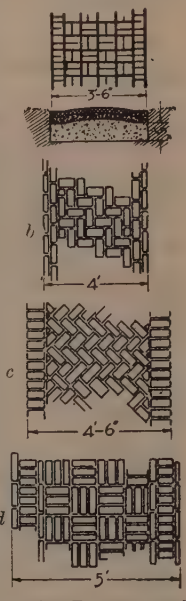
3974. A, Stepping-stones in the grass—the simplest dry path in the natural style. B, The same, conventionalized for the formal style.

design as to demand greater width, the character should change, and gravel or crushed stone be used.

For macadam paths (Fig. 3975) excavate 8 inches at the sides, 6 inches in center, and lay 5 inches of stone or "spawls" on edge across the path. Over this spread 2 inches of crushed stone the size of a hen's egg (1½-inch stone) and a sprinkling of clayish soil, and roll firm, a hand roller being used. An inch of crushed limestone or hard shale should then be spread and rolled until a firm hard surface results. The walk should be raised 1 inch at the center for each 2 feet of width. These hard walks must be contained by borders of grass sod, boxwood, stone, brick, or cement curb. The curb should stand only 1 inch above the walk-surface; it should be 2½ inches wide for a 4-foot path and ½ inch wider for each added foot width of the walk up to 4 inches, which is sufficient for a highway.

Gravel paths appear well up to any width, but as they are widened their color increases in design importance. Many garden designers use red gravel only; others prefer blue trappe rock; few use washed beach gravel or other white surface material because of its glare. This fault is a grievous one with respect to cement as a walk material; it also seems too artificial and not gardenesque.

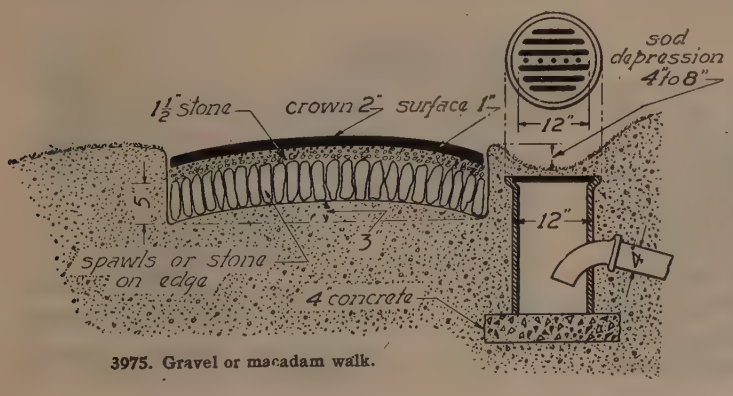
Brick in various colors and textures is an old and valuable path material which meets the requirements of color, texture, interest, drainage, and neatness, as well as anything yet devised. The pattern of laying should not be complicated to the degree of attracting attention which should be bestowed on the garden itself. In front of seats or steps, about a pool or a garden dial, it may be embellished by special design or by tile introduced into the pattern. Usually the patterns are three, or adaptation of those shown in Fig. 3976. A tile effect can be secured by using extra-wide joints, but glazed tile will be found too slippery for out-of-door use. Brick walks should be laid over a foundation of 16 inches of cinders or broken stone, for drainage and to prevent heaving by frost. To lay "dry," an inch of sand is spread upon this foundation, the bricks laid and afterward swept over with sand until joints are filled. If a cemented job is desired, spread 3 inches of concrete upon the "frostproof" foundation; lay the brick upon a layer of cement mortar spread above the concrete, and pour the brick joints afterward with cement (one part), sand (one part); scour the bricks with muriatic acid, one part to ten of water.



3976. Forms of simple brick walks. *a*, Basketry pattern; *b*, straight herringbone; *c*, herringbone, corner cutting required but effectiveness of pattern increased; *d*, basket, with Roman (or extra-size) brick.

Much may be said in favor of stone paths. It is a material full of interest and generally harmonizes well in garden or lawn. The stones, as a rule, should be larger if the walk or terrace is wide or long. They may be laid regularly or irregularly (Fig. 3977); smooth or rough of surface; cemented joints over foundations as for bricks; or laid with grass joints. These last are very gardenesque, particularly if the joints are planted with low-lying perennials like *Sedum acre, Armeria vulgaris*, certain saxifragas, and *Veronica rupestris*. Such a walk is not easy to keep free of either snow or heavy dew, so that it must not be laid where service demands dryness.

In the English or natural landscape style, lawns and informal gardens are made up of grass, shrubs, trees, and vistas. Paths are introduced for the sole purpose of giving easy access to various points or objects of interest and are not relevant, as in formal gardens, to the design. On the other hand, it is easy to intercept and spoil a vista, subdivide charming greensward, or mar a graceful slope by introducing a walk. Considerable study is required to lay out paths which will be direct, serving the practical needs of the place without interfering with esthetic considerations. Usually it is best accomplished by keeping paths somewhat toward boundaries, and consisting of graceful long curves in harmony with the general rounded outlines of foliage, foregrounds, and slopes in hillsides, rather than by more conventional straight lines, directed through centers. These paths must not seem circuitous or precipitous, however, and the interest must be satisfying to the traveler by presenting special vistas, close examination of interesting plantings, providing good restful benches, passing through arches or otherwise made interesting and seemingly short. Paths of this character must not be laid out in an unrelated system nor built simply to break up lawns and afford aimless strolls. It should not often be necessary for the traveler to return the way he came along a path, at least any distance, and even in small



3975. Gravel or macadam walk.

grounds a full circuit should be devised, or else no path-scheme laid out at all. When crossing a vista, as is often necessary to secure directness or continuity, the path may be graded lower to obscure its course (Fig. 3978), or it may be of an inconspicuous material such

3977. Forms of stone paths of a gardenesque appearance. *A*, grass or flower joints; *B*, cement joints; *C*, cobbles and stones in cement.

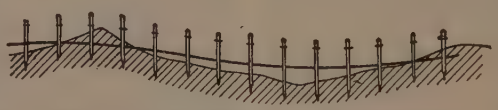
as a blue slate, brown stones, or dark stepping-stones with grass joints (Fig. 3973).

The materials of such lawn-paths may be simply of turf when passage is through woods or meadows. This latter charming device is secured by mowing a strip through the longer meadow grass and daisies. Macadam or gravel is usually the method of construction.

For crowded parks, the width should be 8 to 12 feet or more. The construction may be heavier by 2 inches, and special care given to drainage. Oiled macadam, valuable for roads, is not suitable for paths unless top-surfaced with fine screenings to prevent tracking the oil.

3978. Walk crossing a lawn in slight depression for concealment.

Asphalt paths are sometimes used and are best if the residuum used in the flux of the surface coat be reduced to the minimum in order to leave as hard a pavement as possible. Concrete is being more generally used because of its wearing properties. It should be colored with red ochre, and lamp-black to destroy the usual whiteness of cement surface. These walks may be constructed in the usual way (8 inches cinders, 3 inches concrete, 1 inch cement float), except that the surface should be rough finished —neither troweled nor rolled. Wing walks at each side of the cement may often be provided to good advantage. They are 2 to 4 feet wide, made of 4 inches of gravel (or crushed stone) laid upon 6 inches of cinders or broken stone.



3979. Transition of grades. Method of sighting by stakes and twine.

Drainage should be provided for all paths. Brick, asphalt, or cement walks should be crowned in the center or on the high side. Three-fourths of an inch is sufficient for an 8-foot cement walk. At each side, or at the upper side at least, of paths on a slope, drainage should be provided by sod gutters. These will carry the surface water to park inlets which discharge into sewer lines.

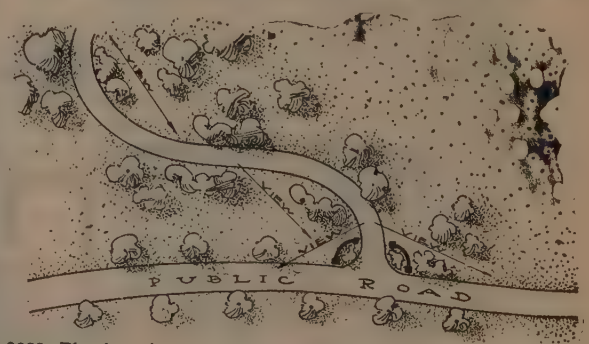
Driveways.

If walks and drives were not necessary to a human use of the informal type of landscape, they would never be put into it. Drives should be regarded as secondary, not primary elements of beauty in this style of gardening and they should remain unobtrusive by direction, width, and material. But as the landscape becomes more formal, drives become increasingly important and prominent in the design. It is simpler to plan a straight avenue in the formal balanced lawn of a house with terrace and gardens in a straight line swung on evident axes than to observe the indefinite lines, the less apparent unity and balance of informal gardening and incorporate therein a wide roadway. A straight formal drive should not be intruded through an informal lawn, or an irregularly curved and planted road through a formal place.

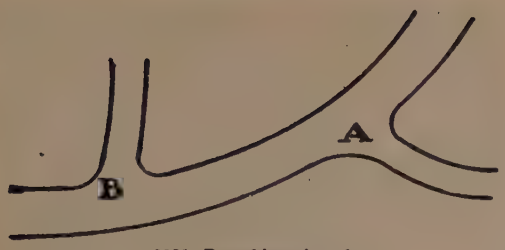
As elements of beauty, roads are tolerable only as they serve their purpose thoroughly well. This purpose may be a service-way to the kitchen, when directness is the first consideration; or to the front door, when good views of the house and lawn may warrant more indirectness; or a pleasure-drive, where directness is lost sight of, and good views, interest of scenery, and gradient become all-important. Success in laying out driveways depends on skill in applying the principles of landscape design, with a true regard for grades and excellence of construction. Mere engineering skill will not attain good private or park drives, for part of the function of such roads is to harmonize as far as possible with the other elements of the created or natural landscape.

Practical reasons urge a principal entrance toward the most-used corner of the property. As far as possible, the natural inclination for "short cuts" should always be recognized. Neither straight lines nor tiresome turnings are esthetically pleasing; grades must be considered and fine existing natural features, trees, rocks, and the like usually avoided. The driveways should command interesting views ahead and to the side and attract attention to handsome plantings in the curves. The curves should always be directed toward and not away from the objective point, and circuitousness for sake of adding mere length to the approach should be avoided.

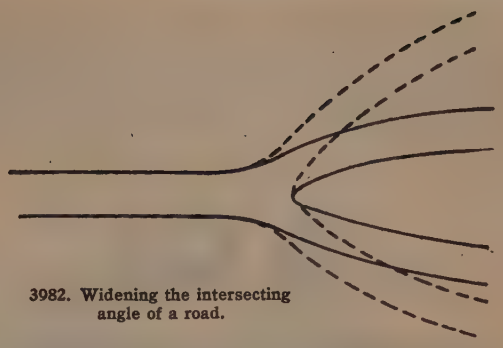
To be comfortable as well as practicable, the gradient should be as low as about 6 per cent (6 feet of rise in 100 of length), at turns never over 7 per cent, although 10 or 12 may be required elsewhere to accomplish the ascent. Transition from one slope to another must be carefully arranged so as to avoid sharp jolts (Fig. 3979); this is accomplished by filling the hollows or cutting off the crests where the grades reverse. There should always be a flat place in front of doors and at entrances. Road-curves should be long, at least equal to 60 feet radii. It is an advantage to plot the curves at least roughly upon the ground first and transfer them to paper rather than vice versa, as their true artistic and practical effect may be perceived better. Long stakes should be used to aid the sight or a coil of rope laid upon the ground, and moved about until the desired line is attained, then the rope staked.



3980. Planting of curves, and free views. Entrance at right angle to highway.



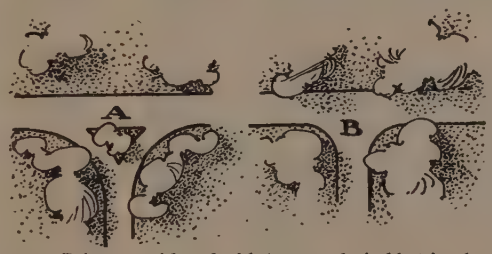
3981. Branching of road.



3982. Widening the intersecting angle of a road.

By tying colored twine around the stakes and moving it up and down while sighting, the new grades may also often be visualized. In cleared ground this method is very sure. It is better than the engineer's method of regular curves connected by straight tangents.

Precaution should be exercised at curves and intersections to secure safety as well as appearance and convenience. The fast-moving almost noiseless modern vehicles emphasize this precaution; therefore the view ahead at sharp turns should always be unbroken by banks or dense, tall plantings (Fig. 3980). Drives should branch on the outside (A) not inside (B) of curves (Fig. 3981). Danger lurks in narrow branchings and may be avoided by widening the intersecting triangle (Fig. 3982). Small triangles at right-angle intersections are not to be advised. When used at all they should be large and clear of tall planting which obscures the view. Triangles with less than 50-foot sides may better be omitted altogether (Fig. 3983).



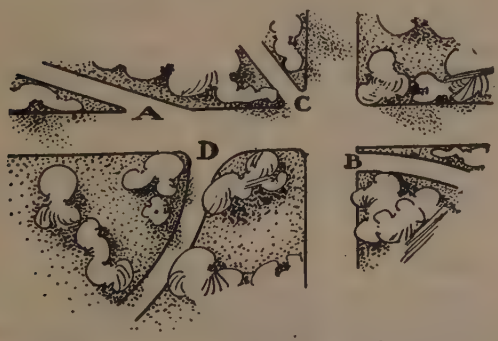
3983. Driveway with and without an undesirable triangle.

At the turn-in from the public road especial care must be exercised to avoid danger. The acute angle (A) is bad (Fig. 3984), and the corner entrance (B) is not much better, or is absolutely fool-hardy when arranged as C. The best turn-in is shown at D. When possible, enter from an outward bend of the public road (Fig. 3985) or at the head of the street (Fig. 3986), and always at nearly right angles to the public road (Fig. 3980), making a gradual bend, if desired, to an angle within the property. Avoid if possible the street entrance at the foot of a steep hill as it is the point of greatest speed. Formerly entrances were heavily emphasized by gate-piers, lodges, and tree-plantings; now they are recessed and the planting is less high.

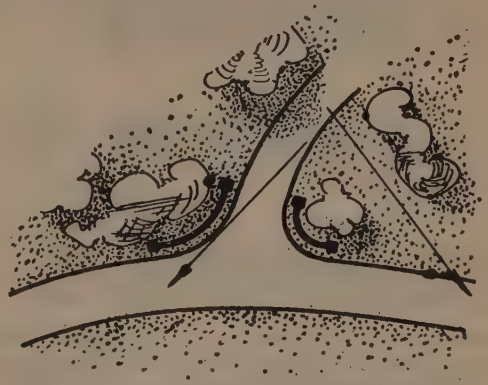
The road-surface should be smooth, dry, elastic, clean, and of good color. All this is to be obtained by various constructions. The gravel roadway is always pleasing as to color and wear, but the present-day macadam, although somewhat lacking as to color, better withstands modern traffic. Brick, concrete, and asphalt are too noisy and seem too hot and formal for private roads in the country, although for short distances in the city they may be used properly.

The construction of any roadway is begun by grading the level for the bottom of the road. This is called the sub-grade and is made higher in the center than at the sides by ½ inch or more to each foot width. The sub-grade should be rolled before the stone is laid. For private drives generally a light Telford consisting of native stone, about 6 inches wide and 1 to 3 inches thick, is laid by hand upon edge crosswise of the road. Over this a sprinkling of clay soil is thrown and covered 2 inches deep with crushed stone of the 1½-inch grade; this in turn is covered by an inch of crushed limestone screenings. Each course as laid is sprinkled and rolled with a six- to ten-ton steam roller. This is a water-bound macadam. (Fig. 3987 A.) Since it does not withstand automobile traffic without dust, various oil-binding treatments of the surface are on the market. Bitulithic macadam is an excellent method of binding the top courses together, with hot pitch applied under pressure. There is no tracking of oil when this method is practised and the color and texture are satisfactory. Local conditions so influence materials and methods that it is necessary to investigate before applying any general specification in detail.

A cheaper road (Fig. 3987 B) may be built of spawls, or other broken stone, spread evenly, rolled, and surfaced with the other two courses of crushed stone, each thoroughly rolled wet. Where gravel of a cementitious quality is obtainable, or a hard shale, it may be substituted for crushed limestone surfacing.

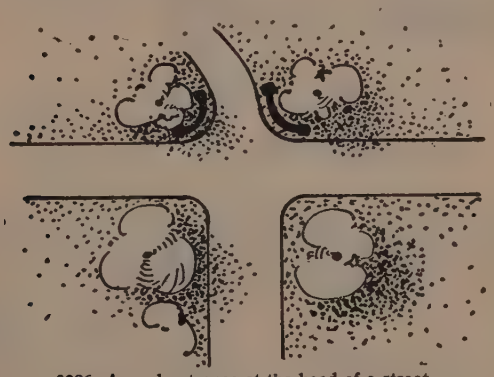


3984. Good and bad entrances from the public road.



3985. A good entrance from an outward bend of the road.

The earth road has its country uses. Its success depends on dryness, and this is brought about by wide ditching at the side, a rather high crown in the center, and puddling the surface by repeated dragging while in a wet condition. The turf road (Fig. 3987 C) in country estates, for occasional travel, is made by laying



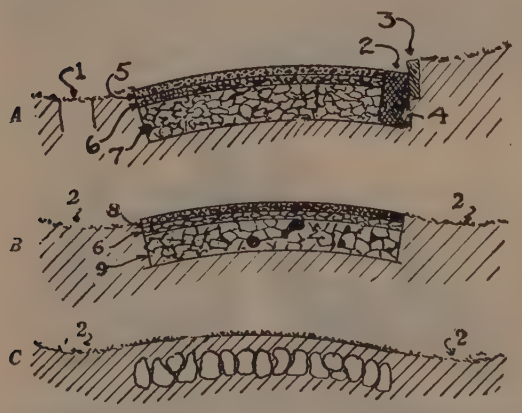
3986. A good entrance at the head of a street.

roundish stone without "chinking in" the interstices. Cover with soil 1 inch thick over top of stone and seed with grass.

Whatever material the road is made of, it should be of convenient although not of unnecessary width, 9 feet for a single suburban lot being sufficient, 13 to 16 feet, including gutters, for more pretentious places, 14 feet for the little-traveled by-roads in parks, and 22 to 30 feet for the principal drives, and 60 to 80 for boulevard widths. The roads should also partake of the decoration suited to the large feeling of the place. Such accessories as gutters and inlets, signs and light-posts, entrance-piers and gates, should be rustic or more refined, carved or conspicuous in proportion as the surroundings have been conventionalized. Roads must harmonize and obey the demands of unity in design. The use of roadside shrubbery and arrangement of taller-growing trees is the means whereby the designer may tie together an artificial road to the landscape.

ARTHUR W. COWELL.

WALLFLOWER. The vernacular name of *Cheiranthus Cheiri*, which see. A favorite spring bloom in Great Britain, and sometimes secured as early as Christmas; in this country it is little known, probably because of climatic reasons.



3987. Types of road construction: *A*, macadam; *B*, broken stone; *C*, turf; *1*, sod gutter; *2*, gutter; *3*, stone curb; *4*, cinders; *5*, screenings; *6*, 1½-inch crushed stone; *7*, Telford; *8*, screenings or gravel; *9*, spawls.

The wallflower is a perennial, blooming profusely the second year, but needing to be renewed frequently. The compact forms grow only 1 foot or 18 inches high, but some kinds are taller than this. There are single-flowered and double-flowered kinds, and colors in yellow, orange, blood-red, maroon-red, yellow-brown, light brown, ruby-purple, pink. The yellows are most commonly seen in English gardens, and make a most attractive show about cottages in early spring. The double kinds are propagated by cuttings taken in spring, and they make good blooming plants the following spring if not allowed to become stunted; double wallflowers are also grown from carefully selected seeds. The seeds of wallflowers may be sown in spring and plants are kept in vigorous condition until protected for the winter; they are transplanted when young into permanent beds. If seeds are started in late winter, bloom may be had in the following holidays, in a climate mild enough to carry them.

WALLÍCHIA (Nathaniel Wallich, 1786–1854, Danish botanist; wrote on plants of India). *Palmàceæ*. Stove palms, one of which, the first described below, is cultivated outdoors in southern Florida and southern California and in Europe under glass, and the second, while not advertised in America, is probably in a few northern greenhouses.

Low palms, cespitose, with short branching caudices, or in 1 species tall: lvs. densely fasciculate, terminal, distichous, scaly, unequally pinnatisect; segms. solitary or the lowest in groups, cuneate at the base, oblong-obovate or oblanceolate, erose-dentate, the terminal one cuneate; midnerve distinct; nerves flabellate; margins recurved at the base; petiole slender, laterally compressed; sheath short, split, with the margins deeply crenate: spadices short-peduncled, the staminate drooping or recurved, ovoid, much branched, densely fld., the pistillate looser, erect; spathes very numerous, slender-coriaceous, the lower ones the narrower, tubular, the upper ones cymbiform, entire, imbricated: fls. symmetrical, the pistillate much smaller than the staminate, yellow: fr. ovoid-oblong, red or purple.—Three species, Himalayas. Wallichia is allied to Didymosperma, Arenga, and Caryota, differing in having 6 stamens instead of an indefinite number. Caryota is the only one of this group with ruminate albumen. Didymosperma has a cup-shaped 3-lobed calyx, and in Arenga the calyx has 3 distinct sepals.

dísticha, T. Anders. Fig. 3988. Caudex 10–15 ft. high, about 5–6 in. diam.: lvs. graceful, 6–10 ft. long, alternate, erect; lfts. 1–2 ft. long, 2–2½ in. wide, fascicied, linear, narrowed to the base, denticulate at the apex, with a large tooth on each side above the middle, glaucous beneath; petiole and sheath short, scurfy; lvs. disposed in a one-third spiral: spadix 3–8 ft., the staminate usually twice as long as the pistillate: fls. in many spiral series, green. Himalaya.

caryotoìdes, Roxbg. (*Harìna caryotoìdes*, Buch.-Ham. *Didymospérma caryotoìdes*, Hort.). St. very short or none, often sheathed with the persistent lf.-bases: lfts. oblong or linear-oblong, panduriformly excised and acutely toothed, white beneath: spadix about 18 in. long, the fls. purple or yellow, according to sex. F. 1874, p. 161. R.H. 1870, p. 368.

W. densiflòra, Mart., a palm like W. caryotoides and differing only in technical ovary characters, is offered in Eu. Unknown in Amer. J.F. 3, pls. 233, 234.—*W. porphyrocárpa*, Mart. See Didymosperma.

JARED G. SMITH.
N. TAYLOR.†

WALNUT (formerly sometimes written *wallnut*, but the name has no connection with *wall*, being rather of Anglo-Saxon derivation signifying "foreign nut," as the product came from the continent). A name applied to *Juglans règia* and its fruit, to us known mostly as

English walnut because the supply yearly reached America through England; also, by extension, to other species of the genus Juglans. The name is sometimes, but provincially, given to hickory-nuts.

The walnuts may be thrown into three horticultural groups: (1) The Persian or English domesticated species, *Juglans regia* (Fig. 3989), the walnut of commerce and of extensive cultivation in California and other parts of the United States. (2) The North American walnuts, of several species but chiefly known in the black walnut, *J. nigra* (Fig. 3990). (3) The East Asian walnuts, represented by *J. Sieboldiana* and allies, promising but yet little grown in this country. To the genus also belongs the butternut, *J. cinerea* (Fig. 3991), sometimes called white walnut. There is much promise of important cultural races in the species of Juglans, but the markets yet know practically only the nuts of *J. regia*. See *Juglans*, Vol. III.

L. H. B.

The walnut in California.

The extent of the present Persian or English walnut (*J. regia*) industry of California amounts to between 45,000 and 50,000 acres, or about 1,250,000 trees. An average crop for the past few years is about 12,000 tons, valued at $3,500,000. The crop for the year 1915 equaled 14,300 tons, valued at approximately $4,250,000 to the growers. The investment in the walnut industry of California represents about $45,000,000.

English walnuts may have first been planted in California by the Mission Fathers. However, it was not until after the coming of the first Americans that this industry attained any commercial importance. The present walnut industry is of comparatively recent origin and owes its establishment to the early efforts of Joseph Sexton, of Santa Barbara, and the late Felix Gillet, of Nevada City. The Santa Barbara Soft Shell seedlings and the several grafted varieties of this type all trace back more or less directly to the efforts of Sexton. The French varieties, such as the Mayette, Franquette, and the like, owe their popularity to the tireless work of the late Gillet in promoting the production of this type of walnut.

Commercial walnut-growing is largely centralized in the following counties mentioned in their order of importance: Orange, Los Angeles, Ventura, Santa Barbara, San Joaquin, and Contra Costa.

This industry is almost everywhere a specialized crop. It is seldom seen as one of two or more general farm crops, but, on the contrary, nuts are the one and only crop produced by many of the orchardists engaged in this industry. Success with this crop depends on the soil and climatic conditions and the availability of irrigation water. A deep rich alluvial loam containing plenty of humus is desirable. Groves planted on the light sandy loams or soils underlaid with a fluctuating water-table or a hardpan within 4 or 5 feet of surface are usually short-lived and unsatisfactory in the end. Although good drainage is imperative to a depth of at least 6 or 8 feet, irrigation water is necessary throughout most of the walnut areas of California for the best production of nuts.

The walnut industry has been most successful throughout the coast regions. In general, the high humidity and frequent fogs, together with a relatively small daily range in temperature, seem favorable to this crop. Walnuts grown inland are subject to sun-scald injury on both the nuts and the trees. The inland regions are subject to a very low humidity, an extreme maximum temperature and a wide daily range. Some of the more recently introduced varieties seem to endure the inland conditions better than the Santa Barbara Soft Shell seedlings. It seems very likely that the inland valleys may yet be devoted to this crop with the proper choice of varieties.

Clean culture, with the use of a winter cover-crop, is the most prevalent type of soil-management practised by the progressive growers. Such cover-crops as melilotus clover, vetch, and rye are often seen. These crops are usually planted immediately after harvest, the latter part of September or October, and should be nearly waist-high at the time they are plowed under, in the latter part of March or April.

3988. Wallichia disticha.

Irrigation water is applied by the furrow system in most cases, although occasionally a grove is watered by the basin method, where the land is level or where possibly a sod is grown in the grove throughout the year. From one to five or six applications of water are made in a season, depending on the moisture-holding capacity of the soil and local climatic conditions. Each irrigation should penetrate from 6 to 8 feet from the surface of the ground in order to reach the entire root-system. If the trees are irrigated a week or two before harvest, the shucks will open and remain on the trees, dropping the clean nuts to the ground. In case the trees are drought-stricken at harvest, the shucks are likely to become sunburned, stick to the nuts, and thus cause an increase in harvesting expense.

The larger number of growers do very little systematic pruning of the walnut except to remove the lower limbs which interfere with cultivation. Occasionally, however, a grove is to be seen in which the branches are annually thinned out. Such trees usually bear more nuts on the main limbs near their centers than the unpruned ones.

Companion crops in bearing groves are seldom seen, and in fact young groves, before they reach a bearing age, are sometimes handled with clean cultivation. The interplanting of young walnut groves with lima beans or other hoed vegetable crops, small-fruits, alfalfa, and occasionally apricots and peaches, is a common practice. Certain intercrops, as beans, if properly handled, will commence making returns immediately without detriment to the future walnut grove. Vegetable crops are preferable to tree crops for interplanting. Peaches and especially apricots have an apparent dwarfing effect on the young walnut trees. Their use may be profitable, however, in the end in spite of the injury caused.

The older plantings of walnuts were set too close together. Although 40 to 50 feet apart seemed ample room for development, it is very evident now that a distance of 60 feet is none too much for the larger-growing varieties on the rich loam soils which are best adapted to this crop. It is a matter of common observation to see the outside trees in a grove produce considerably more than the trees in the center. This leads one to believe that perhaps some of the older plantations might produce more walnuts today with fewer trees to the acre.

The older groves are composed entirely of seedlings, most of which are of the Santa Barbara Soft Shell type and trace directly or indirectly to the original trees grown by Sexton at Santa Barbara. It is only within a comparatively recent time, during the last ten to fifteen years, that the walnut has been propagated by budding and grafting in commercial quantities. During this time, a comparatively large number of varieties have been introduced and many of these have been discarded even thus early in the development of the industry. At the present time the following five varieties are being propagated to a greater extent than all other sorts combined: Placentia, Eureka, Franquette, El Monte, and Prolific. In general, the first two mentioned varieties compose nearly 70 per cent of the trees propagated at the present time in southern California nurseries.

3989. Juglans regia, the walnut of commerce. Often known as "English walnut."

The several black walnuts are used as rootstocks. The northern California species (*J. Hindsii*) is held in the greatest favor at present. This is a strong vigorous

3990. Black walnut.—Juglans nigra. On the right is the bare nut; on the left the husk not removed. (×½)

tree which will withstand adverse soil conditions much better than the Persian walnut itself. Very few eastern black walnuts (*J. nigra*) are used for propagation, as they are usually thought to be less vigorous than California species. The southern California black walnut (*J. californica*) is little used at present, although it was once popular (Fig. 3992). This species starts growth so much earlier in the spring than the Persian walnut that it suckers profusely when used as a rootstock. It is not so rapid-growing as the *J. Hindsii*. Some of the nurserymen are using the Royal hybrid as rootstock. The Royal hybrid is the name commonly given to a cross between *J. nigra* and either of the California species. Some observers think the Royal hybrid root more resistant to excessive soil-moisture and general adverse soil conditions than any other rootstock. The Paradox hybrid, which is a cross between *J. regia* and any of the black species, is an exceedingly vigorous rapid-growing tree. This hybrid can be obtained by planting black walnuts which were produced in the neighborhood of *J. regia* trees. Such nuts will produce from 50 to 90 per cent hybrid progeny. Although this hybrid makes an excellent root and produces an exceptionally large and vigorous tree, it is rather impractical for general use as it cannot be obtained in wholesale quantities.

The nursery propagation of walnuts is usually by crown-grafting in place. The black walnut root is grown one year in the nursery and grafted the second spring just before the leaves start to come out. A short whip-graft is used, tied in place by soft cotton twine or raffia. After tying, the graft and top of the cion are covered thoroughly with hot wax. Some additional protection is usually given to prevent the cion drying out excessively. This is done by covering with a paper bag or by hilling the soil over the union until growth starts. The young trees are staked in the nursery, as they are very supple, due to their rapid growth. The one-year-old trees are preferred by most planters and should be 6 to 10 feet high at this age. As the trees are set in the orchard, they are usually cut back to about 5 feet. Some growers in the inland sections, however, prefer to cut the trees back to 18 inches and then train one sprout from the trunk of the tree. This sprout is pinched back when it reaches a height of 5 feet. The method necessitates staking the trees. At the end of one season's growth such severely headed-back trees may be as large as though they were left 5 feet high in the beginning. The trees cut back to 18 inches grow much more vigorously than trees only moderately pruned.

The harvesting of walnuts is done largely by Mexican families who camp in the groves through the picking-season. A portion of the nuts fall naturally to the

ground and the remainder are shaken off by means of hooks attached to long poles. The pickers receive from 80 cents to $1 for 100 pounds for gathering the nuts and placing them in barley sacks. The nuts ripen through a period of a month or six weeks; therefore two or three pickings are made, followed by a gleaning of scattered nuts.

3991. Juglans cinerea of the eastern states. Sometimes known as white walnut. (×⅓)

The nuts are washed, dried (Fig. 3993), culled, and sacked on the farm. They are then delivered to a central packing-house to be bleached. This is accomplished by spraying with electrolyzed salt-brine, or dipping in a solution of chloride of lime and sal soda, to which sulfuric acid is added. Either process removes all discoloration from the shells and gives them a bright light tan color, attractive in appearance. There are many ways of handling the nuts after bleaching to hasten their drying. Some packing-houses pass the nuts through a warm air-current in long drums, thence they are elevated to the bins, where they arrive nearly dry enough to sack. Other houses dry the nuts for about twenty-four hours in wire or lath bins. By putting each grower's nuts into several bins as the nuts come from the bleacher, and then drawing from several bins at the time the nuts are sacked, a thoroughly mixed uniform product is packed in each bag. Each bag contains 100 pounds of nuts.

The grading of California walnuts has developed rapidly within the last decade, as compared with sales in the past of seedling nuts ungraded and unbleached, as plain walnuts; the grading has gradually reached a stage where part of the nuts are sold under their variety name and another larger portion is disposed of after being bleached and strictly graded according to size, shape, color of the meat, and quality of same. The California Walnut-Growers' Association has recently introduced a one- and two-pound carton and has standardized the product handled in this package as strictly as breakfast foods and canned goods are graded and packed.

Although the walnut industry has not an established reputation for profitableness which is comparable with citrous fruits of California, it has nevertheless maintained its position as a stable, conservative, permanent crop within this state. The income to the acre for this product will vary widely according to variety, soil, and climatic conditions as well as the personal element of management. Such incomes will fluctuate from $100 to $300 an acre. Whereas the average yield of walnuts for the state is between 800 and 1,000 pounds, the better groves will average from 1,500 to 2,000 pounds to the acre annually.

The future development of this industry seems to be drifting gradually inland, giving way in Orange and Los Angeles counties to citrous culture. The inland valleys were formerly thought to be poorly adapted to walnut-production because of the darkening of the meats by the intense hot sunshine; however, there are several sections which give promise for development along these lines with the proper choice of varieties adapted to these particular environments.

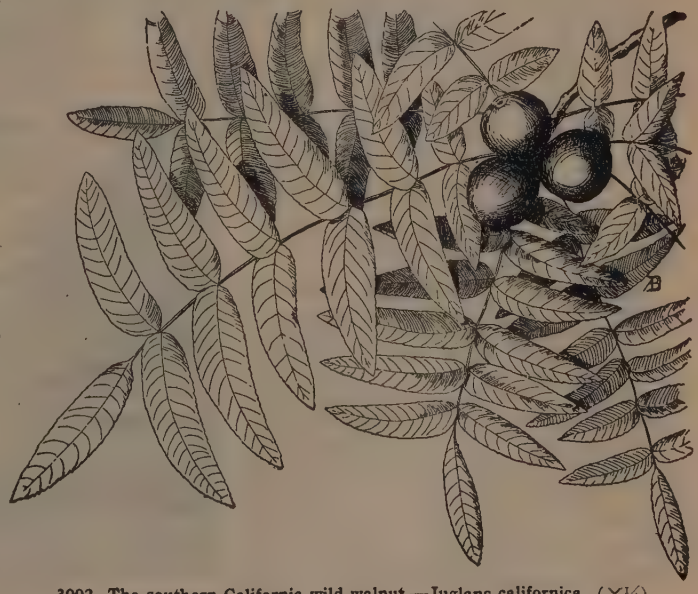
The walnut industry enjoys one of the most notable features of any fruit industry of the country, inasmuch as its product may be successfully stored awaiting disposal for a period of at least twelve months if necessary. This has given the industry a very stable character and has freed this product from the speculative manipulations which are frequently found in connection with the perishable fruit products. It is interesting to note that the importations of walnuts into the United States have gradually increased during the last ten years and within this same period the total production and the prices to the growers of California have also gradually increased. This may be taken as only one of many indications that the walnut is being looked on more and more as a necessary food by the people of this country.

From present indications, this industry is less liable to the dangers of over-production than almost any other agricultural or horticultural crop within the borders of the state.

The chief insect and fungous troubles of the walnut are the walnut aphis, and also the walnut blight or bacteriosis (*Pseudomonas juglandis*). The aphis may be controlled by means of tobacco sprays; this is rarely done, however, as the damage is only occasional. There is no means of control known at present for the blight or bacteriosis (Fig. 3995). The wide variation among seedling trees in their susceptibility to the disease gives promise of eventual relief through the selection of blight-resistant varieties. Minor losses are due to red-spider, codlin-moth, and melaxuma.

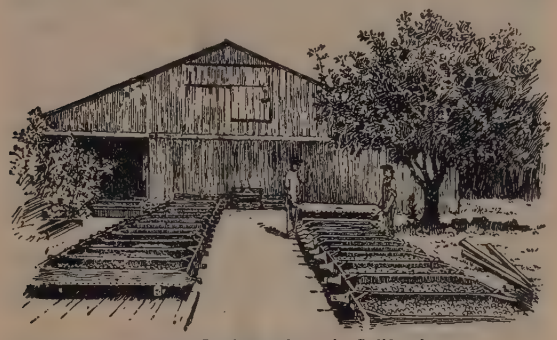
Bibliography.

Lewis, C. I., "The Walnut in Oregon," Oregon Agricultural Experiment Station Bulletin No. 43 (1906); "Walnut Special," Better Fruit, Vol. 4, No. 2 (1909). Wickson, E. J., "The English or Persian Walnut," California Fruits, pp. 510–24 (1910). Kraus, E. J., "A Method of Budding the Walnut," Oregon Agricultural Experiment Station Circular No. 16 (1911). Smith, R. E., "Walnut Culture and Walnut Blight," University of California Bulletin No. 231 (1912). Lake, E. R., "The Persian Walnut Industry of the United States," United States Department of Agriculture, Bureau of Plant Industry Bulletin No. 254



3992. The southern California wild walnut.—Juglans californica. (×¼)

(1913). Davidson, W. M., "Walnut Aphis in California," United States Department of Agriculture Bulletin No. 100 (1914). Tylor, A. R., "Spraying for the Control of Walnut Aphis," University of California Circular No. 131 (1915). Fawcett, H. S., "Melaxuma of the Walnut," University of California



3993. Drying walnuts in California.

Experiment Station Bulletin No. 261 (1915). Batchelor, L. D., "Problems in Walnut Breeding," Journal of Heredity, Vol. VII, No. 2 (1916). L. D. BATCHELOR.

Commercial possibilities of walnuts other than Persian in the United States.

Theoretically, the commercial possibilities of a number of walnut species in this country are large and encouraging. The genus Juglans, to which all true walnuts belong, either as native or as planted trees, covers practically every cultivated section of the United States wherever suited to hardwood growth. Apparently some of its representatives may be taken to many new small localities where it is now not found. The nuts of practically all species possess kernels rich in food properties and exceedingly pleasing to the taste. Most of its species are fairly rapid growers and develop into shapely trees. Rightly chosen and well cared for, they may be used most effectively as ornamentals and as nut-producers at the same time. The eastern black walnut, *Juglans nigra*, is exceedingly valuable for timber purposes, and its planting is now strongly urged by the foresters; to a large extent the various native walnuts and their hybrids make the best stocks now available for the Persian walnut.

Practically, there is little doubt but that each of these species will ultimately be developed for purposes of nut production, although in common with most new industries the progress will be slow and beset with more or less disappointment. It should be borne in mind that these walnuts are wild and uncultivated species and cannot be expected to respond to cultivation with the same readiness as species which have been selected and cultivated for centuries.

The principal problem now before the prospective planter appears to be one of varieties. It is well established that seedlings vary greatly in all essential characteristics and, therefore, are less desirable than are budded or grafted trees of suitable varieties. However, to date, there are fewer than a half-dozen varieties of black walnuts offered by the nurserymen, and so far as generally known, there is none of butternuts or other kinds of walnuts, exclusive of Persian. Therefore, for the present, planters must depend very largely on seedling trees, for which, although they are generally condemned by the leading horticulturists, there are at least four substantial reasons for using, as follows: (1) Budded and grafted trees are as yet offered by the nurserymen only to a very limited extent; (2) the available varieties are new and practically untried; (3) the prices necessarily asked by the nurserymen are beyond the reach of many who would otherwise plant walnut trees; (4) desirable varieties are liable to result from the planting of nuts from choice trees.

Definite steps are now being taken toward the development of these species and already some distinct progress has been made; but as yet it is very doubtful whether commercial planting of trees of any species of Juglans, other than *J. regia*, for purposes of nut production alone, is to be recommended. In general, it is unwise to attempt the growing of trees for the dual-purpose of timber and nut production, as for the former, the trees should be set close together in order to induce the development of long trunks with a minimum of top, while for the latter purpose, they should be given orchard space between in order to allow for the development of low heads, large tops, and a maximum fruiting surface. But in view of the uncertainty of outcome with any of the present available varieties and the value of black walnut timber, it is possible that trees of this species might wisely be planted at one-half or one-quarter the usual orchard distances apart, with the idea of allowing them to become forest trees, if for any reason the nuts should not justify their retention for orchard purposes. It is very doubtful whether any other species of walnut could be recommended for such use, as with the possible exception of the two forms of hybrids common in California, Paradox and Royal, no other species of walnut is now being seriously considered for forest-planting and, except in rare instances, neither of these Californian forms produces nuts of value in commercial quantities.

Without doubt, the most promising place for walnut planting at the present time is about the home grounds, both in the city and in the country, and along the fence-rows everywhere. Very often walnuts yielding both beauty and product could as well be planted as trees of other species capable of affording beauty and shade only. In the country, few grounds are so crowded that there is not room for a few walnut trees, which could be procured at small initial cost and which could be developed into useful trees at practically no further expense. If one-quarter of the American farmers were to plant even two walnut trees about their premises, it is difficult to estimate what would be the aggregate increased value to such farms by the end of a

3994. Walnut orchard in southern California.

quarter-century, but certainly it would be very appreciable.

Among the species of walnuts not usually under cultivation, but which give promise of commercial possibilities, some are discussed in the following:

The American black walnut, Juglans nigra.

As a producer of marketable nuts, this species now gives greater promise than does any other secondary species of Juglans. Its natural range extends from middle New England to north Florida, in the east, and from Minnesota to Texas on the west. Although best suited to deep fertile loams, moist yet well drained, it readily adapts itself to conditions less favorable. It attains its best development in the basin drained by the Ohio River but is common at practically all altitudes in the eastern states up to about 1,400 feet where it is superseded by the butternut. The tree is a symmetrical and fairly rapid grower; usually moderately productive and very useful both in the landscape and as a forest tree. The nuts usually are thick-shelled, and it is seldom that the kernels can be separated from the cracked shell in perfect halves. A few varieties, the kernels of which crack out more or less perfectly, are now listed by the nurserymen. The two best known are the Thomas, introduced from Pennsylvania in the early eighties, and the Stabler from Maryland in 1915.

The butternut, white or long walnut, J. cinerea.

In many respects, this species is similar to the preceding. Its northern range is somewhat more extensive than is that of the black walnut and its southern and western limits are less by about 300 miles. The tree is shorter-lived, not as symmetrical in form, nor as capable of adapting itself to unfavorable conditions, and the timber is of inferior value to that of black walnut. The nuts have thicker and rougher shells and are more difficult to crack but the kernels are more readily separated from the broken shells in perfect halves than are those of the former species. By many, the kernels of the butternut are much preferred to those of any other nut.

3995. Blight or bacteriosis of the walnut, as shown on fruits and leaves.

The Japanese walnut, J. Sieboldiana.

This species and its variety *cordiformis*, described in Vol. III, page 1723, as there explained do not breed true to type but revert to each other or to intermediate forms, and not infrequently to a type, the nuts of which are often practically indistinguishable from those of the butternut. These forms are now fairly common throughout much of the eastern and southern United States. The trees are dwarfish in habit, broadly spreading, ornamental, precocious, and usually prolific. A few varieties have been recognized and propagated to a limited extent, but so far as can be ascertained, none is now listed by the nurserymen. However, enough good strains may now be selected to cover practically every section of the United States, with the possible exception of the dry Southwest. The nuts vary in size and form, but typically are broadly rounded at the base, conical, and smaller than are those of *J. nigra*. When struck with a hammer, they tend to open at the suture, thereby breaking both half-kernels into quarters. Frequently, nuts of the cordiformis type open automatically at the apex, and with the aid of a knife-blade, the half-shells may be separated entirely and the whole kernel removed without breaking. In color, texture, and flavor of kernel, the Japanese walnuts are very similar to those of the butternut, *J. cinerea*.

Miscellaneous species of Juglans.

A species from northeastern China (*J. mandshurica*), the nuts of which are intermediate in form between those of *J. cinerea* and *J. Sieboldiana*, was introduced into the United States some years ago but is not yet sufficiently well tested to make possible a definite report. It should be hardy and therefore of value in the northern states. Aside from those already included, there are a number of species of Juglans which are more or less common in parts of the United States, but all are of minor importance, so far as nut production is concerned, and apparently of use only in sections where the better species are unadapted and as stocks for superior varieties. Among such are included *J. californica*, *J. Hindsii*, *J. major*, and *J. rupestris*. For full accounts of these species, see Vol. III, pages 1721 to 1724.

Juglans hybrids.

The various walnut species so freely interpollinate, when grown in close proximity to each other, that when pure strains are desired it is not safe to plant the nuts where there is danger of such pollination having taken place. The familiar Paradox and Royal of California, crosses of *J. regia* with any species of black, and of any California black with the eastern black, respectively, are typical examples of such natural hybridity. In the East, there are numerous crosses of *J. regia* with other species, viz., *J. intermedia* (*J. regia* × *J. nigra*); *J. quadrangulata* (*J. regia* × *J. cinerea*); and one between *J. regia* and *J. Sieboldiana*, which apparently has not yet been described. Frequently, individual trees of these forms are sturdy growers and make valuable stocks for other species, as already noted, but usually they are practically nonproductive and of little value to the orchardist.

C. A. Reed.

WANDERING JEW: *Zebrina pendula* and *Tradescantia fluminensis*. The common purple-leaved wandering jew of greenhouses, with pink flowers that open in sunshine, is *Zebrina pendula*, often confused with Tradescantia.

WARDIAN CASE. A nearly air-tight case with glass sides and top, used for transporting growing plants on long sea voyages, invented about 1836 by N. B. Ward, who wrote a book of ninety-five pages "On the Growth of Plants in Closely Glazed Cases," published at London in 1842. It provides the best and safest method of transporting potted and living plants across the ocean, as it insures the necessary light, protects the plants from salt spray and foul gases, and requires a minimum of care, as the plants need no watering. Such cases maintain nearly uniform conditions of temperature, moisture, and atmosphere. Similar cases are used in greenhouses for growing filmy ferns, dwarf foliage plants, and other small specimens that require a very moist and close atmosphere and invariable conditions.

WARPÙRIA (named after G. Warpur, who collected the genus). *Acanthàceæ.* Low perennial greenhouse herb, branching from the base: lvs. opposite, approximate, entire or nearly so: fls. minute, white, in dense many-fld. cymes, head-like, long-peduncled, collected in the axils; calyx hyaline, 5-parted, segms. narrow, posterior 3 distinct nearly to their base, anterior 2 con-

3996. Warscewiczella discolor. (×¼)

nate to their middle; corolla-tube rather cylindrical, limb minute, lobes 5, rotundate; stamens 4; disk annular; ovary 2-celled, cells 2-ovuled: caps. oblong, the upper third contracted into a beak.—One species, Madagascar.

clandestìna, Stapf. Plant about 4–5 in. high, pilose: st. short, prostrate or ascending: lvs. petioled, oblong or oblong-lanceolate, 2½–3 × ¾–1¼ in., acute or subacute at both ends: peduncles declinate, densely canescent; head ½–1 in. diam., white-pilose: calyx-segms. triangular-subulate from the base; corolla white, limb minute. Madagascar.

WÁRREA (named for Frederick Warre, who discovered the first species in Brazil). *Orchidàceæ.* Plants with the habit of small forms of Phaius. Lvs. few, long, plicate: scape tall, bracted, bearing a raceme of terminal showy fls.: sepals and petals subequal, concave, the lateral sepals united with the base of the column; labellum not spurred, united with the base of the column, undivided, concave, with longitudinal ridges; column without appendages; pollinia 4, with a narrow stipe. —Two species, Peru and Colombia. They require the same treatment as phaius.

bidentàta, Lindl. (*W. Lindeniàna,* Henfr.). Labellum regular, slit at the end; ridges convex, the central ones thinner and deeper: bracts one-fourth as long as the pedicels. Sept. Venezuela and Colombia. A.F. 6:655.

W. cyànea, Lindl.=Aganisia cyanea.

HEINRICH HASSELBRING.

WARSCEWICZÉLLA (from J. von Warscewicz, a Pole, collected in S. Amer. for Van Houtte; died 1866 in Cracow). *Orchidàceæ.* Orchids suitable for a cool-house. Fls. solitary, large, on a peduncle; sepals and petals similar, the lateral sepals forming a chin; lip jointed to the foot of the column, 2–5-lobed, with erect side lobes; and a transverse plate free from but lying upon the middle lobe; pollina 4.—About 10 species, from Costa Rica to Colombia and Peru. By some included in Zygopetalum.

díscolor, Reichb. f. (*Wárrea díscolor,* Lindl. *Zygopétalum díscolor,* Reichb. f.). Fig. 3996. Lvs. narrowly lanceolate, jointed, 9 in. long: scapes 1-fld., shorter than the lvs.: sepals spreading, lanceolate, white; petals shorter, ovate, white with a tinge of purple, half-spreading; labellum large, broadly obovate, somewhat convolute, white, changing to deep purple toward the disk, and having a whitish or yellowish crest. Cent. Amer. B.M. 4830.

Wéndlandii, Hort. (*Zygopétalum Wéndlándii,* Reichb. f.). Lvs. tufted, lanceolate: fls. 4–5 in. across, solitary, on a scape 3–4 in. long; sepals and petals lanceolate, somewhat twisted, greenish white; labellum ovate, cordate, undulate, white, streaked and spotted with violet-purple; apex revolute, crest semi-circular, violet-purple.

W. aromática is offered by Lager & Hurrell. Apparently little known. Described as having white fls., with an azure lip, white-bordered. Said to come from Costa Rica.

GEORGE V. NASH.

WASHINGTÒNIA (named for George Washington). *Palmàceæ,* tribe *Córypheæ.* Tall North American palms, making noble specimens for planting in California and similar regions.

Trunks clothed above with remains of the sheaths and petioles: lvs. terminal, ample, spreading, orbicular, flabellately plicate, lobed nearly to the middle; segms. induplicate, filamentous on the margins; rachis short; ligule large, appressed; petiole long, stout, plano-convex, very spiny along the edges: spadices long, copiously paniculately branched, glabrous: branches slender, flexuous; spathes long membranous, split, glabrous: fls. white: fr. small, ellipsoid, black drupe, with a thin and sweetish rather dry pulp; seed brown, oblong to oblong-ovate, flattened, excavated or wrinkled on the raphal face.—Species 3, now recognized, Ariz., S. Calif., and Mex.

Probably the oldest use of the generic name Washingtonia is by Rafinesque in 1818 for the umbelliferous plants commonly known as Osmorrhiza; it was also once proposed for the Sequoias; and the name Neowashingtonia has been advanced for these palms. However, the use of Washingtonia for the palm is too well established to warrant the change. Parish, who has recently studied these palms, retains the name Washingtonia as the only tenable one, discarding the name Washingtonia when applied to the sequoias and also when used for the osmorrhizas on what he considers to be sound nomenclatorial grounds (Bot. Gaz. 44, pp. 408–434, 1907). His systematic treatment of the genus is followed in the present account.

The washingtonia that is best known in the wild is *W. filifera* var. *robusta.* The finest grove occupies the narrow palm cañon for a mile or more, 22 miles east of

CXVIII. Washingtonia filifera var. robusta.

Banning, Riverside County, California. This is the largest group of indigenous fan palms in the United States, and the only grove of important size on the Pacific side of the United States. The grove contains thousands of trees, some of them nearly 100 feet high. There are many young ones of all sizes and the older trees are still vigorous. Most of the cañons of the desert bases of San Jacinto, according to Parish, contain these palms; and a few grow in the cañon of the White Water River, which is the western limit of the species. The southern limit is probably Carrizo Creek, San Diego County, and the northern at Corn Springs in San Bernardino County. Except in trees protected in cultivation, old specimens are rarely seen bearing the great shaggy mass of dead hanging leaves, for they are burned off by Indians or take fire by accident; even in cultivated trees, the mane is usually cut away to give the plants a neater appearance but much of the characteristic beauty of the palm is then lost. Parish writes that "the functional life of a leaf is about one year. How long the dead leaves would remain attached to the trunk if undisturbed cannot be stated; probably for a very long period."

The washingtonias are much planted in California, thriving even in the climate about San Francisco Bay. In southern California they attain great size and comprise a characteristic feature of the landscape. They grow readily from seeds, but the trunks rise slowly. Two species are commonly planted, *W. filifera* var. *robusta*, with leaves bearing many filaments or threads on the edges and in the sinuses, and *W. gracilis* which is practically devoid of filaments.

A. *Petiole prolonged into the blade with an acuminate point.*
B. *Blade of lf. abundantly supplied with threads or filaments* ..... **filifera**
BB. *Blade nearly or quite destitute of filaments or threads* ..... **gracilis**
AA. *Petiole obtuse at its top where it joins the blade* ..... **Sonoræ**

filífera, Wendl. (*Bràhea filamentòsa*, Hort. *B. filífera*, Hort. *Pritchárdia filamentòsa*, Wendl. *P. filífera*, Hort.). Margins of the petioles armed up to the middle or somewhat beyond with stout hooked spines, but naked above: st. cylindrical, 20–40 ft., enlarged at the base (2–3 ft.), covered with persistent petiole-bases: petioles 2–5 ft. long, 1–2½ in. wide at the summit, glabrous, plano-convex; ligule large, glabrous, lacerate; blade circular, tomentose on the margins of the many segms., 3–5 ft. diam., cleft on the upper side nearly to the middle, gray-green; segms. margined with numerous fibers 6–12 in. long: seed flattened on the raphal face. Probably S. Calif. and W. Ariz.—Cult. on the Riviera, S. France, but not distinguished in this country.

Var. **robústa,** Parish (*W. robústa*, Wendl. *W. filífera*, Hort., not Wendl. *Neowashingtònia filamentòsa*, Sudw.). Fig. 3997. The palm usually cult. in this country as *W. filifera*, whereas the one cult. as *W. robusta* is really *W. gracilis:* margins of petiole armed throughout: trunk stout, enlarged at base, 60–90 ft. tall: petioles stout and erect until old, 3–5 ft. long, the upper surface concave; ligule paper-like, acuminate and torn; lf.-blade 3–5 ft. across, with 60–70 folds, cleft two-thirds to the base, the margins with abundant threads: panicle declined, exceeding the lvs., the infl. dense, but in fr. becoming diffuse or open: fls. with heavy odor: seed excavated on raphal face. Borders of the Colorado Desert in S. Calif., at low altitudes.—The commonly planted Washingtonia in Calif. with filiferous lvs. The portraits in horticultural magazines are mostly not clearly referable.

Var. **microspérma,** Becc. Cult. in the Riviera but yet undiscovered in the wild, differing in smaller stature, and margins of petioles armed only at base: seed flattened on raphal face.

grácilis, Parish (*W. robústa*, Hort., not Wendl.). A slender-trunked palm, to 80 ft. or so, the lvs. nearly or quite destitute of filaments: petioles 2–3 ft. long, rather convex on upper surface, the hard margins armed with short yellow hooked spines for the entire length, the top acuminate where it joins the blade; ligule paper-like, narrow, entire; lf.-blade about 3 ft. diam., with 75–80 folds, cleft little more than one-third toward base: peduncle declined, exceeding the lvs.: fls. nearly sessile: seed broad-ovate, about ¼in. long, somewhat rugose or wrinkled on the raphal face. Probably native in northern Low. Calif.—From the *W. filifera* group this tree is distinguished by its slender trunk, smaller and less deeply divided shorter-stalked lvs. which bear no filaments or threads except now and then one in the sinuses of some of the folds.

3997. Old tree of Washingtonia filifera var. robusta.

Sonòræ, Wats. (*Neowashingtònia Sonòræ*, Rose) Top of petiole obtuse where it joins the blade, the latter abundantly supplied with filaments: st. 25 ft. high, 1 ft. diam.: lvs. 3–4 ft. diam., somewhat glaucous, very filiferous; petioles 3 ft. long, very slender, 2 in. wide at base, ¾in. at apex, floccose-hairy along the margins and with stout curved spines: fr. ¼in. long, edible. Guyamas and Low. Calif., Mex.—Yet imperfectly known in cult. L. H. B.†

WATER ALOE: *Stratiotes aloides.* **W. Arum:** A name sometimes applied to *Calla palustris.* **W. Beech:** *Carpinus caroliniana.* **W. Caltrops,** or **Water Chestnut:** *Trapa natans.* **W. Chinkapin,** or **Chinquapin:** *Nelumbo lutea.* **W.-Cress:** *Cress* and *Roripa Nasturtium.* **W. Hyacinth:** *Eichhornia.* **W.-Leaf:** *Hydrophyllum.* **W. Lemon:** *Passiflora laurifolia.* **W.-Lettuce:** *Pistia Stratiotes.* **W.-Lily:** *Nymphæa.* **W. Milfoil:** *Myriophyllum.* **W. Oak:** *Quercus nigra,* commonly known as *Q. aquatica.* **W. Oat:** *Zizania* [illegible]*clus-*

tris. W.-Planta'n: *Alisma Plantago-aquatica.* W. Reed: *Arunda.* W. Pest: *Elodea canadensis.* W.-Shield: *Brasenia Schreberi.* W. Soldier: *Stratiotes aloides.* W.-Thyme: *Elodea canadensis.* W.-Weed: *Elodea canadensis.*

WATER-GARDENING: *Planting*, Vol. V, p. 2668.

WATERING. The watering of plants usually exhibits the skill, or the lack of it, of the gardener. It is a practice that cannot be well explained in print, although a few general statements may be made.

An abundant and convenient supply of pure fresh water should always be a first consideration in locating a garden or greenhouse. Having this, the next matter is knowing how to use it, for here, good gardeners say, lies nine-tenths of the elements of success. Certain it is, especially in the indoor cultivation of plants, that more depends on knowing when to give or withhold water than on any other single matter. The art of watering is unteachable; it requires experience, judgment, skill. Some knowledge of the commoner facts of vegetable physiology, physics, and soil physics will be helpful, but even then experience will be necessary.

In American gardens watering is usually performed with a hose from a stored water-supply. Two common types of watering-cans are shown in Fig. 3998.

A fairly safe guide to watering is: never water plants until the soil has become dry, though not "powder-dry," and then give them a thorough soaking. Plants dislike a continuously wet soil. In the care of plants in earthenware vessels, a useful test is to thump the jar. If it rings the soil is dry; if the sound produced is dull the soil is sufficiently moist. Such rules, however, are only for the novice. They presuppose activity of growth, and take into account only one consideration aside from this, and that is the condition of the soil as regards moisture. The experienced gardener reads his practice in his plants and the conditions under which they are being kept. The following suggestions are based on the most important considerations.

Actively growing plants may be watered very freely, as a rule, whereas in a dormant or semi-dormant state the same plants will require only occasional waterings. Soft-stemmed or rapid-growing plants ("soft-wood" and "herb-like" plants), and those with large leaves, need, as a rule, an abundance of water when growing actively. Hard-wood or slower-growing plants, with smaller leaves, must be watered with greater care. Soft-wooded plants, with some exceptions, may at times even flag somewhat for want of water, and recover without permanent injury when a fresh supply is given. Hard-wooded plants, as camellias, azaleas, and heaths, on the other hand, suffer permanent injury from becoming too dry. It is safest to allow no plant in active growth to flag.

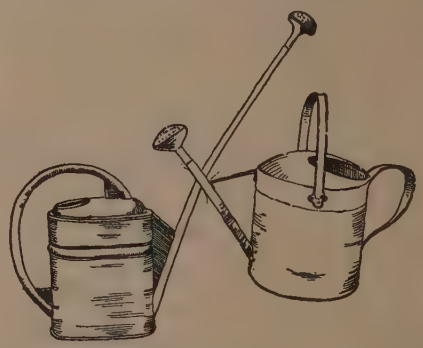
The amount of foliage affects the plant's capacity for using water. Plants which have been cut back, or which from disease, insects, or other causes, have lost most of their foliage, must be kept drier until they have regained their foliage. Unhealthy plants are benefited, as a rule, by being kept rather dry until they begin to show signs of renewed vigor.

Small cuttings, or any plants freshly potted or newly transplanted, are not in condition to use much water until the root-hairs have attached themselves to the soil-particles and growth has begun. A thorough watering at the time of potting or repotting the plants, especially if they are subsequently shaded for a few days, is usually sufficient until they have become established.

The character and bulk of soil should be kept in mind. Porous and warm soils dry out much sooner, while the heavier clay soils are in danger of becoming water-logged and sour unless watered with care. When there is a large mass of soil in proportion to root-development, as in the case of greenhouse beds newly set with young plants, care must be used in watering until the soil is occupied with roots.

Serious trouble often begins in the greenhouse from a heavy watering at the beginning of a period of dark muggy weather. Not only does such watering do damage to the soil and roots, but the excessive humidity of the air about the plants and its weakening effect on their tissues invite the attacks of various mildews, fungi, and insect pests.

The time of day is important. In the greenhouse in winter free ventilation is usually impossible. At night there is a tendency toward a damp atmosphere. Careful florists, therefore, water in the early part of the day at this season, so that the house will have become somewhat dried out by nightfall. It is seldom advisable to let plants under glass go into the night with wet foliage. It gives the fungi a chance. Especially hazardous is it to water cutting benches or boxes of young seedlings late in the day in the winter season. The various damping-off fungi find under such treatment the condition suitable for their development. Excessive humidity on the interior of a closed plant-house is most likely to occur in moderate weather. During severe weather the condensation upon the glass is large and renders the air of



3998. Watering-cans, capacity 3 to 4 gallons. Used chiefly for sprinkling seed-beds or newly potted small seedlings and cuttings; for use on older plants the "rose" is commonly removed. The can on the left, flattened on the sides, is generally preferable. It can be carried in greenhouse walks and in narrow rows. The long spout enables the operator to apply the water directly to the roots; and the greater force of the discharging water makes a better spray from the "rose."

the house drier. During summer, when there is free ventilation, the watering may advantageously be done late in the day. Midday watering at seasons when the sunshine is very bright is often followed by scalding of the foliage unless the plants are well shaded. Ferns, Rex begonias, Chinese primroses and richardias are among plants easily injured in this way.

Consider the temperature at which the plants are kept, the position of the heating-pipes, the amount of light, and the freedom of ventilation permissible in watering plants in glasshouses. It is better, as a rule, to have the watering conform to these conditions; but frequently the practice must be reversed.

The temperature of the water exerts a marked effect on the growth, flowering, and fruiting of plants. It is now held that, in general, the water should be of a temperature close to that of the air in the house where the plants are growing, or about 10° F. below.

Watering may be indirect. Shading the glass of greenhouses in summer with some suitable material is much practised by florists for the purpose of sheltering plants from too great intensity of light, and for the purpose of reducing evaporation and transpiration. Certain kinds of plants, as palms, and some kinds of ferns, require this; also newly potted plants. Syringing of walks, by reducing the temperature and increasing the humidity of the air, also tends to reduce transpiration and save watering. Watchfulness and attention to ventilation are necessary, however, to avoid exces-

sive humidity, which tends toward a soft watery growth and extreme sensitiveness and susceptibility to disease.

Vessels to contain plants should always be provided with openings at the bottom for perfect drainage. This, in a measure, is a safeguard against overwatering. Investigation has shown that a soil which is kept continuously wet through bad drainage or otherwise is rapidly impoverished through loss of nitrogen. A fermentation is also set up in the roots, which, through the formation of various deleterious products, results in their destruction.

While a constantly wet soil is always very objectionable, thoroughness in watering as often as the plants need water is of the greatest importance. When enough water has been supplied there will be more or less dripping from the bottom of the pot. It is a good plan to leave a space of 1½ to 2 inches or more at the top of the pot, according to its size, for the reception of water. This space should be so large that when filled the supply of water in soaking downward will penetrate to the bottom of the vessel.

Plunging the pots or tubs is a means of controlling the water-supply. The late William Scott gives the following advice on this practice: While it is true that most of the water given to the plant passes through the soil and escapes from the hole in the bottom of the pot, yet much that is left in the soil—which is considerable if the soil is saturated as it should be—is evaporated from the porous sides of the earthenware pots. In warm sunny weather, plants in small pots, standing on a bench, dry out very quickly. This can be avoided by plunging the pots in some material, as coal-ashes, tan-bark, or, better than all, spent hops. When plunged to the rims, only half of the surface-watering is needed, and the advantage of less watering is shown by a marked improvement in the health and vigor of the plants. Such a benefit is this plunging that plants which would otherwise need a shift into a size larger pot can be carried along another month in perfect health. This applies more particularly to quick-growing soft-wooded plants, geraniums more especially, for these are quickly exhausted by too frequent waterings.

In watering beds in the open ground and lawns, the chief consideration is thoroughness. Superficial waterings induce the formation of roots near the surface. Neglect and subsequent drought then prove more disastrous than ever. The evening is the best time for surface sprinkling. Watered in the heat of the day, grass and various other plants are likely to have the foliage injured. Ordinarily it is better to avoid watering beds of plants in the open ground if possible or delay it until really necessary, and then water thoroughly. Other references to watering may be found in the article "Greenhouse Management," beginning on page 1408, Vol. III; see also "Sub-irrigation in the Greenhouse," page 1684.

ERNEST WALKER.

WATERMELON: *Melon*, Vol. IV, page 2031.

WATSÒNIA (named for Sir Wm. Watson, M.D., 1715–1787, electrician and professor of botany at Chelsea). *Iridàceæ*. Tunicate bulbous herbs, much like gladiolus, used in the garden for summer bloom.

Stems usually tall: lvs. long, sword-shaped: spikes long, simple or slightly branched; spathes lanceolate oblong or narrow, usually numerous: fls. 1 to a spathe, sessile; perianth-tube curved, broadened above, lobes subequal, ovate, oblong or lanceolate; stamens affixed within the throat; ovary 3-celled, cells many-ovuled: caps. globose, ovoid or short-oblong, loculicidally 3-valved.—About 33 species, S. Afr. The main differences between Watsonia and Gladiolus, from the horticultural as well as botanical points of view, are the longer tube and regular fl. of Watsonia, 3 of the 6 perianth-segms. in Gladiolus being usually different in size, shape, and direction of spread. An important botanical difference is that the style-branches of Watsonia are simple, while those of Gladiolus are bifid.

Watsonias bloom from July to September and have scarlet, rose, or white six-lobed flowers, with usually a long slender tube which is bent near the base. They are very much like gladioli, having the same kind of a corm, the same sword-shaped rigid leaves, the same kind of a spike and the same season of bloom. It is, therefore, a great mistake to suppose that they are suited only to greenhouse cultivation. Great interest has been aroused in watsonias by the introduction of the white watsonia, known to the trade as *W. Ardernei*. The plant might be roughly described as a white gladiolus. It grows 3 to 4 feet high, strong specimens being branched, and bears a dozen or more flowers, each 2½ to 3 inches long and about 3 inches across. The purity of its color and its value for cutting make it of exceptional interest to florists. There are other white-flowered forms of watsonia, but none of them seems to be in the American trade. Pure white is the exception in the iris family, while it is a common, if not dominant, "color" in the lily and amaryllis families. The white watsonia has acquired so many names that a short historical sketch of the plant is desirable. All the stock in the trade at present is supposed to be descended from plants cultivated by H. W. Arderne, of Cape Town. The original bulb was found 80 miles away in a peat-bog amongst thousands of the common pink-flowered kind. In October, 1892, Arderne had 400 spikes in bloom and in March, 1893, some of his plants were pictured in "The Garden" under the name of *Watsonia alba*. However, a pure white-flowered form had been previously found near Port Elizabeth and a bulb sent to J. O'Brien, of Harrow, flowered in England in 1889 and was then fully described as *W. iridifolia* var. *O'Brienii*, the name adopted in this work. In the recent discussions of the plant, the fact has been overlooked that T. S. Ware, of Tottenham, cultivated a white variety in 1880, it being figured in "The Garden" for that year as *Watsonia alba*. A nearly white form was cultivated in England as early as 1801, but the tube was pinkish outside and there was a rosy spot at the base of each perianth-segment. William Watson, of Kew, was the first to emphasize the close horticultural parallel between Watsonia and Gladiolus and to urge the whole group on the attention of the plant-breeder. This suggestion, coming from the man who may be said to have created the modern Cape primrose or streptocarpus, should result in another fine race of hybrids before many years. However, the Watsonia "bulb" is not so easily and safely stored as that of Gladiolus.

A. *Upper part of tube cylindrical or narrowly funnel-shaped.*

B. *Length of perianth-segms.* ⅓–½*in.*

aletroìdes, Ker-Gawl. Bright scarlet or pale pink-fld. species, 1–2 ft. high, remarkable for the short perianth-segms.: st. simple or branched: spikes 6–12-fld. B.M. 533 (rosy scarlet, splashed with cardinal, the inner segms. white at the tip).

BB. *Length of perianth-segms.* ¾*–1 in.*

C. *Sts. tall, 3–4 ft., often branched.*

D. *Spikes lax, 12–20-fld.*

E. *Fls. scarlet.*

angústa, Ker-Gawl. (*W. iridifòlia* var. *fúlgens*, Ker-Gawl.). Scarlet-fld. species distinguished from *W. Meriana* by the color of the fls. and by the shape of the perianth-segms. In *W. angusta* the segms. are decidedly acuminate, while those of *W. Meriana* are more nearly oblong and come to a point suddenly; also the style of *W. angusta* reaches to the tip of the perianth-segms., while in *W. Meriana* it does not. B.M. 600. Gn. 17:390 (as *W. Meriana* var. *coccinea*); 44:164. Gn.W. 21:683.

EE. *Fls. rose-red or white.*

F. *Lvs. ½–¾in. wide: spikes about 12-fld.*

Meriàna, Mill. This seems to be the dominant species of the genus and hence the most variable and the one most interesting to the plant-breeder. In its widest sense it includes *W. iridifolia,* but for horticultural purposes it will be convenient to consider the latter a distinct species. *W. Meriana* is best restricted to the commonest type at the Cape, which is a rose-fld. species 3–4 ft. high, the st. usually branched, lvs. ½–¾in. wide, and the spikes 12–20-fld. This is the plant figured in B.M. 418 as *Antholyza Meriana.* Gn. 17:390 is more typical in color. The white-fld. form, which is rarer in nature, is treated under *W. iridifolia.* Baker says that there are scarlet-fld. forms of this species, but he gives them no name, and it is probable that all such should be referred to *W. angusta.*

FF. *Lvs. wider: spikes denser, 20-fld. or more.*

iridifòlia, Ker-Gawl. (*W. Meriàna* var. *iridifòlia,* Baker). This is treated by Baker as a variety of *W. Meriana* characterized by broader lvs. than the type: fls. closer and more numerous, white or pinkish. For horticultural purposes it will be convenient to treat it as a distinct species and restrict the name to the pink or rose-colored type.

Var. **O'Brìenii,** N. E. Br. (*W. álba,* Hort. *W. O'Brìenii,* Mast. *W. iridifòlia* var. *álba,* Wm. Robinson. *W. Árdernei,* Hort. *W. Árdernei* var. *álba,* Hort. *W. Meriàna* var. *álba,* Hort. *W. Meriàna* var. *Árdernei,* Hort.). WHITE WATSONIA. A variety with pure white fls., discussed on page 3509. Gn. 17:390; 43, p. 229; 51, p. 284; 61, p. 89; 72, p. 17. J.H. III. 29: 219. G.C. III. 11:305; 19:143; 52:129. A.G. 20:573. G. 26:235; 37:285. R.B. 27, p. 33. G.M. 49:477. G.L. 27:180. R.H. 1910, pp. 504, 505.

DD. *Spikes dense, 30–50-fld.*

densifiòra, Baker. This very distinct and handsome rose-colored species more nearly resembles a gladiolus than any other by reason of the density and regularity of its pyramidal infl.: sts. unbranched, 2–3 ft. high: spikes a foot long: fls. bright rosy red. B.M. 6400.—There is a choice variety with pure white fls. Var. **álba,** Hort., was intro. as early as 1891.

CC. *Sts. shorter, mostly 1–2 ft., unbranched.*

D. *Tube 1½–2 in. long.*

coccínea, Herb. This showy scarlet-fld. species differs from *W. Meriana* in its st. being shorter and unbranched, the spikes fewer-fld., and the styles a trifle longer: st. 1 ft. high: spikes 4–6-fld.: corolla-tube elongated, longer than the limb, the lobes spreading, oblong, acutish. B.M. 1194 (*W. Meriana* variety). J.H. III. 53:61.

DD. *Tube 1½–2 in. long.*

hùmilis, Mill. This species has rose-red fls. apparently the same size and color as *W. densiflora* but only 4–6 in a spike and the st. only a foot or so high: corolla-lobes oblong-lanceolate, acutish. B.M. 631.—A variegated form figured in B.M. 1193 as *W.ròseo-álba* has a spike of 8 flesh-colored fls. with broad bands and splashes of scarlet.

AA. *Upper part of tube short and broadly funnel-shaped.*

rôsea, Ker. Robust rose-colored species, growing 4–6 ft. high and the fls., though fewer than those of *W. densiflora,* are perhaps capable of greater size: spikes about 15-fld.: lvs. lorate-lanceolate: corolla-limb nodding, subcampanulate. B.M. 1072. G. 26:445. Gn. 77, p. 484. J.H. III. 44:162.

WILHELM MILLER.
F. TRACY HUBBARD.†

WATTLE: *Acacia.*

WAXBERRY: *Symphoricarpos.* **W. Myrtle:** *Myrica cerifera.* **W.-Palm:** *Ceroxylon* and *Diplothemium.* **W.-Plant:** *Hoya carnosa.* **W.-work:** *Celastrus scandens.*

WEDÈLIA (Georg Wolfgang Wedel, professor at Jena, Germany, 1645–1721). *Compósitæ.* Scabrous-pubescent or hirsute, annual or perennial herbs or subshrubs, suitable for growing in the greenhouse: lvs. opposite, usually dentate, rarely 3-cleft or entire: head heterogamous; ray-fls. male, disk-fls. fertile or the innermost sterile; involucre ovoid, campanulate or somewhat hemispherical, bracts in 2 rows; corolla yellow, male ligulate, spreading, apex entire or 2–3-toothed, female regular, tubular, 5-toothed or shortly 5-cleft: achenes glabrous or pilose, smooth or tuberculate, cuneate-oblong or obovate.—About 70 species, natives of the warmer regions of the world.

oblónga, Hutchins. Glandular-hairy herb, up to nearly 3 ft. high: lvs. oblong or oblong-lanceolate, acute, 3–3½ x ¾–1 in.: peduncles 1½–2 in. long: fl.-heads lemon-yellow, 1½–2 in. diam.; outer bracts leaf-like, inner somewhat scarious; ray-florets about 12, 3-toothed. British E. Afr.

To this genus, Pascalia is referred by recent authors. *P. glaùca,* Orteg., is from Chile, probably not in cult. The plant cult. under this name in England, and once offered in this country, is probably the plant shown in P.M. 8:125, which is thought to be a Helianthus. It is not hardy and there seems to be little reason for cultivating it here where there are so many hardy sunflowers. *P. glauca* is an herbaceous perennial, with opposite linear-lanceolate lvs., the upper ones entire and lower ones irregularly dentate: heads terminal and solitary, yellow-rayed.

WEEDS. A weed is a plant that is not wanted. There are, therefore, no species of weeds, for a plant that is a weed in one place may not be in another. There are, of course, species that are habitual weeds; but in their wild state, where they do not intrude on cultivated areas, they can scarcely be called weeds. The common pigweed and the purslane are sometimes vegetables, in which case potato plants would be weeds if they grew among them.

It would have been a sorry thing for agriculture if there had been no weeds. They have made us stir the soil, and stirring the soil is the foundation of good farming. Even after we have learned that crops are benefited by the stirring of the land, we are likely to forget the lesson or to be neglectful of it unless the weeds constantly remind us of it. Necessity is always the best schoolmaster; and of these necessities, weeds are amongst the chief.

The one way to destroy weeds is to practise good farming. Judicious tillage should always keep weeds down in cultivated lands. In idle lands weeds are likely to be a serious nuisance. In sod lands they are also likely to take the place of grass when for any reason the grass begins to fail. The remedy for weeds in grass lands, therefore, is to secure more grass. In order to do so, it may be necessary to plow the land and reseed. In some cases, however, it is only necessary to give the land a light surface tillage, to add clean and quickly available fertilizers, and to sow more grass seed. This is the fundamental remedy for weeds on lawns. If such weeds are perennial, as dandelion and plantain, it is advisable to pull them out; but in order to keep them out, a stiffer sod should be secured. The annual weeds that come in the lawn the first year are usually destroyed by frequent use of the lawn-mower.

Foul lands may usually be cleared of weeds by a short and sharp system of rotation of crops, combined with good tillage in some of the crops of the series. When the land for any reason is fallow—as when it is waiting for a crop—surface tillage with harrows or cultivators will serve to keep down the weeds and to make the land clean for the coming crop. Often lands that are perfectly clean in spring and early summer become foul in the fall after the crops are removed. Cleaning the land late in the season, therefore, may be one of the most efficient means of ridding the place of weeds. Coarse and rough stable manure, which is not well rotted, may also be a conveyer of weed seed. The seeds of weeds are sometimes carried in the seed with

which the land is sown, particularly in grass and grain seeds.

It does not follow that weeds are always an evil, even when they are abundant. In autumn a good covering of weeds may serve as an efficient cover-crop for the orchard. They are likely to entail some extra care the next year in order to prevent them from gaining a mastery, but this extra care benefits the orchard at the same time. It is, of course, far better to sow the cover-crop oneself, for then the orchardist secures what he wants and of the proper quantity and at the right season: but a winter cover of weeds is usually better than bare earth.

From the above remarks it will be seen that weeds are scarcely to be regarded as fundamental difficulties in farming, but rather as incidents. In the most intensive and careful farming the weeds bother the least. There should be a careful oversight of all waste areas, as roadsides and vacant lots. The greatest difficulty arises on commons and waste land, not on farms.

Weeds are often troublesome in walks, particularly in those made of gravel. If the walk were excavated 2 feet deep and filled with stones, rubble, or coal-ashes, weeds cannot secure a foothold. It is particularly important that gutters be not laid directly on the soil, else they become weedy. There are various preparations that can be applied to walks to kill the weeds, although, of course, they also kill the grass edgings if carelessly applied. Strong brine, applied hot, is one of the best (one pound of salt to one gallon of water). There are also preparations of arsenic, vitriol, lime, and sulfur, known as herbicides. For identification of weeds and means of control, see Georgia's "Manual of Weeds," New York, 1914.

L. H. B.

WEIGÈLA, WEIGÈLIA: *Diervilla.*

WELDENIA (for Ludwig von Welden, an Austrian army officer, wrote on natural history; 1780–1853). *Commelinàceæ.* Tuberous-rooted herb, suitable for the greenhouse: lvs. numerous, grouped at the top of the st., forming a sort of involucre about the fls.: cymes very densely fasciculate, sessile among the lvs.; calyx sessile, 1½ in. or less long, membranaceous, long and laxly tubular, often spathe-like, split, apex shortly 3-cleft; corolla-tube slender, much longer than the calyx, lobes broad, spreading, subequal; stamens 6; ovary ovoid.—One species. **W. cândida,** Schult. f. St. short, simple: lvs. 6–8, strap-shaped, 2–6 in. long, with folding bases, pale green: fls. snow-white, 1 in. diam., solitary on erect scapes. Mex. and Guatemala. B.M. 7405.

WÉLFIA (named in honor of the English royal family). *Palmàceæ.* Unarmed palm, with a thick tall reed-like caudex, suitable for the warmhouse: lvs. terminal, pinnatisect; segms. coriaceous, strongly narrowed at base, apex entire or acuminately cut, many-nerved, plicate: spadices stout, pendulous; spathes 2, deciduous: fls. in deep hexagonal depressions, monœcious; male asymmetrical, sepals lanceolate, acute, petals broadly ovate, obtuse, stamens numerous, ovary rudimentary; female about equaling the male, compressed, sepals free, cymbiform-lanceolate, acuminate, petals much larger, 2 lateral cymbiform wing-keeled, dorsal narrower, flat, staminodes in a conical cup, ovary conical-subulate, 3-celled: fr. oblong, compressed, about 2 in. long, dark violet.—Two species, Cent. Amer. and Colombia. *W. règia,* H. Wendl. Up to 60 ft. high: lvs. when young divided almost to the base into a pair of oblong acuminate lobes, having a bronzy tint, at length becoming pinnatisect, borne on slender petioles; adult lvs. about 20 ft. long, pinnæ numerous, narrow, unequal, decurrent on the angular rachis, whitish beneath. G.C. 1870:764. F.M. 1873:60. I.H. 18:62.

WELLINGTÒNIA: *Sequoia.*

WELWÍTSCHIA (Dr. Friedrich Welwitsch, 1806–1872, botanical traveler, who brought this remarkable plant to notice). *Gnetàceæ.* One of the most singular of plants, sometimes seen in the dried state in museums and rarely grown in botanic gardens.

The plant consists essentially of 2 persistent woody lvs. lying near or on the ground, the ends becoming much frayed (at one time supposed to be persistent cotyledons), and from the center or crown the cone-like fructification arises. It may be described as follows: A low woody plant, sometimes grown as an oddity: st. or trunk thick, cone- or top-shaped, usually somewhat raised above ground, more or less 2-lobed, said to be sometimes 14 ft. in circum.: lvs. 2, lasting the life of the plant, linear at first, later splitting into many sections: infl. axillary, paniculate, dichotomously branched, the branches ending in 4-angled ament-like spikes which are colored: fls. dioecious; male fls. with 4 perianth-segms. in the shape of a cross, stamens 6, joined at the base, seed sterile; perianth of female fls. tubular, inclosing completely the fertile seed.—One species, arid places Trop. and S. W. Afr.

The oldest actual name for this strange plant is Tumboa, which was mentioned incidentally in the Gardeners' Chronicle, 1861, page 75, in a running account of a meeting of the Linnean Society; and the name *T. Bainesii,* Hook. f., was similarly mentioned on page 1008 in an account of a meeting of the Royal Horticultural Society. In the same journal in 1862 the name *T. strobilifera* was also mentioned. Neither the genus nor the species was botanically defined. In Gardeners' Chronicle for 1862, the name Welwitschia was proposed, and under this name the characters were carefully drawn and the plant regularly described in Trans. Linn. Soc., 1863, and in the same year in B.M. 5368, 5369. Under this name the plant has passed; but in Engler & Prantl, Pflanzenfamilien Nachtr. (1897), attention is called to the older Tumboa as the proper name, and this name is taken up in Cat. Welwitsch Afr., pl. II, pt. 1 (1899). All the preceding literature is under Welwitschia and all the horticultural references; and inasmuch as the aim in nomenclature is, or should be, stability rather than priority, the principle of long-accepted usage should be invoked in this case and the name Welwitschia retained, particularly as the name Tumboa was not formally founded and as the revival of it contributes nothing to clearness or definition. (It is retained by the Brussels Congress.)

In respect to the cultivation of Welwitschia, W. Watson, Curator of the Royal Botanic Gardens, Kew, England, writes in 1916: "We have a plant here which was raised from a seed in 1880. It lives, but growth is very slow, so slow that a full-sized plant, such as we have in our Museum, might at this rate be reckoned a thousand years old. We grow it in a tropical house devoted to succulents, where it gets all the sunlight, the usual amount of water, except for about three months in winter, when it gets very little, and it is potted in sandy loam. There may be a set of conditions that would suit the plant better, though experiments with other plants raised here since did not reveal anything better."

mirábilis, Hook. f. Lvs. 6 ft. or more long, the split ends reclining on the ground, flat and long-narrow, attached at the base to the crown of the wrinkled brown and hard trunk: plant said to persist a century. G.C. III. 47:56. J.H. III. 46:38. G.W. 9, pp. 294–5.

L. H. B.

WESTRÍNGIA (J. P. Westring, Swedish physician and author; died 1833). *Labiàtæ.* Shrubs, suitable for greenhouse cult., although apparently not now in common cult.: lvs. in whorls of 3, 4, or rarely more, entire·

fls. axillary or rarely in terminal leafy heads; calyx campanulate, 5-toothed; corolla-tube short and dilated at the throat, limb 2-lipped, upper lip flat, broadly 2-lobed, lower spreading, 3-lobed; stamens, 2 upper perfect, 2 lower sterile: nutlets reticulate-rugose.—About 12 species, natives of extra-Trop. Austral.

rosmarinifòrmis, Smith. Victorian Rosemary. A bushy shrub with the branches and under side of lvs. silvery white with appressed hairs: lvs. in whorls of 4, oblong-lanceolate to linear, ½–1 in. long: fls. white, axillary, almost sessile; calyx 3 lines long; corolla not twice as long as the calyx. Sandy hills, near the seacoast, Austral.—Offered in S. Calif.

F. Tracy Hubbard.†

WHEAT: *Tríticum.* **W., India:** *Fagopyrum tataricum.*

WHÍPPLEA (in honor of Lieut. A. W. Whipple, commander of the surveying expedition to the Pacific Ocean in 1853–1854). *Saxifragàceæ.* Two low shrubs in W. N. Amer. with small opposite nearly sessile lvs., 3-nerved and entire or sparingly dentate, appressed-hairy on both sides, and with small white fls. in terminal cymes: fls. 5- or rarely 6-merous; receptacle turbinate, adnate to the base of the ovary; sepals lanceolate;

3999. Wigandia caracasana. (×¾)

petals small, oblong-spatulate; stamens 10, rarely 12, with dilated lanceolate filaments and subglobose anthers; ovary half-superior or nearly superior, with 3–6 short styles: fr. a caps. separating into 3–6 1-seeded carpels. They are not hardy N. and rarely cult. in botanical collections only, as they possess no particular ornamental qualities. They are plants of dry regions and demand a well-drained soil; the best place for them is in a rockery. Prop. is by greenwood cuttings under glass and by seeds treated like those of deutzia or hydrangea.

modésta, Torr. Sarmentose; the long shoots with numerous short upright flowering branchlets, pubescent: lvs. broadly ovate to elliptic, acutish, with a few shallow teeth or nearly entire, appressed-hairy on both sides, ½–1 in. long: fls. white, about ⅕in. across, in slender-stalked dense cymes ⅛–½in. long. May. Ore., Calif.

utahénsis, Wats. (*Féndlera utahénsis,* Greene. *Fendlerélla utahénsis,* Heller). Much-branched, upright shrub, to 2 ft., pubescent: lvs. elliptic-ovate to linear-oblong, acute, entire, ⅛–½in. long, appressed-hairy on both sides: fls. white, in terminal small cymes ½–¾in. across. July. Ariz., Colo., Utah.

Alfred Rehder.

WHITFIÈLDIA (named after Thomas Whitfield, intrepid naturalist who made several explorations into Trop. W. Afr. and brought back many choice plants). *Acanthàceæ.* Glabrous shrubs, rarely used as warm-house ornamentals: lvs. opposite, entire: fls. white or brick-colored, solitary in the axils of opposing bracts, arranged in a terminal raceme; calyx 5-parted, segms. membranaceous, colored, oblong or lanceolate; corolla-tube swollen almost from the base or slender-cylindrical and abruptly inflexed above widening to a campanulate throat, 5-lobed, lobes ovate or oblong-lanceolate; stamens 4, in pairs.—About 17 species, Trop. Afr. The material which has been offered in Amer. as *W. lateritia* is really *Jacobinia carnea* (see Vol. III, p. 1714): the true *W. lateritia,* Hook., is rarely cult. and is a tender evergreen shrub about 3 ft. high: lvs. ovate or oblong-ovate, wavy: fls. red; corolla bell- or funnel-shaped. W. Trop. Afr. B.M. 4155. F.S. 1:36.

WHITLÀVIA: *Phacelia.*

WHORTLEBERRY: *Vaccinium.*

WIDDRINGTÒNIA: *Callítris.*

WIGÁNDIA (named after Johannes Wigand, Pomeranian bishop; wrote on plants; 1523–1587). *Hydrophyllàceæ.* Tall hispid perennial herbs or subshrubs, used for subtropical bedding, or may be grown in the greenhouse.

Leaves alternate, large, rugose, doubly dentate, cymes terminal, large, dichotomous: fls. sessile, 1-sided along the branch; calyx-segms. linear; corolla-tube shortly and broadly campanulate, scaled inside; limb broad, spreading, 5-lobed, lobes imbricate; stamens 5; ovary rather perfectly 2-celled: caps. 2-valved.—About 3 or 4 species, widely dispersed in the mountains of Trop. Amer. Monographed by A. Brand in Engler's Pflanzenreich hft. 59 (IV. 251). The species of Wigandia are very much confused in current reference books, as well as in the trade. The following account is based on André's revision of the genus in R.H. 1861: 371, with an important change in the name of one species. In respect to *W. urens,* André follows the previous revision by Choisy in DC. Prod. 10:184. The combination *Wigandia urens* was first used by Kunth, who applied it to a Mexican plant. Before this, however, another plant of the same family but a native of Peru had been called *Hydrolea urens.* When Choisy came to monograph the whole family he transferred *Hydrolea urens* to the genus Wigandia and called it *Wigandia urens,* Choisy. He therefore had to rename the Mexican plant, and this he called *Wigandia Kunthii.*

Wigandias are chiefly valued as foliage plants for subtropical bedding, because of their very showy character. Their leaves are covered with stinging hairs, similar to nettles. Many large specimens may be seen in California, but the plants are considered to be rather coarse and straggling. They are generally raised from seed every year, the seed being started indoors as early as January. The plants attain a height of 6 to 10 feet in a single season. They are unsatisfactory greenhouse plants, as they do not grow vigorously indoors. The roots may be kept over winter in a frostless place and stock may be secured in spring by cuttings. In general, the plants are not much used in North America.

caracasàna, HBK. Fig. 3999. Erect robust subshrub, up to 9 ft. high, softly golden or silky-pubescent: lvs. rather long-petioled, ovate, obtuse, base subcordate, 18 x 10 in., coarsely, doubly and irregularly crenate, white-tomentose beneath: infl. golden silky-pubescent, terminal, elongate, strict (a thyrsoid cincinnus): corolla violet, tube white: caps. equaling or a little longer than the calyx. S. Mex. to Venezuela and Colombia. B.M. 4575 (adapted in Fig. 3999). B.R. 1966. F.S. 8:755. Gn. 4, p. 503; 8, p. 198. R.H. 1859, p. 653. J.F. 2:132. Var. **macrophýlla,** Brand (*W. macrophýlla,* Cham. & Schlecht.), is a larger-lvd. form which also grows rather taller than the type and has the infl. white-silky-pubescent. R.H. 1861:371.—It is the Mexican form of the species and the one mostly in cult.

Kúnthii, Choisy (*W. ùrens,* HBK., not Choisy). Very hispid subshrub, not golden pubescent, about 6–15 ft. high: lvs. doubly sharp-serrate, not white-tomentose: infl. not at all thyrsoid, but paniculate, very hispid, rarely pubescent or dirty tomentose: corolla violet, tube white: caps. slightly longer than the calyx, very densely hispid. Mex. to Honduras.

ùrens, Choisy, not HBK. (*W. peruviàna,* W. Mill. *Hydròlea ùrens,* Ruiz & Pav.). Stout erect subshrub up to 12 ft. high, very densely dirty white-hispid: lvs. short-petioled, 8–12 x 6–7 in., broadly ovate, irregularly dentate-serrate, base cordate or truncate, apex obtuse: fls. arranged in a broad terminal raceme (cincinnus); sepals lanceolate-acute, hispid; corolla violet, parted to the middle, lobes elliptical, densely silky outside: caps. oblong, twice shorter than the calyx. Peru. R.H. 1867, p. 470.

W. imperiàlis is listed as a very ornamental plant, but is not treated by Brand.—*W. Vigièri,* Carr., is not treated in Brand's monograph and is apparently a horticultural form, perhaps of W. caracasana. Carrière merely said it was a silvery plant instead of somber and glutinous like W. caracasana. It is frequently listed in the trade and is said to have lilac-blue or wine-colored fls.

F. Tracy Hubbard.†

WIKSTRŒMIA (named after J. E. Wikstrœm, professor of botany at Stockholm, 1789–1856). *Thymelæàceæ.* Shrubs or trees, occasionally grown in the warmhouse or greenhouse: lvs. opposite or rarely alternate: fls. in short terminal or axillary racemes, spikes or heads; perianth tubular, limb spreading, 4-lobed, without scales in the throat; stamens 8; ovary villous, 1-celled: fr. a berry-like drupe.—About 40 species, Trop. Asia, Austral., and the islands of the Pacific.

canéscens, Meissn. (*W. pauciflòra,* Franch. & Sav.). Small shrub, 1–3 ft. high: lvs. 1–3 in. long, thin, alternate and opposite, oblong-lanceolate: perianth 3–4 lines long: fr. silky. Himalayas, Ceylon, China. The Japanese plant is *W. Ganpi,* Maxim. (*W. canescens* var. *Ganpi,* Miq.); from its bark apparently is made the celebrated Japanese copying-paper.

WILCÓXIA (named for Brig.-Gen. Timothy E. Wilcox, U. S. Army). *Cactàceæ.* Usually low weak plants growing from a cluster of dahlia-like roots: sts. slender, with low inconspicuous ribs covered with clusters of delicate spines: ovary and fr. bearing clusters of spines; seeds black.—Three species native of Texas and Mex.

Posélgeri, Brit. & Rose (*Echinocèreus tuberòsus,* Rümpl. *Cèreus tuberòsus,* Posel.). Roots black, several, borne near the surface: sts. 2 ft. or less high, with about 8 ribs, the lower and older part naked, spiny above, the spines almost hiding the ribs; spines appressed, delicate, pubescent, radials 9–12; central one ascending, black-tipped: fls. purple, 2 in. long: seeds pitted or rugose, ⅓in. long.—This species, although often cult., does not do well under glass when grown on its roots, but when grafted on various species of Selenicereus, it does extremely well. J. N. Rose.

WILD FLOWERS: Their appeal and conservation. In many countries some kind of wild flower holds first place in the love and sentiment of the inhabitants. The rose, the thistle, the shamrock, the iris, the edelweiss and alpine rose, the chrysanthemum, the poppy and the lotus have all contributed their share to the literature and art of the Old World. Thirty of the states have adopted some native American plant for the state flower, including the arbutus, bitter-root, black-eyed Susan, columbine, gentian, goldenrod, laurel, lupine, magnolia, mistletoe, moccasin-flower, Oregon grape, pasque flower, golden poppy, pine cone and tassel, rhododendron, rose, Sego lily, sunflower, syringa, and violet. Of these the goldenrod and violet lead in popularity, with the arbutus, magnolia, and rhododendron next in public favor. Nine states have chosen either cultivated plants of economic value or introduced weeds like the daisy. Thus far, no national flower has been adopted, principally because no wild flower grows or could be grown in all the states and territories, owing to the diversity of climate and flora. An attempt has been made recently to adopt the mountain laurel, but as this is a plant which grows only in the Appalachian regions of the eastern states it has not met with unanimous approval.

That a widespread interest in native plants exists there can be no question. Local and popular floras abound, poems and songs appear frequently, yet the people as a whole are still barbarians when it is a question of real love and protection. Arbutus is still pulled up from the roots and sent through the mails in frail and broken pasteboard boxes, having been nearly or quite exterminated where formerly it was abundant. Orchids and lilies are gathered by the basketful to adorn college commencements and church services. Ropes of laurel and ground-pine are used at balls and Christmas festivities, and the holly which used to be abundant is rapidly becoming scarce and hard to find. All these supplies come from wild sources and few of them would pay to cultivate. Moderation and protection are recommended for all of them. Some few of our wild flowers take kindly to cultivation, and are grown for their beauty: laurel, rhododendron, azalea, dogwood, and magnolias perhaps lead in popularity, but some of the smaller herbaceous plants such as bloodroot, hepatica, columbine, lilies, jack-in-the-pulpit, forget-me-nots, and many of the native ferns may be readily grown if given suitable conditions of soil, moisture, and shade. Most wild flowers prefer an acid soil with plenty of leaf-mold to the ordinary garden soil, and should be planted in some place by themselves where natural conditions can be maintained.

A hopeful sign of advancing appreciation is that the best landscape architects and park superintendents are recommending the planting and preservation of native plants and in many of the national parks and public reservations the native flora is protected from depredation. With the increase of motors has come an interest in good roads and roadside planting, but some of the railroads in Colorado still run "flower excursions" where a lot of vandals are taken to some beautiful spot and come home loaded with wild flowers which they promptly throw away. It is this spirit of selfish and thoughtless destructiveness which should be combated by all true lovers of native plants, and various organizations for their conservation have been formed to try to accomplish it. Arbor Day might fitly be called Conservation Day and used to impress on school children the importance of this work.

The following associations are interested and will supply information to those wishing to coöperate: Conservation Department, General Federation of Women's Clubs; Conservation Society of National Educators; American Association of Forestry; State Associations of Forestry; Garden Clubs of America, Philadelphia; Lincoln Highway Commission; Society for the Protec-

tion of Native Plants, Boston; Stokes Fund for the Preservation of Native Plants, New York Botanical Garden; American Association of Park Superintendents, Portland, Oregon; Wild Flower Preservation Society of America, Brooklyn Botanic Garden.

List of state and provincial flowers.

Alabama	Goldenrod.
Alaska	Forget-me-not.
Arkansas	Apple blossom.
California	Golden poppy.
Canada	Sugar maple.
Colorado	Blue columbine.
Connecticut	Mountain laurel.
Delaware	Peach.
Florida	Orange blossoms.
Georgia	Cherokee rose.
Idaho	Syringa.
Illinois	Native violet.
Indiana	Carnation (pink).
Iowa	Goldenrod.
Kansas	Sunflower.
Kentucky	Goldenrod.
Louisiana	Magnolia.
Maine	Pine cone and tassel.
Maryland	Black-eyed Susan.
Massachusetts	Arbutus, May-flower.
Minnesota	Moccasin flower.
Mississippi	Magnolia.
Missouri	Goldenrod.
Montana	Bitter-root (Lewisia).
Nebraska	Goldenrod.
New Jersey	Violet.
New York	Rose.
North Carolina	Daisy.
North Dakota	Wild rose.
Nova Scotia	Arbutus.
Ohio	Red carnation.
Oklahoma	Mistletoe.
Oregon	Oregon grape (Mahonia).
Pennsylvania	Laurel.
Rhode Island	Violet.
South Dakota	Pasque flower (Anemone).
Tennessee	Daisy.
Texas	Blue bonnet, lupines.
Utah	Sego lily (Calochortus).
Vermont	Red clover.
Washington	Rhododendron.
West Virginia	Rhododendron.
Wisconsin	Violet.
Wyoming	Gentian.
Hawaii	Lehua (Metrosideros).

ELIZABETH G. BRITTON.

WILD-GARDEN: *Planting*, Vol. V, page 2663.

WILLOW: *Salix.* **W., Virginian:** *Itea virginica.*

WILSONÀRA (from a personal name). *Orchidàceæ.* A hybrid orchid described and figured in G.C. III. 59, pp. 312, 315 (June 10, 1916). "The parents include Cochlioda, Oncidium, and Odontoglossum; *Oncidioda Charlesworthii* (*Oncidium incurvum* × *Cochlioda Noezliana*), and *Odontoglossum illustrissimum* (*Lambeauianum* × *ardentissimum*), and through the parentage of the latter *O. crispum*, *O. Pescatorei*, and *O. Harryanum* enter into its composition. The hybrid approaches closely to *Oncidioda Charlesworthii*, and in a marked degree resembles *Odontioda Hermione* (*C. vulcanica* × *Oda. heatonensis*), many of the factors in the combination being difficult to trace. The erect oncidium-like spike bore ten pretty flowers, with purplish claret-red sepals and petals, the three-lobed lip being of whitish lilac color, with a blotch of claret-red in front of the crest."—Exhibited by Charlesworth & Co. For names of similar construction, see *Adamara*, *Linneara*, *Lowiara*, *Vuylstekeara.*

WINDBREAK. In horticultural usage, windbreaks are plantations of trees or other plants designed to check the force of the wind or to deflect it to other directions. Windbreaks are often of the greatest use, and at other times they are detrimental. In regions of very strong prevailing winds, they may be necessary to prevent injury to the plants. This is true along seashores. In the dry interior regions, windbreaks are often useful, also, to check the force of parching winds that would take the moisture from the land. In other cases, they are employed for the purpose of sheltering the homestead, to make it more comfortable for human occupancy: such breaks are usually known as shelter-belts. See *Hedges.*

Whether windbreaks shall be used for orchard plantations depends wholly on circumstances. In regions of very strong prevailing winds, as near large bodies of water or on the plains, such breaks are usually necessary on the windward side of the orchard. However, if the prevailing winds are habitually warmer than the local temperature, the winds should not be stopped or wholly deflected, but they should be allowed to pass through the windbreak with diminished power in order that, while their force may be checked, they may still prevent too low temperature. In regions that are very liable to late spring and early fall frosts, a tight break is usually a disadvantage, since it tends to confine the air—to make it still—and thereby to increase the danger of light frosts. If windbreaks are employed in such cases, it is best to have them somewhat open so that atmospheric drainage may not be checked. In most regions, the greatest value of the windbreak for orchard plantations is to protect from the mechanical injuries that result from high winds and to enable workmen to pursue their labors with greater ease. The lessening of windfall fruit is often sufficient reason for the establishment of a windbreak. Usually very cold and very dry winds should be turned from the orchard; very strong winds should be checked; temperate winds should nearly always be allowed to pass through the orchard,

4000. Windbreaks running across the direction of the prevailing winds.

if their velocity is not too great; care must be taken to allow of adequate atmospheric drainage.

Windbreaks for orchards require much land, and crops near them are likely to suffer for lack of food and moisture, and also from shade. In small places, therefore, it may be impossible to establish large breaks. It is well to plant the windbreak at some distance from the first row of orchard trees, if possible. It is usually best to use native trees for the break, since they are hardy and well adapted to the particular climate. Windbreaks often harbor injurious insects and fungi, and care must be taken that species of trees liable to these difficulties are not used. In the northeastern states, for example, it would be bad practice to plant the wild cherry tree, since it is so much infested with the tent caterpillar. In some cases, very low breaks may be as desirable as high ones. This is true in the open farming lands in the dry regions, since it may be necessary only to check the force of the wind near the surface of the ground. Windbreaks only 2 or 3 feet high, placed at intervals, may have this effect. Fence-rows sometimes act as efficient windbreaks. Near the seacoast, gardeners often plant low hedges for the purpose of protecting the surface of the garden. (See *Plants for the Seaside*, page 2670.) Along the Atlantic coast, the California privet is considerably used. This is *Ligustrum ovalifolium*, a Japanese plant. Farms in the open windy country may be efficiently protected by belts of woodland, or, if the country is wholly cleared, rows of trees may be established at intervals of a quarter or half mile across the direction of the prevailing winds (Fig. 4000).

In middle California, the most common windbreak is a tall thick hedge of Monterey cypress (*Cupressus macrocarpa*), either clipped close or allowed to grow naturally; it withstands heavy winds better than almost any other heavy-foliaged tree and is rapid in its growth. (Fig. 1790.) The Italians and Chinese, who have almost complete control of the truck-gardening industry in and around San Francisco, make extensive use of a Californian tree-mallow, *Lavatera assurgentiflora* (see page 1830), as a break and protection from the drift-sand. In California, various species of Eucalyptus may be used for breaks and wind-stops. The giant reed (*Arundo Donax*) is frequently grown around vineyards, particularly in the immediate vicinity of water. In California the olive, European walnut, fig, and almond are frequently planted for the outside row of an orchard of deciduous fruit-trees, to act as a partial windbreak.

On the plains and prairies, several kinds of poplars and willows, and also the box-elder (*Acer Negundo*), are planted for shelter-belts, because they thrive under most conditions, grow rapidly, and are hardy.

L. H. B.

4001. A hotel window-box.

WINDFLOWER: *Anenome.*

WINDOW-GARDENING. The growing of plants in windows and similar openings, particularly when conducted as a regular and systematic undertaking.

Although not strictly a part of the planting of the property, window- and veranda-boxes give color and tone to the place as well as provide pleasure and satisfaction for the inmates of the residence. For those who live in crowded localities or are unable to care for a garden, these outside boxes offer an opportunity for a display of flowers, not only in the summer months, but, in the case of window-boxes and by the substitution of other kinds of plants, through the winter months as well. The illustrations (Figs. 4001–4003) show good forms of window-boxes. The first two are drawn from illustrations in Gardening, May 15, 1916. See *House Plants*, Vol. III.

These boxes may be purchased and may be highly ornate, having pattern tiling or made of finely finished wood and suspended by fancy brackets; but such boxes are not necessary. A stout pine box of the required length, from 10 to 12 inches wide and at least 6 inches deep, if painted a suitable color serves quite as well as the others, for the side and ends of the box should be soon covered by the drooping vines. Provision for drainage should be made by boring holes in the bottom of the box, these holes being covered with pieces of broken pots, coal-cinders or gravel-stones. This allows for the drainage of water while holding the earth from escaping. The soil for these window-boxes should be rich in plant-food, as the roots will be restricted. The most desirable soil is one that does not pack hard when watered, or contract much when dry, but remains porous and springy.

This soil may be made by mixing two parts of garden loam, one part of leaf-mold or wood earth, and one part of sand. To this mixture should be added well-decayed manure, preferably cow-manure, at the rate of one peck to two bushels of soil.

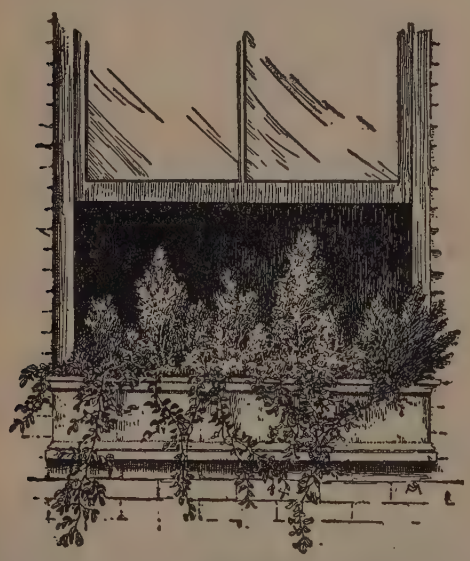
Many kinds of plants may be used in window- and porch-boxes, but in planting one should choose the subjects most suitable for the particular exposure. If the boxes are to be placed in full sunlight, it will be necessary to choose vigorous-growing sun-loving plants. For

4002. Window-box in a club building.

a shady corner or a northern exposure, more delicate plants may be used. For the former, such plants as geranium, coleus, achyranthes (iresine), Paris daisy, double petunias, may be used; or, if a more pretentious display is desired, crotons, colored-leaved dracenas, acalypha, aspidistra, or small palms may be employed. Low-growing plants for the front of the box may consist of the dwarf white-leaved geranium Madame Salleroi, the golden feverfew, lobelia, sweet alyssum, and the white-leaved cineraria. For the drooping vines, nothing excels the variegated-leaved vinca, nasturtiums, tradescantia, and German ivy. If the position is shady, vigorous-growing ferns, such as the nephrolepis, a few of the pteris, and perhaps the hardiest of the adiantums are effective. The narrow-leaved dracena (*Cordyline indivisa*), grevillea, and Rex begonias are all good plants for shady places.

After the plants have filled the box with roots, it will be necessary to work into the soil more plant-food, either a light coating of bone-meal or a thicker layer of well-rotted manure; still better would be a watering about once each week with dilute liquid manure.

One of the objections to veranda-boxes, especially those that are fastened permanently in place, is that in winter they are usually bare of foliage and therefore unsightly. This disadvantage may be overcome and a seasonable appearance given by the use of small conifers, broad-leaved evergreens, small Irish junipers, low-growing junipers, arbor-vitæ, both pyramidal or globular, young trees of spruce, hemlock, or pine. Of broad-leaved evergreens, dwarf box, mahonia, *Evonymus radicans* and pachysandra or *Vinca minor* are all



4003. A window-box of evergreens for winter use.

available. To lighten the somber effect of the solid green, small shrubs bearing bright-colored fruits may be introduced, such as dwarfed plants of barberry, either *Berberis vulgaris* bearing long clusters of dark red fruits or *B. Thunbergii* with bright scarlet berries borne along the gracefully bending branches. Privets, either *Ligustrum vulgare* or *L. Regelianum*, are good for berries, both bearing clusters of blue-black fruits contrasting well with the green of the conifers or the reds of the barberry; these fruits are held through the winter without change in color. Hardy strains of English ivy or drooping plants of *Evonymus radicans* may be used to hide the boxes in winter.

It often happens that one or more plants in a box fail to thrive and the desired effect is lost. An attempt to remove such a plant by digging it out injures the remaining plants, or if the plant is cut out spaces are left. This condition may be obviated by using pot-grown plants, setting the pots containing the plants in the boxes and filling in around the pots with earth or moss; by so doing, any one plant may be removed and another substituted without injury or check to those remaining. By this method it is also possible to effect quick changes in the character of the boxes. The change may be from the winter material to spring-flowering bulbs, from bulbs to pansies, then to summer-blooming annuals, and again to autumn-blooming plants. Combinations may be changed at will, seasonable effects be secured, and the monotony of a planted box be overcome. It is not necessary to grow the plants in large pots, a 4- or 5-inch size being large enough for most of the kinds to be used. In employing this method, however, it is best to have 2 or 3 inches of rich earth in the bottom of the box on which to place the pots; the roots of the plants will escape through the hole in the bottom of the pot and find sufficient food to develop.

This plan of filling the boxes with potted plants will recommend itself when it is not possible to heat the room at all times, as a schoolroom from Friday until Monday; in this case the plants may be carried home over this period.

C. E. Hunn.

WINTER-GARDEN: *Planting*, Vol. V, page 2677.

WINTERGREEN: *Gaultheria* and *Pyrola*. **W., Flowering:** *Polygala paucifolia*.

WINTER PROTECTION: *Planting*, Vol. V, page 2684.

WISTÈRIA (named for Caspar Wistar, 1761–1818, Professor of Anatomy in the University of Pennsylvania, but spelled Wisteria by Nuttall, author of the genus, the spelling Wistaria being a later adaptation). *Leguminòsæ*. Wisteria. Wistaria. Attractive large twiners with pea-shaped flowers, planted for covering porches (Fig. 4004), arbors, and buildings; the noblest of the woody vines for temperate regions.

Stout vines, often attaining great age and with woody trunks reaching several inches in diam.: lvs. odd-pinnate, alternate, with 9–13 lfts.: fls. blue, lilac, purplish, or white, in long drooping racemes, in late spring and early summer; calyx bell-shaped, somewhat 2-lipped from the 3 lower teeth being longer than the 2 upper ones; standard large, reflexed, narrowed below and typically with 2 callosities or appendages at base; wings falcate, auricled at base; keel obtuse, scythe-shaped; stamens diadelphous: fr. an elongated 2-valved torulose pod.—The recognized species are 2 in the eastern U. S., and 4 in eastern Asia. Under the American Code, the genus takes the name Kraunhia; the name Bradleia has also been applied. The so-called "evergreen wisteria" is *Millettia megasperma*, described on page 2706, Vol. V. The species of Wisteria are so much confused in domestication that few portraits of them are cited in the following account.

Wisterias will live in rather dry and sandy soil, but they prefer a deep and rich earth. The roots are long and few and go down deep, making few fibers. They resemble licorice root. They are hard to transplant, unless they have been pot-grown for the purpose or frequently transplanted in the nursery row. Unless manured heavily when transplanted, they are very slow in starting into vigorous growth. The most satisfactory method of propagation for the amateur is layering in summer; the following year the layers may be detached. Seeds grow readily, but do not reproduce the horticultural forms; such forms may be grafted on seedlings of *W. frutescens* or other available stock, the union being made at the crown; sometimes root-grafting is employed. Cuttings of roots, an inch or two long, are also frequently used. Cuttings of ripened wood may be struck under glass.

CXIX. Wisteria sinensis in a striking setting.

Those who wish to give a young wisteria an extra-good start may sink a bottomless tub in the ground and fill it with good soil. If a wisteria is to be trained to a tree, choose an old tree, if possible, which is past the height of its vigor; but good results are to be expected only when sunlight and opportunity are ample, and these can rarely be secured under a living tree-head.

The Japanese wisteria (*W. floribunda*) is one of the best and commonest of hardy climbers. It has pale green pinnate foliage and bears profusely of dense drooping clusters of purplish pea-shaped flowers. The clusters are about a foot long. This is the commonest and best form. The variations furnish the connoisseur with variety in habit, color, and season of bloom, but they are not as prolific, and doubling adds nothing to the beauty of the flowers. Moreover, the double flowers decay quickly in wet weather.

The wisterias bloom in May and usually give a smaller crop of flowers in August or September. The spring crop is borne on spurs, while the autumn crop is borne on terminal shoots of the season. There are several ideas about training a wisteria. A good way is to let it alone. This produces rugged twisted and picturesque branches and gives a certain oriental effect, but it is not the best method for covering a wall-space solidly or for making the best display of bloom. To cover a wall completely it is necessary to keep the leaders taut and to train outside branches wherever they are needed. If quantity of bloom is the first consideration, the vines should be pruned back every year to spurs, a common method in Japan. The low one-storied Japanese building will have a wisteria so trained that the vine follows the eaves all around the house. The foliage is all above, and the yard-long clusters of purple blossoms depend therefrom in solid unbroken linear masses two or three ranks deep. When trained as a standard, the wisteria requires much care. A fine standard is figured in G.F. 6:256 and Gng. 1:321, where directions may be found. "When young plants of wisteria are cut back to a height of 6 or 8 feet and pruned in for some years, the stem will stiffen until it is able to stand alone, and the top will spread out into a broad head."

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KEY TO THE SPECIES.

A. *Standard of the fl. with distinct callosities or appendages at base (Wisteria proper).*
B. *Lfts. 7–9 pairs*.....1. **floribunda**
BB. *Lfts. usually less than 7 pairs.*
C. *Lvs. smooth or nearly so on both surfaces at maturity.*
D. *Racemes long, 6–12 in. or more.*
E. *Fls. large (more than 1 in. across at full expansion): Chinese*.....2. **sinensis**
EE. *Fls. small (less than 1 in. across): American*.....3. **macrostachys**
DD. *Racemes short, 4–5 in. or less: American*.....4. **frutescens**
CC. *Lvs. persistently velvety at maturity* 5. **venusta**
AA. *Standard lacking auricles at base (transition to Millettia)*.....6. **japonica**

1. floribúnda, DC. (*Glycìne floribúnda*, Willd. *Wistèria brachybòtrys*, Sieb. & Zucc. *Kraùnhia brachybòtrys*, Greene). JAPANESE WISTERIA. Young lvs. densely covered with straight appressed hairs, but foliage soon glabrous; lfts. 7–9 pairs, ovate-elliptic, rather abruptly acuminate, acute, rounded at base: fls. violet or violet-blue, rather small, in moderately long racemes (or sometimes in short racemes, particularly later in the season, whence the name *brachybotrys*); standard oblong-orbicular, subcordate at base and auriculate, with a short stipe-like claw; calyx hairy, the 2 upper teeth very short and broad. Common on

4004. Wisteria covering for a porch.

the margins of woods and along streams in Japan; much cult. there in temple grounds, parks, and gardens; also grown in this country. F.S. 9:880.—From the Chinese wisteria (*W. sinensis*) it is distinguished by more numerous lfts. which are shed earlier in autumn, much smaller, and 2–3-weeks-later fls., and greater hardiness. It runs into several marked forms. Var. **álba** (forma *álba*, Rehd. & Wils. *W. multijuga* var. *álba*, Carr.) has white fls. R.H. 1891, p. 421. Var. **ròsea** (forma *ròsea*, Rehd. & Wils.) has rose-colored or pale pink fls. with wings and tip of keel purple. Var. **variegàta** (forma *variegàta*, Rehd. & Wils. *W. chinénsis* var. *variegàta*, Nichols.) has variegated foliage. Var. **violàceo-plèna** (forma *violàceo-plèna*, Rehd. & Wils. *W. chinénsis* var. *flòre-plèno*, Mill.) is a double-fld. form. R.H. 1887:564. Gn. 17, p. 105. F. 1882:557. Var. **macrobòtrys** (forma *macrobòtrys*, Rehd. & Wils. *W. macrobòtrys*, Sieb. *W. multijuga*, Van Houtte. *W. grandiflòra*, Hort.) has very long racemes, sometimes 2–3 ft.: much prized. F.S. 19:2002. R.H. 1891, p. 176. Under the name *W. multijuga Russelliana*, a slender-racemed form is shown in Gn. W. 21, suppl. Apr. 2, although the lfts. are not more than 5 pairs. This variety is described as having a purple calyx, soft purple standard deepening in color with age on both faces and a creamy white eye-like blotch on the inner face; wings and keel dark blue, the tip of the keel violet; racemes reach 2¾ ft. in length. Named for John Russell, Richmond, Surrey.

2. sinénsis, Sweet (*Glycìne sinénsis*, Sims. *Wistèria chinénsis*, DC. *W. consequàna*, Loud. *Kraùnhia*

sinénsis, Makino). CHINESE WISTERIA. Fig. 4005. Lvs. smooth or nearly so at maturity, the petiole swollen at base; lfts. about 5 pairs, ovate-acuminate or ovate-lanceolate, short-stalked, 2–3 in. long, the margins ciliate but entire: racemes pendulous, 6–12 in. long, terminating the branches; calyx villous; corolla large, blue-violet, not fragrant, showy. Low altitudes in China, and much cult. there; apparently little grown in this country and not so hardy as *W. floribunda*. B. M. 2083 (from which Fig. 4005 is adapted). B. R. 650. L.B.C. 8:773. P. M. 7:127. Var. **álba** (forma *álba*, Lindl. Var. *albiflòra*, Lem.) has white fls. I.H. 5:166.

4005. Wisteria sinensis. (× about ⅔)

3. **macrόstachys**, Nutt. (*Kraùnhia macrόstachys*, Small). Slender vine 20–25 ft. high or long: lfts. usually about 9, ovate to elliptic-lanceolate, about 2 in. long, acuminate or acute, cordate or rounded at base: racemes 6–10 in. long, drooping, loosely fld., the pedicels and calyx glandular-hairy; fls. light blue or purplish, the standard about ½in. across and not prominently auricled; calyx-teeth half or more the length of the tube. Swamps, Ill., southward.—Probably rarely if at all cult.

4. **frutéscens**, Poir. (*Glycìne frutéscens*, Linn. *Kraùnhia frutéscens*, Greene. *Bradlèia frutéscens*, Brit. *W. speciòsa*, Nutt.). Tall stout climber, the trunk attaining several inches in diam.: not glandular, smoothish or somewhat downy at maturity: lfts. 4–6–7 pairs, ovate to ovate-lanceolate, acuminate but obtuse, glabrous above: racemes 4–6 in. long, densely fld.; fls. lilac-purple; auricles of the standard rather prominent; calyx-teeth very short. Low grounds, Va. to Fla. and Texas.—Sometimes planted. Var. **álba**, Hort., with white fls., has been listed. Var. **magnífica**, Herincq (*W. magnífica*, Hort.), supposed to belong here, has racemes 50–60-fld. and 6–8 in. long: fls. 1 in. across, lilac with a yellow spot, earlier than in the type. F.S. 11:1151.

5. **venùsta**, Rehd. & Wils. (*W. brachybótrys* var. *álba*, Mill.). SILKY WISTERIA. Tall, reaching 30 ft. or more, the young growth pubescent: lfts. usually 5 pairs (from 4–6 pairs), velvety both sides, oblong-lanceolate or elliptic- to ovate-oblong, short-acuminate, at the base subcordate or rounded or truncate, entire: raceme pendulous, 6 in. or less long including the short peduncle, broad, the rachis densely appressed-villous; fls. very large, white, on nearly horizontal spreading pedicels; standard suborbicular, truncate at apex and auricled at base, clawed; upper calyx-teeth subulate: pod compressed, densely velvety. China, province Chi-li.—More or less planted in Eu. and U. S., but only recently distinguished. Var. **plèna** (forma *plèna*), Rehd. & Wilson. With double white fls., occasionally offered by Japanese dealers; the only double-fld. white wisteria known.

6. **japónica**, Sieb. & Zucc. (*Milléttia japónica*, Gray. *Phaseolòdes japónicum*, Kuntze. *Kraùnhia japónica*, Taub.). Glabrous throughout: lfts. 4–6 pairs, petiolulate, narrow-ovate or ovate-lanceolate, acuminate but obtuse at point, entire, light green: fls. small, white, in long drooping simple racemes to 8 in. long; calyx cylindrical urn-shaped or cup-shaped, pubescent; standard obovate, lacking the callosities at base; ovary and style glabrous: pod linear-oblong, mucronate at apex, woody, not large. Japan, Korea.—Little known in this country, and not hardy in the northern parts. By some authors this species is kept in the genus Millettia, where it was placed by Asa Gray; and under that name it is described in Vol. IV, page 2051.

L. H. B.†

WITCH-HAZEL: *Hamamelis*.

WITHÀNIA. See note under *Salpichroa*.

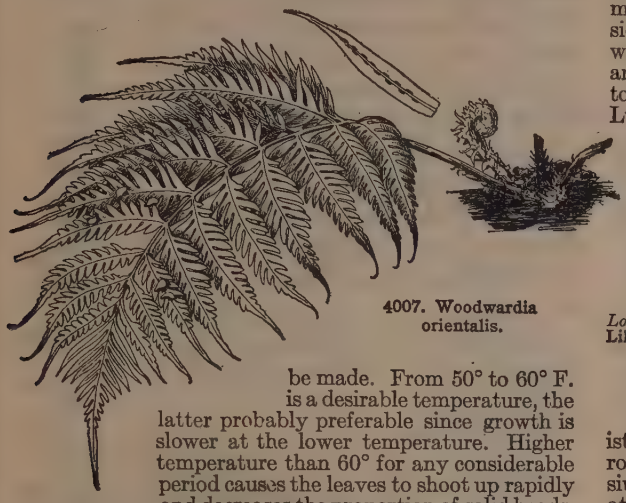
WITLOOF (Dutch, "white-leaf") is a salad vegetable comprised of the compact blanched leaf-head produced by certain forms of chicory. The large thick roots of chicory produce leaves when forced in absence of light, and these leaves may be further blanched by forcing them through sand or other covering. See *Chicory*.

The vegetable known as barbe-de-capucin, often shortened to barbe, is very similar to witloof, being produced by forcing either wild or improved roots of chicory and having a looser more leafy head. Witloof is usually forced from a special variety, grown for this purpose. As seen in the market in its best form, it is a firm oblong-pointed head about 6 inches long of white crisp undeveloped leaves. (Fig. 4006.) This vegetable is imported into this country in large quantities, being much prized as a delicate salad with a slightly bitter and characteristic flavor. It is frequently known as French endive.

4006. Witloof. (×¼)

There seems to be no reason why witloof can not be produced in this country. The New York Agricultural Experiment Station (Geneva) has recently published the results of tests (J. W. Wellington, Bulletin No. 418), from which the following directions are adapted: The seed (sold by many American seedsmen) from which to grow the forcing roots may be sown any time in May in open ground, in rows 18 inches apart and the plants later thinned to 6 inches apart in the row. Ordinary garden culture only is needed, but the plants should make a steady luxuriant growth, resembling large smooth-leaved dandelions. The roots should be lifted just before the ground is liable to freeze, the leaves trimmed to within 2 inches of the crown, and the roots stored. When needed for forcing in winter, the roots should be placed in beds or boxes where moderate heat can be applied, first cutting them off at the bottom to a uniform length of 8 or 9 inches. For holding the roots any soil or sand will do, since the growth of the heads is from the food stored in the roots and does not depend at all on the soil fertility. The roots may be set quite close together, but not touching, upright in the soil, and

covered to the crowns. Various materials may be used for holding and bleaching the heads during their growth; 8 inches of clear sand is a good medium. This may be placed on the bedding material as soon as the roots are set. One or more free applications of water should



4007. Woodwardia orientalis.

be made. From 50° to 60° F. is a desirable temperature, the latter probably preferable since growth is slower at the lower temperature. Higher temperature than 60° for any considerable period causes the leaves to shoot up rapidly and decreases the proportion of solid heads. At these temperatures the leaves should begin to show through the 8 inches of sand in about two weeks, when the heads are ready for harvesting.

In the Geneva tests four grades or sizes of roots were used: extra, averaging 2 inches in diameter, large, 1.4 inches, medium, 0.9 inch, and small, 0.6 inch. Of these the large and medium roots gave more than 70 per cent of marketable heads, while the extra roots produced too many divided and loose heads, or heads too large to serve satisfactorily as individual portions at table. The small roots produced many small heads, too slender for market purposes. The heads should be 4 to 6 inches long, and weigh two to three ounces to suit the market best. In Europe they are packed in baskets holding ten kilograms; but a three-pound Climax basket makes a satisfactory package for American markets. L. H. B.

WITSÈNIA (named after Nicholas Witsen, Dutch patron of botany in first half of 18th century). *Iridàceæ*. An ornamental greenhouse shrub with erect ensiform lvs. which are equitant; subsessile fls. with a cylindrical tubed perianth, which has erect connivent lobes and a 3-celled ovary which becomes a shiny leathery caps. Only one species from S. Afr., *W. Maùra*, Thunb., which is not in cult. B.R. 5. P.M. 8: 221. The plant known in horticulture as *W. corymbosa*, Ker, is more correctly named *Nivènia corymbòsa*, Baker. St. tall, woody at base, branched, compressed, acutely angled: lvs. erect, rather rigid, ensiform and equitant, upper ones smaller: fls. 1 (or 2 ?) to a spathe, subsessile; perianth purplish blue, tube elongated, cylindrical, lobes erect, connivent, outer ones rather thick, tomentose outside, inner ones shorter; spathes usually 2 to an axil. S. Afr. G. 32:739. Gn. 72, p. 375.

WÍTTIA (named for N. Witt, of Manaos, Brazil). *Cactàceæ*. Epiphytic spineless flat-stemmed plants: fls. rather small, not fugacious, with a very definite tube; lobes much shorter than the tube. In some respects similar to Rhipsalis, but with very different fls.: perhaps closest to Disocactus.—Three species.

panaménsis, Brit. & Rose. This species has recently been grown in Washington and the New York Botanical Garden, blooming freely every spring. St. much flattened, erect: fls. purple, 1 in. or more long. Native of Panama. J. N. Rose.

WITTMÁCKIA (named for L. Wittmack, professor at Berlin). *Bromeliàceæ*. Tall herbs: lvs. with relatively small thorns, never banded: infl. arising from the lf.-rosette, with membranous sheaths, often nodding or hanging, compound panicled with long many-fld. racemose branches: calyx free or slightly adnate, the right side strongly winged; petals free, linear, acuminate, without scales: fr. a dry berry. About 5 species, Cent. and S. Amer. This genus has sometimes been referred to Æchmea; see *Billbergia* for cult. *W. lingulàta*, Mez. Lvs. about 10 in a rosette, firm, strap-shaped, rounded, shortly cuspidate, about 2 ft. long, 2½ in. wide, spines short, broad-based, about 3 lines apart: scape floccose when young; sheaths lanceolate; panicle pinnately branched: fls. numerous, sessile; sepals white, ovate, bearing an awn nearly 1 line long; petals yellow, ovate from an oblong base; ovary glabrous, rather cylindrical. W. Indies. B.M. 8056.

WOOD BETONY: *Stachys Betonica*. **Woodbine:** In England, *Lonicera Periclymenum;* in America, *Parthenocissus quinquefolia*. **W. Lily:** *Trillium*. **Woodruff:** *Asperula*. **W. Sorrel:** *Oxalis Acetosella*.

WOODS, IN LANDSCAPE: *Planting*, Vol. V, page 2662.

WOÒDSIA (after Joseph Woods, an English botanist, 1776–1864). *Polypodiàceæ*. A genus of mainly rock-loving ferns characterized by their inferior indusium, which is attached beneath the sorus, inclosing it at first but soon splitting into star-like lobes, and later hidden beneath the sorus.—Some 15 species are known, of which 7 grow wild in this country. The following native species are sometimes cult. in borders. Treatment given other hardy ferns will suit them well. Both grow best amongst rocks.

ilvénsis, R. Br. Growing in rosettes or tufts: lf.-stalks dark, polished, jointed about ½in. from the rootstock; lf.-blades 3–8 in. long, 1 in. or more wide, bipinnatifid; segms. crowded, obscurely crenate: sori confluent when old. Eu. and N. Amer. north of Va.

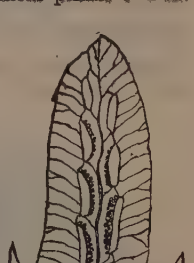
obtùsa, Torr. Lvs. clustered, 6–15 in. long, 2–4 in. wide, minutely glandular-hairy, bipinnate; pinnæ rather remote, triangular-ovate. New England to Ariz.

W. glabélla, R. Br., and *W. alpìna*, Gray, are two rare alpine hardy species which have been offered. They are of interest only as rarities in large collections. R. C. Benedict.†

WOÓDWÁRDIA (Thomas J. Woodward, an English botanist). *Polypodiàceæ*. Chain Fern. A group of rather coarse-foliaged ferns of diverse habit and structure, but all bearing the sori in rows arranged parallel to the midrib like links of sausages. See *Fern*.

A. *Lvs. of two sorts, the veins everywhere forming areoles.*

areolàta, Moore (*W. angustifòlia*, Smith). Sterile lvs. deltoid-ovate, with numerous oblong-lanceolate sinuate pinnæ; sporophylls with narrowly linear pinnæ 3–4 in. long. Mich. to Fla., mostly near the coast.—Often and probably better separated under a distinct genus, Lorinseria, on account of its different lvs. and habit of growth.



4008. Fruiting lobe of Woodwardia virginica. (×⅓)

AA. *Lvs. uniform.*

B. *Veins forming one or more series of areoles.*

radìcans, Smith. Lvs. rising from a short erect st., 3–5 ft. long, gracefully curved; pinnæ 8–15 in. long, 2–4 in. wide, pinnatifid nearly to the midrib. The true *W. radicans* from Eu. bears scaly buds toward the apex of the lf. and roots to form new plants. The Californian and Mexican species, which has often been referred to

this species, is really distinct and never roots; it is apparently not in the trade.

orientàlis, Swartz. Fig. 4007. Lvs. 4–8 ft. long, 12–18 in. wide, with lanceolate pinnæ and sinuate pinnules; veins uniting freely. Japan and Formosa.

BB. *Veins free between the sori and the margin.*

virgínica, Smith. Fig. 4008. Lvs. arising singly from a long creeping rootstock; lf.-blades 12–18 in. long, 6–9 in. wide on stout stalks; pinnæ linear-lanceolate, 4–6 in. long, cut nearly to the rachis into oblong lobes. Canada to Mich., Ark., and Fla.—Better separated as a distinct genus, Anchistea, on account of its slender long-creeping rootstock, from which the lvs. arise at intervals.

W. spinulòsa, Mar. & Gal. (W. paradoxa, Wright). Resembles W. radicans but has narrower fronds, and veinlets perfectly free from sorus to the margin. Vancouver Isl. to Mex.

L. M. UNDERWOOD.
R. C. BENEDICT.†

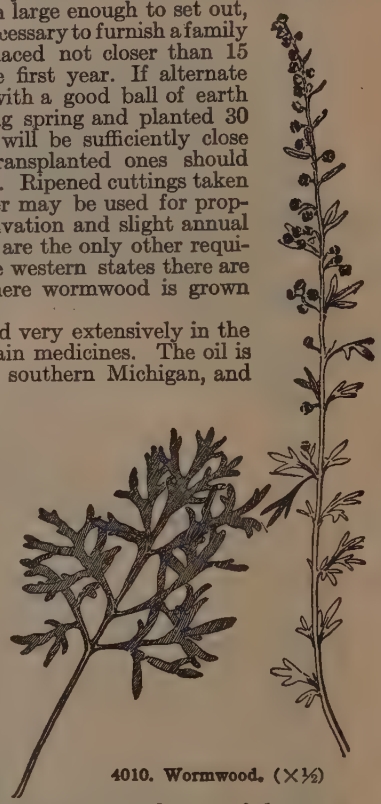
WORMS. Under the names of "worms," "snails," and "caterpillars," various odd fruits of leguminous plants are grown as curiosities. The pods are often put in soups as a practical joke, not for their edible qualities. The plants chiefly grown for this purpose are *Scorpiurus vermiculata,* Linn., *S. subvillosa,* Linn., *S. muricata,* Linn., *S. sulcata,* Linn., *Medicago scutellata,* Mill., and *Astragalus hamosus,* Linn. The last is the one usually known as "worms." The picture, Fig. 4009, shows species of Scorpiurus, chiefly *S. vermiculata* (beneath) and *S. subvillosa* (above). All these various plants are annuals of the easiest culture. They are practically unknown in this country, although offered by seedsmen. See *Caterpillars.* L. H. B.

WORMWOOD (*Artemisia Absinthium*). Fig. 4010. An erect hardy herbaceous perennial, native of middle and western Europe and the countries that bound the Mediterranean, and sometimes found in waste places as an escape from American gardens, having angular rather shrubby stems 2 to 4 feet tall, which bear abundant much-divided hoary leaves of intensely and persistently bitter flavor, and panicles of greenish or yellowish flower-heads. The seed, grayish and very small, retains its vitality for about four years, but is usually sown soon after harvesting. The tops and leaves, gathered and dried in July and August when the plant is in flower, are officially credited in America with aromatic, tonic, and, as its name implies, anthelmintic properties, although now, for no apparent reason other than caprice of practice, they are less popular with the profession than formerly. In domestic medicine they are employed as mentioned and as a diuretic; locally as a fomentation or as a decoction with vinegar to ulcers, sprains, and bruises. In the dry state they are occasionally placed among clothing as a moth-repellant. Formerly wormwood was used by brewers to embitter and preserve liquors, but at the present time it finds its most extensive use as the principal ingredient in absinthe, in the manufacture of which peppermint, angelica, anise, cloves, and cinnamon are also ingredients. According to Blythe, the green color of this liquor is due not to wormwood but to the chlorophyl of spinach, parsley, or nettles. The plant may be grown without trouble in light dry rather poor garden soil from seed which, owing to its small size, should be started where it may not be washed out or packed down by rain. When large enough to set out, the few specimens necessary to furnish a family supply should be placed not closer than 15 inches each way the first year. If alternate plants be removed with a good ball of earth early in the following spring and planted 30 inches apart, they will be sufficiently close together and the transplanted ones should suffer from no check. Ripened cuttings taken in March or October may be used for propagation. Clean cultivation and slight annual dressings of manure are the only other requisites. In the middle western states there are several localities where wormwood is grown for export.

4009. Pods known as "worms" and "caterpillars," sometimes grown for curiosity and as surprises.

Wormwood is used very extensively in the manufacture of certain medicines. The oil is produced largely in southern Michigan, and Wisconsin supplies a large acreage.

M. G. KAINS.



4010. Wormwood. (×½)

WUÊRTHIA: *Ixia. W. elegans,* Regel, is *Ixia columellaris.*

WULFÈNIA (named for F. X. Wulfen, 1778-1825). *Scrophulariàceæ.* Hardy perennial glabrous or slightly pilose herbs, suitable for the border or rock-garden.

Leaves nearly radical, petioled, crenate: peduncles scape-like, simple: fls. racemose at the top of the scape or spicate, solitary at the axils of the bracts, nodding, blue; calyx 5-parted, segms. narrow; corolla-tube exserted, cylindrical, limb 4-lobed, erect-spreading; stamens 2: caps. acute, septicidally and loculicidally dehiscent, 4-valved.—About 8 species. Eu. and Asia.

Amherstiàna, Benth. Lvs. obovate-oblong or obovate-spatulate, 2–5 in. long, coarsely crenate or lobulate, narrowed at base and subpinnatifid; petioles ½–1½ in. long: scapes 5–10 in. long, slender; racemes long, many-fld.: corolla ⅓in. long. Himalayas. G.W. 9, p. 375.

carinthìaca, Jacq. About 9 in. high: lvs. oblong or oval-oblong, doubly crenate, slightly lobed, narrowed at base, radical few, 3–8 in. long: scape 1–2 ft. long; raceme dense, spike-like, at length elongated: corolla-tube ¼in. long, limb shorter, upper segms. bifid, lower somewhat crenate. Mountains of Carinthia.

W. cordàta, Greene=Synthyris reniformis.

F. TRACY HUBBARD.

WYÈTHIA (named for N. J. Wyeth, North American botanical collector). *Compósitæ.* Hardy perennial herbs, probably adapted to the wild-garden or border. Caudex stout: sts. usually simple, 1-headed: lvs. radical or alternate, entire: heads large, heterogamous; ray-fls. pistillate, in 1 row, disk-fls. perfect and fertile; involucre hemispherical, 2–3 rows of bracts: corolla yellow, rays ligulate, spreading, entire or minutely 2-toothed.—About 7 species, N. Amer. *W. móllis,* Gray. Plant floccose-woolly when young, more or less glabrous when old, 1–3 ft. high, bearing solitary or few heads: lvs. oblong or ovate, base rounded, truncate or cuneate: rays 10–15, over 1 in. long: achenes minutely pubescent at summit. Nev. and Calif. B.M. 7772.

X

XANTHÍSMA (Greek, *dyed yellow*, referring to the color of the flowers). *Compósitæ.* Summer-blooming yellow-flowered composites.

Annuals or biennials, with alternate, usually entire, narrow lvs.: fls. all fertile, exclusively radiate: achenes top-shaped, 4–5-ribbed or angled; pappus persistent, composed of 10 or 12 rigid bristles which are minutely scabrous above, gradually chaffy-dilated toward the base, and longer than the disk-corolla, as many more one-half shorter, and usually 5 still smaller and shorter external ones.—Two species, of easy cult.

texànum, DC. (*Centaurídium Drúmmondii,* Torr. & Gray). Fig. 4011. Nearly glabrous biennial or annual, 1–4 ft. high: lvs. narrowly oblong to lanceolate; st.-lvs. entire or with a few teeth toward the apex: fls. attaining a diam. of 2 in. even in the wild, very showy, composed of a small disk and about 20 rather slender rays. On prairies, Texas.—Suitable for dry open places. In cult. treated like a hardy annual, the seed being sown in the open border early in spring. The second species, *X. Berlandièri,* Small (*X. texànum* var. *Berlandièri,* Gray), also of the prairies in Texas, is probably not cult. N. Taylor.†

4011. Xanthisma texanum. (×½)

XANTHÓCERAS (Greek, *xanthos,* yellow, and *keras,* horn, alluding to the yellow horn-like processes of the disk). *Sapindàceæ.* Ornamental shrub planted for its showy racemes of white flowers and also for the handsome pinnate foliage.

Deciduous: lvs. alternate, odd-pinnate, with narrow serrate lfts.: fls. polygamous, the upper ones of the terminal raceme pistillate, the lower ones staminate, those of the lateral racemes staminate, with rarely a few pistillate ones at the apex; sepals and petals 5; disk with 4 suberect cylindric horns about half as long as stamens; stamens 8; ovary superior, 3-loculed, with a rather short, thick style: fr. a caps., with thick walls dehiscent into 3 valves, each locule with several globose, dark brown seeds.—One species from N. China, allied to Ungnadia and Koelreuteria.

A very handsome shrub or sometimes a small tree with rather finely pinnate dark green and glossy foliage which is not attacked by insects and retains its bright color until frost sets in, and with showy white flowers appearing in upright profusely produced racemes with the leaves on last year's branches. The large greenish fruits are similar to those of the buckeye. It is hardy as far north as Massachusetts and is well suited for solitary planting on the lawn. Xanthoceras is also sometimes used for forcing. It is not very particular as to soil. A porous loamy soil and a sunny position seem to suit it best. Propagation is by seeds, stratified and sown in spring, and by root-cuttings, which succeed best with moderate bottom-heat.

sorbifòlia, Bunge. Figs. 4012, 4013. Shrub or small tree, attaining 15 ft. with rather stout upright branches, glabrous: lvs. 6–12 in. long; lfts. 9–17, usually opposite, sessile, narrow-elliptic to lanceolate, sharply serrate, dark green above, paler beneath, 1–2 in. long: racemes 6–10 in. long: fls. on slender pedicels, white, about ¾in. across, each petal with a blotch at the base changing from yellow to red: fr. green, 1½–2½ in. long; seeds ½in. across. May. N. China. B.M. 6923. F.S. 18:1899. R.H. 1872: 290; 1898, p. 356. Gn. 8, p. 524 (col. pl. not numbered); 34, p. 372; 50, p. 227; 63, p. 407; 65, p. 412; 71, p. 298; 76, p. 121. G.C. II. 26:205; III. 2:274, 275; 11:533; 17: 197; 58:90. G. 27:83; 37: 121. J.H. III. 48:424; 49:210. G.F. 6:285. A.F. 3:109; 12: 36. A.G. 18:357. Gng. 2: 292, 293; 3:289; 12:610, 611. Mn. 1, p. 27. F.E. 17:389. M.D.G. 1900:592, 593; 1909: 499. G.W. 12, p. 425. I.H. 24:295. Gn. W. 21:429.

Alfred Rehder.

XANTHORRHÍZA: *Zanthorhiza.*

XANTHORRHŒA (Greek, *yellow flow,* referring to the resin which exudes from the trunks). *Liliàceæ.* Persistent perennials with a thick woody caudex, adapted to greenhouse culture and which have been tried out-of-doors in the extreme South.

Caudex very short to arborescent: lvs. in a dense tuft at the top of caudex, long-linear, brittle, spreading or recurved: scape or peduncle terminal, often several feet long, terminating in a dense cylindrical spike: fls. greenish, numerous, sessile; perianth persistent, segms. 6, 3 outer glume-like, erect, concave or almost hood-shaped at the top, 3 inner much thinner, erect with the

outer but more or less protruded beyond them; stamens 6; ovary sessile, 3-celled: caps. protruding from the perianth, ovoid or acuminate, 3-valved, hard, brown and shining.—About 14 species, Austral.

The "grass trees," "grass gums," or "black boys," form a conspicuous feature of the Australian landscape. These picturesque desert plants are well worth trial in the warmer and more arid regions of the United States. The trunk varies from almost nothing in some species to 15 feet in the case of aged specimens of *X. Preissii*. The tall and palm-like trunks are thickly covered with the bases of the old dead leaves, which are cemented together by the black or yellow resinous gum that flows freely from the stems. In Australia the trunks are often charred and discolored by bush fires. The following species have been offered in southern Florida and southern California, but are practically unknown to cultivation in this country. All the species are long-lived perennials native to dry and rocky places. They are said to thrive in a compost of peat and loam and to be propagated by offsets. *X. Preissii* seems to be the most desirable species.

4012. Xanthoceras sorbifolia. (×⅓)

A. *Trunk very short.*

B. *Spike 3–8 in. long.*

mìnor, R. Br. Lvs. 1–2 ft. long, 1–2 lines wide: scape longer than the lvs.: spike less than ¾in. wide. B.M. 6297.—Belongs to the group in which the inner perianth-segms. have a white blade conspicuously spreading above the outer ones, while in the next two species the inner segms. have a short whitish tip, little longer than the outer and scarcely spreading.

BB. *Spike 1½–2 ft. long.*

hâstilis, R. Br. Lvs. 3–4 ft. long, 2–3 lines broad: scape often 6–8 ft. long, not counting the spike. Readily distinguished by the dense, rusty tomentum covering the ends of the bracts and outer perianth-segms. B.M. 4722. G.C. III. 17:196. F.S. 9:868. G. 24: 612. Gn.W. 22:13. R.H. 1914, p. 67.

4013. Fruit of Xanthoceras sorbifolia. (×⅓)

AA. *Trunk becoming 5–6, or even 15 ft. long.*

Preìssii, Endl. Lvs. 2–4 ft. long, 1–2 lines broad, rigid, very brittle when young: scapes 2–6 ft. long, including the spike, which occupies one-half to nearly all its length. B.M. 6933. G.C. III. 39:228.

undulatifòlia, Tod. ex Riccobono. Trunk 8 ft. or so high, 12 in. diam.: lvs. in a large crown, 5 ft. long, fragile, sword-shaped, reflexed, rhomboidal in section: scape quite erect, cylindric, about 12 ft. long, with a dense spike of golden yellow fls. Austral.

F. Tracy Hubbard.†

XANTHOSÒMA (Greek, *yellow body*, referring to the stigma). *Aràceæ*. This group is interesting to the horticulturist as containing the handsome variegated stove foliage plant known to the trade as *Phyllotænium Lindenii*, and part of the vegetables known as yautia, malanga, and tanier, a crop to which much of the arable land in Porto Rico is devoted.

Milky herbs of S. and Cent. Amer. with a thick sometimes elongated corm: lvs. arrow-shaped, 3-cut or pedately cut: fls. unisexual, naked; males with 4–6 stamens connate in an inversely pyramidal synandrium with 5 or 6 faces; ovary 2–4-loculed; ovules anatropous.—A genus of 25 species, according to Engler, who has given an account of them in DC. Mon. Phaner., vol. 2 (1879).

Many species of the arum family are noted for their huge corms, some of which are edible after the acrid and more or less poisonous properties are destroyed by cooking. Of this class the best known are the taros (*Colocasia esculenta*, Schott, the common taro of southern Asia and the Pacific islands, and *C. antiquorum*, Schott,

the Egyptian taro, and the yautias, taniers, or malangas (*Xanthosoma sagittifolium*, and other species of this genus) of the West Indies. The botany of the species of Xanthosoma is confused. The corms and cormels (offsets) of some taros, and the cormels of some varieties of yautia, are free from acridity even in the raw state

4014. Xanthosoma sagittifolium.

as cultivated in southern United States. Yautia corms are strong-flavored and are seldom eaten. The young leaves of colocasia and xanthosoma when properly cooked are said to be equal or superior to spinach.

A. *Caudex a short, thick, erect rhizome.*

sagittifòlium, Schott (*Árum sagittifòlium*, Linn.). YAUTIA. MALANGA. Fig. 4014. A tropical vegetable. "Young plants of this are stemless, but in age, from the decay of the old lvs., an annulated caudex or corm is formed some inches in height, each throwing out stout fibers from the base, and from time to time producing offsets by which the plant is easily prop., or if suffered to remain the plant becomes tufted, and numerous lvs. are produced from the summit of the short, yet st.-like trunks" (B.M. 4989). Lvs. 1–2 or almost 3 ft. long, broadly sagittate-ovate, suddenly and shortly acute at apex, basal lobes obtuse: spathe large, with a creamy white limb. Trop. Amer.—In northern hothouses said to bloom in winter.

AA. *Caudex tuberous.*

Líndenii, Engl. (*Phyllotænium Líndenii*, André). Fig. 4015. Tender variegated foliage plant with large arrow-shaped lvs. marked with white along the midrib and parallel veins which run therefrom to the margin. I.H. 19:88. A.G. 19:573 (1898). G.W. 5, p. 308.—Tuberous plant from Colombia. G. W. Oliver, in his "Plant Culture," remarks that this stove ornamental plant should be more used for decorative purposes than it is at present, for it will stand more rough usage than one would suppose. After a goodly number of leaves have been developed in a warm, moist atmosphere, the plants will maintain a good appearance in a greenhouse temperature and may even be used as house plants. The lvs. are firmer in texture than caladiums. Prop. by division. Before repotting, put the pieces in a warm sand-bed to encourage fresh roots. Lvs. oblong-hastate, with acute basal lobes. A very worthy species for ornament.

X. bataviénsis, Hort. Said to have purple sts. and dark green lvs., with edible tubers.—*X. belophýllum*, Kunth, has a short thick erect rhizome and a cordate-hastate lf. Venezuela. Var. *caracasànum*, C. Koch (X. caracasanum, Schott. Colocasia caracasana, Engl.), has lvs. pale green beneath, the posterior lobes more produced at the apex and the midrib and nerves often rosy. Caracas.—*X. cordàtum*, N. E. Br. Lvs. glabrous: tube of spathe green; blade yellow-green outside, rose-tinted at base, whitish inside. British Guiana.—*X. cordifolium*, N. E. Br. Allied to X. sagittifolium, but differing in lvs. being obtusely round-cordate and spadix bearing club-shaped neutral organs. British Guiana.—*X. Hóffmannii*, Schott. Lf.-stalk whitish with dark purple blotches: spathe with green tube, purple inside, the limb white. Costa Rica.—*X. maculàtum*, Nichols., is described as having immense pale green lvs. variegated with creamy yellow, the petiole violet-tinted.—*X. Mafáffa*, Schott (Colocasia Mafaffa, Hort.). Closely allied to X. belophyllum, has a similar caudex and a cordate-ovate lf., but the posterior costæ are separated by a right or acute angle, the angle in X. belophyllum being obtuse.—*X. Márshallii* is said to be a very rapid grower, with green lvs. and dark sts.—*X. nuevoleonénse*. Grows to 6 ft. high, and has very large lvs. which stand almost horizontal.—*X. violàceum*, Schott. Lvs. primrose, finally green, sagittate-oblong-ovate, 8–16 in. long, 6–12 in. wide: spathe with a tube 4 in. long, the blade 6 in. long, 3 in. wide.

WILHELM MILLER.
ROBERT A. YOUNG.†

XANTHÓXYLUM: *Zanthoxylum.*

XENIA. When sweet corn is fertilized by pollen from a starchy variety, the grains which result from this union become smooth and hard because packed with starch. In like manner the pollen of a purple-seeded variety like the Black Mexican sweet corn, produces purple seeds on ears which would otherwise have white or yellow seeds, and pollen from a yellow-seeded variety produces yellow seeds on the ears of a white-seeded variety. Such direct effects of the pollen are known as xenia (Focke, 1881). While the phenomenon is best known in Indian corn, it has been demonstrated recently also in rye (von Rümker), in which a green-seeded variety bears yellow seeds if pollinated by a yellow-seeded variety. In both maize and rye, the xenia characters affect only the endosperm (albumen) of the seeds, while characters of the seed-coat show no xenia. The correct interpretation of xenia in maize was given by de Vries (1899) and Correns (1899), and almost simultaneously by Webber (1900). This explanation is briefly as follows: The pollen-tube contains two male nuclei, one of which fertilizes the egg, while the other unites with certain other nuclei of the embryo-sac to form the endosperm-

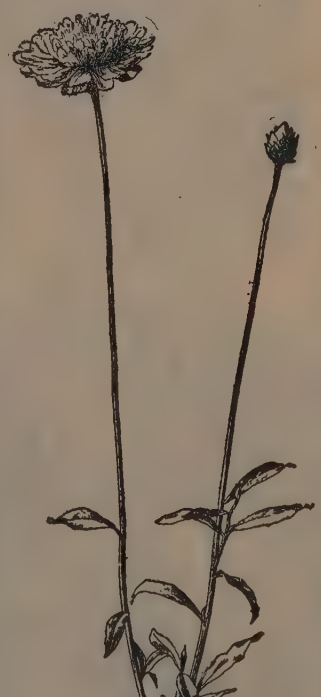
4015. Xanthosoma Lindenii. Leaves 1 foot or so long.

nucleus from which the whole of the endosperm is developed. The direct effect of the pollen on endosperm characters is due to this participation of one of the male nuclei in the production of the endosperm. A slightly different phenomenon is seen in peas, in which pollen from a yellow-seeded variety produces yellow seeds in the pods of a green-seeded variety, for here the xenia character resides not in the endosperm, but in the embryo itself. Physiological effects of pollen in causing local disturbances of nutritive or other functions in tissues surrounding the style or ovary, thus affecting the size and quality of the fruits, are not properly included under xenia. Many reported cases of xenia in plants other than those here mentioned are undoubtedly mythical and will not stand the test of careful experimental investigation. The deterioration of melons supposedly caused by growing in the proximity of pumpkins or cucumbers, is doubtless a case of this kind. GEO. H. SHULL.

XERÁNTHEMUM (Greek, *dry flower:* it is one of the "everlastings"). *Compósitæ.* Annual erect herbs, densely pubescent or tomentose, of which *X. annuum* is one of the oldest and best known of the "everlastings" or immortelles.

Heads rayless, but the large involucral scales are petal-like and persistent, giving the plant its value as a subject for dry bouquets: outer fls. few and sterile, inner ones fertile; receptacle chaffy; involucral scales in many series, of various lengths, glabrous; heads solitary on long naked peduncles.—Four or 5 species, Medit. region.

The culture of xeranthemum is very simple. Seeds are usually sown in the open, where the plants are to stand; but they may be started outdoors and the seedlings transplanted. Hardy or half-hardy annuals.



4016. Xeranthemum annuum. (×½)

ánnuum, Linn. Fig. 4016. Annual, 2–3 ft. tall, erect, white-tomentose: lvs. alternate, oblong-lanceolate, acute, entire: heads purple, 1–1½ in. across, the longer scales wide-spreading and ray-like. S. Eu. G. 4: 74, 75.—Runs into many varieties. Var. **ligulòsum,** Voss (*X. plenìssimum* and *X. imperiàle,* Hort.). A double or half-double form. Var. **perligulòsum,** Voss (*X. superbìssimum,* Hort.), has very full double heads. In these and the single types there are white-fld. (var. *álbum*), rose-fld. (var. *ròseum*), and purple-fld. (var. *purpùreum*) varieties. There are also violet-fld. forms. Var. **multiflòrum,** Hort. (var. *compáctum*) has a more compact and bushy habit, with somewhat smaller heads. *X. várius,* Hort., is a trade name for mixed varieties. Xeranthemums are considerably used for a certain type of bedding, but they are mostly grown for cutting.

X. inápterum, Mill. (X. erectum, Presl), has white heads, of which the scales are little or not at all open or spreading. S. Eu. to S. W. Asia. L. H. B.

XEROCLÀDIA (*dry branch,* from the character of the growth). *Leguminòsæ.* One species, *X. viridiràmis,* Taub. (*X. Zèyheri,* Harv. *Acàcia viridiràmis,* Burch.), of S. Afr., likely to be planted in warm dry regions in choice collections, differs from Acacia in having only 10 (rather than indefinite) stamens, powdery pollen, 5 free petals, and other technical characters. It is described as a small, dry, and very rigid bush 1–2 ft. high, with pale bark, spinous stipules, deciduous bipinnate lvs., and fls. 8–12 in nearly or quite sessile heads: petals oblong; filaments not much exceeding the petals; anthers with a very minute sessile gland: pod or legume semi-orbicular, indehiscent, 1-seeded, about ½in. long, winged.

XERONÈMA (Greek, *dry* and *thread,* referring to the filaments which dry and persist). *Liliàceæ.* Perennial herb, sometimes grown in the warmhouse: rhizome very short: st. erect, simple: lvs. grouped at base of st., elongate, rigidly veined: raceme terminal, simple, secund rachis abruptly bent at base, frequently horizontal: fls. grouped on erect short pedicels; perianth red, showy, about ½in. across, persisting, segms. distinct, linear, erect, 1-nerved; stamens 6; ovary sessile, obtuse, 3-celled: caps. very short-stipitate, loculicidally dehiscent. One species, New Caledonia. *X. Moòrei,* Brongn. & Gris. St. about 20 in. long with a few reduced lvs.: basal lvs. 12–16 in. long, erect: fls. bright crimson; perianth ½–¾in. long; stamens exserted. New Caledonia. B.M. 8342.

XEROPHÝLLUM (Greek, *dry leaf*). *Liliàceæ.* TURKEY'S BEARD. Tall subaquatic hardy perennial herbs not extensively in cultivation.

Rhizome short, thick and woody: sts. erect, tall, simple: lvs. radical or grouped at base of st., long-linear, rather stiff, margin scabrous; cauline lvs. sparse, much smaller: fls. white, numerous, in a terminal raceme; perianth withering, persistent, segms. distinct, oblong or lanceolate; stamens 6; ovary sessile, 3-grooved, obtuse, 3-celled: caps. subglobose, or short-oblong, 3-grooved, loculicidally dehiscent.—Three species, N. Amer. Watson, in Proc. Am. Acad. 14:284.

The turkey's beard of the eastern states (*X. asphodeloides*) is a strong herb, 3 to 4 feet high, resembling asphodel. It has a dense tuft of numerous long, wiry leaves from the center of which springs a stately shaft sometimes 5 feet high, with an oval or oblong raceme 6 inches long, crowded with yellowish white 6-parted flowers, each ¼ inch across. It blooms from May to July, flowers with delicate fragrance lasting a long time. The species is a native of the dry pine barrens from southern New Jersey to eastern Tennessee and Georgia. The chief species of the Pacific coast, *X. tenax,* has white and violet flowers, the latter color supplied by the stamens. Each region should cultivate its own species. The forms are too much alike for the same garden. A third species, *X. Douglasii,* Wats., is a rare plant ranging from Montana to Oregon. It is distinguished by its six-valved capsule and is said to be inferior as a garden plant to the other species.

asphodeloìdes, Nutt. (*Helònias asphodeloìdes,* Linn. *X. setifòlium,* Michx.). Fig. 4017. Tall hardy perennial, 1–4 ft. high: lvs. 1 line or less wide: raceme 3–6 in. long: perianth-segms. exceeding the stamens. Pine barrens, E. U. S. B.M. 748. L.B.C. 4:394. Gng. 1:173. A.F. 7:171. Gn. 27, p. 224; 39:526 and p. 527; 58, p. 15. G.C. II. 13:433.

tènax, Nutt. Two to 5 ft. high: lvs. about 2 lines wide: raceme 1–2 ft. long; pedicels longer: perianth-

segms. scarcely equaling the stamens. Calif. to Brit. Col. June, July. B.R. 1613 (erroneously as *X. setifolium*).
F. TRACY HUBBARD.†

XIMÈNIA (named after Francis Ximenes, Spanish monk, who wrote on plants of Mex. in 1615). *Olacàceæ*. Glabrous or tomentose shrubs or trees, one of which, *X. americana*, occurs native in S. Fla. and is a tropical fr. of minor importance. Branches usually thorny: lvs. alternate, entire, subcoriaceous, usually fascicled: fls. whitish, arranged in short axillary cymes or rarely solitary; calyx small, 4–5-toothed or -lobed, unchanged in fr.; petals 4–5, valvate, narrow, bearded inside; stamens twice the number of petals; ovary 3-celled at base or higher, ovules 3: drupe ovoid or globose, flesh pulpy.—About 5 species, natives of the tropical regions of the world. Here belongs the hog plum which grows wild throughout the tropics, and in the U. S. is native to Fla. south of Tampa Bay. The fr. is about an inch long, shaped like a plum, and the pulp is sweet and aromatic. The "stone" which incloses the seed is proportionately very large. The fr. is borne on a small tree, each branch of which ends in a thorn about ½in. long. The frs. are generally eaten, but although it is fairly common in Fla. it is not cult. The species has been suggested by the American Pomological Society as worthy of cult. with a view to improvement.

americàna, Linn. HOG PLUM. Also called "mountain" or "seaside plum" and "false sandalwood;" "wild olive" in Jamaica. Tropical fruit-bearing tree: lvs. 2–3 together, oblong, obtuse, short-petioled: peduncles 2–4-fld., shorter than the lvs.: fls. small, yellow; petals thick, lanceolate, rusty-hairy within: fr. yellow; nut white, globose. Tropics.—The "hog plum" of Jamaica is *Spondias lutea*.
F. TRACY HUBBARD.†

XYLÒBIUM (Greek, *wood* and *life*, in allusion to the substance on which the plants grow). *Orchidàceæ*. Epiphytic herbs, grown in the warmhouse.

Stems short, with many sheaths, soon thickened into fleshy pseudobulbs, which are 1–2-lvd.: lvs. large or elongated, plicate-veined, contracted to the petiole: scapes erect, simple, arising from the base of the pseudobulb: fls. racemose, medium-sized or rather large, very shortly pedicelled; bracts linear, usually rather long; sepals subequal, erect, finally spreading, lateral broader than the dorsal, forming a chin; petals similar to the dorsal sepal if not smaller; labellum somewhat articulate with the foot of the column, lateral lobes erect, surrounding the column, midlobe short, broad, surface smooth, lamellate or callous at the base; pollinia 4, ovoid: caps. oblong, erect.—About 30 species, natives of Trop. Amer.

bractéscens, Kränzl. (*Maxillària bractéscens*, Lindl.). Pseudobulbs conical, elongated, sulcate: lvs. broad, folded: scape 3-sheathed; raceme elongated, few-fld.: sepals oblong-lanceolate, they and the similar but smaller petals dull yellow; lip reddish brown, 3-lobed. Peru.

brachystàchyum, Kränzl. Pseudobulbs almost globose, slightly narrowed above, 1-lvd.: lf. oblong, acute, 3-nerved, thick, shining, petiole sulcate, blade 10 by about 4 in.: raceme very short, few-fld.: dorsal sepal broad ovate-oblong; lateral ones much larger, outside dull purple; petals oblique at base, oblong above, dull purple outside, yellow spotted purple inside; lip simple, obovate-oblong, rather acute, slightly fiddle-shaped. Brazil. G.C. III. 40:302 (desc.).

dècolor, Nichols. (*Maxillària dècolor*, Lindl.). Pseudobulbs clustered, oblong, compressed, 1–2 in. long, bearing a single lf.: lf. 12–15 in. long, oblong-lanceolate, plicate and acuminate at both ends: scapes erect, many-fld.: sepals and petals sulfur-colored or shaded with white; lip whitish, obsoletely 3-lobed, obtuse. W. Indies. B.M. 3981. B.R. 1549.

elongàtum, Hemsl. (*Maxillària elongàta*, Lindl.) Pseudobulbs cylindrical, elongated, about 6 in. long, 2-lvd.: lvs. lanceolate, 3-ribbed: scape erect, 2-sheathed, many-fld., infl. a dense oblong raceme: sepals and petals pale yellowish white, linear, acuminate; lip ovate-oblong, very fleshy, purplish brown. W. Indies.

leontoglóssum, Benth. (*Maxillària leontoglóssa*, Reichb. f.). Pseudobulbs fusiform, congregated, 1-lvd.: lf. petioled, elliptic-lanceolate, acute, plicate: scape

4017. Xerophyllum asphodeloides growing near the margin of a pond.

stout, bearing an oblong or cylindrical, dense and nodding raceme: fls. yellow, spotted with maroon; dorsal sepal oblong, lateral sepals oblong-lanceolate; petals similar to lateral sepals; lip oblong, lateral lobes narrow, midlobe rotundate fleshy and marked with purple-brown. Colombia. B.M. 7085.

squàlens, Lindl. (*Maxillària squàlens*, Hook.). Pseudobulbs stout, 2–3 in. long: lvs. 9–12 in. long: scapes densely fld.: sepals and petals yellowish white, petals and midlobe of lip streaked with purple, lateral lobes of lip deep purple. Venezuela. B.M. 2955.

X. xtivum, Hort., is offered in the trade.—*X. peruviànum*, Hort., is also offered.
F. TRACY HUBBARD.

XYLOPHÝLLA ARBÚSCULA, Swartz: *Phyllanthus speciosus*.

XYLÒPIA (from the Greek *Xylopikron*, bitter wood). *Annonàceæ*. Shrubs and trees grown mostly for their fruits, and also for spices and other products.

The genus resembles other Annonaceæ in having alternate distichous entire lvs., and fls. with 6 petals in 2 series, but distinguished by the form of the torus, or receptacle, which has a concavity in the middle including the carpels, surrounded by a ring of stamens borne on the convex portion of the receptacle: infl. instead of being extra-axillary or lf.-opposed, as in many other genera of the family, consists of short-stemmed or sessile fls. growing from the axils of the lvs., either solitary or in clusters of 2 to several: calyx

with 3 valvate sepals connate for some distance from the base; outer petals elongate, thick, valvate, and connivent, or scarcely opening, and triquetrous above, inclosing the 3 inner linear petals, which are concave at the base; after anthesis the receptacle undergoes a transformation, its center becomes depressed so as to form a cone-like sac, while its margin grows in such a way as to form a dome with an orifice at its apex; through this orifice protrude the styles, while the ovaries occupy the cavity, and the surface of the dome in most species is covered with the crowded stamens, the expanded connectives of which form a sort of tile-like covering to the pollen-sacs; carpels vary in number and the ovaries have a ventral placenta bearing an indefinite number of ovules primitively arranged in 2 vertical rows: fr. consists of clusters of berries either sessile or shortly stipitate, more or less elongate, often constricted between the seeds, which have a ruminate endosperm, like other members of the Annonaceæ, and in many cases there is an aril on both sides of the terminal umbilicus. In the African species, sometimes separated as a distinct genus under the name Habzelia, instead of a central cavity there is only a slight depression at the summit of the torus or even none at all. In the genus Pseudannona, treated by Baillon as a section of Xylopia, but given generic rank by the writer (see Journ. Wash. Acad. Sci. 3:16. 1913), both the corolla and the fr. differ radically from those of Xylopia. The inner petals form a diminutive acute triquetrous corolla over the essential parts, and the outer ones, much broader and longer, recall by their form and the thickness of their margin the fls. of certain species of Annona, while their few-seeded frs. are thick and fleshy, when mature suggesting the frs. of our common *Asimina triloba*. It is intended here to describe only the species of economic importance.

Xylopia æthiopica, *X. Eminii*, *X. aromatica*, *X. carminativa*, *X. frutescens*, and *X. grandiflora* are worthy of cultivation for the sake of their spicy fruits; while *X. parvifolia* and *X. nigricans* of Ceylon are desirable for the exquisite perfume of their flowers, which like those of the ilang-ilang (*Canangium odoratum*) might be utilized as a source of an essential oil for use in perfumery. Propagation is possible either by seeds or by grafting and budding, as in the case of other Annonaceæ. Seeds should be sown as soon as ripe in shaded beds and the small seedlings should be transferred to pots and kept until ready for planting out, preferably in good, well-drained soil in sheltered situations.

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A. *American species* (*Nos. 1–7*).

B. *Lvs. acute or acuminate.*

1. **grandifiòra,** Aubl. (*X. cubénsis*, A. Rich. *X. longifòlia*, A. DC.). MALAGUETO MACHO. MALAGUNTO GRANDE. ZEMBÉ. FRUTA DEL BURRO. ACHON. Fig. 4018. Tree with younger branches rufous-tomentose near extremities: lvs. approximate, distichous, elliptical-lanceolate or oblong, acute at the apex, usually obtuse at the base, puberulous above, tomentose and rufescent beneath, the blade 4 in. or more in length, the petiole about ¼in. long, grooved above, tomentose and rufous: peduncles axillary, very short, 2-fld.; pedicels incurved, bracteate, villous, ferruginous: fls. often 2 in. long; calyx short, cup-shaped, shortly 3-parted; petals erect, the outer ones linear, acutish, concave at the base, silky near the base, subtomentose above; the inner ones shorter and narrower, linear and triquetrous, acute, expanded and shell-like at the concave base, so as to cover the essential parts; receptacle hollowed in the center, forming a cavity in which the ovaries are included, the styles protruding beyond its opening. A wide geographical range, which has undoubtedly been extended through human agency. It is spread in S. Amer. from Brazil to Panama and also occurs in Cuba, where it is known as Malagueta brava, or "wild melegueta," and Guacima Maria, or St. Mary's guacima."—Varies considerably in the size and pubescence of its lvs. According to Baillon the frs. of this species, together with those of *X. frutescens* and *X. sericea* (*X. carminativa*), are offered for sale in the pharmacies of Brazil. They contain large cells filled with a volatile aromatic oil, having a pepper-like flavor, but more agreeable and delicate than pepper. Martius regards these frs. as worthy of intro. into the pharmacopœia, on account of their tonic and carminative properties.

2. **carminativa,** R. E. Fries. (*Unòna carminativa*, Aruda da Camara. *X. sericea*, St. Hil.). PAO D' EMBIRA. PINDAIBA. PIMENTA DE MACACO. A tree closely allied to *X. grandiflora*, but with the lvs. narrower in comparison with their length, and with the apex more attenuate and the base more acute, but the latter varies and is sometimes rounded; lf.-blade clothed with appressed silky hairs longer than those of *X. grandiflora*, and usually smaller than the latter, but also varies in size: fls. much smaller than those of *X. grandiflora*, scarcely exceeding ½in. in length, and serving at once to distinguish the two species: frs. either rounded at the tip or pointed, shorter than those of *X. grandiflora*, and usually containing 3 or 4 seeds, but sometimes only 1 or 2, in the latter case they resemble the frs. of *X. frutescens*, from which, however, they may be distinguished, when dry, by their black color and rough surface. Ranges from Minas Geraës in Brazil to British Guiana.—The seeds are commonly found in apothecary shops in Brazil, where they are sold as carminatives. According to St. Hilaire the bark is stringy and tenacious and is excellent for cordage, especially for boat-cables. The frs. have the odor and taste of pepper and are used as a condiment, but are not so pungent as pepper. Specimens were purchased at Januaria, state of Minas Geraës by Messrs. Popenoe, Shamel, and Dorsett, of the U. S. Dept. of Agric. during their recent mission to Brazil.

3. **frutéscens,** Aubl. MALAGUETA HEMBRA. MALAGUNTO CHICO. COUGNERECOU (Carib name). JEJERECOU (Cayenne). EMBIRA. PINDAIBA (Brazil). Fig. 4018. A shrub or small tree with distichous branches; new branchlets pilose, reddish: lvs. oblong-lanceolate, acuminate at the apex, with the tip of the acumen obtuse or rounded, and the margins revolute, above glabrous, beneath silky with white, appressed, sericeous hairs: peduncles pilose, very short, bracteolate, solitary, or in 2's or 3's, growing from the axils of the lvs.: calyx pilose, with the divisions ovate acute; petals oblong, never opening widely, sericeous on the outside: frs. glabrous, aromatic. Endemic in Brazil, Venezuela, Guiana, Colombia, and Panama.—Collected at Gatun by Hayes, who states that "the negroes of the Isthmus use the red berries of this small tree as a substitute for pepper and the bark for making ropes." Specimens in the National Herbarium were recently collected by Henry Pittier in the Canal Zone, and bear the common name "malagueta hembra," to distinguish them from the fr. of the "malagueto macho." The name malagueta, sometimes modified to malagunta, undoubtedly comes from Afr., where it is applied to the so-called "grains of paradise" (*Amomum Melegueta*, Roscoe), a famous spice of the west coast of Afr.

4. **muricàta,** Linn. (*X. jamaicénsis*, Griseb.). SMALLER BITTER-WOOD. Fig. 4018. A shrub with ovate or lanceolate, long-acuminate lvs., with the slender acumen often obtuse at the tip, clothed beneath with

strigose hairs, and bearded at the tip: fls. small, in axillary clusters: berries punctate.—This species, the type of the genus Xylopia, was based by Linnæus on a plant growing in the mountains of Jamaica described and figured by Patrick Brown in his Natural History of Jamaica, and called by him Xylopicrum, on account of the bitter taste of its wood. The vernacular name was applied to it to distinguish it from *X. glabra*, Linn., a species based on Plukenet's *Xilopicron*, or *Lignum amarum*, of Barbados, commonly called bitter-wood.

5. **discrèta,** Safford (*Unòna discrèta*, Linn. f. *Habzèlia discrèta*, A. DC.). Peyricoboom. A shrub or small tree with privet-like, or willow-like lvs. and

4018. Xylopia.—*a–e*, X. grandiflora, showing flower-bud and leaf at *a*, section of flower with cavity in receptacle at *b*, fruiting branch at *c*, four-seeded fruits, *d*, *e*; *f*, X. frutescens, fruiting branch; *g*, X. muricata, type of the genus; *h*, X. obtusifolia, fruit and three leaves. (*b* nat. size; others × about ½.)

slender, flexible, virgate branches: lvs. alternate, short-petioled, 2-ranked, narrowly oblong-lanceolate, about 1 in. long, clothed beneath with appressed silky hairs: fls. resembling those of an Anona but with the carpels distinct and stipitate, developing into a cluster of berries borne on the center of the indurated receptacle: berries purple, aromatic, oblong-linear, 1-3-seeded, more or less constricted between the seeds; the latter ovate-globose, smooth and glossy.—This species was first described by the younger Linnæus from a tree growing in Surinam, or Dutch Guiana, and proposed by him as the type of a new genus Unona. It proved, however, to be congeneric with Xylopia. The name Unona was afterward applied to an Asiatic genus previously described by Loureiro as Desmos, but according to the laws of botanical nomenclature, was not available for the name of a second genus. The generic name Desmos is therefore valid, and must be used for the Asiatic plants commonly called Unona. (See *Desmos*, Vol. II, p. 991 of this work.)

6. **aromática,** Baill. (*Habzèlia aromática*, A. DC. *Wària zeylánica*, Aubl.). Maniguette. Bois d' Ecorce. Poivre des Nègres. A tree with a trunk 20 ft. high or more, with a spreading crown and leafy branches; lvs. ovate or oblong-acuminate, glabrous, subsessile: fls. axillary, solitary or in pairs; calyx-divisions subrotund-ovate, acute, fleshy; petals 6, the 3 outer ones longer, ovate-oblong, on the outside villous, cinereous, on the inside glabrous, violet-colored, the 3 inner ones smaller, glabrous, violet-colored: berries reddish, numerous (12–25 in a cluster), oblong, subterete, shortly stipitate, with a longitudinal seam down one side; constricted between the seeds; seeds 3–6, orbiculate, reddish.—A species of doubtful relationship, owing to its broad petals and orbiculate seeds. It has been referred to *Unona concolor*, Willd., and may possibly be congeneric with Desmopsis or Unonopsis. The type, described by Aublet under the name *Waria zeylanica*, was collected in the forest of Timoutou, French Guiana.

bb. *Lvs. obtuse or rounded at the apex.*

7. **obtusifòlia,** A. Rich. (*Habzèlia obtusifòlia*, A. DC.). Guimba. Guavica. Guavico de Savana. Pico de Gallo. Fig. 4018. A shrub or small tree with numerous crooked branches, the extremities of which are ferrugineous-pubescent when young. It differs from all other species here described in its perfectly glabrous lvs., which are quite obtuse or rounded at the apex and obovate or subspatulate in outline, coriaceous, pale green and glossy above and paler beneath, and about 1–1½ in. long: fls. axillary, solitary, very shortly peduncled, subtended by small scale-like bracteoles; calyx-divisions broad, subacute, and ciliate along the margin; outer petals narrowly linear, acutish, dilated and concave at the base, covered on the outside with rufous silky hairs; inner petals shorter and narrower, triquetrous above, expanded and concave at the base, covering the essential parts; carpels included in the cup-like hollow of the receptacle, numerous, but usually only 2–8 developing into fr.; the latter a cluster of terete follicles more or less constricted between the 2–4 seeds, which have a whitish fleshy aril on each side of the hilum.—This plant is known only from the Island of Cuba, where it is prized for its fine yellow wood. Its local name Pico de gallo (cock's beak) is suggested by the form of its sharp elongated fl.-buds.

aa. *Asiatic species.*

8. **parvifòlia,** Hook. f. & Thom. (*Patònia parvifòlia*, Wight. *Unòna tripetaloídea*, Moon). Netawu. Atukétiya. A tall aromatic tree of Ceylon, with a straight trunk, smoothish bark, and silky shoots and young branches: lvs. oval, acuminate, acute at the base, 3–5 in. long, glabrous; petiole ¼ in., finely pubescent: fls. axillary, solitary or in clusters of 2 or 3 on very short peduncles bearing several short imbricated scale-like bracteoles; calyx-divisions small, broad, united half-way up, acute, pubescent; petals hairy, the outer ones linear, strap-shaped, acute, hollowed at the base; the inner a little shorter, thick, trigonous, expanded and hollowed at the base, covering the essential parts; stamens truncate; carpels 5, sunk in the center of the receptacle; ovules 4–6 in two rows: fruiting carpels 1–4 on very short thick stalks, broadly ovoid, 1-1½ in. long, containing several smooth brown oblong seeds.—This species is common in the moist low country near Colombo, Ceylon. Its bark, especially that of the root, its yellow fls., and the fr. are all delightfully sweet-scented and aromatic, and are chewed by the natives with their betel. The wood is

yellowish gray and soft. Two other Ceylon trees with fragrant yellow fls. are *X. nígricans*, with the calyx-divisions divided almost to the base; and *X. Champiònii*, with blunt ovoid fl.-buds.

aaa. *African species.*

9. **æthiòpica,** A. Rich. (*Unòna æthiòpica*, Dunal. *Habzèlia æthiòpica*, A. DC.). Guinea Pepper. Negro Pepper. Habb Selim. Grains of Selim. Akola. Bikuè. A leafy tree of moderate height: lvs. coriaceous, glabrous and glossy above, finely appressed pilose beneath, oblong-elliptic or oblong, obtuse or narrowed at the base and more or less acuminate at the apex: fls. solitary or in clusters of several, short-pedicelled; calyx with the segms. broadly triangular and acute; petals on the outside fulvo-sericeous, linear, subconcave at the dilated base, the outer ones with thick margins, the inner ones narrower, triquetrous; stamens with the dilated connective puberulous, outer circle of stamens sterile, a little broader than the fertile ones; carpels numerous; ovules 6–8 in a single series; mature carpels subsessile, slender, cylindrical, somewhat incurved, about 2 in. long, slightly constricted between the seeds, glabrous, vermilion-colored within; seeds 6–8, of medium size, ellipsoid, about ½in. long and half as thick.—This species is endemic in W. Afr. where its fr. is used as a substitute for pepper. It was known to old authors under the name *Piper æthiopicum*. Closely allied to this species and similarly used are *X. niamniaménsis* of Cent. Afr., formerly brought by caravan across the Sahara to the shores of the Medit., and *X. Éminii*, Engler, of the Uganda. So precious are these spices held, not only for seasoning food but for use as carminatives and stomachics, that in certain districts of Afr. they are circulated as money.

W. E. Safford.

XYLÓSMA (Greek, *xylos*, wood, and *osme*, odor; alluding to the aromatic wood of some species). Syns., *Myróxylon, Hisíngera. Flacourtiàceæ.* About 45 species of evergreen, often spiny, trees or shrubs distributed throughout the tropical and subtropical regions of both hemispheres except Afr. Lvs. alternate, short-petioled, usually dentate, exstipulate: fls. small, in axillary racemes, usually dicœcious, apetalous; sepals 4–5, slightly connate at the base; stamens many, distinct, surrounded by a disk; ovary superior, surrounded by a disk and sometimes by staminodes, 1-celled with several ovules; styles 2–3, usually connate. Little known in cult.; prop. by seeds and probably by cuttings of half-ripened wood under glass.

racemòsa, Miq. (*Hisíngera racemòsa*, Sieb. & Zucc. *Myróxylon racemòsum*, Kuntze). Tung-Ching Tree. Small tree or shrub, unarmed or spiny, glabrous: lvs. ovate, acuminate, rounded at the base, serrate, 1½–2 in. long: fls. yellow, fragrant, scarcely ¼in. across, in axillary racemes ⅛–1 in. long: fr. globose, ⅛–¼in. thick, black, 2–3-seeded. Aug., Sept.; fr. in Nov., Dec. Japan, Korea, E. China. S.Z. 1:88. Var. **pubéscens,** Rehd. & Wilson. Tree, to 80 ft.: branchlets pubescent: lvs. ovate to oblong-ovate, glabrous, 1½–3 in. long. Cent. and W. China.—Only this variety seems to be in cult. and Wilson pronounces it one of the handsomest evergreen trees of China; it has proved hardy in S. England and probably will do well in the southern states and Calif.

Sálzmannii, Eichl. Shrub, to 15 ft., glabrous, the sts. and older branches armed with stout branched spines: lvs. chartaceous, ovate to ovate-oblong, obtuse or obtusely acuminate, cuneate at the base, crenate-dentate, 1½–4 in. long: fls. greenish yellow, fascicled; sepals ciliate; disk of the pistillate fl. annular; styles 2, 2-parted at the apex: fr. black, 3–4-seeded. Brazil, Argentina, Paraguay.

X. Aquifòlium, Sprague. Lvs. holly-like or occasionally nearly entire, having pair of glands at base of blade, 2–4 in. long: racemes short, axillary, of very small fls.: styles 6–7. Habitat unknown, probably Polynesia or Austral.

Alfred Rehder.

Y

YAM. The name yam properly belongs to the members of the genus Dioscorea, although unfortunately it has been applied for many years in the United States to the large varieties of the sweet potato, *Ipomœa Batatas*. The name as applied to the sweet potato is thought by some to be a corruption of an African word pronounced "nyam," brought by the negroes who were transported to America in the early days. This word was used for the true yam or other large roots or tubers used for food in Africa and was bestowed by the negroes on the large sweet potatoes in America.

The botany of the cultivated yams has not been cleared up. Many varieties are of mediocre quality, while some are excellent, being superior in flavor and mealiness to almost any other starchy vegetable. Single roots or tubers of some varieties, particularly of *D. alata*, attain great size, occasionally even reaching 100 pounds or more in weight, and several feet in length. The best varieties, however, are of small size, often less than a pound in weight. Among the best known of these are the yampis of Jamaica and the Isthmus of Panama, and other varieties of similar quality, such as the cush-cush of the Island of Trinidad. The Chinese yam or cinnamon vine, *D. Batatas*, is of excellent flavor, but on account of its deep-growing habit is very difficult to dig. Several kinds of yam are grown scatteringly in Florida. For further discussion, see *Dioscorea*.

ROBERT A. YOUNG.

YARROW: *Achillea.*

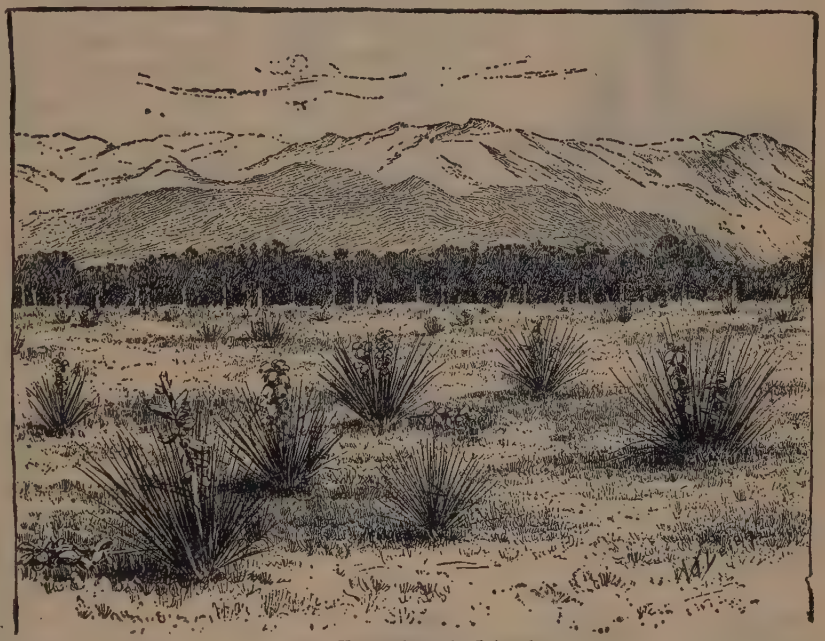
YELLOW-WOOD: *Cladrastis.*

YEW: *Taxus.*

YÚCCA (*Yùca*, native name for the manihot or cassava, erroneously applied to the present plants by Gerarde). *Liliàceæ*, tribe *Yúcceæ*. Bold stiff-leaved plants suitable for lawn planting, subtropical massing, and a few of them for flower-garden use.

Acaulescent to arboreous endogens with fibrous evergreen sword-shaped lvs. usually pungent and often denticulate or fibrous on the margin: fls. white or shaded with cream or violet, cup- or saucer-shaped, usually pendent in large usually erect panicles, opening at night and then somewhat sickishly fragrant; pollination rarely occurs except through the aid of a small white moth, *Pronuba yuccasella*, found wherever yuccas occur wild on the continent, which deliberately gathers the pollen and thrusts it into the stigmatic chamber, its larvæ feeding exclusively on the maturing seeds of these plants: fr. either capsular and erect or fleshy and hanging in the principal groups or subgenera.—About 30 species, confined to N. Amer. and the W. Indies, most of them native to the arid S. W. U. S. and the Mexican tableland. A few species have been cult. for centuries, and within the last decade a large number of artificial hybrids have been produced and intro. into cult., especially along the Medit. There are recent monographs by the writer in Rep. Mo. Bot. Gard., Vol. 13, pp. 42–116, with illustrations, and by Molon in a small manual "le Yucche," Milano, 1914, in which many of the Sprenger hybrids are also figured. See *Hesperoyucca, Samuela.*

Propagation is by seeds, offsets, stem-cuttings or rhizome-cuttings. These should be planted in well-drained sandy loam, usually in the succulent house. The only species hardy where frost is severe are *Y. glauca, Y. filamentosa, Y. flaccida, Y. baccata, Y. recurvifolia*, and *Y. gloriosa*, which flower in the sequence given, the last-named often blossoming late in autumn. *Y. Treculeana* shows considerable resistance to frost. The tender species are kept in the cactus house. Well-drained sandy loam suits yuccas best, but with good drainage they are tolerant of a large range of soil and exposure. *Y. Treculeana* blooms usually in March in plant-houses, as when wild, and the Mexican species when brought to flower are usually spring bloomers, but they often refuse to flower for long periods and then suddenly and unexpectedly produce an abundance of simultaneous bloom, even on the smaller plants. Of the hardy species, *Y. glauca* flowers in June and it is quickly followed by *Y. filamentosa* and *Y. flaccida*, while the forms of *Y. gloriosa*, which usually flower only at intervals of several years, bloom from late August to so late in the autumn as to be cut down by frost. The only well-known yucca in northern gardens



4019. Yucca glauca in Colorado.

is the common Adam's needle, *Y. flaccida*. This persists for years, sending up a tall panicle of cream-white flowers in late spring or early summer. All yuccas are suited to bold and formal effects in gardening; as tub specimens they may be used effectively in subtropical bedding or massing.

Most yuccas may be fertilized if fresh pollen is transferred directly from the anther to the stigmatic cavity of a newly opened flower, preferably one seated directly on the main shaft, where nutrition is more certain. *Y. aloifolia* commonly fruits freely, but the others rarely fruit spontaneously in cultivation except *Y. filamentosa* and *Y. flaccida*, which are pollinated by the small white moth (*Pronuba yuccasella*) that accompanies them when cultivated in the western states, but emerges from the pupa too late to pollinate *Y. glauca* and disappears too early for *Y. gloriosa*. See Rep. Mo. Bot. Gard. 3:99; 4:181, for additional discussion.

4020. Yucca radiosa.

The great yuccas, or "yucca palms," of southern California are chiefly *Y. arborescens*. They grow in the higher lands bordering the Mojave and adjacent deserts, reaching a height of 15 to 20 feet. The old plants are exceedingly weird and picturesque. Occasionally this species is transferred to gardens, but it is apparently not in the trade. This "Joshua tree" is now separated as *Clistoyucca arborescens*, Trelease; as it is not in cultivation, it need not be discussed further here except to say that Clistoyucca differs from Yucca in its very short style, fleshy incurved perianth, and spongy dry indehiscent fruit.

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t. Lvs. not toothed, with fine marginal threads: fr. capsular.

B. *Style swollen, green.*

1. **glaùca**, Nutt. (*Y. angustifòlia*, Pursh.). Fig. 4019. Acaulescent or with prostrate trunk: lvs. narrow, ¼–½in. wide, gray-green, narrowly white-margined: infl. 3–6 ft. high, rarely branched: fls. greenish white. S. D. to N. Mex. B.M. 2236. F.E. 14, p. 34. G.F. 2: 247 (adapted in Fig. 4019). Rep. Mo. Bot. Gard. 3:8, 51; 13:23–25, 83. Gn. 76, p. 402. G.W. 10, pp. 83, 214.—A distinctly caulescent erect form with larger branched infl. is var. **stricta**, Trel. (*Y. stricta*, Sims). B.M. 2222. Gn. 8, p. 130. Rep. Mo. Bot. Gard. 13:26, 27.

BB. *Style oblong, white.*

2. **radiòsa**, Trel. (*Y. angustifòlia radiòsa*, Engelm. *Y. angustifòlia elàta*, Engelm. *Y. elàta*, Engelm.). Fig. 4020. Short-trunked or up to 15–20 ft. high: lvs. ¼–½in. wide, gray-green, narrowly white-margined: infl. panicled, long-stalked: fls. white. S. Ariz., W. Texas, and Mex. G.F. 2:569 (adapted in Fig. 4020). B.M. 7650. S.S. 10:504. Rep. Mo. Bot. Gard. 3:9; 4:10, 15, 22; 13:21, 22, 83, 86.

3. **filamentòsa**, Linn. ADAM'S NEEDLE. Figs. 4021, 4022. Acaulescent: lvs. 1 in. wide, scarcely glaucous, with curly threads: infl. long-stalked, 4–12 ft. high, usually glabrous: fls. nearly white: carpels with rounded backs. S. C. to Miss. and Fla. B.M. 900. Redouté, Lil. 5:277, 278. Mordaunt, Herb. Gén. 4:258. Rep. Mo. Bot. Gard. 13:8–12, 83. G.C. III. 57:187. G. 34: 605.—A variegated form is f. **variegàta**, and a form with broad stiff spoon-like lvs. is var. **concàva**, Baker (*Y. concàva*, Haw.). Rep. Mo. Bot. Gard. 13:10, 83.

4. **flàccida**, Haw. Differs from the preceding, for which it is commonly grown, in its more flaccid recurving lvs. with slenderer straighter threads, and carpels with angular backs. N. C. to Ala. Gn. 58, p. 447; 78, p. 433. Rep. Mo. Bot. Gard. 13:12–17, 83.—A distinctly glaucous form, much cult. as *Y. filamentosa*, is var. **glaucéscens**, Trel. (*Y. glaucéscens*, Haw.). B.M. 6316 (as *Y. orchioides* var. *major*). Ref. Bot. 324. Rep. Mo. Bot. Gard. 3:10; 13:12–15, 17, 83. A transiently variegated form of this is f. **lineàta**.

4021. Adam's needle.—Yucca filamentosa. (From a plant 4 feet high)

AA. *Lvs. not toothed, with marginal threads: fr. fleshy.*

5. **baccàta,** Torr. Nearly acaulescent: lvs. 2 in. wide, very rough and concave, with coarse threads: infl. erect, 3 ft. high: fls. very large (3 in. long): fr. sometimes 8 in. long. S. Colo. to New Mex. and Nev. R.H. 1887, p. 368. G.C. III. 28:103. Gn. 16, p. 517; 35, p. 585. I.H. 20:115. Rep. Mo. Bot. Gard. 13:68, 69, 85. G.Z. 21, p. 78.

4022. Flowers of Yucca filamentosa. (×½)

6. **austràlis,** Trel. (*Y. baccàta austràlis,* Engelm. *Y. filífera,* Chab.). Becoming a large tree: lvs. 1 in. wide, smooth, rather flat, with short coarse threads: infl. hanging, 3–6 ft. long: fls. and fr. small. E. Cent. Mex. R.H. 1876, p. 433; 1884, p. 53; 1910, p. 401. Gn. 10, p. 554. G.F. 1:78. Bull. Soc. Tosc. Ort. 14:9. Contr. U. S. Nat. Her. 5:38. Rep. Mo. Bot. Gard. 3:3, 4; 13: 60, 61, 85. G.W. 10, pp. 84, 631.

AAA. *Lvs. entire, transiently denticulate, or slightly filiferous.*

B. *Fr. fleshy.*

7. **Treculeàna, Carr.** (*Y. áspera,* Regel. *Y. longifòlia,* Buckl. *Y. Vandervinniàna,* Koch. *Y. argospàtha,* Verlot. *Y. agavoìdes, Y. contórta,* and *Y. cornùta,* Hort.). Fig. 4023. Small tree: lvs. 1–2 in. wide, rough, very concave, at first entire or slightly denticulate, becoming sparingly filiferous: infl. with large bracts below. Texas to E. Mex. H.F. II. 6:236. R.H. 1869, p. 406; 1887, p. 368. Gn. 12:328; 35, p. 585. S.S. 10:498. Rep. Mo. Bot. Gard. 13:52, 84. G.F. 1:55 (adapted in Fig. 4023). The broader-lvd. form is var. **canaliculàta,** Trel. (*Y. canaliculàta,* Hook. *Y. revolùta,* Hort. *Y. undulàta,* Koch). B.M. 5201. Rep. Mo. Bot. Gard. 13:53, 54. Gn. 73, p. 254.

BB. *Fr. dry but indehiscent.*

8. **gloriòsa,** Linn. (*Y. acuminàta,* Sweet. *Y. gloriòsa acuminàta,* Carr. *Y. integérrima,* Stokes). Short-trunked or arboreous: lvs. 2 in. wide, stiff, smooth, nearly flat, usually with a few teeth when young or a few threads when old: fls. often reddish tinged: fr. drooping. Coast, from S. C. to Fla. Duhamel, Arbr. 325. R.H. 1877, p. 287. S.S. 10:503. G.C. III. 28, p. 262. Gn. 49, p. 218. Rep. Mo. Bot. Gard. 13:43, 44, 84. A smaller form is f. **mìnor,** Carr. Rep. Mo. Bot. Gard. 13:45. Ref. Bot. 5:319. A form with median variegation is f. **mèdio-striàta.** F.S. 23:2393, 2394. Forms with the outer lvs. somewhat recurving are var. **robústa,** Carr., B.M. 1260. Redouté, Lil. 6:326, 327, and its more glaucous form f. **nóbilis,** Carr. (*Y. Ellacòmbei,* Baker. *Y. gloriòsa Ellacòmbei,* Baker). Ref. Bot. 5:317. With glaucous lvs. very plicate toward the end it is var. **plicàta,** Carr., Gn. 31, p. 161; 45, p. 45; 49, p. 332. G.C. II. 19:821; III. 8:692; 15:304. Maund, Bot. Gard. 3:286, a taller greener-lvd. form of which is f. **supérba,** Baker (*Y. supérba,* Haw.). B.R. 1690. G.C. II. 12:689. Gn. 33, p. 202; 58, p. 446. Rep. Mo. Bot. Gard. 3:7; 13:46, 84.

9. **recurvifòlia,** Salisb. (*Y. gloriòsa recurvifòlia,* Engelm. *Y. recúrva,* Haw. *Y. péndula,* Groenl. *Y. gloriòsa móllis,* Carr. *Y. gloriòsa planifòlia,* Engelm.). Short-stemmed: lvs. 2 in. wide, flat, recurved, green: fr. erect. Coast of Ga. and Miss. Salisb. Parad. Lond. 31. Ref. Bot. 5:321. Gn. 1, p. 238; 8, p. 136; 47, p. 337. J.H. III. 42, p. 246. R.H. 1858, p. 434; 1859, p. 490. Rep. Mo. Bot. Gard. 13:46, 47, 84.—A form with median yellow variegation is f. **variegàta,** Trel., and one with a reddish stripe is f. **élegans,** Trel. I.H. 30:475.

BBB. *Fr. not known.*

10. **fléxilis,** Carr. Scarcely differs except in its narrower lvs. and long-stalked infl. R.H. 1859, p. 400. Gn. 8, p. 129. Rep. Mo. Bot. Gard. 13:47. Ref. Bot. 5:318.

11. **De Smetiàna,** Baker. Caulescent, 5–6 ft. high: lvs. stiffly recurved, short, 1–1½ in. wide, purplish, crowded, resembling those of a lily, sometimes slightly rough-margined at base: fls. and fr. unknown. Mex.(?). Rep. Mo. Bot. Gard. 13:48.

AAAA. *Lvs. sharply rough-edged: fr. fleshy.*

12. **aloifòlia,** Linn. (*Y. serrulàta,* Haw. *Y. crenulàta,* Haw.). Slenderly caulescent: lvs. dagger-like, very pungent: fr. black-purple, without a core. W. Indies and Mex. to Va. and around the Gulf. D C. Pl. Gr. 1:20. Redouté, Lil. 7:401, 402. B.M. 1700. S.S. 10:497. Rep. Mo. Bot. Gard. 3:7, 44; 4:18; 6:45–7; 13:49, 84. With lvs. yellow-margined it is f. **marginàta,** Bommer. Naudin, Pl. Feuill. Col. 2:52. G.W. 18:207. With lvs. yellow or white in the center it is f. **trícolor,** Bommer, also often known as *Y. tricolor, Y. quadricolor,* because shaded with red when young, and *Y. mèdio-pícta. Y. aloifòlia Menándii,* Trel., is a very narrow-lvd. form of this. Rep. Mo. Bot. Gard. 13:50.

13. **elephántipes,** Regel (*Y. guatemalénsis,* Baker. *Y. Lennedna,* Baker. *Y. Mooredna, Y. Ghiesbréghtii,* and *Y. Roèzlii,* Hort. *Dracæna Lennedna, D. Lénnei, D. Ehrenbérgii, D. Fintelmánni,* and *D. yuccoìdes,* Hort.). Becoming a rather large tree with swollen base: lvs. not pungent, 2–3 in. wide: fr. yellow. S. E. Mex. Ref. Bot. 5:313. B.M. 7997. Gn. 67, p. 178. G.C. III. 18: 523. Rep. Mo. Bot. Gard. 4:1, 2, 19; 13:51, 82, 84.—*Y. gigantèa,* Lem., planted in the Azores and around the Medit., is scarcely different. Rep. Mo. Bot. Gard. 9:40–42.

Y. Dràco=Y. flaccida × Y. aloifolia.—*Y. karlsruhénsis*=Y. filamentosa × Y. glauca.—*Y. rekowskiàna*=Y. filamentosa × Y. gloriosa.—*Y. Whípplei*=Hesperoyucca.

WILLIAM TRELEASE.

4023. Yucca Treculeana.

Z

ZALÁCCA (said to be the name of the genus in the Moluccas). *Palmàceæ.* Stemless palms with creeping roots, adapted to the warmhouse. Lvs. elongated, equally pinnatisect; segms. alternate, fascicled or equidistant, lanceolate or oblanceolate, straight or falcate, acuminate; rachis obtusely 3-angled, not produced into a spine; petioles rather terete, usually with spirally disposed prickles; sheaths strongly armed with compressed prickles; ligule none: spathes persistent, the lower ones sheathing the peduncle and branches, incomplete, the partial ones subtending the floriferous branchlets; spadices simple or fastigiately branched, pendulous, floriferous branchlets catkin-like, rather short, remote or clustered, sessile or pendulous: fls. polygamous-dicœcious, usually rose-colored: fr. globose, turbinate or ovoid, 1–3-seeded, usually beaked.—About 14 species, Assam and Malay. Two forms have been sometimes cult. *Z. edùlis*, Blume (*Z. Blumeàna*, Mart.). Lvs. copious, clustered, erect, clothed with long, often serrate prickles; pinnæ linear-lanceolate, very long-acuminate, 1½–2¼ ft. long, 1½–2 in. broad, whitish beneath; petiole rather shorter than the rachis and armed with robust prickles: spadices drooping, long-branched: fr. fulvous-fuscescent, pyriform, 2½ in. long. Malay Archipelago. Var. *Wallichiàna*, Mart. (*Z. Wallichiàna*, Mart.), has lvs. 18–20 ft. long, clustered, nearly erect; pinnæ fascicled in 2's, 3's, or 4's, narrow-lanceolate, with a long and slender, cuspidate point, attenuated and reduplicate at base, flat, older ones 1½ ft. long, 3–4 in. broad; petiole 4–6 ft. long, armed with robust, fuscous prickles: fr. ovate-pyriform, 1½ ft. long. India, Burma, and Malaya. G.C. 1873:1083.

F. Tracy Hubbard.

ZALUZÀNIA (named for the Pole, Adam Zaluziansky von Zaluzian). *Compósitæ.* Hoary-tomentose or scabrous-pubescent shrubs or subshrubs: lvs. alternate, entire, dentate, lobed or many-cut: heads pedicelled, heterogamous, arranged in corymbose leafy panicles: ray-fls. in 1 row, pistillate; disk-fls. perfect and fertile; involucre broadly campanulate; corolla yellow or perhaps white.—About 12 species, Mex. Apparently none in cult.

ZALUZIÁNSKYA (after Zaluziansky, as indicated above, who wrote Methodus Herbariæ, Prague, 1592). Including *Nycterínia*. *Scrophulariàceæ.* More or less viscous annual or perennial garden herbs, also grown in the greenhouse.

Leaves, lowest opposite, upper alternate, usually few-toothed; floral lvs. smaller, bract-like, entire: fls. sessile, usually arranged in dense or interrupted terminal spikes; calyx ovate-tubular, shortly 5-toothed, 2-lipped or 2-parted; corolla persistent, tube elongated, finally split to the base; limb 5-lobed, entire or 2-cleft; stamens usually 4: caps. oblong, leathery or membranaceous, septicidally dehiscent.—About 36 species, natives of S. Afr. All the species mentioned here have their corolla lobes bifid.

4024. Leaf of Zamia floridana.

Three of the species are known as night balsams or star balsams, from their night-blooming habit. The name night-blooming phlox would be better, as the flowers are salver-shaped and five-lobed, each lobe being deeply cut. These plants are generally treated as half-hardy annuals, the seed being sown indoors in early spring. The plants bloom in about ten weeks after being set out and continue in flower through July and August. Some cultivators declare that this method is very unsatisfactory and urge that the seed be sown in the autumn and the young plants wintered in a coldframe. They will then begin to flower by June. The blossoms are closed by day and are fragrant by night.

A. *Corolla-tube slightly pubescent.*

B. *Duration perennial: bracts broadly lanceolate: lvs. oblong-linear.*

lychnídea, Walp. (*Nycterínia lychnídea*, D. Don. *Erinus lychnídea*, Linn. *E. grácilis*, Lehm., not Hort.). Subshrub, about 2 ft. high: lvs. oblong-linear, sessile, entire or few-toothed: corolla-tube 1–1½ in. long, limb ½–¾in. across, white inside, purplish or red outside. B.M. 2504; 8215 (the latter as *Z. maritima*). B.R. 748. G.C. III. 42:162 (as *Z. maritima*).—Usually acts much like an annual and is generally treated as such when cult.

BB. *Duration annual: bracts oblong-lanceolate: lvs. linear or the lower ones lanceolate.*

capénsis, Walp. (*Nycterínia capénsis*, Benth.). Differs from the above, as described by Bentham, in stature, duration, strict sts. and smaller lvs., but unfortunately Bentham does not give the height of the plant or color of the fls. According to R.H. 1851:221, the plant has white or lilac fl.-clusters on the same plant, each fl. having an orange eye. The spikes, according to Bentham, are commonly short and 4–8-fld., sometimes long and 15–20-fld. There is some evidence that this species and the next are confused in the trade. In R.H. 1851:221 the fls. are ¾–1 in. long and less than ½in. across.

AA. *Corolla-tube glabrous.*

selaginoìdes, Walp. (*Nycterínia selaginoìdes*, Benth.). Dwarf annual, branched at the base, 3–5 in. high, rarely 6 in., with spatulate lvs. and fls. ¾–1 in. long, color of fls. not stated by Bentham, but in R.H. 1896, p. 308 (same picture as Gn. 24, p. 89) the fls. are said to range from white to lilac and darker depending on their stage of development, with an orange-colored eye which becomes crimson later. This suggests the preceding species, and it is evident that the two must be distinguished by technical characters until the colors can be verified. G.C. III. 55:173.—The plant once advertised in America as *Nycterinia selaginoides* is said to be a pink-fld. half-hardy perennial, growing 9 in. high, which does not agree with authentic descriptions. A species passing under this name is hardy at San Francisco.

Wilhelm Miller.
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ZÀMIA (name used by Pliny, meaning *loss* or *damage*, and first applied to barren pine cones, and transferred to these plants apparently because of the cone-like fruit). *Cycadàceæ*. Perennial, tropical and subtropical plants, resembling palms and in some respects ferns.

Caudex sometimes a low trunk, simply lobed or branched, standing above or almost below ground: lvs. few, developing one after the other, pinnately compound; pinnæ broad or narrow, articulate at base, entire or serrate, parallel-veined; petiole smooth or spinulose: cones rather small for the order, glabrous or rarely scurfy: fls. dicœcious, male cone oblong-cylindrical, female cone similar but larger and thicker: ovules sessile, ovoid.—About 36 species, Trop. and Subtrop. Amer. One of the 9 genera of the Cycas family, as constituted by Alphonse De Candolle (Prodr. 16, pt. 2, pp. 522–47). Other genera of horticultural interest and discussed in this Cyclopedia are Ceratozamia, Cycas, Dioon, Encephalartos, and Macrozamia. The fls. of cycads are dicœcious, without envelopes; the pistillate fls. are mere naked ovules inserted under scales in cones, and the staminate fls. are simple anthers under similar scales. The plants are therefore gymnosperms (seeds naked or not inclosed in a pericarp or ripened ovary) and are allied to the conifers. The fr. is a berry-like drupe. In Zamia the floral scales are peltate (and not horned) and form a cylindrical cone; the anthers are numerous, and the ovules pendulous in pairs. The fecundation of Zamia has been studied by H. J. Webber (Bull. No. 2, Bur. Pl. Ind., U. S. Dept. Agric.). His conclusions respecting the Floridian species are accepted below.

4025. Staminate cone of Zamia floridana.

The zamias are stocky short- and usually simple-stemmed cycas-like plants, the trunk sometimes subterranean, with long-pinnate evergreen leaves or fronds, the leaflets being thickened and usually broadened at the base, and jointed. Zamias are warmhouse plants, to be treated like species of Cycas or Encephalartos, which see. The plants are propagated by means of seeds and offsets; also by division when there is more than one crown.

A. *Petiole prickly.*

furfurà̀cea, Ait. Trunk cylindrical, 1–2 ft. tall: petioles dilated and concave at the base, with several small prickles; lfts. about 10–12 pairs, opposite or alternate, oblanceolate, entire on the lower half but serrate or jagged toward the top, acute or obtuse, scurfy beneath (as also the rachis): cone oval-conical, downy, pedunculate, pale yellowish brown, the pistillate ones 4 in. or less long. Mex. B.M. 1969.

Lìndenii, Regel. Trunk cylindrical, 2–4 ft. or more tall when well grown: petioles long, cylindrical, sparsely provided with tawny wool, the prickles short-conical and spreading; lfts. 20 or more pairs, glabrous or somewhat puberulous, nearly or quite opposite, sessile, long-lanceolate and acuminate, dentate-serrate toward the top. Ecuador. I.H. 22:195.

4026. Pistillate cone of Zamia floridana.

AA. *Petiole not prickly.*

B. *Species growing beyond the limits of the U. S.*

integrifòlia, Ait. Trunk 12–18 in. tall, erect, globular or oblong: lvs. glabrous; lfts. alternate, 7–16 pairs, oblong to linear-lanceolate to lanceolate, mostly obtuse, entire or somewhat dentate toward the apex: cones oblong and obtuse, short-peduncled. W. Indies. B.M. 1851.—The Fla. plants, sometimes referred here, are apparently all *Z. floridana* and *Z. pumila*.

mexicàna, Miq. Distinguished by DeCandolle as follows: scales of the lf.-buds tomentose and also the petioles at the base, the petioles 3-cornered, unarmed, glabrous, somewhat warty: lfts. of 9 or more pairs, subopposite, narrow-lanceolate, straight or slightly curved, acute or acutish, rigidly coriaceous, dark green, many-nerved, spinulose-serrulate from the middle to the apex. Mex.—By Index Kewensis referred to *Z. Loddigesii*, a species with prickly petioles.

pseùdo-parasítica, Yates (*Z. Roèzlii*, Regel). Distinguished as follows by DeCandolle: trunk cylindrical: lfts. lanceolate, sinuose-falcate, entire, glabrous, acute at the base, cuspidate at the apex, with 18 strong nerves which are twice bifurcate. Panama.—Grows on tree trunks.

angustifòlia, Jacq. Foliage glabrous when mature; lfts. 5 in. long, 4–20 pairs, usually alternate, elongated and narrowly linear, the apex obtuse and very obscurely serrulate or entire, the base not narrowed, 6–8-nerved: pistillate cone obtuse but cuspidate. Bahamas, Cuba.

4027. Aggregate fruit of Zamia floridana. Cone not mature. (×⅓)

BB. *Species native to Fla.*

floridàna, DC. Coontie. Comptie. Figs. 4024–4027. Lvs. ovate or ovate-lanceolate; petiole triangular in outline, sericeo-tomentose at base, with scattered hairs above; lfts. mostly opposite, 14–20 pairs, glabrous above and with scattered hairs beneath, linear, falcate and somewhat twisted, narrowed at the base and obtuse at the apex, the margin revolute and with a few obscure teeth: mature pistillate cones oblong, 5–6 in. (12–16½ cm.) long, markedly umbonate (projection on the scales), densely tomentose.—Abundant in S. Fla. on the east coast below latitude 26° 30′, in open comparatively dry pine woods.

pùmila, Linn. Differs, according to Webber, in having shorter and broader lfts. which are less twisted and not so erect and rigid, and in its shorter and non-umbonate cones with seed-bearing scales thinner and more flattened at outer end.—Abundant in Cent. Fla., ranging from 28° 30′ north for 1° of latitude, in dense moist woods.

Z. corallipes, Versch., is Macrozamia spiralis.—*Z. Dénisoni*, Auth., is Macrozamia Peroffskyana.—*Z. glaùca*, Hort.=Cycas Rumphii(?).—*Z. pùngens*, Ait.=Encephalartos pungens.—*Z. spinòsa*, Lodd.=Encephalartos Altensteinii.

L. H. B.

ZAMIOCÚLCAS (*Zamia* and *Culcas*). *Aràceæ*. One species, sometimes grown in the warmhouse for ornament and curiosity, it being one of the very few aroids with pinnate lvs. **Z. zamiifòlia,** Engler (*Z. Loddigèsii*, Schott. *Calàdium zamiæfòlium*, Lodd.), grows in Trop. Afr. It is an evergreen perennial herb, with stout creeping rootstock, and erect glabrous radical lvs. standing 1½–2 ft. high: lfts. about 12, opposite or alternate, oblanceolate, acute, jointed to the petiole and forming small tubers at the base after falling: spathe convolute at base with spreading or reflexed blade, green, glabrous; spadix club-shaped, with female fls. below and male fls. on the longer upward part, whitish, about 1–1½ in. long and ½in. thick. B.M. 5985. L.B.C. 15:1408. Prop. by the lf.-tubers and by division.

ZANNICHÉLLIA (named in honor of G. G. Zannichelli, a Venetian botanist). *Naiadàceæ.* Horned Pondweed. Slender branching herbs, growing under water, of little horticultural value for ponds: lvs. mostly opposite, long and linear, thread-like, entire; stipules membranous, sheathing: fls. monœcious, sessile, naked, usually both kinds from the same axil. About 5 species, scattered throughout the world. **Z. palústris,** Linn. Style at least half as long as the fr., which is flattish, somewhat incurved, even, or occasionally more or less toothed on the back (not wing-margined), nearly sessile. Cosmopolitan in fresh or brackish water.

ZANÒNIA (Jacob Zanoni, 1615–1682, botanist of Bologna). *Cucurbitàceæ.* Under this genus, one species, *Z. sarcophýlla,* Wall., is sometimes listed among cult. plants. This plant is now placed in the genus *Alsomìtra* and becomes *A. sarcophýlla,* Hook. f. It is native of Burma: climbing shrub with very fleshy 3-foliolate lvs.; lfts. oblong, entire: fls. small, white, diœcious, in compound panicles; corolla rotate, 5-parted, with obtuse segms.; calyx rotate and 5-parted, with acute segms.; male fls. with 5 stamens; females with a 1-celled elongate 3–4-styled ovary: fr. a medium-sized 3-valved caps.; seeds black, narrowed at base, with 2 flat curved horns at apex.

ZANTEDÉSCHIA (Francesco Zantedeschi, wrote on Italian plants in 1825). Syn., *Richárdia. Aràceæ.* Calla of horticulturists. Perennial herbs grown for their ornamental corolla-like spathes and sometimes for spotted foliage; greenhouse subjects in the northern regions, but grown permanently in the open in California and other warm parts. The genus comprises the "calla lily."

Herbaceous plants with many long-petioled lvs., all from a thick rhizome: peduncles appearing with the lvs.: petioles spongy, often bristly below; blade sagittate, hastate, or lanceolate to cordate-ovate, the numerous primary and secondary nerves excurrent: peduncle as long or longer than the lvs.; spathe large, open, with a flaring, pointed, recurved tip; spadix staminate above, and pistillate below (Fig. 4029): fls. many and small, naked, crowded, staminodes sometimes mixed with the ovaries: fr. a 1–3-celled berry.—Engler admits 8 species in his latest monograph (Das Pflanzenreich, hft. 64, 1915), in Trop. and S. Afr. The common calla-lily was long known in commerce as *Calla æthiopica.* Later it was known as *Richardia africana,* it having been found that the genus Calla, as more closely defined, could not include it. The Richardia of Kunth, 1818, under which the plant has been named, is antedated by another Richardia, and Zantedeschia, 1826, is considered by latest authorities to be the tenable name and is retained in the "nomina conservanda" of the International Rules as against both Richardia and Aroides. The genus Calla, as understood by modern botanists, comprises a single species, *C. palustris,* native in swamps in the northern hemisphere, including N. E. U. S. and Canada; see Fig. 742, Vol. II. For the black calla, see *Arum.*

When grown for the flowers only, zantedeschias may be planted out permanently on a bench, using very rich soil and giving an abundance of water while growing. They may be kept growing continually or given a season of rest, as desired. Plants in pots are usually started late in summer from dry tubers. The species having yellow and pink spathes seem to do best when grown without a resting-period.

Culture of callas. (T. D. Hatfield.)

The so-called calla of gardens (*Zantedeschia æthiopica*) has been a favorite for generations. Although often grown as a window-plant, it is very unsuitable and seldom blooms under house treatment. When grown for winter flowers, it is customary to give the roots a rest during summer-time. They may be dried and stored if necessary. It is in this condition that Californian callas are received. It is the opinion of the writer that summer-resting would be the best treatment for those grown as house-plants, as well-grown dried roots are more likely to bloom. But rest must be enforced, for callas will grow all the year round, increasing in size and numbers when planted out. The largest blooms are always secured from summer-grown plants. They are taken up in the autumn, given good loam and plenty of root-room, with a liberal allowance of liquid fertilizer when well established. They thrive best under good light, and in a minimum temperature of 55°.

4028. Zantedeschia albo-maculata. (×⅓)

There are several varieties, all differing only in size, from those which grow 6 feet to "Little Gem"—1 foot. Some are said to be more odorous than others, although all are fragrant. Besides being invaluable pot-plants, they can be used with good effect in indoor water-gardens, growing luxuriantly when partly submerged; and also in bog-gardens, and on the margins of ponds, to give sub-tropical effects.

Although introduced to cultivation about twenty-five years ago, *Z. Elliottiana* is yet of secondary importance, although an acquisition. It is a South African species, about which comparatively little is known in the wild. (N. E. Brown writes in "Flora of Tropical Africa," Vol. 8, 1902: "This species is stated to have been raised from seeds received from South Africa, but I have reason to believe that its habitat is somewhere in the northern part of the Transvaal." The plant was described as *Richardia Elliottiana* in Garden and Forest, New York, 1892.) When introduced, it was thought difficult to grow. It was first grown in this country by William Robinson, gardener to F. L. Ames, North Easton, Massachusetts, Mr. Harris, gardener to H. H. Hunnewell, Wellesley, Massachusetts, and Joseph Tailby, of Wellesley. The last named is a commercial grower, who looked on his importation as an investment. The bulbs (corms or roots) were expensive—a guinea or thereabouts—and about as big as marbles. Tailby's experience is interesting and it may be valuable to the reader. He came near losing his whole stock by cutting out the eyes, with the object of getting separate plants. There had been no sign of natural division, nor has there since; although some are still of the opinion that by proper manipulation they may be increased by division, as we now do potatoes, but the wounds must be given time to heal over. The roots are kept over in a cellar at a temperature of 45° F., or thereabouts, until

April, when they will show signs of starting. They should be potted then, but kept rather dry until the roots develop. The pots will be fairly well filled with roots before much growth shows, and they can be kept under benches in a coolhouse, or even in the cellar, for two weeks after potting. With the roots well started, they come along quickly, coming into bloom in ten to twelve weeks. A good bright intermediate house suits them best, and some liquid fertilizer will help them when the flower-stems appear. The blooms last a long time, opening greenish yellow, turning to pure orange-yellow, and finally green when aging. Seeds are formed plentifully; and by these, though slow, is yet the surest and quickest method of propagation. During the ripening period of seeds, they must have the very best attention. They usually do not become thoroughly ripened until August. Pot-grown plants are better stored in pots. The whole culture is easy when it is known.

4029. Common calla lily.—Zantedeschia æthiopica. Left-hand specimen shows the spadix, the spathe being removed. (×⅓)

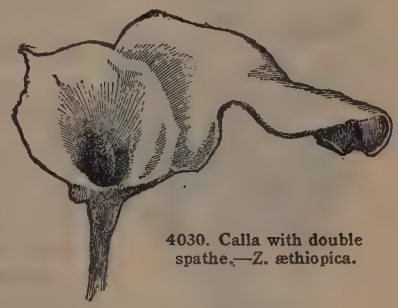
Seeds of *Z. Elliottiana* sown in November usually come up strong, but the plantlets are difficult to handle and liable to go off when very young. It is the safest way to let them stay in the seed-boxes, ripen there, and plant them farther apart next season. Seeds have been sown outdoors with very gratifying results. Almost a year is gained in this way, as the roots (or bulbs) are considerably larger than box-grown seedlings. Older roots held over until settled weather and planted like potatoes bloomed freely all summer, making fine roots; they were green when cut by frost in October, but ripened seeds. To do this successfully takes a longer season, and the plants must be started indoors.

The calla in California. (Ernest Braunton.)

In considering the calla in California, it is necessary to treat it under two general heads: first, as an ornament; and second, as an article of commerce. The popular and growing demand for calla bulbs (or tubers) speaks much for the plant as an ornamental. Many, indeed, are the uses to which it is put. It is, perhaps, most commonly used as a belt along fences, and not infrequently as a hedge between two properties; or nearly as often is found along one side of a house in a long narrow bed. For effective planting it is much in demand for grouping around hydrants and unsightly objects in damp places, at watersides; sometimes as a border around a fish- or lily-pond, oftentimes growing in bunches or masses in the water itself; or massed on a slope near water; mixed with other tropical vegetation; or as a border to tropical jungles; and very effective, indeed, is it in the lower tiers of basins around a large fountain with myriophyllum hanging down from the base of the callas. For all of these purposes the foliage is of even more importance than the flowers. As it grows luxuriantly here in almost any location, it is very seldom seen as a pot-plant either in the dwelling or on sale at the nurseries. In the most favored places only is it entirely secure from the frost, although the damage to it from this source is not serious in or around Los Angeles. Although doing fairly well in the full sun, our summer climate is too dry for it to attain its greatest beauty and luxuriance wholly without protection, and it may therefore be seen in perfection only when grown in partial shade. A good supply of water and manure is also an important factor in its proper development.

The spathe is subject to many variations in form, both in size and shape, some being long, rather narrow and pointed, ending in a decidedly recurved awn, while others are nearly circular, with the sharp point almost wanting and standing upright the same as the remainder of spathe. It frequently happens that the spathe is double and even triple, sometimes in its entirety but often only partially so. In the latter case it often assumes some very strange forms. The spadix is not so variable and seldom departs from the type, although an occasional double or abnormal spadix is found. Most other species or varieties than *Z. æthiopica* are found but sparsely in California gardens, the most common ones being the spotted-leaved and the dwarf form known as the Little Gem, but *Z. Elliottiana* is grown extensively in certain areas, especially about Santa Cruz, which is the center of the bulb-growing industry in California.

Commercially, the growing of the bulbs for eastern and foreign markets is a sure source of revenue, and is conducted extensively throughout southern California. The local market for the so-called flowers is of course limited, but if grown in a practically frostless belt, the blooms will more than pay for the cultivation of the winter field, as in that season of the year flowers of all kinds are scarce. The average retail price for good blooms in midwinter is 50 cents a dozen; the wholesale price about $1 a 100. Bulbs at retail cost about one-half, or even less, what they do in the East. The commercial growers get at present (January, 1916), $25 to $60 a 1,000, according to size, the market calling for tubers 1½ to 3 inches in diameter. Larger sizes are quoted as "fancy" and command extra prices. Although they can be grown in almost any soil with some success, a free cool blackish loam is best, and they do not thrive in a hot gravelly or stony soil. The lands near the coast, where swept by the cooling sea-breeze, are productive of the best results, both in bloom and tuber. Land containing sufficient alkali to prevent the growth of many common crops will produce good callas if other requirements are present. In field-planting it is much better to put in small bulbs about 4 inches apart than to sow the offsets promiscuously in the row; when the sets are thus sown, they should be taken up the following year and the small bulbs properly planted. Offsets sown as above and left four to six years (the usual time for a good crop) have never produced satisfactory results. No pest seriously attacks foliage or bloom, but in dry years more especially, the common sow-bug eats into the tubers very seriously and receives considerable assistance from millipedes. Both these pests are a considerable nuisance to the California nurseryman and gardener.



4030. Calla with double spathe.—Z. æthiopica.

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A. *Lvs. lanceolate.*

1. **Réhmannii,** Engler (*Richárdia Réhmannii,* N. E. Br.). Pink or Rose Calla. Dwarf perennial: lvs. lanceolate to long-lanceolate, unequal-sided, light green and white-pellucid-dotted, petioled, equaling or exceeding the peduncle and spathe, the petiole without bristles: spathes about 4 in. long, erect, trumpet-shaped, with a caudate tip 1 in. long: fr. an obovoid or depressed obtuse 1–2-celled berry. B.M. 7436.—In Natal, where it is native, the spathes are said to be dull rose without, rose-purple within, with a dark crimson blotch at the base inside. In cult. the spathes are white, with a faint rose tinge to the back and margins. Var. **speciòsa,** Hort., is dwarfer and more robust than the type.

AA. *Lvs. sagittate or cordate.*

B. *Foliage spotted.*

2. **álbo-maculàta,** Baill. (*Richárdia álbo-maculàta,* Hook. f.). Spotted Calla. Fig. 4028. Petiole short, without bristles; blade 12–18 in. long, white-spotted all over, hastate, 3–4 times longer than broad, acute, the basal lobes widely spreading, triangular, obtuse or acute, 3–4 in. long: spathe trumpet-shaped, 4–5 in. long, 2 in. wide, dull creamy yellow or milk-white with a blotch of crimson at the base. S. Afr. B.M. 5140. I.H. 7:255. F.S. 21:2258.—Will stand in the open in frosty regions with good protection for the roots. Not of much value except in botanical collections.

3. **Nélsonii,** Hort. Allied to *Z. albo-maculata:* very vigorous and floriferous, reaching 3–4 ft., the scape overtopping the foliage: lvs. sagittate, bright green, sprinkled with pellucid dots or spots, as in *Z. Elliottiana:* spathe scarcely spreading, the limb short, very pale yellow with a purple blotch at the bottom.—Not recognized by monographers, and perhaps a synonym or a form of some other species. In S. Calif. blooms only in summer, after *Z. Elliottiana* is past.

4. **melanoleùca,** Engler (*Richárdia melanoleùca,* Hook. f. *R. Sprèngeri,* Comes). Black-throated Calla. Scape and petioles bristly below: lvs. 6–12 in. long, hastate-ovate-acuminate, the basal lobes obtuse, marked all over with oblong, white, translucent spots: spathe pale straw-colored, widely flaring and open from the base, the margins and cuspidate tip recurving, with an ample black-purple spot at the base within. Natal, 1868. B. M. 5765. Var. **tropicàlis,** Engler (*Richárdia melanoleùca* var. *tropicàlis,* N. E. Br.), of Trop. Afr., differs in larger size and absence of bristles at base of petiole.

4031. Zantedeschia æthiopica var. minor, Little Gem. (×⅙)

5. **Elliottiàna,** Engler (*Cálla Elliottiàna,* Knight. *Richárdia Elliottiàna,* W. Wats.). Golden Calla. Lvs. glabrous; petiole 2 ft. or more long, lacking bristles, more or less mottled; blade ovate or orbicular-ovate, cordate at base, obtuse but subulate-pointed at apex, light green, with a few white or translucent spots, with undulate margins, about as large as those of *Z. æthiopica:* spathe a rich lustrous yellow, lasting about two weeks, becoming greenish with age, not purple-blotched, about 6 in. long: berries about ¾in. diam., nearly globose, green: tuber proliferous. Afr., probably in Trop. Transvaal. B.M. 7577. Gn. 46:446. Gn. W. 11: 553. R.H. 1904:136.

BB. *Foliage without spots.*

C. *Base of the lf.-blade cordate.*

6. **æthiòpica,** Spreng. (*Cálla æthiòpica,* Linn. *Colocàsia æthiòpica,* Spreng. *Richárdia æthiòpica,* Hort. *R. africàna,* Kunth). Common Calla. Lily-of-the-Nile. Fig. 4029. Stout robust plant: lvs. smooth, the petiole without bristles; blade about twice as long as wide, broad or narrow but cuspidate at the apex, cordate-sagittate at the base, both lvs. and spathes varying greatly in size: spathe 3–10 in. long, white, creamy inside at the base, flaring outward and narrowing to a cuspidate tip. S. Afr. B.M. 832. Gn. 33:584. Gn.W. 21:73.—Fragrant. Sports with double and triple spathes often occur. A.F. 5:83. Gn. 46, p. 447. See Fig. 4030.

Var. **mìnor,** Engler (*R. nàna compácta,* Hort.). Little Gem. Fig. 4031. Like the type, but only 12–16 in. high: spathes 3–4 in. long. Var. **devoniénsis,** Hort. (*R. devoniénsis,* Hort.). Dwarf; freer bloomer than Little Gem, and more fragrant.

There are many forms of the calla lily in cult., a number of which have received Latin names. Some of these horticultural names are **candidíssima,** spathe large, pure white; **gigantèa,** plant very large; **Godefreyàna,** dwarf, white; **grandiflòra,** spathe large; **Childsiàna,** dwarfer and more compact than type and more floriferous.

7. **macrocárpa,** Engler (*Richárdia macrocárpa,* W. Wats. *R. Péntlandii,* Whyte. *Cálla Péntlandii,* Whyte. *Z. Péntlandii,* Hort.). Erect perennial: lvs. ovate-cordate, acuminate-caudate, with an open sinus, basal lobes rounded; midrib thick: spathe golden yellow, broadly trumpet-shaped, its lower margins convolute one-third, flaring above, the subulate tip abruptly recurved, margins recurved, slightly warty and with a black-purple blotch at the base within. Basutoland, S. Afr. B.M. 7397.—Hooker writes (in B.M. 7397) that "*R. Pentlandii* is much the largest-leaved species, and is the only one with a deeply gamboge yellow spathe within, which is much the largest and broadest of any." First flowered in 1892 by R. Whyte, Pentland House (Lee, England).

CC. *Base of the lf.-blade hastate.*

8. **oculàta,** Engler (*Cálla oculàta,* Lindl. *Richárdia hastàta,* Hook. f. *Z. hastàta,* Engl. *R. Lútwychei,* N. E. Br. *Z. Lútwychei,* Dur. & Schinz.). Pride of the Congo. Yellow Calla. Petioles 12–18 in. long, usually or always bristly below; blades dull green, hastate-ovate, twice longer than wide, rather flaccid, 8–16 in. long, cuspidate at the apex, basal lobes separated by a narrow sinus or overlapping and very obtuse: spathe cup-shaped, 4–5 in. long (with a tail 1 in. long), greenish yellow, the tip erect, black-purple at the base within, the lateral nerves usually rather prominent above. Cent. and S. Afr. B.M. 5176. Gn. 18:596.

Most of the garden forms have been named under Richardia rather than under Zantedeschia; in the following list R=the former and Z the latter.—*R. Adlamii,* Hort. Leichtlin. Strong-growing, with lvs. sagittate, bright green, and somewhat exceeding the scape: spathe short and rather open, creamy white with a black or purple throat. Trop. Afr. Distributed by Max Leichtlin (Germany) in 1898. There are hybrids of this and Z. Elliottiana.—*Z. angustíloba,* Engler (R. angustiloba, Schott. Z. chloroleuca, Engler & Gilg). Lvs. glabrous, without spots, the petiole without bristles; blade hastate, narrow, the basal lobes one-fourth the length of the apical one, 20 in. long, 3 in. wide at the base: peduncle 4–4½ ft. long: spathe about 4 in. long, sulfur-yellow, red inside at base. Angola.—*R. auràta,* Hort., said to be a hybrid of Z. albo-maculata × Z. hastata (oculata): lvs. spotted: spathes large, yellow.—*R. cantabrigiénsis,* Lynch=Z. Elliottiana × R. aurata or Z. Rehmannii × Z. Elliottiana.—*R. intermèdia,* Hort. Very free-flowering: lf.-stalks bright green, marbled with white and rose: spathe very dark yellow, with small black blotch at the base.—*R. Lathamiàna,* Hort.=Z. Elliottiana × Z. albo-maculata.—"*R. suffùsa.* A distinct dwarf-habited plant with a creamy white spathe, the base in the inside of a rich violet-purple shade. It is apparently a plant of good constitution." Gn. 55, p. 317, note.—*R. Tàylori,* Hort., is Z. Elliottiana × R. aurata.

Jared G. Smith.
L. H. B.†

ZANTHORHÌZA (Greek, *yellow root*). Often spelled *Xanthorrhìza*. *Ranunculàceæ*. Shrubby plants cultivated mostly for their handsome foliage, which is much like that of Actæa, and which changes to a beautiful golden color in the autumn.

Leaves pinnate or bipinnate: fls. in drooping racemes or panicles; sepals 5, petal-like, deciduous; petals 5, smaller than the sepals, and 2-lobed; stamens 5–10;

4032. Zanthorhiza apiifolia. (×½)

carpels 10, sessile, forming only 1-seeded follicles, 1 ovule of each usually not maturing.—One species, E. U. S. from N. Y. to Fla.

The plants will grow readily in any good soil but usually prefer damp and shady places, although they often thrive in loose sandy soil. Propagated both by seed and root-division in autumn or early spring. The seeds should be sown in a well-prepared seed-bed as the young seedlings are rather delicate. If sown in early autumn they may be given partial shade to advantage. Old plants when divided are easily grown, and for this reason root-division is often preferred. Often not hardy in Massachusetts and extreme northern states.

apiifòlia, L'Her. Shrub Yellow-Root. Fig. 4032. Sts. of bright yellow wood, 1–20 ft. high: roots yellow, sending up suckers in spring: lvs. in clusters from terminal buds; lfts. about 5, cut-toothed or lobed, with wedge-shaped bases and entire sinuses: fls. small, dark or purple. April. Damp and shady places. A.G. 12: 289. Var. **ternàta,** Huth. Lvs. only ternate; lfts. often more deeply lobed, the sinuses entire. Same distribution.

K. C. Davis.

ZANTHÓXYLUM (Greek, *xanthos*, yellow, and *xylon*, wood). Also spelled *Xanthóxylum*. Including *Fagàra*. *Rutàceæ*. Ornamental woody plants chiefly planted for their handsome foliage and for their ornamental fruits.

Deciduous or evergreen shrubs, sometimes sarmentose, or trees, with usually prickly branches; most parts, particularly the frs., emitting a strong aromatic odor when bruised: lvs. alternate, odd-pinnate, 3-foliolate or rarely simple: fls. dicœcious or polygamous, small, in cymes or panicles; sepals, petals, and stamens 3–8, sepals often wanting; pistils 3–5: fr. composed of 1–5 separate small dehiscent caps., each with 1–2 shining black seeds.—The genus contains about 150 species in the tropical and subtropical regions of both hemispheres, and a few in temperate regions. Several species are used medicinally. The wood of some W. Indian species and that of the Australian *Z. brachyacanthum* is considered valuable. The frs. of *Z. piperitum* are used like pepper in Japan.

The zanthoxylums in cultivation are prickly shrubs or rarely small trees with mostly deciduous odd-pinnate, medium-sized or rather small foliage and small greenish or whitish flowers in small, rarely large, axillary or terminal clusters, followed by usually reddish small pods disclosing lustrous black seeds at maturity. *Z. americanum* is the only species which is hardy North, while the species from eastern Asia, as *Z. schinifolium*, *Z. Bungei*, and *Z. alatum* var. *planispinum*, have proved fairly hardy in favorable positions as far north as Massachusetts, the first being the hardiest, but they probably will be perfectly hardy in the Middle Atlantic states. They do not seem to be particular as to the soil, but grow best in a well-drained soil and sunny position. Propagation is by seeds and by suckers or root-cuttings.

A. *Rachis not or very narrowly winged.*

B. *Fls. before the lvs., in axillary fascicles.*

americànum, Mill. (*Z. fraxíneum*, Willd. *Z. ramiflòrum*, Michx.). Prickly Ash. Fig. 4033. Shrub or small tree, attaining 25 ft., with prickly branches: lfts. 5–11, opposite, almost sessile, ovate, entire or crenulate, dark green above, lighter and pubescent beneath, 1½–2 in. long: fls. small, greenish, in axillary sessile clusters, appearing shortly before the lvs.: seeds black. Que. to Neb. and Va. B.B. (ed. 2) 2:444.

BB. *Fls. after the lvs., in terminal corymbs.*

C. *Prickles solitary.*

schinifòlium, Sieb. & Zucc. Shrub or small tree, to 20 ft.: lvs. 3–7 in. long, glabrous; lfts. 13–21, elliptic-lanceolate to lanceolate, narrowed into a short stalk, minutely emarginate at the apex, crenate-serrulate, ¾–1½ in. long: fls. minute, with sepals and petals in terminal short-stalked clusters, 2–4 in. across: fr. greenish or brownish. June; fr. in autumn. Japan, Korea. S.I.F. 2:33.—Sometimes cult. under the name of the following; handsomer in foliage and hardier.

4033. Leaf of prickly ash.—Zanthoxylum americanum.

CC. *Prickles in pairs.*

piperìtum, DC. Shrub or small tree; prickles rather slender, ascending: lvs. 2–6 in. long, with puberulous rachis; lfts. 11–19, ovate to oblong-ovate, narrowed into a short stalk, emarginate at the apex, remotely toothed, with conspicuous glands at the base of each tooth, midrib pubescent above, ½–1½ in. long: fls. with simple perianth, in small corymbs ½–1½ in. across, on short lateral branchlets; style slender: fr. reddish, glandular-dotted. Japan, Korea, N. China. June; fr. in Sept. S.I.F. 1:52.—The wood, according to Issa Tanimura, is dense and heavy with deep yellow grain; tree commonly cult. in Japan for ornament, to make utensils, and for food; the seeds and inner bark are cooked or pickled; the fresh lvs. are added to soup; and the dried fr. used on roasted fish as a fragrant pepper.

Búngei, Planch. (*Z. Bungeànum*, Maxim.). Spreading shrub or small tree; prickles stout, flattened, very broad

at the base: lvs. 3–5 in., rarely to 9 in. long, often with small prickles on the rachis and on the midrib of the lft. above and below; lfts. 7–11, ovate to ovate-oblong, crenately serrulate, glabrous, ½–2 in. long: infl. a corymb or panicle, mostly on short lateral branchlets: fr. reddish. June, July; fr. in Sept., Oct. N. and Cent. China.

4034. Indian corn.—Zea Mays.

aa. *Rachis distinctly winged.*

alàtum, Roxbg. Shrub or small tree, glabrous, with stout spreading prickles in pairs: lvs. 3–8 in. long, with conspicuously winged sometimes prickly rachis; lfts. 5–11, elliptic-ovate to ovate-lanceolate, rarely obovate-oblong, acuminate, finely serrulate or nearly entire, 1½–5 in. long, the terminal one the largest: fls. in short lateral panicles, 1–2½ in. long, from the axils of last year's branches: fr. red, warty. Himalayas. Var. **planispìnum,** Rehd. & Wilson (*Z. planispìnum,* Sieb. & Zucc.). Lfts. 3–5, otherwise like the type. June; fr. in Sept. China, Korea, Japan. S.I.F. 2:34. R.H. 1913, p. 17. G. 35:213.—Only the variety seems to be cult.

Z. ailanthoides, Sieb. & Zucc. Tree, attaining 60 ft.: branches with numerous short prickles: lvs. 1–4 ft. long; lfts. oblong-ovate, glabrous, glaucous beneath, 3–6 in. long: fls. and fr. in terminal corymbs. Japan. This is called by Sargent one of the most beautiful trees of Japan. —*Z. clàva-Hérculis,* Linn. (Z. carolinianum, Lam.). Toothache-Tree. Pepperwood. Small very prickly tree, 30 or occasionally 50 ft.: lfts. 7–17, ovate-lanceolate, pubescent beneath when young, 1–2½ in. long: fls. and fr. in terminal panicles. April, May. S. Va. to Fla. and Texas. S.S. 1:29.—*Z. dissìtum,* Hemsl. Scandent shrub, to 12 ft. or more: rachis usually with hooked prickles; lfts. 6–15, coriaceous, petioled, elliptic to oblong-lanceolate, entire, lustrous above, often prickly beneath, 3–6 in. long: fls. in axillary panicles 2–5 in. long, with sepals and petals; stamens long-exserted: fr. crowded, yellowish brown; seeds over ¼in. long. Cent. and W. China. This and the two following species have been recently intro. from China.—*Z. Piasézkii,* Maxim. Allied to Z. piperitum. Shrub, to 10 ft.: lfts. 7–15, ovate or obovate to oblong, slightly crenulate or nearly entire, quite glabrous, ½–1 in. long: fls. in small corymbs; style short: fr. warty, reddish. W. China.—*Z. stenophýllum,* Hemsl. Scandent shrub, to 6 ft.: rachis usually with many slender hooked prickles; lfts. 7–13, ovate-oblong to lanceolate, denticulate, glabrous, 1½–3 in. long: fls. in terminal loose corymbs, 2–3 in. across, with petals and sepals; stamens long-exserted: fr. reddish, beaked; seeds ⅛in. long. W. China. Has not proved hardy at the Arnold Arboretum.

Alfred Rehder.

ZAUSCHNÈRIA (named for a professor of natural history at Prague). *Onagràceæ.* Low perennials, some of them subshrubby, few of them used in the flower-garden.

Leaves, the lowest opposite, others alternate: fls. racemose, large, scarlet, fuchsia-like; calyx-tube globose, inflated just above the ovary, then becoming funnelform, 4-lobed, bearing 8 small scales within; petals 4, obcordate, or deeply cleft; stamens 8: caps. slender-fusiform, obtusely 4-angled, 4-valved, many-seeded.—About 7 species, W. N. Amer.

califórnica, Presl. California Fuchsia. Hummingbird's Trumpet. Balsamea. Half-hardy perennial with the fl. of a fuchsia and the fr. of an epilobium: height ¾–2 ft.: lvs. linear to oblong, ½–1½ in. long, pubescent or tomentose: fls. scarlet or vermilion, the trumpet-shaped calyx 1½ in long; calyx-lobes ovate; petals obcordate, spreading: fr. 4-valved, imperfectly 4-loculed. Calif. P.M. 15:195. F. 1847–8:241. Gn. 31: 28 and p. 29. R.H. 1849:141. Var. **spléndens,** Hort., is perhaps a little more luxuriant plant, otherwise not differing from the type. Var. **latifòlia,** Hook. Often nearly glabrous: lvs. broad-ovate to ovate-lanceolate, markedly feather-veined. B.M. 4493. F.S. 4:404.—Varieties have been made based on linear, lanceolate, or ovate lvs., but they run into one another. The plants also vary from glabrous and pubescent to tomentose. As a bedding-plant it has been occasionally used for novelty effects by European gardeners. To overcome its thin and leggy habit, it is well to set the plants rather close and pinch out the young shoots until compact bushes are secured. The plant is sometimes grown in pots for greenhouse decoration in late autumn. There are said to be forms that vary considerably in hardiness. The plant is hardy in most parts of England

4035. Ear or pistillate spike of maize. The husks are a kind of involucre. Each kernel represents a flower. The "silks" are styles.

with slight winter covering. In favored spots it is considered to be a choice plant of pendent habit for the steep sides of rockeries and for naturalizing on old walls. In light and dry soils it spreads underground like the epilobiums. It is prop. by division, by cuttings made in autumn and wintered in a coldframe, or by seeds sown in early spring in mild heat. In Calif. the plant is considered objectionable on account of the unkempt appearance produced by the woolly seeds. It is remarkably resistant to drought.

WILHELM MILLER.

4036. Zea Mays.—Flint corn.

ZÈA (an old Greek name for some common cereal, probably spelt). *Gramíneæ.* A large annual grass with monœcious infl., the staminate fls. being in the tassel at the top and the pistillate fls. in one or more ears in the axils of the lvs., each ear inclosed in several reduced lvs. or husks, the numerous styles protruding from the tip as the silk. As now limited the genus is founded on the single polymorphous cult. species, *Zea Mays*, maize or Indian corn (Figs. 4034, 4035, 4036), whose origin is unknown but is suspected by some to be teosinte (*Euchlæna mexicana*). Most of the evidence points to Mex. as the region in which it originated and from which it spread.

After a prolonged study of maize, teosinte, and hybrids between them, Collins advances the hypothesis (Journ. Wash. Acad. Sci. 2:520. 1912) that maize originated as a hybrid between teosinte and an unknown grass belonging in the Andropogoneæ. This grass is thought to have been not unlike the earless varieties of pod or husk corn (*Zea Mays* var. *tunicata*, Figs. 4037, 4038). The chief distinction between pod corn and the ordinary varieties of maize is that the glumes of the pistillate spikelets are developed in pod corn and completely inclose the grain, while in ordinary maize the glumes are reduced to minute scales at the base of the grain. Collins has found that if plants of pod corn are isolated and bred among themselves for a few generations, there will usually result a still greater divergence from the ordinary type of maize. Plants will appear in which the lateral inflorescence or ear is aborted while the terminal inflorescence is greatly enlarged, containing both stamens and pistils. These may be borne either in separate spikelets, in separate florets of the same spikelet, or in perfect florets. Plants of this earless type of pod corn possess no characters which would exclude them from the Andropogoneæ. The constant recurrence of such plants among many varieties of corn Collins considers to be strong indication that some perfect-flowered grass has figured in the ancestry of maize. Harshberger (see G.F. 9:522; Contr. Bot. Lab. Univ. Penn. 2:231) after a study of teosinte-maize hybrids, showed that *Zea canina*, Wats. (Figs. 4039, 4040), originally described as a wild species, is an early-generation hybrid between ordinary maize and teosinte. Harshberger concludes that Indian corn is the result of a cross between teosinte and a race or variety of the same species produced by successive cultivation of the wild plant until its characters as a variety or race have become fixed. Collins holds that this conclusion does not take into consideration the evidence afforded by the podded varieties of maize. To explain maize as a hybrid Collins holds that the second parent must be assumed to be some plant radically different from teosinte, for only such a parent would account for the appearance of characters the very opposite of those which characterize Euchlæna. Under the article *Corn* are given the botanical characters of the genus, a classification of the subspecies, as proposed by Sturtevant, and a discussion of sweet corn and pop-corn.

4037. Pod or husk corn.—Zea Mays var. tunicata. Each kernel inclosed in a husk. (×⅓)

The following varieties of *Zea Mays* are grown for ornament:

Var. **japónica,** Koern. (*Z. japónica,* Van Houtte. *Z. vittàta,* Hort.). Foliage variously striped with white: plant small: ears small; kernels yellowish, flint. Said to have come from Japan. F.S. 16:1673, 1674. G. 2:463.

Var. **gracíllima,** Koern. (*Z. gracíllima* and *Z. mínima,* Hort.). Very dwarf, slender form with green lvs., sometimes cult. in Eu. A var. **variegàta** is also mentioned.

Var. **Curágua,** Alef. (*Z. Curágua,* Molina), is described as a very robust green-lvd. form. Sturtevant places it in the pop-corn tribe. Gn. 42, p. 207.

A. S. HITCHCOCK.

ZEBRÌNA (name refers to the striped leaves). *Commelinàceæ.* One of the species, the wandering Jew, is a very common greenhouse plant, much used for baskets and for covering the ground underneath benches.

Differs from Tradescantia chiefly in the fact that the corolla is tubular (petals not free); stamens 6,

4038. Cross-section of ear of husk corn. (×⅓)

4039. Zea canina, showing the long branches, with ears at the joints.

equal; fls. few, sessile, in 2 conduplicate bracts.—Two species, Mex. and Texas.

pèndula, Schnizl. (*Tradescántia zebrìna,* Hort. *T. tricolor,* Hort., in part. *Cyanòtis vittàta,* Lindl. *Commelìna zebrìna,* Hort.). WANDERING JEW, in part. Fig. 4041. Trailing, half-succulent, perennial herb rooting at the joints: lvs. lance-ovate, sessile, the lf.-sheath about ½in. long and hairy at top and bottom and sometimes throughout its length; under surface of lf. red-purple; upper surface silvery white, suffused with purplish, the central part and the margins purple-striped: fls. about 2, rose-red, contained in 2 boat-shaped bracts, one of which is much smaller than the other. Mex.—Commonly confused with *Tradescantia fluminensis,* Fig. 3829, and sometimes with *Commelina nudiflora.* See *Tradescantia.* The lvs. of *Z. pendula* seem never to be green. They vary somewhat in color. All forms are easily grown, and they prop. readily from pieces of st. Var. **quadrìcolor,** Bailey (forma *quadrìcolor,* Voss. *Tradescántia quadrìcolor* and *T. multìcolor,* Hort.). Lvs. with metallic green undertone and striped with green, red, and white. Handsome.

a *b*

4040. Ears of Zea canina. *a,* Second year from the wild. Cob flattish. *b,* Third year from the wild. Kernels less pointed. Cob nearly cylindrical. (×⅔)

L. H. B.

ZELKÒVA (after the vernacular name Zelkoua in Crete, or Selkwa in the Caucasus). Syn., *Abelìcea,* and including *Hemiptèlea. Ulmàceæ.* Ornamental trees grown for their handsome foliage and attractive habit.

Deciduous: lvs. alternate, short-petioled, penni-nerved, serrate, stipulate: fls. polygamous, the perfect ones solitary in the axils of the upper lvs., the staminate ones clustered in the axils of lower lvs. or bracts; calyx 4–5-lobed; stamens 4–5; styles 2: fr. a 1-seeded drupe, usually broader than high, oblique, with the style eccentric.—Five species in Crete, the Caucasus, and E. Asia. They are closely related to Celtis and Aphananthe and are chiefly distinguished by the connate sepals, the eccentric style and the oblique fr. *Z. serrata* is an important timber tree; the wood is very durable, and considered the best building material in Japan. The young wood is yellowish white in color; the old wood is dark brown and has a beautiful grain.

4041. Zebrina pendula. (×½; fl. enlarged)

The zelkovas are trees, sometimes shrubby, in general appearance much like some of the small-leaved elms, with rather small more or less two-ranked short-stalked leaves, with insignificant greenish flowers appearing at the base of the young branches and followed by inconspicuous fruits. *Z. serrata* and *Z. Davidii* are hardy North, while *Z. ulmoides* is hardy only as far north as Massachusetts, at least only in sheltered positions. *Z. serrata* is a very graceful round-headed tree and well adapted for avenues or as single specimens on the lawn. *Z. Davidii,* which is of recent introduction, may be useful as a hedge-plant on account of its upright rather stiff stems armed with spines. They do not seem to be very particular as to soil and position. Propagation is by seeds sown soon after ripening; also by layers and by grafting on Ulmus.

A. *Fr. not winged: branches not spiny.*

serràta, Makino (*Z. acuminàta,* Planch. *Z. hirta,* Schneid. *Z. Keàki,* Mayr. *Z. cuspidàta,* Hort. *Planèra acuminàta,* Lindl. *Planèra japónica,* Miq. *Planèra Keàkii,* C. Koch. *Ulmus Keàkii,* Sieb.). Fig. 4042.

4042. Zelkova serrata. (×⅛)

Tree, attaining 100 ft., with broad, round-topped head: branches slender: lvs. short-stalked, ovate to oblong-ovate, acuminate, rounded or slightly cordate at the base, sharply and coarsely serrate, with acuminate teeth, pairs of veins about 10, somewhat rough above, almost glabrous, 1–2½ in. long on fertile branches, 2–5 on sterile branches. April, May. Japan. G.F. 6:325. Gt. 37, pp. 22, 23. S.I.F. 1:36. G.W. 16, p. 216.

ulmoìdes, Schneid. (*Z. crenàta,* Spach. *Z. carpinifòlia,* Koch. *Planèra Richardii,* Michx. *Planèra carpinifòlia,* Wats. *Planèra crenàta,* Desf. *Abelìcea ulmoìdes,* Kuntze). Tree, attaining 80 ft., with slender

branches forming an oval or oblong head: lvs. oval or ovate to oblong, slightly cordate or rounded at the base, coarsely toothed with obtusish teeth, with 6–8 pairs of veins, usually almost glabrous above at length, pubescent on the veins beneath, ¾–3 in. long. April, May. Caucasus. Gn. 24, p. 371.

4043. Zenobia pulverulenta. (×½)

aa. *Fr. with a small wing on one side: branches usually spiny.*

Dàvidii, Hemsl. (*Z. Davidiàna*, Franch. *Hemiptèlea Dàvidii*, Planch.). Shrubby tree, the branches with axillary spines ½–4 in. long: lvs. oval to elliptic or elliptic-oblong, acute, subcordate at the base, with 8–12 pairs of veins on each side, at first with scattered hairs above, each leaving a dark circular depression, and with few scattered hairs on the veins beneath, finally glabrous, ¾–2 in. long: fr. conical, 2-edged, ¼in. long, short-stalked. April, May. N. China, Korea. R.H. 1913, p. 29.

Z. sínica, Schneid. Allied to Z. hirta. Tree, to 50 ft.: lvs. ovate-oblong, rounded or broadly cuneate at the base, firm, crenate-serrate, ¾–2 in. long. Cent. China.—*Z. Verschaffèltii*, Nichols. (Ulmus Verschaffeltii, Hort. Z. japonica Verschaffeltii, Dipp.). Shrub or small tree, allied to Z. ulmoides: lvs. oval or ovate, with 6–9 coarse triangular teeth on each side, rough above, with soft hairs beneath, 1½–2½ in. long. Origin not known, possibly from the Caucasus.

ALFRED REHDER.

ZENÒBIA (after Zenobia, queen of Palmyra, who lived in the third century; a fanciful allusion to her having been chained as was Andromeda, whose name is commemorated by a closely allied genus). *Ericàceæ*. Ornamental shrub grown for its handsome white flowers, and also for the foliage which is covered with a bluish white bloom in one form.

Deciduous or half-evergreen: lvs. alternate, short-petioled, crenulate or entire: fls. in axillary clusters forming terminal racemes on the upper part of last year's branches; calyx 5-lobed, with short valvate lobes; corolla campanulate, as broad as high, obtusely 5-lobed; stamens 10; anthers with 4 slender awns: caps. depressed-globose, obscurely 5-lobed, somewhat carinate at the dorsal sutures, loculicidally 5-valved; seeds numerous, small, oval, angled.—One species in N. Amer., closely allied to Andromeda and Pieris but chiefly distinguished by the open-campanulate fls. and 4-awned anthers.

Zenobia is a low bush with medium-sized short-petioled leaves entire or nearly so and with handsome white nodding flowers in clusters along the upper part of last year's branches. It is hardy as far north as Massachusetts, and a very handsome shrub for borders of shrubberies, particularly when in bloom; the glaucous form is one of the most conspicuous shrubs with light-colored foliage. After flowering, the flower-bearing part of the shoots should be cut off. Zenobia is also recommended for forcing. It thrives best in a sandy or peaty soil. Propagation is by seeds and by layers; also by cuttings of half-ripened wood in July placed in gentle heat, or by greenwood cuttings from forced plants. See, also, *Andromeda* and *Pieris* for culture.

pulverulénta, Pollard (*Z. speciòsa*, Don. *Andrómeda pulverulénta*, Bartram. *A. speciòsa*, Michx. *A. glaùca*, Hort. *A. cándida*, Hort. *A. dealbàta*, Lindl.). Figs. 4043, 4044. Shrub, 2–4 ft. high, with upright or arching branches: quite glabrous: lvs. oval to oblong, obtuse or acutish, crenulate or finely serrulate, often covered more or less with glaucous bloom, 1–2 in. long: fls. on slender nodding pedicels, clustered and forming racemes, 2–5 in. long; corolla white, ⅓in. across. May, June. N. C. to Fla. B.M. 970. L.B.C. 6:551. Gn. 22, p. 271; 24:420; 57, p. 185; 75, p. 212. G.C. III. 23, suppl. May 28. G. 5:299; 6:235; 11:475; 21:179; 28:663. R.B. 31:169. G.M. 31:218; 55:117. Gn.M. 20: suppl. June 20. Var. **nùda**, Rehd. (*Z. cassinifòlia*, Pollard. *Andrómeda cassinifòlia*, Vent. *A. speciòsa* var. *nítida*, Michx. *A. speciòsa* var. *víridis*, Hort.). Lvs. green, without bloom.

ALFRED REHDER.

ZEPHYRÁNTHES (Greek, *flower of the west wind*). Syn. *Atamósco*. *Amaryllidàceæ*. ZEPHYR FLOWER. FAIRY LILY. Half-hardy tunicate-bulbous herbs, grown in the greenhouse, in window-gardens, and in the garden for summer- and autumn-blooming.

Leaves narrow, usually contemporary with the fls.: peduncle elongated, slender, hollow; spathe membranous, tubular, apex bifid: fls. white, red, or yellow, solitary in the spathe; perianth funnel-shaped, erect or slightly inclined, tube short or elongated, segms. subequal; ovary 3-celled: caps. subglobose, loculicidally 3-valved.—About 53 species, natives of the warmer regions of Amer. A general revision of Zephyranthes is found in Baker's Handbook of the Amaryllideæ, 1888, where the following subgenera are made: Subgenus ZEPHYRANTHES proper. Fl. erect; tube short; stamens inserted near its throat. Subgenus ZEPHYRITES. Fl. slightly inclined; tube short; stamens inserted near its throat; style more declinate than in the other two subgenera. Subgenus PYROLIRION. Fls. erect; tube longer, dilated in the upper half; stamens inserted at the middle of the perianth-tube. For the further separation of the species, Baker uses the characters which appear in the key below, except the foliage-characters and the color of the fls. However, the genus may be readily separated into 3 sections based on the color of the fl., and this arrangement is here used as being more convenient to

4044. Forced plant of Zenobia pulverulenta.

the horticulturist. The seasons of bloom indicated herein are those for localities where the plants will thrive outdoors the year round. For an account of bigeneric hybrids of Zephyranthes and Cooperia, see Lancaster, Journ. Roy. Hort. Soc. 38, p. 531.

The zephyr lilies must be wintered in a place free from frost, and as the best kinds are natives of swampy places it is fair to presume that they will need more

moisture during the resting-period than the generality of bulbous plants. The best four species are: *Z. candida* (Fig. 4045), white, autumn; *Z. Atamasco*, white, spring; *Z. carinata*, rosy, summer; *Z. rosea*, autumn. All of these will probably survive the winter out-of-doors in the middle states if given a fair degree of protection.

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KEY TO THE SPECIES.

A. *Stamens inserted near the throat of the perianth-tube.*
  B. *Fl. erect.* (*Subgenus Zephyranthes proper.*)
    C. *Stigma trifid.*
      D. *Ovary stalked.*
        E. *Perianth white, often tinged with rose outside.*
          F. *Length of perianth about 3 in.*
            G. *Lvs. channeled, bright green, shining, with acute margins* ..... 1. Atamasco
            GG. *Lvs. thick, semi-terete, deep green, not shining, with rounded margins* ..... 2. Treatiæ
          FF. *Length of perianth about 1½–2 in.*
            G. *Neck of bulb short* ..... 3. tubispatha
            GG. *Neck of bulb about 1 in. long* ..... 4. erubescens
        EE. *Perianth rose-colored or crimson-purple.*
          F. *The perianth 2½–3 in. long.*
            G. *Spathe 1½–2 in. long: pedicel shorter than the spathe* ..... 5. carinata
            GG. *Spathe 1 in. or slightly more long: pedicel usually longer than the spathe* ..... 6. Conzattii
          FF. *The perianth 1–2 in. long.*
            G. *Pedicel about as long as the spathe: spathe 1–1¼ in. long* ..... 7. Lindleyana
            GG. *Pedicel much longer than the spathe: spathe ½–¾ in. long* ..... 8. rosea
        EEE. *Perianth yellow, often reddish outside.*
          F. *Spathe much longer than the pedicel* ..... 9. longifolia
          FF. *Spathe much shorter than the pedicel* ..... 10. texana
      DD. *Ovary sessile* ..... 11. verecunda
    CC. *Stigma capitate, faintly 3-lobed* ..... 12. candida
  BB. *Fls. somewhat inclined; style declinate.* (*Subgenus Zephyrites.*)
    C. *Perianth yellow inside, coppery red outside* ..... 13. Andersonii
    CC. *Perianth cardinal-red inside and out* ..... 14. cardinalis
AA. *Stamens inserted at the middle of the perianth-tube.* (*Subgenus Pyrolirion.*) ..... 15. aurea

Subgenus ZEPHYRANTHES Proper.

1. **Atamásco,** Herb. (*Amaryllis Atamásco*, Linn.). ATAMASCO LILY. Fig. 4046. Most popular and largest of the spring-blooming white-fld. species; the commonest zephyr lily native to the U. S.: bulb short-necked, less than 1 in. thick: lvs. 4–6, linear: scape 6–12 in. high: fls. pure white, about 3 in. long. March–June. Va. to Fla. and Ala. B.M. 239. L.B.C. 19:1899. Gn. 24, p. 199:37, p. 155. J.H. III. 63:379.

2. **Trèatiæ,** Wats. Closely allied to *Z. Atamasco* and best distinguished by the lvs. as indicated in the key: perianth-segms. sometimes keeled with rose, but in both species the fls. turn pinkish with age. It is a Fla. species, found in damper localities and blooming several weeks later than *Z. Atamasco*. V. 6:299. Gn. 33, p. 11. G. 10:603. J.H. III. 53:273.

3. **tubispàtha,** Herb. Bulb globose, 1 in. diam.: lvs. narrow-linear, flaccid, bright green, sometimes 1 ft. long: peduncle slender, 6 in. long; spathe 1–1½ in. long, slit at the tip only: perianth 1½–2 in. long, white, slightly tinged with green, never with red, tube scarcely any, segms. obovate. W. Indies, Venezuela, and Colombia.

4. **erubéscens,** Wats. (*Amaryllis erubéscens*, Horsford). Rare white-fld. August-blooming species supposed to be native to sandy plains of Texas, but perhaps from N. Mex.: distinguished from the 2 preceding species by the larger, longer-necked bulb, shorter perianth, and fls. strongly tinged with rose outside: bulb over 1 in. thick; neck as long: spathe bifid above: tube equaling and closely embracing the pedicel (about 1 in. long).—Intro. by Horsford 1889 and probably lost to cult.

5. **carinàta,** Herb. (*Z. grandiflòra*, Lindl.). Largest and choicest of the rosy-fld. species and said by Baker (1888) to be the commonest zephyranthes in cult.; however, the name *Z. rosea* is far commoner in American catalogues: a summer-blooming species with fls. 2½–4½ in. across, and about 3 in. long: bulb 1 in. thick, short-necked: ovary stalked: stigma trifid. Jamaica,

4045. Zephyranthes candida. (×¼)

Cuba, Mex., Guatemala. B.R. 902. Gn. 33:10 (erroneously as *Z. Atamasco*). I.H. 35:49. J.H. III. 29: 339. G. 21:276; 34:341.

6. **Conzáttii,** Greenm. Bulb globose, about 1 in. diam.: lvs. produced after the fls.: peduncle 6–9 in. high, slender; spathes about 1 in. long: perianth (dried) rose-colored or crimson-purple, tube short, segms. oblanceolate, style declinate. Mex.

7. **Lindleyàna,** Herb. Rare summer-blooming rose-colored species from the mountains of Mex., inferior to *Z. carinata* for general cult.: bulb globose, ¾ in.

thick; neck short: fls. 1½–2 in. long; ovary stalked; stigma 3-fid; spathe 3-fid only at tip.

8. **rósea,** Lindl. Autumn-blooming rosy-fld. species, with much smaller fls. than *Z. carinata* but, according to American catalogues, the most popular rosy-fld. species: fls. only about 1 in. long and 1½ in. broad: bulb globose, ¾in. thick; neck scarcely any: spathe 2-fid at tip only: ovary stalked: stigma 3-fid. Oct.

4046. Zephyranthes candida above and one Z. Atamasco below.

Cuba. B.M. 2537. B.R. 821. Gn. 12:88.—Trade plants of *Z. rosea* should be compared with *Z. carinata.*

9. **longifólia,** Hemsl. Summer-blooming, yellow-fld. species, distinguished from the next by characters of pedicel and spathe: bulb ovoid; neck 1½–2 in. long: spathe tubular in the lower half: pedicel much shorter than spathe: fls. yellow, coppery outside, ¾–1 in. long. New Mex.—Intro. 1889, and probably lost to cult.

10. **texàna,** Herb. Yellow-fld. Texan species: bulb globose; neck 1–1½ in. long: spathe bifid only at the tip: pedicel much longer than the spathe: fls. yellow, coppery outside, 1 in. long, 1½ in. across. B.M. 3596 (as *Habranthus Andersoni* var. *texanus*). Var. **aùrea,** Hort., with bright yellow fls., is offered in the trade.

11. **verecúnda,** Herb. (*Z. striàta,* Herb.). Rare spring- and summer-blooming species, distinguished from other white-fld. species cult. by the sessile ovary and long-necked bulb: bulb 1 in. or less thick; neck 1–2 in. long: fls. 1½–2 in. long, greenish white, more or less tinged outside or keeled with rose. Highlands of Cent. Mex. B.M. 2583; 2593.—Offered by Dutch dealers.

12. **cándida,** Herb. Figs. 4045, 4046. Most popular of white-fld. zephyr lilies, being distinguished from the others by its autumn-blooming habit and capitate stigma: lvs. appearing in autumn with the fls. and lasting through the winter in favored localities, over 1 ft. long: fls. pure white or slightly tinged rose outside, 1½–2 in. long. Marshes of La Plata. Gn. 37:154; 59, p. 115; 76, p. 551. B.M. 2607. B.R. 724. L.B.C. 15:1419. J.H. III. 43:232. Var. **màjor,** Hort., has fls. 4 in. long, borne on long stout sts. Uruguay.

Subgenus Zephyrites.

13. **Ándersonii,** Baker. Yellow-fld. S. American species of uncertain blooming-time: fls. usually flushed and veined with red outside and there is a variety with copper-colored fls., inside and out: bulb ovoid, short-necked: fls. 1–1½ in. long, 2 in. across. Montevideo, Buenos Ayres. L.B.C. 17:1677 and B.R. 1345 (both as *Habranthus Andersoni*).—Apparently the only representative in cult. of its subgenus, which is characterized by strongly declinate stamens.

14. **cardinàlis,** C. H. Wright. Lvs. ligulate, acuminate, about 6 in. long, above shining green, slightly canaliculate, below keeled: scape cylindrical, rose below, green above; spathe rose: perianth cardinal-red, tube funnel-shaped about 1 in. long, green, segms. broadly oblong-oblanceolate, subobtuse. Amer. B.M. 8553.

Subgenus Pyrolirion.

15. **aùrea,** Baker. Bulb globose, 1½ in. diam.: lvs. about 5, linear, 1 ft. long, ¼in. broad: peduncle 6–12 in. long: spathe membranous, 1½ in. long, cylindrical below; perianth-limb erect, bright yellow, tube funnel-shaped, suddenly dilated at the middle, segms. acute, 1½ x ½in. Peru. G.C. III. 43:405. G. 34:35. G.M. 54:937. Gn. 72, p. 326.

Z. álba, Hort., with pure white fls. is offered in the trade.—*Z. floribúnda,* Hort., is a trade name.—*Z. sulphùrea,* Hort., is offered in the trade.

Wilhelm Miller.
F. Tracy Hubbard.†

ZÍCHYA: *Kennedya.*

ZÍNGIBER (name ultimately derived from a Sanskrit word meaning *horn-shaped;* probably referring to the ginger root). *Zingiberàceæ.* Ginger. Perennial herbs sometimes grown as warmhouse plants, and also for summer bedding in the southern United States for their decorative value; source of ginger.

Rhizomes horizontal, tuberous: sts. leafy, the flowering and sterile differing: lvs. oblong-lanceolate, clasping the st. by their long sheaths: infl. thyrsoid-spike-like, dense cone-like or rather long, terminal or lateral; bracts usually 1-fld.: calyx cylindrical, shortly 3-lobed; corolla-tube cylindrical, segms. lanceolate, upper concave; later staminodes none or adnate to the obovate-cuneate lip; anther-cells contiguous, crest narrow, as long as the cells; ovary 3-celled, ovules many, superposed: caps. oblong, finally dehiscing.—About 70 species, natives of the tropics of the Old World. Monographed by K. Schumann in Engler's Pflanzenreich, hft. 20 (IV. 46). It is said by gardeners that in Zingiber the leaves tend to roll up or inward and in Hedychium downward.

The ginger plant is a small reed-like plant 2 feet or more high, as cultivated in greenhouses, with tuberous rhizomes, aromatic leaves and dense cone-like clusters of bracts. The flowers, however, are very rarely produced in cultivation, and Roxburgh wrote that he never saw the seeds. The plant is supposed to be native to India and China, but, like many other tropical plants of economic importance, its exact nativity is uncertain. Some idea of the importance of ginger to the world may be gained by the fact that as early as 1884 Great Britain imported 5,600,000 pounds valued at $620,000. Medicinal ginger is prepared from the dried "root;" condimental ginger from the green. Candied ginger is made from carefully selected succulent young rhizomes which are washed and peeled and then preserved in jars of sirup. Housewives often preserve their own ginger; it is important to have the hands protected while scraping the roots or they will "burn" for days. Ginger probably could be cultivated commercially in southern Florida and California. In Florida it thrives in rich soil and partial shade, and the roots can be dug and used at any time. The plant is cultivated commercially even in localities where it is necessary to lift the roots and store them over the cool season, as in the lower Himalayas. In the West Indies ginger may be cultivated up to an altitude of 3,500 feet.

Zingibers are occasionally cultivated as warmhouse

decorative plants. The shoots having a reed-like appearance, they may often be used to good advantage in arranging plants for artistic effects. They are of the easiest culture. Propagation is effected by division of the rhizomes in spring. These should be potted in fibrous loam to which a third of well-decomposed cow- or sheep-manure has been added. Water should be given sparingly until the shoots have well developed, when they should have an abundance. They are also benefited by an occasional watering with weak liquid manure water. Toward the end of summer the shoots will begin to mature, when the water-supply should be diminished, and as soon as the plants are ripened off the pots may be stored either under the greenhouse stages or in some other convenient place, where they should be kept almost dry for the winter.

4047. Commercial roots of ginger, as seen in the stores. (×⅓)

AA. *Margins of lvs. colored creamy white or often pink.*

Dárceyi, Hort.; also spelled *d'Arceyi* and *d'Arcyi*. About 2–3 ft. high: lvs. lanceolate, 6–8 x 2–2½ in., bright shining green with a broad creamy white or often pink margin and oblique stripes of the same color: fls. deep red, ball-like.—Intro. into Fla. This species is not treated by Schumann and is probably of horticultural origin.

AA. *Margins of lvs. not colored.*

B. *Leafy st. different from the flowering st.: spike from the rhizome.*

Miòga, Roscoe. About 3 ft. high: lvs. moderately or shortly petioled, linear-lanceolate or nearly linear, attenuate-acuminate and caudate at base, both surfaces glabrous, 10–15 x 1–2½ in., membranaceous: spike ellipsoidal, 2–3½ in. long: fls. white; calyx tubular, acuminate; corolla-lobes lanceolate or oblong-lanceolate, lip obovate, entire, basal-lobes yellow; ovary silky: caps. somewhat ovoid, 3-valved. Japan. B.M. 8570.—It is said to be still a saying in Japan that those who eat this plant forget everything, although no one has yet demonstrated it.

BB. *Leafy st. not differing from the flowering st.: spike terminal.*

C. *Bracts green, often pale-margined, rotundate.*

D. *Lvs. grass-like, scarcely ¾in. broad: lip purple, yellow-spotted.*

officinàle, Roscoe. GINGER. Fig. 4047. Sts. normally more than 3 ft. high from a tuberous rhizome: lvs. sessile, lanceolate or linear-lanceolate, attenuate-acuminate at base, up to 8 in. long and scarcely ¾in. broad: spikes ellipsoidal, obtuse, dense, 2 in. long; bracts ovate, pale green, margins often yellow: calyx crenate; corolla yellowish green, lobes lanceolate, acute, lip oblong-ovate, purple, yellow-spotted, lateral lobes ovate, acute. Native of Trop. Asia, but cult. throughout the tropics and intro. into S. Fla. Gn. 26, p. 284.

DD. *Lvs. lanceolate or oblong-lanceolate: lip yellow.*

Zerúmbet, Roscoe. Sts. 12–20 in. high, stout, from a tuberous rhizome: lvs. densely aggregated, oblong-lanceolate, acuminate, base acute, both surfaces glabrous or scattered pilose beneath, 3½–6 x 2–2¾ in.: spike subglobose, dense, 2–3½ in. long; bracts obtuse, pale green, margins pubescent (sometimes, at least when older, red): calyx spathe-like, white; corolla-tube slender, lobes lanceolate, white, lip short, broadly suborbicular or subovate, pale yellow, tinted orange in the center (sometimes red-spotted), lateral lobes short, rotundate. India and Malaya. B.M. 2000.

CC. *Bracts red or at the beginning reddish green, later becoming obscurely red or rose, commonly acute.*

D. *Spike elongated cylindrical, 8 in. or more long, apex obtuse.*

spectábile, Griff. Leafy sts. 6 ft. or more high, robust: lvs. subsessile, oblong-lanceolate, acuminate at base, obscurely green above, paler pubescent beneath, 8–12 x 3½ in.: spike 8–12 in. long, a little over 2 in. diam., laxly cylindrical, apex rounded; bracts yellow, finally scarlet, apex obtuse: corolla yellowish white, dorsal lobe deep concave, broad, anterior narrower, linear-lanceolate, lip obovate, emarginate, 2-lobed, lemon-yellow, apex almost black, lateral lobes half as long as midlobe, ovate. Malay Penins. B.M. 7967.

DD. *Spike 4 in. or less long, elongated, narrow-fusiform, apex acute.*

cylíndricum, Moon. Leafy sts. 6 ft. or more high: lvs. sessile, oblong-lanceolate or lanceolate, attenuate-acuminate; base acute, glabrous above, puberulent beneath, up to 8 x 2½ in.: spike 3½ in. long, cylindrical, narrowed at both ends, dense, bracts lower obtuse, upper acute, pale or reddish; corolla-lobes lanceolate, greenish, subequal, greenish, lip yellowish white, lateral lobes small, obtuse. Ceylon.

Z. cordìlinum, Hance. Leafy sts. differing from the flowering, almost 3 ft. high: lvs. sessile, linear-lanceolate, glabrous above, pilose beneath, 12x 2½ in.: spike oblong, obtuse, 7 in. long, bracts ovate, scarlet: corolla-lobes red, oblong, acuminate; lip obovate, lateral lobes inconspicuous. China.—Once offered in Fla.

F. TRACY HUBBARD.†

ZÍNNIA (Johann Gottfried Zinn, 1727–1759, professor of medicine at Göttingen). Syn. *Crassìna. Compósitæ.* YOUTH-AND-OLD-AGE. Popular flower-garden subjects for summer and autumn bloom, mostly annual or treated as such.

Annual, perennial, and subshrubby plants, mostly Mexican but ranging from Texas and even Colo. to Chile, probably 16–20 species: lvs. opposite, mostly entire: heads terminal, of fls. which are peduncled or sessile: rays pistillate, fertile, disk yellow or purple, its fls. hermaphrodite, fertile; involucre ovate-cylindric or campanulate, the scales in 3 to many series, broad, obtuse or rounded, more or less colored: achenes laterally compressed, 2-toothed at the summit and frequently 1-awned from the inner angle, rarely 2-awned. See the botanical revision by Robinson & Greenman in Proc. Amer. Acad. Arts & Sci. 32: 14 (1897). Illustrated historical sketch in Gn. 48, pp. 464, 465.

4048. Single zinnia.—*Z. elegans.*

The familiar zinnias (Figs. 4048-4050)

are hardy plants, growing a foot or more high and covered from July until the first hard frost with double flowers 2 inches or more across. Several well-marked colors are commonly seen in zinnias—white, sulfur, yellow, golden yellow, orange, scarlet-orange, scarlet, flesh-color, lilac, rose, magenta, crimson, violet, purple, and dark purple. There are also variegated forms, but the solid colors are most popular. The zinnia is rich in shades of purple and orange, but lacks the blue and pink of the China aster and is poor in reds compared with the dahlia. Three forms or classes of the common zinnia (*Z. elegans*) may be noted here:

I. Tall zinnias are ordinarily 20 to 30 inches high. This size and the next smaller size are the favorites for general purposes. The tall kinds are available in twelve and more colors. A robust race, which attains 28 to 40 inches under perfect conditions, is sometimes known to the trade as *Z. elegans robusta grandiflora plenissima.* It is also known as the Giant or Mammoth strain. This strain was developed after many years by Herr C. Lorenz and was introduced in 1886. A maximum diameter of 6 inches is recorded for flowers of this strain. In G.C. II. 26:461 is shown a flower measuring 4 by 4 inches, with about eighteen series of rays, the latter being so numerous and crowded that the flower is less regular than the common type. A specimen zinnia plant 3 feet high is attained in the North only by starting the seed early and giving perfect culture.

II. Medium-sized zinnias range from 12 to 20 inches in height. They are available in several colors. Here belong most of the forms known to trade catalogues as *Z. pumila*, *Z. nana*, and *Z. compacta.*

III. Dwarf zinnias range from 3 to 12 inches in height and are of two subtypes, the pompons and the Tom Thumbs. The pompons, or "Liliputians," are taller-growing and smaller-flowered, generally about 9 inches high, with a profusion of flowers about 2 inches across. The Tom Thumb type represents the largest possible flower on the smallest possible plant. Both types are available in several colors, not all of which are yet fixed in the seed.

Second in importance to *Z. elegans* is *Z. Haageana.* The single form was introduced to cultivation about 1861 and the double about 1871. It is dwarfer than most zinnias, and has smaller flowers, with a color-range restricted to shades of orange. It is distinct and pretty but less showy than the common zinnias. The first race of hybrids between *Z. Haageana* and *Z. elegans* appeared in 1876 under the name of *Z. Darwinii.* This group is said to resemble *Z. elegans* in size and color of flowers and to recede from *Z. elegans* in habit, being more branched and forming a broader and thicker bush.

Zinnias are of the easiest culture, thriving in any deep good soil, whether loamy or sandy. The seeds may be sown about May 1, or whenever the soil is in fit condition for hardy annuals. Such treatment will give flowers from the first of July until frost. The young plants should be thinned so as to stand 1 to 2 feet apart, depending on whether they are of medium- or tall-growing habit. By midsummer the foliage should obscure the ground. For the very best results the seed may be started indoors about April 1, and the seedlings transplanted once or twice before being placed outdoors in permanent quarters. Dwarf varieties should be set 14 to 16 inches apart: taller kinds 2 feet each way. Zinnias are essentially coarse plants, but if the tall kinds are massed heavily in the borders or at some distance they produce striking and very acceptable effects. Their colors are strong, and the stoutness of stems and foliage add to the composition.

4049. Double zinnias—Z. elegans. (×⅓)

A. *Plant annual.*

B. *Achenes of the disk-fls. short and broad, obovate, 2–2½ lines long.*

C. *Colors various: lvs. clasping, cordate-ovate or elliptic.*

élegans, Jacq. Youth-and-Old-Age. Figs. 4048–4050. Erect annual, a foot or more high, but varying from 3 in.

4050. Common garden zinnias. single and semi-double.—Z. elegans.

to 3 ft.: lvs. ovate or elliptic, clasping, about 1 in. wide: rays becoming reflexed, originally purple or lilac, but now of nearly every color except blue and green; disk originally yellow or orange, but nearly or quite absent in the common double forms: fls. 2–5 in. across. July to Oct. Mex. Single forms are pictured in B.M. 527. P.M. 1:223, B.R. 1294 (the last two as *Z. violacea*). Double forms, F.S. 13:1394, R.H. 1861:251; 1864:331, G. 4:138. Pompons in Gn. 48, p. 464 (Liliput); 30:270 (deceptive as to size), R.B. 20, p. 152.—The common species from which most of the garden zinnias are derived.

CC. *Color orange: lvs. sessile, narrower, lanceolate.*

Haageàna, Regel (*Z. mexicàna,* Hort.). Fig. 4051. Distinguished from *Z. elegans* by the orange-colored fls., which are generally smaller; also the plant is dwarfer, as a rule, and the lvs. are merely sessile, not clasping. Trop. Amer. Single forms, Gn. 30, p. 270; 48, p. 464. Double, Gn. 30, p. 271; 48, p. 464, G. 2:73. F. 1871, p. 229, A.G. 13:218. Var. **stellàta,** Hort. Florets twisted and acuminate, orange-yellow.—This is considered by Robinson & Greenman as a horticultural species not certainly distinguishable from *Z. angustifolia,* in spite of its broader lvs.

BB. *Achenes longer, narrower, oblong, 3–4 lines long.*

C. *Color of rays yellow; disk yellow.*

pauciflòra, Linn. An erect annual: lvs. lanceolate to oblong-ovate, usually rough: heads yellow, about 1 in. across, with rather broad, spreading, red, purple or mostly yellow rays in cult. specimens: plant hirsute, with spreading hairs; somewhat corymbosely branched above: peduncles at maturity enlarged upward and hollow. Mex., Peruvian Andes.

4051. Zinnia Haageana. (×⅔)

CC. *Color of rays red or purple.*

D. *Rays suberect or scarcely spreading; disk yellow.*

multiflòra, Linn. This and the next are included by most writers in *Z. pauciflora,* but *Z. multiflora* may be distinguished from *Z. pauciflora* by the pubescence of the st. being much finer, appressed or rarely spreading, and the rays red or purple, mostly narrow and suberect or scarcely spreading. B.M. 149.

DD. *Rays revolute; disk dark-colored.*

tenuiflòra, Jacq. Fig. 4052. Very distinct by reason of its linear rays which are cardinal-red in color, becoming revolute. It has a dainty fl.-head about 1 in. across hardly comparable with the showy *Z. elegans.* This species has been cult. in Amer. but seems to be no longer advertised here. It is referred to *Z. pauciflora* by most writers, and to *Z. multiflora* by Robinson & Greenman. B.M. 555. A.G. 11:243.

4052. Zinnia tenuiflora. (×⅔)

AA. *Plant perennial.*

grandiflòra, Nutt. Hardy, low-growing, Colo. perennial, with woody root, erect, stiff, and very rough st. having a shrubby base, linear lvs., and sulfur-yellow rays which are very broad, almost round in outline: lvs. less than 1 in. long and 3-nerved. Colo., New Mex., Ariz., Mex. WILHELM MILLER.

ZIZÀNIA (an old Greek name of some wild grain). *Gramíneæ.* Tall aquatic grasses with lush sts., long blades, and large terminal panicles of monœcious fls.: spikelets 1-fld., the pistillate upper portion of the panicle narrow and appressed, the staminate lower portion spreading; pistillate spikelets long-awned.—Species 3, 2 in N. Amer. and 1 in N. Asia.

palústris, Linn. (*Z. aquática,* of Auth., not Linn.) INDIAN RICE. WATER OATS. WATER RICE. WILD RICE. Fig. 4053. Annual: culms tall, as much as 9 ft.: lvs. broad and flat.—Recommended for borders of lakes and ponds. The grain is excellent for fish and waterfowl. Wild rice lakes and ponds are favorite resorts of sportsmen in the fall. Before sowing, put the seed in coarse cotton bags and sink them in water for 24 hours. Sow in water from 6 in. to 5 ft. deep, with soft mud bottom, or on low marshy places which are covered with water the year round. In running water, sow as much out of the current as possible. Sportsmen are not generally aware that seed can be obtained in large quantities and at a reasonable price from seedsmen. Wild rice is very desirable for aquatic gardens, being one of

the handsomest of tall hardy grasses for the margins of ponds. C.L.A. 16:40. G. 24:21. Gn. 71, p. 191. See U. S. Dept. Agric. Bur. Pl. Ind. Bull. No. 50, Wild Rice: Its Uses and Propagation; also Recreation 32:149.

A. S. HITCHCOCK.

4053. Zizania palustris.

ZÍZIA (named for I. B. Ziz, a Rhenish botanist). *Umbellíferæ*. Perennial herbs of little horticultural value, but offered by some dealers in native plants.

Leaves ternate or ternately compound or the basal undivided: fls. yellow, in compound umbels, the central fr. of each umbellet sessile; involucre none; involucels of several small bracts; calyx-teeth prominent: fr. ovoid or oblong, glabrous or nearly so, ribs filiform, not winged. —Three species, N. Amer.

A. *Rays of umbels 9–25, stout, ascending.*

aûrea, Koch. GOLDEN ALEXANDERS. Height 1–2½ ft., glabrous and branched: basal and lower lvs. 2–3-ternately compound; upper lvs. ternate: fr. oblong, 2x1½ lines. April–June. Fields, meadows, and swamps, New Bruns., Sask. and S. D. to Fla. and Texas.—A weedy-looking plant.

AA. *Rays of umbels 2–12, slender, diverging.*

Bébbii, Brit. Distinguished from *Z. aurea* by the rays and by the fr., which is oval or broader, 1–1¼ lines. May. Mountain woods, Va. and W. Va. to N. C. and Ga.

F. TRACY HUBBARD.†

ZÍZYPHUS (from Zizouf, the Arabian name of *Z. Lotus*). *Rhamnàceæ*. JUJUBE. Ornamental woody plants grown chiefly for their handsome foliage, and some species for their edible fruits.

Deciduous or evergreen shrubs or trees: lvs. alternate, short-petioled, 3–5-nerved from the base, serrate or entire; the stipules mostly transformed into spines, often only one stipule spiny or one a straight and the other a hooked spine: fls. 5-merous; ovary 2–4, usually 2-loculed; style usually 2-parted: fr. a subglobose to oblong drupe.—About 40 species distributed throughout the tropical and subtropical regions of both hemispheres, allied and very similar to Paliurus, but chiefly distinguished by the drupe-like fr. The fr. of *Z. sativa*, *Z. Jujuba*, and *Z. Lotus* are edible, and the first-named is cult. in China.

The jujubes are slender-branched shrubs or small trees with prickly branches, usually 2-ranked, small or medium-sized generally oval or oblong leaves and with small greenish or whitish flowers in axillary cymes followed by drupe-like sometimes edible fruits. They are not much cultivated in this country and none of the species is hardy North; the hardiest seems to be *Z. sativa* but it is tender north of Washington, D. C. Most kinds have handsome foliage and are well adapted for planting in shrubberies in the southern states and California. They seem to thrive in any well-drained soil. Propagation is by seeds, by greenwood cuttings under glass and by root-cuttings.

Jujûba, Lam. Fig. 4054. Tree, 30–50 ft. high: branches usually prickly; young branchlets, petioles and infl. densely rusty tomentose: lvs. broadly oval or ovate to oblong, obtuse, sometimes emarginate, serrate or entire, dark green and glabrous above, tawny or nearly white-tomentose beneath, 1–3 in. long: fls. in short-stalked many-fld. axillary cymes: fr. subglobose to oblong, usually orange-red, ½–¾in. long, on a stalk nearly half its length. March–June. S. Asia, Afr., Austral. Gn. 13, p. 194. S.M. 3:447.—Variable in shape and color of the fr.; for figures of several varieties see Hooker Jour. Bot. 1 (1834):321. The jujube is somewhat planted in Fla. and Calif., although it yet has no commercial rating as a fr.-plant. The frs. or berries are ripe in Nov. and Dec., and the plant begins to bear at 3 years from planting. The jujube fr. is used in confectionery.

sativa, Gaertn. (*Z. vulgàris*, Lam.). COMMON JUJUBE. Shrub or small tree, attaining 30 ft., glabrous: prickly or unarmed; the longer prickle up to 1¼ in. long: branchlets often fascicled, slender and having frequently the appearance of pinnate lvs.: lvs. ovate to ovate-lanceolate, acute or obtuse, oblique at the base, sometimes

4054. Jujube.—Zizyphus Jujuba. (× nearly ½)

emarginate, serrulate, glabrous, ¾–2 in. long: fls. yellowish, fascicled, in axillary cymes: fr. ovoid to oblong, dark red or almost black, ½–¾in. long, short-stalked. March–June. S. Eu., S. and E. Asia; naturalized in Ala. R.H. 1859:602, 603. F.E. 19:395 (pl. 96). Var. **inérmis**, Schneid. (*Z. vulgàris* var. *inérmis*, Bunge). Branches unarmed. A.G. 12:79.

Z. Giráldii, Sprenger. "A fine tree with a slender st. and compact crown and black edible fr." N. China. This is probably not different from Z. sativa, which occurs in N. China and has been collected there by Giraldi according to his herbarium specimens.—*Z. Joazeiro*, Mart. Lvs. broadly ovate, acutish, cordate at base, serrulate, nearly glabrous, 2–3 in. long: cymes many-fld.: fr. cherry-like, yellow. Brazil.—*Z. Lòtus*, Lam. Prickly shrub, 3–4 ft. high: lvs. ovate-oblong, crenulate, glabrous: fls. in few-fld. axillary cymes: fr. subglobose, yellow. S. Eu., N. Afr.—*Z. Mistol*, Griseb. Spiny tree, to 30 ft.: lvs. short-petioled, coriaceous, oval, obtuse or retuse, subcordate at base, minutely and sparingly serrulate, hoary pubescent, about 1 in. long: fr. black, ½in. diam. Argentina.—*Z. nummulària*, DC.=Z. rotundifolia.—*Z. oxyphýlla*, Edgew. Closely related to Z. sativa. The slender prickle about ½in. long: lvs. ovate, acute, finely crenate-serrate: fr. elliptic, black, acid, less than ½in. long. Temp. Himalaya. A plant intro. under this name from Arabia by the Dept. of Agric. is said to have sweet frs. of date-like flavor.—*Z. Palìurus*, Willd.=Paliurus Spina-Christi.—*Z. Párryi*, Torr. Belongs to the genus Condalia, which is easily distinguished by not having spiny stipules but the branchlets transformed into slender thorns and by its entire, usually penni-nerved lvs. *C. Párryi*, Weberb., is a much-branched, glabrous thorny shrub, 4–15 ft. high: lvs. elliptic to obovate, obtuse, cuneate at the base, ⅓–½in. long: fls. slender-pedicelled, in sessile clusters: fr. ovoid, ½in. long. S. Calif. This plant was once offered by a collector of native plants, but it is probably not in the trade now.—*Z. rotundifòlia*, Lam. Shrub, heavily armed: lvs. ovate to orbicular, tomentose on both surfaces: fr. globose, black, woody, about ⅜in. diam. Persia eastward.—*Z. rugòsa*, Lam. Large evergreen shrub or small tree, sometimes of climbing habit, armed: lvs. elliptic, glabrous above, 2–6 in. long: fr. fleshy, 1-seeded, obovoid or globose, ¼–½in. diam. Himalaya.—*Z. Spina-Christi*, Willd. Small prickly tree: lvs. oval to oblong, crenulate, glabrous or pubescent on the veins beneath: fls. in axillary clusters; pedicels tomentose: fr. ovoid-globose, red. N. Afr., W. Asia. This species is supposed by some to have furnished Christ's crown of thorns; see also Paliurus Spina-Christi.

ALFRED REHDER.

Cultivation of the jujubes.

While several species of Zizyphus bear edible fruits, *Z. Jujuba* is the only one of much importance in cultivation. As to its original country, preponderance of evidence favors Syria, from whence it was carried to Europe by Sextus Popinius toward the end of the reign of Augustus Cæsar, about the beginning of the Christian era, and soon spread to all the countries bordering the shores of the Mediterranean. It is a quite hardy tree but its cultivation in Europe is confined to the warmer parts of Italy, France, Spain, and Portugal, and in Africa to the northern states of that continent. Its first introduction into the United States seems to have been by Robert Chisolm who brought trees from Europe in 1837 and planted them at Beaufort, North Carolina. It was introduced to California and neighboring states from southern France by the writer in 1876. The original trees of this importation are still growing in Sonoma Valley and have reached a height of 25 feet and a diameter of trunk of 8 to 10 inches, and are annually bearing abundant crops of fruit.

The tree is of drooping habit, the branches, especially in autumn, bending down with the burden of fruit. Its delicate light green foliage renders it very ornamental, while its reddish brown shining fruit, the size and shape of a small olive, adds to its beauty in autumn. The fruit is dry and wrinkled when fully ripe and has a subacid flavor which is pleasing to most persons. In southern Europe it is used to a considerable extent as a table dessert and in winter as a dry sweetmeat. It is regarded as a valuable pectoral and is esteemed for throat troubles in the form of pastes, tablets, sirup, and the like.

The tree has been extensively cultivated in northern China for thousands of years and hundreds of varieties have been developed. Frank N. Meyer, an explorer sent out by the Office of Foreign Seed and Plant Introduction of the United States Department of Agriculture, has introduced many of the best varieties, most of which are now fruiting at the Department experiment station, and are being distributed in the least frosty sections of the country. The fruits of the Chinese varieties are much larger than those grown in Europe, but are somewhat inferior in flavor. In China orchards of hundreds of acres in extent were observed by Meyer in the vicinity of the cities. One variety has recently borne at the Introduction Garden at Chico, California, the fruit of which is as large as an average hen's egg. Meyer says there are 300 or 400 varieties in cultivation by the Chinese. Some types are spherical and brown in color, others elongated and light mahogany-brown. Some sorts are eaten fresh and others are dried and keep indefinitely. The largest varieties when processed with sugar and honey make a delicious sweetmeat, comparable to a good quality of Persian dates. The Chinese shops in this country carry stocks of the dried and processed fruits which are much appreciated, not only by the Chinese, but by Europeans. Most of the varieties are armed with sharp stipular thorns, though occasionally thornless and seedless sorts have been produced.

Besides *Zizyphus Jujuba*, which produces the best fruits, other species are useful in various ways. *Z. Joazeiro* of Brazil, according to Dorsett, Popenoe, and Shamel, is a beautiful dense umbrageous tree producing enormous crops of fruit which is greedily eaten by sheep, cattle, horses, and swine, and has the advantage of thriving in very arid regions. *Z. Lotus* grows about the shores of the Mediterranean, the fruit of which, though inferior to *Z. Jujuba*, is eaten by the people of its native country. *Z. rotundifolia* (*Z. nummularia*) is a thorny shrub native of northwestern India where it is much used as a garden hedge. The fruit is small, but of pleasant subacid flavor. *Z. rugosa*, with an edible drupe, is hardier than the last, ascending in Burma to 4,000 feet. *Z. sativa* is a small or medium tree of Syria and northern India, ascending the Himalayas to 6,500 feet, therefore quite hardy. Its fruit is the size of a large olive, acid, but used for pastes and pectoral lozenges. *Z. Spina-Christi* is a bush used for hedges, so named from a notion that the crown of thorns was fashioned from the twigs. *Z. Mistol* is a small tree of Argentina with edible fruit with large stones.

The common jujube thrives in nearly all parts of the southwestern states and California and on all kinds of soil, except heavy clay and in wet locations, and requires little irrigation. The trees are planted 15 to 20 feet apart and are given the usual orchard cultivation. On account of their beauty the trees are often planted in dooryards. Propagation is by seeds or offsets. The seeds are very hard and are often cracked before planting, otherwise they will be one or even two years in germinating. Seedlings have been known to blossom at one year, but four years is more usual. As established trees send up abundant sprouts, the usual method of propagation is by this means.

The trees are regular bearers and the crop is never cut off by spring frosts, as they do not blossom until June in the valleys of California. The fruit of most varieties ripens in October and November and if desired for consumption fresh is gathered when showing the characteristic reddish brown or mahogany color, but if to be dried it is left on the tree until it assumes a darker shade and the skin is wrinkled. In this condition, after a short exposure to the sun the fruit will keep a year or longer. For preserving in sirup or glacéing, the unwrinkled fruit, being slightly more acid, is preferred.

The jujube is well worth the attention of fruit-growers and when produced in sufficient quantities will find an active demand from citizens from the south of Europe. It will appeal to all when fresh from the tree when properly processed, and for its medicinal virtues when simply dried or made into pastes or tablets. G. P. RIXFORD.

CXX. Zinnia, Giant Yellow and Scarlet.

ZÒYSIA (after Karl von Zoys, an Austrian botanist). *Gramíneæ.* Low creeping maritime perennials, sometimes used for lawns and putting-greens. Propagated by cuttings of the rhizomes.

Flowers in a close spike-like panicle; spikelets closely appressed, 1-fld., awnless, the single glume coriaceous, acute, compressed, inclosing the lemma and palea.—Species 4. S. E. Asia and Australasia.

japónica, Steud. KOREAN LAWN-GRASS. PALM-BEACH GRASS. Somewhat coarser than *Z. Matrella,* the blades as much as ⅛in. wide, the panicles about 1 in. long, often purplish. A native of Japan and China; intro. many years ago from Korea; now grown in Fla. and is hardy as far north as Conn. Recommended for use on sandy soil from N. C. to Fla. Dept. Agric., Div. Agrost. 20:29.

Matrélla, Merr. (*Z. púngens,* Willd. *Osterdàmia Matrélla,* Kuntze). MANILLA GRASS. Sts. creeping, throwing up numerous short leafy shoots and flowering sts.: lvs. crowded, firm, 1–3 in. long, ending in a sharp hard point; spikes 1–2 in. long; spikelets ⅛in. long, smooth and hard. A native of S. E. Asia, E. Indies.—Grown in Fla. and along the Gulf Coast.

tenuifòlia, Willd. MASCARENE GRASS. VELVET-GRASS. Lvs. thread-like, finer than in the other species. Forms a beautiful turf resembling that of red fescue. Native of the Mascarene Isls. Intro. into the U. S. from Guam in 1912. Used in Calif. where it is called velvet-grass, and along the Gulf Coast.

The name velvet-grass describes it very aptly as it looks like dark green velvet. It grows so thickly that it will smother out any other plant, even Bermuda- or "devil"-grass. Even if frozen off it will come up from roots. It needs little water, no cutting, will run out all other plants, will not become a pest as it sets no seeds in California, and is lovely in appearance. It is so fine that it may be pulled into thousands of pieces to the square foot and every little piece will grow, so that a small quantity will plant a large area. (Ernest Braunton.)

A. S. HITCHCOCK.

ZYGÁDENUS (Greek, *yoke* and *gland,* some of the species having two glands in the base of the perianth). *Liliàceæ.* Smooth and somewhat glaucous perennials with non-bulbous rhizomes or with tunicate bulbs; some of the species are grown in pots, others in the open; interesting plants of secondary importance horticulturally.

Leaves radical or gathered at the base of the st., long-linear, those of the st. small and few: raceme terminal, simple or paniculately branched: fls. perfect or polygamous, white, yellowish or greenish; perianth withering-persistent, spreading, the petal-like oblong or ovate sepals 1–2 glandular near the more or less narrowed but not clawed base; stamens 6, free: caps. 3-celled in fr., the cells separate at the top or for their entire length.—About 25 species have been described, one of which is Siberian, one Japanese, and the remainder from N. Amer. including Mex. The species of Zygadenus are little known in cult. They are sometimes recommended for the wild-garden, where they thrive in wet or boggy places. Increased by division; also rarely by seeds. Some or all of the species have poisonous seeds, bulbs, rhizomes, and foliage, being known as "death camas" (see Bull. No. 125, Professional Paper, U. S. Dept. Agric., May 13, 1915). Monographed by Watson. Proc. Amer. Acad. Arts & Sci. 14:278 (1879), so far as American species were then concerned.

A. *Sts. from a creeping rootstock.*

glabérrimus, Michx. Sts. 1–3 ft. high: lvs. grass-like, channeled, conspicuously nerved, elongated, tapering to a point: panicle pyramidal, many-fld.: fls. perfect; sepals ovate, becoming lance-ovate with a short claw. Va. to Fla. and Ala. B.M. 1703 (as *Helonias bracteata*). L.B.C. 1330. G.W. 6, p. 269.

AA. *Sts. from a more or less bulbous base.*

B. *Locules of the caps. dehiscing to the base: stamens free from perianth-segms.: glands usually 1 or 2 in the base of the perianth. (Zygadenus proper.)*

C. *Glands large, covering nearly the whole base of the perianth-segms.: bulb tunicated.*

D. *Fls. usually perfect, rather large.*

élegans, Pursh (*Z. glaùcus,* Nutt. *Helònias glabérrima,* Ker. *Anticlèa élegans,* Rydb.). Three feet or less tall, the lvs. ½in. or less broad and very glaucous: bracts purplish: fls. greenish, in simple or sparingly branched racemes, the segms. broad and less than ½in. long, coherent to the ovary, the fl. opening about ½in. across. Across the continent from New Bruns. and south to New Mex. B.M. 1680. B.R. 24:67.

Frèmontii, Torr. Lvs. an inch or less broad, less glaucous than the above: bracts green: fls. usually larger, rotate, the segms. free from the ovary. Calif. from San Diego north, in the Coast Range.—One of the "soap plants." Said to be the best of the genus for cult.

Núttallii, Gray (*Toxicoscòrdion Núttallii,* Rydb.). Lvs. from ¼–¾in. wide, scarcely glaucous, light green: bracts scarious: fls. ½in. across, in a simple or branched raceme, the segms. free from the ovary. Kans. to Colo. and Texas.

DD. *Fls. polygamous, small.*

venenòsus, Wats. Slender, 2 ft. or less tall: lvs. very narrow (¼in. or less), scabrous, not glaucous, the st.-lvs. not sheathing: bracts narrow, scarious: fls. in a short simple raceme, the perianth free from the ovary, the segms. ¼in. or less long, triangular-ovate to elliptic, short-clawed. Calif.—Bulb poisonous.

paniculàtus, Wats. Usually stouter, the lvs. broader and sheathing: raceme compound: perianth-segms. deltoid, acute, short-clawed. Sask. to Calif.—Bulb poisonous.

CC. *Glands very obscure: bulb somewhat fibrous, narrow.*

leimanthoìdes, Gray (*Oceanòrus leimanthoìdes,* Small). St. slender and leafy, 4 ft. or less tall: lvs. ⅛in. or less wide, green on both sides: racemes panicled: fls. about ⅛in. across, the segms. oblong, not clawed. N. Y. to Ga.

BB. *Locules dehiscing only above middle: stamens inserted on perianth-segms.: glands none: bulbous. (Amianthium; preferably retained as distinct genus.)*

muscætóxicus, Regel (*Helònias làta,* Ker. *Amiánthium muscætóxicum,* Gray. *Chrospérma muscætóxicum,* Kuntze). FLY-POISON. Slender, 4 ft. or less tall: lvs. rather short, the basal ones varying from ⅛in. to over 1 in. broad, not glaucous: racemes simple: fls. about ⅛in. across, the segms. ovate-oblong and obtuse. N. Y. to Fla. and Ark. B.M. 803; 1540. L.B.C. 10:998. Gn. 57, p. 160.—Bulb and herbage poisonous. A fly-poison has been made from the bulb.

L. H. B.

ZYGOCÁCTUS (cactus with zygomorphic flowers). *Epiphyllum* of horticulturists. *Cactàceæ.* CRAB-CACTUS. This genus is confined to Brazil, so far as known, where the plants grow as epiphytes upon the trees, along with orchids, growing in large clusters on the branches: sts. flat and jointed, becoming rounded with age, bearing areoles only on the margins and more or less truncated ends, from which grow the new branches and the conspicuously zygomorphic fls.; ovary devoid of bracts, and those of the tube comparatively large and colored as the petals. The genus is allied to Epiphyllum (Phyllocactus), with which it was at first united; but it is still more closely connected with Schlumbergera. In cult. many forms have been produced through hybridization between the different species and with Epiphyllum and the allies of Cereus, so that typical plants are rarely met with.

truncàtus, Schum. (*Epiphýllum truncàtum,* Haw.). Crab Cactus. Christmas Cactus. Fig. 4055. Sts. much branched and hanging in large bunches from the trees; joints obovate to oblong, with strongly truncate apex, 1¼–2 in. long by about ¾–1 in. broad, bright green, margins coarsely serrate, with 1–3 large, acute teeth on each side, the 2 upper ones forming more or less incurved horns on either side of the truncation: areoles bearing a few short yellowish or dark-colored bristles, or sometimes none: fls. horizontal, growing from the truncated end of the younger joints, strongly irregular, 2½–3½ in. long, in various shades of red: fr. pear-shaped, red, about ⅝ in. diam. Brazil. B.M. 2562. G.C. III. 19:9.—Most of the forms in cult. are hybrids between this species and some other of the genus or with allies of Cereus. A common basket- and rafter-plant.

4055. Zygocactus truncatus. (×⅓)

For *Epiphyllum Russellianum* and *E. Gærtneri,* see Schlumbergera.

J. N. Rose.

ZYGOCÒLAX (compounded from *Colax* and *Zygopetalum*). *Orchidàceæ.* Hybrids between the genera Colax and Zygopetalum. *Z. Amesiànus,* Hort. (Z. brachypetalum × C. jugosus). Fls. larger than the latter parent; sepals and petals clear green, heavily marked with dark purple; midlobe of lip heart-shaped, white, with interrupted radiating lines of violet-blue.—*Z. Chárlesworthii,* Hort. (Z. Perrenoudii × C. jugosus). Fls. dark green; sepals and petals closely marked with purplish chocolate; lip violet with a white margin.—*Z. leopardìnus* (Z. maxillare × C. jugosus). Fls. about 2 in. across; sepals and petals whitish, spotted and marked with brown-purple; lip 3-lobed, side lobes indigo-blue, midlobe same color but mottled with white.—*Z. Veitchii,* Rolfe (Z. crinitum × C. jugosus). Fls. about 3 in. across; sepals and petals light yellow-green, spotted and blotched with brown-purple; lip whitish with radiating lines of violet-purple. B.M. 7980. Gn.W. 20:89. J.H. III. 57:243.—*Z. Wiganiànus,* Hort. (Z. intermedium × C. jugosus). Similar to the former in habit: fls. slightly larger; sepals and petals pale green, barred with light brown; lip white with violet lines. G.M. 43:121. Var. *supérbus,* Hort., has sepals and petals broad and rounded at the tips, heavily barred and marbled with very dark purple; lip flattish, extending horizontally, white heavily marked with violet. G.C. III. 31:156. G.M. 45:142.—*Z. woodlandénse,* Hort. (Z. maxillare var. Gautieri × C. jugosus).

F. Tracy Hubbard.

ZYGONÍSIA (compounded from *Aganisia* and *Zygopetalum*). *Orchidàceæ.* Hybrids between the genera Aganisia and Zygopetalum. *Z. Rolfeàna,* Hort. (Z. maxillare var. Gautieri × A. lepida). In general appearance like the latter parent; its fls. cream-white, blotched with violet. G.C. III. 32:30. F.S.R. 3:176.—*Z. Sánderi,* Hort. (A. lepida × Z. sp.), has cream-white fls. heavily blotched with violet.—These hybrids are not much known.

ZYGOPÉTALUM (name referring to the united flower parts). *Orchidàceæ.* Mostly epiphytic orchids of easy culture.

Plants with numerous distichous lvs. sheathing a short st. which usually becomes thickened into a pseudobulb: lvs. membranaceous, venose or plicate: fls. solitary or in racemes, showy; sepals and petals nearly alike in form and color, often united to each other at the base, the lateral sepals forming a mentum with the foot of the column; labellum with the lateral lobes scarcely prominent, middle lobe broad and plane, spreading, or recurved at the apex, with a prominent fleshy crest on the disk; column incurved, wingless or with small wings; pollinia 4, not appendiculate.

The *Z. Mackaii* group grow well under pot culture. One or two species with creeping rhizomes, like *Z. maxillare,* thrive best on sections of tree fern, osmunda rhizome, or in baskets. A good compost consists of equal parts of chopped sod, peat-fiber and sphagnum moss, well mixed and interspersed with pieces of rough charcoal, about one-half of the pot space being devoted to clean drainage material. After distributing the roots, the compost should be worked in carefully but not too firmly about them, leaving the base of the plant even with, or just above, the rim of the pot. Repotting should be done when the plants show new root-action. The temperature should range about 60° F. by night and 65° to 70° by day in winter, and in summer as low as possible, with free ventilation during inclement weather. A cool, light location in the cattleya department is favorable. The compost should be kept in a moist condition at all times. The plants are propagated by cutting through the rhizome between the old pseudobulbs at a good eye, potting up the parts and removing them to a rather higher temperature until they start into new growth. (Robt. M. Gray.)

A. *Anther long-rostrate.*

rostràtum, Hook. Pseudobulbs oblong, compressed: lvs. lanceolate, 5 in. long: scapes 4 in. long, bearing 1–3 fls.: sepals and petals linear-lanceolate, greenish brown, wavy, 2–3 in. long; labellum about as long as the petals, subrotund, with reflexed margins, pure white with few radiating lines near the base; column-wings rounded, sharply serrate on the upper margin; anther with a long beak surmounting the column. May, June, Oct. Guiana. B.M. 2819. J.H. III. 28:7. A.F. 6:633.

AA. *Anther not rostrate.*

B. *Petals spotted or blotched.*

C. *Labellum glabrous.*

Máckaii, Hook. Fig. 4056. Pseudobulbs large, ovate: lvs. many, linear-lanceolate, 1 ft. long: scape 18 in. long, bearing 5 or 6 large fls.: sepals and petals dingy yellowish green, with blotches of purple on the inside, lanceolate, acute, erect, spreading, all united toward the base; labellum large, rounded, emarginate, white with radiating vein-like deep blue lines, glabrous. Brazil. B.M. 2748. B.R. 1433 (as *Eulophia Mackaiana*). P.M. 3:97. L.B.C. 17:1664. J.H. III. 33:295. G.M. 53:1037.—This is distinguished from *Z. intermedium* and *Z. crinitum* by its smooth labellum and narrower lvs. Vars. **supérbum, grandiflòrum, màjus** are also advertised. Var. **Chárlesworthii,** Hort. Sepals and petals emerald-green, without purple markings. G.C. III. 51:83.

Gautièri, Lem. Pseudobulbs oblong-sulcate, 4 in. high: scape 2–3-fld.: fls. 3 in. across; sepals and petals green blotched with brown; labellum broadly reniform, deep purple at the base, white in front, sometimes nearly all deep purple with a darker crest. Autumn. Brazil. I.H. 14:535. Gn. 49:118.—The lvs. are fasciculate, narrowly oblong, keeled, 12–16 in. long: infl. shorter than the lvs.

maxillàre, Lodd. Pseudobulbs 2 in. long: lvs. lanceolate, 1 ft. long: scape 9 in. long, 6–8-fld.: fls. 1½ in. across; sepals and petals ovate-oblong, acute, green, with transverse brown blotches; labellum horizontal, purple, with a very large, glossy purple, notched horseshoe-shaped crest, middle lobe roundish, waved, and obscurely lobed. Winter. Brazil. B.M. 3686. L.B.C. 18:1776. J.H. III. 33:295. P.M. 4:271.—Distinguished by its small fls. and very large crest.

cc. *Labellum pubescent.*

crinìtum, Lodd. Habit of *Z. intermedium:* lvs. broadly linear-lanceolate: fls. on long, stout scapes; sepals and petals 2 in. long, oblong-lanceolate, green with rather few brown blotches; labellum 2 in. across, spreading, wavy, scarcely emarginate, white with purple veins radiating from the thick crest, disk hairy. Fls. at various times. Brazil. L.B.C. 17:1687. B.M. 3402 (as *Z. Mackaii* var. *crinitum*).—This has fewer brown blotches on the sepals and petals than *Z. intermedium.* There are varieties with pink, blue, or almost colorless veins on the labellum. Var. **cærùleum,** Hort., has the veins deep blue. G.M. 46:153; 50:59. J.H. III. 46:197.

intermèdium, Lodd. Lvs. ensiform, 1½ ft. long, 1½ in. wide: scape longer than the lvs., bearing 5–6 fls. each nearly 3 in. across: sepals and petals oblong, acute, green with large, confluent blotches of brown; labellum rotund, narrowed at the base, deeply 2-lobed in front, pubescent, bluish white with radiating broken lines of purplish blue; column green and white. Fls. in winter. Brazil. R.H. 1873:190 (as *Z. Rivieri*).—Plants of *Z. Mackaii* are often cult. under this name.

dd. *Petals uniformly colored.*

Sèdenii Reichb. f. Plants strong, with the scape, about as long as the lvs. and bearing several fls.: sepals and petals deep purple-brown, bordered with green; labellum pale purple in front, becoming deep purple toward the base. F.M. 1880:417. Gt. 28:265.—A garden hybrid raised by Veitch.

Z. Àrmstrongiæ=Z. Mackaii ×Z. rostratum.—*Z. Bállii*. Rolfe. Fls. white, the sepals purple-tinged, the petals and lip blotched with bright rose-purple. G.C. III. 27:149. G.M. 48:365.—*Z. Bùrtii*, Benth.=Huntleya.—*Z. chloránthum*, Kränzl. Fls. small for the genus, greenish, fragrant, hairy inside.—*Z. cæléste*, Reichb. f.=Bollea.—*Z. díscolor*, Reichb. f.=Warscewiczella.—*Z. Lalíndei*, Reichb. f.=Bollea.—*Z. Patínii*, Reichb. f.=Bollea.—*Z. Prainiànum*, Rolfe. Sepals and petals dusky brown, with obscure green stripes on petals; lip white, streaked with rose-purple. Peru. B.M. 8610.—*Z. Roeblingiànum*=Z. rostratum ×Z. maxillare. G.C. III. 34:227.—*Z. violàceum*, Reichb. f.=Bollea.—*Z. Wéndlandii* Reichb. f.=Warscewiczella.

HEINRICH HASSELBRING.
GEORGE V. NASH.†

ZYGOPHÝLLUM (*yoke leaf*, from the paired or opposite lfts. or lvs.). *Zygophyllàceæ.* Small often spiny twiggy shrubs or subshrubs, with stiff branches, of about 60 species in Eu. and Asia but mostly in S. Afr. and Austral., apparently not in the American trade but likely to be planted for ornament now and then by amateurs in the warmer and drier parts of the country. Lvs. simple or 2-foliolate: fls. white or yellowish or red, on 1-fld. peduncles; calyx 4–5-parted; petals 4 or 5, clawed, twisted; stamens 8–10; disk fleshy and angled; ovary 4- or 5-celled, sessile: fr. an angled or winged caps. Prop. by seeds or cuttings. The species most likely to appear in collections are perhaps *Z. Fabàgo*, Linn., the Syrian bean-caper, with obovate lfts., copper-yellow fls., deep strong root and nearly or quite herbaceous top, S. W. Asia; *Z. Morgsàna*, Linn., with obovate obtuse lfts., long yellow petals, and shrubby habit, from S. Afr.; *Z. spinòsum*, Linn., with linear lfts., yellowish or whitish nodding fls., a small bush only 1–2 ft. high, from S. Afr.

4056. Zygopetalum Mackaii. (×¼)

SUPPLEMENT

Here are assembled certain lists and addenda that are supplementary to the body of the Cyclopedia, to provide the consultant with additional facilities for the use of the volumes. These appendices are as follows:

Collaborators in the making of the Cyclopedia 3555
Cultivator's guide to the articles 3562
Additional species 3565
New combinations in Latin names 3574
Finding-list of trade names 3575
Index to the six volumes 3611

Other articles of a similar character, providing keys and synopses, are printed in Vol. I, as follows:

	Page
Explanations, comprising a statement of the authorship of articles, nomenclature, pronunciation, spelling, the keys, abbreviations of botanical terms and expressions, books and periodicals to which reference is made, the authors of botanical names	xi
Synopsis of the plant kingdom	(with index) 1–78
Key to the families and genera	(with index) 79–147
Name-list, comprising the English equivalents of Latin names of species	148
Glossary of the usual botanical and horticultural technical words	160
A fuller discussion of nomenclature will be found under "Names and Nomenclature," Vol. IV, 2098; also in the Finding-list	3575

For five years the work of compiling the Standard Cyclopedia of Horticulture has been actively under way. The present office was opened in March, 1912, but the organizing of the work had been started before that time. Although founded on the Cyclopedia of American Horticulture, completed in 1902, the present Cyclopedia is newly organized and newly written. Whenever the articles in the former work have been used as a basis, they have been brought down to date. The preface to Vol. I states the scope and intention of the present work.

The List of Collaborators (pages 3555 to 3561) comprises upward of 400 names, and many other correspondents have aided in less formal ways. To all these helpers the reader will extend his gratitude for the satisfaction he may find in any of the pages. The publishers, printers, artists, writers, and others have coöperated in the freest spirit.

If the consultant desires to know the office methods in compiling a work of this character, he may read the introductory account in Vol. IV of the former Cyclopedia, for the general details do not differ greatly between the two. The Editor gathers his force, finds himself a table and a very few simple accessories, supplies himself with writing materials and books, and then goes to work and holds to it through all the letters from A to Etc. If the reader finds a misplaced letter or accent mark, he may consider that each page comprises about 10,000 pieces of type metal, or more than 36,000,000 pieces for the entire work; these pieces are of many technical devices; and human eyes are fallible. In the first year or two of the work, the Editor was engaged otherwise and could give only small fragments of his time to the Cyclopedia.

If the reader desires statistics of such work, the following figures may interest him:

I. The Number of Articles.

Total number of entries or articles, including cross-references (the sub-articles are the independent articles or parts in the main articles and in the symposia, indicated by black-face lower-case type):

		Cyclo. Amer. Hort. 1902
Volume I	693	
Sub-articles	38	
	731	1,270
Volume II	1,101	
Sub-articles	29	
	1,130	1,263
Volume III	756	
Sub-articles	212	
	968	659
Volume IV	808	
Sub-articles	94	
	902	1,165
Volume V	650	
Sub-articles	64	
	714	
Volume VI	905	
Sub-articles	19	
	924	
	5,369	
Supplement (additional generic entries)	3	
	5,372	4,357

II. The Number of Plants.

		Cyclo. Amer. Hort. 1902
The number of genera entered:		
Volume I	422	820
Volume II	709	623
Volume III	442	351
Volume IV	550	461
Volume V	449	
Volume VI	639	
Supplement	3	
	3,214	2,255
The number of main species described or entered, in black-face type:		
Volume I	1,801	2,924
Volume II	2,741	2,675
Volume III	1,512	1,405
Volume IV	1,901	1,789
Volume V	2,064	
Volume VI	2,372	
Supplement	102	
	12,493	8,793

The number of minor species-entries in the main articles, in italic type:		Cyclo. Amer. Hort. 1902
Volume I	267	
Volume II	371	
Volume III	270	
Volume IV	436	
Volume V	396	
Volume VI	320	
	2,060	

The number of species in the supplementary lists, at the end of the various articles, in small italic type (including all but cross-references):		
Volume I	985	2,351
Volume II	1,424	864
Volume III	535	576
Volume IV	993	733
Volume V	1,198	
Volume VI	916	
	6,049	4,524
Total species accounted for	20,602	

The number of synonyms:		
Volume I	1,715	2,446
Volume II	2,379	2,104
Volume III	1,558	1,243
Volume IV	1,727	1,689
Volume V	2,569	
Volume VI	2,444	
Supplement	66	
	12,458	7,482

The number of Latin-named varieties (of species) of all grades in main articles:		Cyclo. Amer. Hort. 1902
Volume I	820	1,187
Volume II	1,272	982
Volume III	795	628
Volume IV	1,031	838
Volume V	1,416	
Volume VI	1,358	
Supplement	23	
	6,715	3,635
Total Latin names accounted for (aside from a few new entries in the Finding-list in Supplement to Vol. VI)	39,775	24,434

III. The Number of Species (in Black-face Type), Native to North America North of Mexico:		
Volume I	353	668
Volume II	551	631
Volume III	358	416
Volume IV	427	704
Volume V	524	
Volume VI	533	
Supplement	7	
	2,753	2,419

IV. The Dates of Publication:	
Volume I	March 25, 1914
Volume II	July 22, 1914
Volume III	May 12, 1915
Volume IV	February 23, 1916
Volume V	October 4, 1916
Volume VI	March 28, 1917

Within the five years several horticulturists have passed away, whose biographies would have been proper subjects for entry in the Cyclopedia. Among such losses are C. E. Bessey, who died February 25, 1915; H. E. Van Deman, April 28, 1915; G. B. Brackett, August 2, 1915; Edwin Lonsdale, September 1, 1915; W. Atlee Burpee, November 26, 1915; William Tricker, July 11, 1916; William S. Lyon, July 20, 1916; Jackson Dawson, August 3, 1916; Ernest Walker, December 5, 1916; W. C. Barry, December 12, 1916.

To spend five years in a review of the vegetable kingdom, with all its marvels and its unsolved problems, is in itself a great privilege. If in addition one may see the applications to the desires of man, may hold associations with several hundred enthusiastic and competent correspondents, may have relations with the commercial and financial questions involved, and may at the same time catch some glimpse of the reaches of evolution and feel a new contact with the earth, the making of a Cyclopedia of this kind becomes not a task but an experience in life. The Editor hopes that the reader may share some of these prospects. The Editor is well aware of the shortcomings of the volumes and he would like to do the work all over again for the delight of it; but this reward must be left for other hands in the years that are to come.

Ithaca, New York,
February 1, 1917.

L. H. BAILEY.

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‡Means contributor deceased since contribution was made for present Cyclopedia.

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CLARKE, W. T., Prof. Agricultural Extension, University of California, Berkeley, Calif. (*California public-service agencies.*)

CLEMENT, F. M., Prof. of Horticulture, Univ. of British Columbia, Vancouver, B. C.; formerly Dir. Horticultural Exp. Station, Vineland, Ontario. (*Grape, Quince.*)

CLINTON, L. A., Agriculturist and Asst. Chief, Office of Extension Work, North and West, States Relations Service, U. S. Dept. of Agric., Washington, D. C. (*Soybean, Spurry.*)

COCKAYNE, L., Botanist, Wellington, New Zealand. (*Veronica.*)

COCKERELL, T. D. A., Prof. of Zoölogy, University of Colorado, Boulder, Colo. (*Helianthus, Sunflower.*)

COIT, J. ELIOT, Prof. of Citriculture, College of Agriculture, University of California, Berkeley, Calif. (*Grapefruit, Lemon, Orange, T. A. Garey.*)

COLLINGWOOD, H. W., Editor "Rural New-Yorker," New York City. (*E. S. Carman.*)

CONARD, H. S., Prof. of Botany, Grinnell College, Grinnell, Iowa. (*Botany of the Nymphæaceæ.*)

CONARD, THOMAS P., Broker in machinery, Lansdowne, Pa. (*A. F. Conard.*)

COOPER, J. R., Assoc. Prof. of Horticulture, College of Agriculture, University of Nebraska, Lincoln, Neb. (*Nebraska.*)

COPELAND, E. B., Dean College of Agriculture, Los Banos, Philippine Isls. (*Coconut.*)

CORBETT, L. C., Horticulturist in Charge of Horticultural and Pomological Investigations, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Many articles on vegetables, Machinery.*)

*COULSTON, M. B. (*W. B. Stiles, Mitella, Morinda, Narthecium, Ononis.*)

*COULTER, JOHN M. (*Echinocactus.*)

COVILLE, FREDERICK V., Botanist, U. S. Dept. of Agric., Washington, D. C. (*Blueberry, Epigæa.*)

COWEE, ARTHUR, Gladiolus Specialist, Berlin, N. Y. (*Gladiolus.*)

COWELL, ARTHUR W., Landscape Architect; Assoc. Prof. of Landscape Gardening, State College, Pa. (*Landscape Gardening, Walks, Paths, and Driveways.*)

*COWELL, J. F. (*Phormium.*)

*COWEN, J. H. (*Lepachys, Leucocrinum, Verbena.*)

*CRAIG, JOHN. (*Fruit-Growing, Rape.*)

*CRAIG, ROBERT. (*Codiæum.*)

CRAIG, W. N., Supt. Faulkner Farm, Brookline, Mass. (*Herbs.*)

CRANEFIELD, FREDERIC, Sec. Wisconsin State Horticultural Society, Madison, Wis. (*Wisconsin.*)

*CROPP, CARL. (*Stocks.*)

CROSBY, C. R., Extension Prof. of Entomology, New York State College of Agriculture, Ithaca, N. Y. (*Diseases and Insects, Rose Insects, Sowbugs.*)

CROW, J. W., Prof. of Horticulture, Ontario Agricultural College, Guelph, Ont. (*Ontario.*)

CUMMINGS, M. B., Prof. of Horticulture and Horticulturist of Experiment Station, College of Agriculture, Burlington, Vt. (*Vermont.*)

CURTIS, RALPH W., Prof. of Landscape Art, New York State College of Agriculture, Ithaca, N. Y. (*Evergreens, Screen-Planting, Planting lists.*)

*CUSHMAN, E. H. (*Gladiolus.*)

*DARLINGTON, H. D., (*Platytheca.*)

DARROW, GEO. M., Scientific Asst., Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Raspberry.*)

DAVIS, K. C., Prof. of Agriculture, George Knapp School of Country Life, Peabody College for Teachers, Nashville, Tenn. (*Many genera of the Ranunculaceæ.*)

*DAVY, JOS. BURTT. (*Arboriculture, Myrtus,* etc.)

DEAN, M. L., State Horticulturist, Missoula, Mont. (*Montana.*)

DEANE, WALTER, Botanist, 29 Brewster St., Cambridge, Mass. (*Herbarium.*)

*DEWEY, LYSTER H. (*Mentha.*)

DICKENS, ALBERT, Prof. of Horticulture, State Agricultural College, Manhattan, Kans. (*Kansas.*)

DORNER, H. B., Asst. Prof. of Floriculture, College of Agriculture, Urbana, Ill. (*Frederick Dorner.*)

DORSETT, P. H., In Charge of Plant Introduction Field Stations, U. S. Dept. of Agric., Washington, D. C. (*Violet.*)

DOUGLAS, R., SONS, Nurserymen, Waukegan, Ill. (*T. H. Douglas.*)

*DOUGLAS, THOMAS H. (*Picea.*)

*DREW, E. P. (*Picea.*)

DUGGAR, B. M., Prof. of Plant Physiology, in Charge of Graduate Laboratory, Missouri Botanical Garden, St. Louis, Mo. (*Autumn Colors, Fertilization, Mushroom, etc.*)

DUGGAR, J. F., Dir. Experiment Station, Auburn, Ala. (*Alabama.*)

DUNBAR, JOHN, Asst. Supt. of Parks, Rochester, N. Y. (*Berberis, Cratægus, Rhododendron.*)

DUNNING, D. M., Pres. Auburn Savings Bank, Auburn, N. Y. (*Grape.*)

*DUPUY, LEWIS. (*Erica.*)

EDWARDS, CHARLES L., Horticulturist, Dallas, Texas. (*Help on Pecan.*)

EGAN, W. C., Amateur Horticulturist, Highland Park, Ill. (*Everlastings, Mertensia, Winter Protection.*)

*EISELE, J. B. (*Cordyline.*)

*ELLIOTT, WILLIAM H. (*Asparagus Fern.*)

EMORY, E. W., Chestertown, Md. (*R. S. Emory.*)

*ENDICOTT, W. E. (*Ixia.*)

ERWIN, A. T., Chief Truck Crops, Agricultural Experiment Station, Ames, Iowa. (*Himalaya Berry.*)

EUSTACE, H. J., Prof. of Horticulture, Michigan Agricultural College, East Lansing, Mich. (*Marketing, Packages.*)

EVANS, WALTER H., Chief of Insular Stations, States Relations Service, U. S. Dept. of Agric., Washington, D. C. (*Alaska.*)

FAIRCHILD, DAVID, Agricultural Explorer in Charge, Office of Foreign Seed and Plant Introduction, Bur. of Plant. Ind., U. S. Dept. of Agric., Washington, D. C. (*Mangosteen, and much help on tropical fruits and vegetables.*)

FARRELL, J. J. M., Gardener on C. D. Matthews Estate, Norwalk, Conn. (*Cultural notes on many glasshouse plants.*)

*FAWCETT, WM. (*Cinchona, Myristica.*)

FERNOW, B. E., Dean Faculty of Forestry, University of Toronto, Toronto, Ont. (*Arboriculture, Forestry, Pine.*)

*FINLAYSON, KENNETH. (*Diosma.*)

FLEMING, BRYANT, Landscape Architect, Prudential Bldg., Buffalo, N. Y. (*Pergola.*)

FLETCHER, S. W., Prof. of Horticulture, State College, Pa. (*Pollination, Strawberry.*)

FOGLESONG, L. E., Landscape Architect, Paddock Bldg., Boston, Mass. (*Herbs.*)

FORBES, R. H., Dir. Arizona Agricultural Experiment Station, Tucson, Ariz. (*Arizona.*)

FRANCESCHI, F., Dir. Stabilmento Orticolo Libico, Tripoli. (Formerly of Santa Barbara, Calif.) (*Many notes on California plants.*)

FREEMAN, GEO. F., Plant-Breeder of Experiment Station, Tucson, Ariz. (*Bean, Cowpea, Dolichos, Phaseolus, Vigna.*)

FROST, CHARLES, Pansy Seed Grower, Kenilworth, N. J. (*Pansy.*)

GAGER, C. STUART, Dir. Brooklyn Botanic Garden, Brooklyn, N. Y. (*Botanic Garden.*)

GALLOWAY, B. T., Plant Pathologist and Plant Introducer, U. S. Dept. of Agric., Washington, D. C. (*Violet.*)

GARCIA, FABIAN, Dir. of Experiment Station, State College, New Mex. (*New Mexico.*)

GARFIELD, CHAS. W., Banker, Grand Rapids, Mich. (*Exhibition.*)

GATES, BURTON N., Assoc. Prof. Bee-Keeping and Apiarist of Experiment Station, Massachusetts Agricultural College, Amherst, Mass. (*Bees.*)

GERARD, J. N., Amateur Horticulturist, Elizabeth, N. J. (*Many articles, especially on bulbous plants, as Crocus, Iris, Narcissus, etc.*)

GILBERT, A. W., Prof. of Plant-Breeding, New York State College of Agriculture, Ithaca, N. Y. (*Potato.*)

GILL, JOHN, Nurseryman, West Berkeley, Calif. (*List of Roses.*)

GOULD, H. P., Pomologist in Charge of Fruit Production Investigations, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Celeriac.*)

GOURLEY, J. H., Prof. of Horticulture, College of Agriculture, Durham, N. H. (*New Hampshire.*)

GREEN, W. J., Horticulturist and Vice-Dir. of Experiment Station, Wooster, Ohio. (*Sub-Irrigation in the Greenhouse, Ohio.*)

‡GREENE, E. L., Botanist, Notre Dame University, Terre Haute, Ind. (*Help on Convallaria.*)

*GREENLEE, L. (*Ixia.*)

GREENMAN, J. M.. Assoc. Prof. of Botany at Washington University, and Curator of Herbarium, Missouri Botanical Garden, St. Louis, Mo. (*Senecio.*)

GREFFRATH, HENRY, Market-Gardener, South Lima, N. Y. (*Muckland-Gardening.*)

GREGG, JOHN WM., Prof. of Landscape Gardening and Floriculture, College of Agriculture, University of California, Berkeley, Calif. (*Herbs, Planting lists.*)

GREGORY, EDGAR, Seedsman, Marblehead, Mass. (*J. J. H. Gregory.*)

GREINER, T., Market-Gardener, La Salle, N. Y. (*Many articles on vegetables.*)

*GREY, ROBERT M. (*Culture of many genera of orchids.*)

HALE, J. H., Fruit-Grower, South Glastonbury, Conn. (*Connecticut, Peach.*)

HALL, HARVEY MONROE, Assoc. Prof. of Botany and Botanist of Experiment Station, University of California, Berkeley, Calif. (*Several woody genera, as Callistemon, Eucalyptus, Eugenia, Pittosporum, etc.*)

*HANSEN, GEORGE. (*Epidendrum.*)

HANSEN, N. E., Prof. of Horticulture and Forestry, State College of Agriculture, Brookings, S. D. (*Buffalo Berry, South Dakota.*)

*HARRISON, C. S. (*Pseudotsuga.*)

HARSHBERGER, JOHN W., Prof. of Botany, University of Pennsylvania, Philadelphia, Pa. (*Lathyrus, Lupinus, Oxytropis, Poisonous Plants, Pyxidanthera, Saprophyte, Scilla, Smut, Symbiosis.*)

*HART, J. H. (*Theobroma.*)

HASSELBRING, HEINRICH, Physiologist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Many genera of Orchids, Iris, Mildew, Moulds, Orchids, Rusts.*)

HASTINGS, G. T., DeWitt Clinton High School, New York City. (*Berria, Bertholletia, Bursera.*)

HATFIELD, T. D., Supt. of the Walter Hunnewell Estate, Wellesley, Mass. (*Several cultural articles.*)

HAWKS, EMMA B., Asst. Librarian of U. S. Dept. of Agric. Library, Washington, D. C. (*Aid on book-list.*)

HEDRICK, U. P., Horticulturist of Experiment Station, Geneva, N. Y. (*Blackberry, Cherry, Dewberry, Dwarfing, Evaporating, Experiment Stations, Juneberry, New York.*)

*HENDERSON, L. F. (*Phacelia.*)

HENDERSON, PETER, & Co., Seedsmen, 35 and 37 Cortlandt St., New York City. (*Bulbs, Polianthes.*)

HENDRICKSON, ISAAC S., Manager for Wholesale Dept. of John Lewis Childs, Inc., and Pres. American Gladiolus Soc., Flowerfield, N. Y. (*Gladiolus.*)

‡HENKEL, ALICE, Asst. in Economic and Systematic Botany, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Notes on medicinal plants.*)

HENRY, A., Prof. of Forestry, Royal College of Science, Dublin, Ireland. (*Help on Populus.*)

HERRICK, G. W., Prof. of Economic Entomology, New York State College of Agriculture, Ithaca, N. Y. (*Ants.*)

HEWS, A. H. & Co., INC., Manufacturers of flower-pots, Cambridge, Mass. (*Pots.*)

*HEXAMER, F. M. (*A. S. Fuller, Geo. Thurber.*)

HICKS, HENRY, Nurseryman, Westbury, L. I., N. Y. (*Arboriculture, Drainage, Evergreens, Ligustrum.*)

HIGGINS, J. E., Horticulturist of the U. S. Experiment Station, Honolulu, Hawaii. (*Hawaiian Islands.*)

HILL, D. H., Pres. College of Agriculture and Mechanic Arts, West Raleigh, N. C. (*T. K. Bruner.*)

HITCHCOCK, A. S., Agrostologist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Botany of the genera of grasses.*)

HITCHINGS, E. F., Assoc. Prof. of Horticulture, College of Agriculture, Orono, Maine. (*Maine.*)

*HORSFORD, F. H. (*Aquilegia.*)

HOTTES, A. C., Asst. Prof. of Floriculture, Ohio State University, Columbus, Ohio. (*Gladiolus, and several genera.*)

HOUSE, H. D., State Botanist, Albany, N. Y. (*Convolvulus, Ibidium, Ipomœa, Quamoclit.*)

HOWARD, W. L., Assoc. Pomologist, Experiment Station, Davis, Calif. (*Rest-Period.*)

HUBBARD, F. TRACY, Botanist, 535 Beacon St., Boston, Mass. (*Many articles in Volumes V and VI.*)

*HUEY, ROBERT. (*Rose.*)

HUME, H. HAROLD, Nurseryman, Glen Saint Mary, Fla. (*Fig, Kumquat, Lemon, Lime, Orange.*)

HUNN, C. E., Asst. in Plant Propagation, New York State College of Agriculture, Ithaca, N. Y. (*Strawberry Forcing, Window-Gardening.*)

HUSS, JOHN F., Head Gardener to J. J. Goodwin, Esq., Estate, Hartford, Conn. (*Many notes on hardy plants.*)

HUTT, W. N., State Horticulturist, Department of Agriculture, Raleigh, N. C. (*North Carolina.*)

IRISH, H. C., Supervisor School Gardening, 1227 Childress Ave., St. Louis, Mo. (*Capsicum, Lactuca, Pepper, Planting list, Rose, Tetragonia.*)

*JACKSON & PERKINS CO. (*Clematis.*)

*JACOB, CHAS. W. & ALLISON. (*Raffia.*)

JARVIS, C. D., Specialist in Agricultural Education, Bureau of Education, Washington, D. C.; formerly Director Extension Service, Conn. Agric. College. (*Apple.*)

JEPSON, W. L., Assoc. Prof. of Botany, University of California, Berkeley, Calif. (*Godetia.*)

JOHNSON, T. C., Dir. Virginia Truck Experiment Station, Norfolk, Va. (*Potato.*)

JONES, KATHERINE D., Asst. Landscape Gardening, College of Agric., University of California, Berkeley, Calif. (*Acacia, Herbs, Planting lists.*)

JONES, L. R., Prof. of Plant Pathology, College of Agriculture, University of Wisconsin, Madison, Wis. (*C. G. Pringle.*)

KAINS, M. G., Horticultural Consultant, Port Washington, N. Y. (*Culture of many culinary herbs.*)

*KEARNEY, T. H. (*A few genera of orchids.*)

KEFFER, CHAS. A., Dir. of Extension Division, College of Agriculture, University of Tennessee, Knoxville, Tenn. (*Tennessee.*)

*KELLER, J. B. (*Notes on many groups of hardy herbaceous perennials.*)

KELLERMAN, KARL F., Physiologist and Asst. Chief of Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Legumes.*)

KELLERMAN, MAUDE. See *Swingle.*

*KELSEY, HARLAN P. (*Galax, Helonias, Leucothoë.*)

*KENNEDY, P. B. (*A few genera of grasses.*)

KINMAN, C. F., Horticulturist of U. S. Experiment Station. Mayaguez, Porto Rico. (*Porto Rico.*)

KNIGHT, HENRY G., Dean College of Agriculture, University of Wyoming, Laramie, Wyo. (*Poisonous Plants.*)

KNUDSON, LEWIS, Asst. Prof. of Botany and Plant Physiology, New York State College of Agriculture, Ithaca, N. Y. (*Etherization.*)

KRUHM, ADOLPH, 125 Midland Ave., Columbus, Ohio. (*E. D. Darlington.*)

KUNDERD, A. E., Gladiolus Specialist, Goshen, Ind. (*Help on Gladiolus.*)

KYLE, E. J., Prof. of Horticulture and Dean of the School of Agriculture, College Station, Texas. (*Texas, Tomato in South.*)

*LAGER, JOHN E. (*Cattleya culture.*)

*LANDRETH, BURNET. (*David Landreth.*)

LEONARD, M. D., Extension Asst. of Entomology, New York State College of Agriculture, Ithaca, N. Y. (*Rose Insects, Sowbugs.*)

LEWIS, C. I., Prof. of Horticulture, State Agricultural College, Corvallis, Ore. (*Apple, Loganberry, Oregon, Prune.*)

LEWIS, F. H., Pecan Orchardist and Nurseryman, Pascagoula, Miss. (*Mississippi.*)

LEWTON, FREDERICK L., Curator, Division of Textiles, U. S. National Museum, Washington, D. C. (*Gums and Resins.*)

LLOYD, JOHN W., Prof. of Olericulture, College of Agriculture, University of Illinois, Urbana, Ill. (*Exhibitions, Muskmelon, Vegetable-Gardening.*)

LORD & BURNHAM CO., Greenhouse Designers and Manufacturers, Irvington-on-Hudson, N. Y. (*Greenhouse.*)

LOVELESS, ALFRED J., Gardener, Lenox, Mass. (*Paphiopedilum, Phalænopsis.*)

LUMSDEN, DAVID, Asst. Prof. of Floriculture, New York State College of Agriculture, Ithaca, N. Y. (*Lilium, Narcissus.*)

*LYON, T. T. (*Pear.*)

MACDOUGAL, D. T., Dir. Department of Botanical Research, Carnegie Institution of Washington, Desert Laboratory, Tucson, Ariz. (*Sap, Transpiration.*)

MACFARLANE, J. M., Prof. of Botany, Dir. of the Botanic Garden, University of Pennsylvania, Philadelphia, Pa. (*Darlingtonia, Dionæa, Drosera, Nepenthes, Sarracenia.*)

MACOUN, W. T., Dominion Horticulturist, Central Experimental Farm, Ottawa, Canada. (*Apple, British North America, Currant, Gooseberry, Herbs, several biographies.*)

MANNING, WARREN H., Landscape Designer, North Billerica, Mass. (*Banks, Herbs, Landscape Gardening, Planting articles, Rock-Garden.*)

MARLATT, C. L., Chairman Federal Horticultural Board, Washington, D. C. (*Inspection.*)

*MASON, S. C. (*Labels, Layering.*)

MASSEY, L. M., Instr. Plant Pathology, New York State College of Agriculture, Ithaca, N. Y. (*Rose Diseases.*)

MATHESON, ROBERT, Asst. Prof. of Economic Entomology, New York State College of Agriculture, Ithaca, N. Y. (*Diseases and Insects.*)

MATHEWS, C. W., Prof. of Horticulture, College of Agriculture, University of Kentucky, Lexington, Ky. (*Kentucky.*)

MATHEWS, F. SCHUYLER, Artist and Author, 17 Frost St., Cambridge, Mass. (*Color, Standards of Color.*)

*MATHEWS, WM. (*Culture of many orchids.*)

MAXON, WILLIAM R., Assoc. Curator, National Herbarium, U. S. National Museum, Washington, D. C. (*Tree Ferns.*)

MAYNARD, S. T., Horticultural Specialist and Landscape Gardener, Northboro, Mass. (*Massachusetts.*)

MCCLELLAND, T. B., Asst. Horticulturist, U. S. Experiment Station, Mayaguez, Porto Rico. (*Coffea.*)

MCCUE, C. A., Prof. of Horticulture, Delaware College, Newark, Del. (*Delaware.*)

MCFARLAND, J. HORACE, Printer, Author, Lecturer, Harrisburg, Pa. (*Border, Garden Cities, Photography.*)

MCHATTON, T. H., Prof. of Horticulture, State College of Agriculture, Athens, Ga. (*Biographies, Georgia, Pear.*)

*MEEHAN, JOSEPH. (*Maclura.*)

MEEHAN, W. E., Nurseryman, Germantown, Philadelphia, Pa. (*Thos. Meehan.*)

MENDERSON, NATHAN, Asst. in Plant Introduction, Office of Foreign Seed and Plant Introduction, U. S. Dept. of Agric., Washington, D. C. (*Sechium.*)

*MEREDITH, A. P. (*Humea.*)

MICHEL, EUGENE H., Supt. Dreer's Nurseries, Riverton, N. J. (*Help on Canna.*)

MILLER, WILHELM, Landscape Architect, 64 E. Van Buren St., Chicago, Ill. (*Autumn-Gardening, Biennials, Chrysanthemum, Herbs, Landscape Extension, Planting articles, and many biographies and genera.*)

MINER, WM. W., Farmer and Fruit-Grower, Palmyra, N. Y. (*A. M. Purdy.*)

MITCHELL, ARCH, Nurseryman, Coaldale, Alberta (*Alberta.*)

MITCHELL, SYDNEY B., University of California Library, Berkeley, Calif. (*Culture of Gladiolus, Iris, Ixia.*)

MONTILLON, EUGENE D., Instr. Landscape Art, New York State College of Agriculture, Ithaca, N. Y. (*Topiary Work.*)

MOON, HENRY T., Nurseryman, Morrisville, Pa. (*James Moon.*)

MOORE, ALBERT HANFORD, Botanist and Photographic Reproducer, 3 Divinity Ave., Cambridge, Mass. (*Escallonia, Philadelphus, Spilanthes.*)

MORRIS, O. M., Head of Horticultural Dept., State College, Pullman, Wash. (*Washington.*)

MORRIS, ROBT. T., Surgeon, 616 Madison Ave., New York City. (*Nut-culture.*)

MORRISON, B. Y., Landscape Architect, Takoma Park, D. C. (*Arboriculture.*)

MORRISON, WM. S., Prof. of History and Political Economy, Clemson College, S. C. (*J. S. Newman.*)

MORSE, C. C. & Co., Seed-growers and Dealers, 739–759 Front St., San Francisco, Calif. (*Seeds.*)

MULFORD, F. L., Landscape Gardener, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Arboriculture, Evergreens, Hedges, Planting list.*)

‡MUNSON, T. V., Nurseryman, Denison, Texas. (*Grape, Texas.*)

*MUNSON, W. M. (*Vaccinium.*)

NASH, GEORGE V., Head Gardener, New York Botanical Garden, Bronx Park, New York City. (*Botany of most of the genera of orchids, aroids, and bromeliads.*)

NEHRLING, H., Horticulturist, Palm Cottage Gardens, Gotha, Fla. (*Cultural notes on many Florida plants.*)

NELSON, AVEN., Prof. of Botany, University of Wyoming, and State Horticulturist, Laramie, Wyo. (*Wyoming.*)

*NEWBURY, H. E. (*Polianthes.*)

NEWBURY, W. R., Magnolia, N. C. (*Polianthes.*)

NEWMAN, C. C., Prof. of Horticulture and Horticulturist of Experiment Station, Clemson College, S. C. (*South Carolina.*)

NORTON, J. B., Physiologist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Asparagus, Smilax.*)

NORTON, J. B. S., Prof. of Botany, Maryland Agricultural College, College Park, Md. (*Botany of the Euphorbiaceæ.*)

O'GARA, P. J., Pathologist and Chief in Charge of Agricultural Investigations, American Smelting and Refining Co., Salt Lake City, Utah. (*Frost.*)

*O'MARA, PATRICK. (*Potting.*)

OLIVER, G. W., Plant-Breeder, U. S. Dept. of Agric., Washington, D. C. (*Many articles on palms, aroids, succulents, and rare plants.*)

OLMSTED, JOHN C., Landscape Architect, Brookline, Mass. (*F. L. Olmsted, Parks.*)

ORPET, E. O., Plant Propagator, U. S. Plant Introduction Field Station, Chico, Calif. (*Culture of many orchids, Border, Osmundine, etc.*)

PADDOCK, WENDELL, Prof. of Horticulture, Ohio State University, Columbus, Ohio. (*Peach.*)

PARSONS, SAMUEL, Landscape Architect, Architects' Bldg., 101 Park Ave., New York City. (*Lawns.*)

*PEACOCK, LAWRENCE K. (*Dahlia.*)

PEASE, A. S., Prof. of the Classics, University of Illinois, Urbana, Ill. (*Help on Name-List.*)

PETERSON, WM. A., Nurseryman, Chicago, Ill. (*Pæonia.*)

PIERSON, W. R., Florist, Cromwell, Conn. (*Rose.*)

PILAT, C. F., Landscape Architect to the Park Board, 52 Broadway, New York City. (*Planting.*)

PIPER, C. V., Agrostologist in Charge, Bureau of Plant Industry, U. S. Dept. of Agric., Washington, D. C. (*Glycine.*)

PITTIER, H., Botanist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Pachira.*)

POPENOE, F. W., Agricultural Explorer, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Culture and botany of many tropical fruits.*)

PRICE, H. L., Dean of Agricultural Dept., Virginia Agricultural College, Blacksburg, Va. (*Virginia.*)

*PRINCE, L. B. (*Wm. Prince.*)

PRING, G. H., Foreman, Exotic Orchid and Aquatic Depts., Missouri Botanical Garden, St. Louis, Mo. (*Oxalis, Peristeria, Phaius, Pinguicula.*)

PURDY, CARL, Nurseryman, Specialist in hardy perennials, Ukiah, Calif. (*California native plants, as Brodiæa, Calochortus, etc.*)

RAFFILL, C. P., Gardener, Royal Botanic Gardens, Kew, England. (*Culture of Achimenes, Calathea, etc.*)

RAMSEY, H. J., Pomologist, Bur. of Plant. Ind., U. S. Dept. of Agric., Washington, D. C. (*Transportation.*)

RANKIN, W. H., Asst. Prof. Plant Pathology, New York State College of Agriculture, Ithaca, N. Y. (*Arboriculture.*)

*RAWSON, GROVE. P. (*Lantana.*)

*REASONER, E. N. (*Banana and many other articles on semi-tropical plants.*)

REDDICK, DONALD., Prof. of Plant Pathology, New York State College of Agriculture, Ithaca, N. Y. (*Damping-off, Diseases.*)

REED, C. A., Nut-Culturist, Bur. of Plant. Ind., U. S. Dept. of Agric., Washington, D. C. (*Nuts, Walnut.*)

REED, WM. N., 122 W. 25th St., New York City. (*Everlastings.*)

REHDER, ALFRED, Botanist, Arnold Arboretum, Jamaica Plain, Mass. (*Most of the hardy trees and shrubs, Names and Nomenclature, many notes and much advice.*)

RICH, WM. P., Sec. Massachusetts Horticultural Society, Boston, Mass. (*S. W. Cole.*)

RICHARDS, M. W., Assoc. Horticulturist, Purdue Experiment Station, La Fayette, Ind. (*Indiana.*)

RICKER, P. L., Asst. Botanist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Musa, Nicotiana, and several leguminous genera.*)

RIXFORD, G. P., Physiologist, Bur. of Plant. Ind., U. S. Dept. of Agric., 1813 Pierce St., San Francisco, Calif. (*Ceratonia, Pistacia, Zizyphus.*)

ROBERTS, I. P., Prof.-Emeritus of Agriculture, Cornell University; Residence, Berkeley, Calif. (*Drainage, Fertility, Manure.*)

ROBINSON, ALBERT E., Gardener to Louis Ettlinger, Peekskill, N. Y. (*Leontopodium.*)

ROBINSON, B. L., Prof. of Systematic Botany and Curator of the Gray Herbarium, Harvard University, Cambridge, Mass. (*Ageratum, Eupatorium.*)

ROEDING, GEO. C., Nurseryman, Fresno, Calif. (*F. C. Roeding, Peach.*)

ROGERS, STANLEY S., Assoc. Prof. of Plant Pathology, College of Agriculture, University of California, Berkeley, Calif. (*Celery in California.*)

ROLFS, P. H., Dean, Florida Agricultural College, Dir. Agricultural Experiment Station; Dir. of Coöperative Agricultural Extension Work, Gainsville, Fla. (*Celery, Eggplant, Florida, Okra, Onion, Pineapple.*)

ROSE, J. N., Research Assoc., Carnegie Institution of Washington; Assoc. in Botany, U. S. National Museum, Washington, D. C. (*Cactaceæ and some Crassulaceæ.*)

ROSE, N. J., 448 East 137th St., New York City. (*Bomarea.*)

ROSS, THEODORE, Sec. for Agriculture, Charlottetown, P. E. I. (*Prince Edward Island.*)

*ROTH, F. (*Fagus.*)

ROTHE, RICHARD, Nurseryman, Glenside, Pa. (*Notes on culture of many hardy garden herbs.*)

ROWLEE, W. W., Prof. of Botany, Cornell University, Ithaca, N. Y. (*Liatris, Salix.*)

SAFFORD, W. E., Economic Botanist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*The Annonaceæ, Avicenna, Bull-Horn, Chiranthodendron, Cycas, Gynopogon, Tutuila, Lophophora.*)

SARGENT, C. S., Dir. Arnold Arboretum, Jamaica Plain, Mass. (*Abies, Arboretum, F. L. Ames, H. W. Sargent.*)

SAUL, B. F., Banker, Washington, D. C. (*John Saul.*)

SCHEEPERS, JOHN, & Co., INC., Flower Bulb Specialists, 2 Stone St., New York City. (*Help on Tulipa.*)

SCHMITT, X. E. E., Head Gardener, Horticultural Hall, Fairmount Park, Philadelphia, Pa. (*Ferns.*)

*SCOTT, WILLIAM. (*Many cultural articles.*)

SEARS, F. C., Prof. of Pomology, Massachusetts Agricultural College, Amherst, Mass. (*C. R. Prescott.*)

*SEAVEY, FRANCES COPLEY. (*Railroad-Gardening.*)

*SEXTON, JOSEPH. (*Pampas-Grass.*)

SHAW, GEORGE W., Land Expert, 74 New Montgomery St., San Francisco, Calif. (*Bean.*)

SHAW, PERCY J., Horticulturist, Agricultural College, Truro, N. S. (*Nova Scotia.*)

SHINN, CHARLES H., Writer, Northfork, Calif. (*Fig, John Rock, James Shinn, California, Sequoia.*)

*SHORE, ROBERT. (*Bedding, Begonia, Marguerite.*)

SHULL, GEO. H., Prof. of Botany and Genetics, Princeton University, Princeton, N. J. (*Xenia.*)

SIEBRECHT, H. A., Florist and Nurseryman, New Rochelle, N. Y. (*Billbergia, Ficus, Gardenia, etc.*)

SIMONDS, O. C., Landscape Gardener, 1101 Buena Ave., Chicago, Ill. (*Adolph Strauch, Landscape Cemeteries, Shrubbery.*)

SIMPSON, CHAS. T., Collaborator, U. S. Dept of Agric., Little River, Fla. (*Many notes on Florida plants, P. F. Reasoner.*)

*SLINGERLAND, M. V. (*Diseases and Insects.*)

SMITH, CORA A., Teacher of Biology, Erie, Pa. (*Birds.*)

SMITH, ELMER, Florist, Adrian, Mich. (*Chrysanthemum.*)

SMITH, IRVING C., Market-Gardener and Fruit-Grower, Ashland, Wis. (*Onion.*)

*SMITH, JARED G. (*Many genera of palms.*)

STANDLEY, PAUL C., Asst. Curator, U. S. National Herbarium, Washington, D. C. (*Help on Pentstemon.*)

*STEELE, E. S. (*Perfumery-Gardening.*)

STEVENS, R. T., Asst. Prof. of Landscape Gardening, College of Agriculture, University of California, Berkeley, Calif. (*Herb, Planting lists.*)

STEWART, GEO. F., Gardener on the Gen. S. C. Lawrence Estate, Medford, Mass. (*Articles on the culture of many greenhouse plants.*)

STEWART, JOHN P., Experimenter in Pomology, Experiment Station, State College, Pa. (*Pennsylvania.*)

STEWART, WM. J., Editor "Horticulture," Boston, Mass. (*Exhibitions.*)

STONE, G. E., Prof. of Botany, Vegetable Physiology and Pathology, Massachusetts Agricultural College, Amherst, Mass. (*Electro-Horticulture, Light.*)

STRAIGHT, E. M., State Specialist in Vegetable-Gardening, College of Agriculture, Durham, N. H.; formerly of Canada. (*Quebec.*)

STUBENRAUCH, A. V., Prof. of Pomology, College of Agriculture, University of California, Berkeley, Calif. (*Storage, Tulipa, etc.*)

STUNTZ, S. C., Botanical Assistant, Office of Foreign Seed and Plant Introduction, Washington, D. C. (*Carica, Carissa.*)

*STURTEVANT, EDMUND D. (*Nymphæa.*)

SWINGLE, MAUDE KELLERMAN (Mrs. W. T.), Botanical Assistant, Bureau of Plant Industry, U. S. Dept. of Agric., Washington, D. C. (*Collaborated with Walter T. Swingle on Citropsis and other genera of the Citrus subfamily.*)

SWINGLE, WALTER T., In charge of Crop Physiology and Breeding Investigations, Bur. of Plant. Ind., U. S. Dept. of Agric., Washington, D. C. (*Genera of the Citrus subfamily.*)

TAFT, L. R., Supt. Farmers' Institutes, State Inspector of Orchards and Nurseries, East Lansing, Mich. (*Greenhouse heating, Hotbeds, Michigan.*)

TANIMURA, ISSA, Dir. of Japan Forage Experiment Station, and Pres. of "Soyoho," Tokyo, Japan. (*Dwarfing, Japanese Gardening.*)

*TAPLIN, W. H. (*Many genera of palms.*)

TAYLOR, A. D., Landscape Architect, 1900 Euclid Ave., Cleveland, Ohio. (*Drainage for Landscape Work.*)

TAYLOR, NORMAN, Curator of Brooklyn Botanic Garden, Brooklyn, N. Y. (*Many Compositæ, Palmaceæ, and Araliaceæ, Alpine Plants, Bog-Gardening, and many other articles.*)

TAYLOR, WM. A., Chief of Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Apple, Chestnut, Gevuina, Ginkgo, Hazel-nut, Hickory-nut, Pecan.*)

THILOW, J. OTTO, Florist, Sec. Henry A. Dreer, Inc., 714 Chestnut St., Philadelphia, Pa. (*Leek, Machinery.*)

THOMPSON, C. H., Asst. Prof. of Horticulture, Massachusetts Agricultural College, Amherst, Mass. (*Bryophyllum, Succulents.*)

THOMPSON, H. C., Horticulturist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Strawberry in the South.*)

THOMPSON, J. B., Asst. Agronomist of U. S. Experiment Station, Honolulu, Hawaii. (*Guam.*)

THORBURN, J. M. & Co., Seedsmen, 53 Barclay St., New York City. (*Hyacinthus, Seeds.*)

TIEBOUT, GEORGE L., Horticulturist of Experiment Station, Baton Rouge, La. (*Louisiana.*)

TILTON, JOHN H., Gardener, Salem, N. H. (*Lilium.*)

TOMPSON, H. F., Prof. and Head Dept. of Market-Gardening, Massachusetts Agricultural College, Amherst, Mass. (*Carrot, Cucumber.*)

*TOUMEY, J. W. (*Date, Opuntia, Root-Galls.*)

TRACY, S. M., Agronomist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Mississippi, Stizolobium.*)

TRACY, W. W., Supt. of Testing Gardens, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Cabbage, Lettuce, Pea, Radish, Seeds, Tomato.*)

TRELEASE, WILLIAM, Prof. of Botany, University of Illinois, Urbana, Ill. (*Liliaceous genera as Agave, Aloe, Furcræa, Yucca, etc.; Henry Shaw; Oxalis.*)

‡TRICKER, WILLIAM, Specialist in Aquatics, Arlington, N. J. (*Aquarium, Aquatics, Nymphæa, Water-Gardening, and many aquatic plants.*)

TRULLINGER, ROBERT W., Specialist in Rural Engineering, U. S. Dept. of Agric., Washington, D. C. (*Machinery.*)

TUCKER, E. S., formerly Assoc. Entomologist, Experiment Station, Baton Rouge, La. (*Orange.*)

*TUCKER, GILBERT M. (*J. J. Thomas, Luther Tucker.*)

TURNER, WILLIAM, Gardener, Supt. to B. H. Rorden, Oceanic, N. J. (*Forcing.*)

TURNEY, A. G., Horticulturist, Dept. of Agriculture, Fredericton, N. B. (*New Brunswick, F. S. Sharp.*)

*UNDERWOOD, L. M. (*Many genera of ferns.*)

‡VAN DEMAN, H. E., Pomologist, Washington, D. C. (*Nut-culture.*)

VAN FLEET, W., Physiologist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Perfumery-Gardening.*)

VAUGHAN, J. C., Seedsman, 31–33 W. Randolph St., Chicago, Ill. (*Christmas Greens.*)

VERBECK, WILLIAM, President and Head Master of St. John's School, Manlius, N. Y. (*Japanese Gardening.*)

VINCENT, C. C., Prof. of Horticulture, College of Agriculture, Moscow, Idaho. (*Idaho.*)

VITALE, FERRUCCIO, Landscape Architect, 527 Fifth Ave., New York City. (*Formal Gardens.*)

WAID, C. W., Extension Specialist in Vegetables, Michigan Agricultural College, East Lansing, Mich. (*Forcing, Greenhouse.*)

WALDRON, C. B., Prof. of Horticulture and Forestry, Dean of Agriculture, Agricultural College, N. D. (*North Dakota.*)

‡WALKER, ERNEST, formerly Prof. of Horticulture, Alabama Polytechnic Institute, State Horticulturist, Auburn. Late of Bolling Farms, Bolling, Ala. (*Arkansas, Watering.*)

*WARD, C. W., (*Pelargoniums.*)

*WARDER, R. H. (*J. A. Warder.*)

WARNER, MARJORIE F., Bibilographer, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Aid on book-list.*)

WARREN, G. F., Prof. of Farm Management, New York State College of Agriculture, Ithaca, N. Y. (*Cost-Accounting.*)

WATROUS, C. L., Nurseryman, Des Moines, Iowa. (*Arboriculture, Iowa.*)

WATSON, B. M., Late Instr. in Horticulture, Harvard University (Retired), Plymouth, Mass. (*Colchicum, Cuttings, Forcing, House Plants, Winter Protection, Rose, Rhododendron.*)

WATTS, RALPH L., Dean and Director of the School of Agriculture and Experiment Station, State College, Pa. (*Celery, G. C. Butz, Gabriel Hiester, Tomato.*)

WAUGH, F. A., Head of Division of Horticulture and Prof. of Landscape Gardening, Massachusetts Agricultural College, Amherst, Mass. (*Many vegetables, Landscape Gardening, Village Improvement, Plum.*)

WEBB, WESLEY, Sec. Peninsula Horticultural Society, Dover, Del. (*J. G. Brown.*)

WEBBER, H. J., Dir. Citrus Experiment Station, University of California, Riverside, Calif. (*Breeding, Casimiroa.*)

WESTER, P. J., Horticulturist, Bureau of Agriculture, Manila, P. I. (*Philippine Islands.*)

WHEELER, H. J., Manager Agricultural Service Bureau of the American Agricultural Chemical Co., Boston, Mass. (*Fertilizers, Lime.*)

WHEELER, WILFRID, Sec. Massachusetts Board of Agriculture, Boston, Mass. (*Strawberry.*)

WHETZEL, H. H., Prof. of Plant Pathology, New York State College of Agriculture, Ithaca, N. Y. (*Diseases, Fungi, Root-Galls.*)

WHIPPLE, O. B., Prof. of Horticulture, State College of Agriculture, Bozeman, Mont. (*Apple.*)

WHITE, E. A., Prof. of Floriculture, New York State College of Agriculture, Ithaca, N. Y. (*Design, Floriculture, Mignonette, Primula.*)

WHITE, ELIZABETH C., Grower of Cranberries and Blueberries, New Lisbon, N. J. (*Cranberry.*)

*WHITNEY, MILTON. (*Irrigation, Soils.*)

WHITTEN, J. C., Prof. of Horticulture and Horticulturist to the Experiment Station, University of Missouri, Columbia, Mo. (*Extension Teaching, Missouri, several biographies.*)

WICKSON, E. J., Prof. of Horticulture, Emeritus, College of Agriculture, University of California, Berkeley, Calif. (*Articles on many of the fruits and vegetables in California.*)

WIEGAND, K. M., Prof. of Botany, New York State College of Agriculture, Ithaca, N. Y. (*Synopsis of Families, Bidens, Cordyline, Flower, and several genera.*)

WIGHT, W. F., Botanist, Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Solanum.*)

‡WILLIAMS, P. F., Horticulturist of Experiment Station, Auburn, Ala. (*W. F. Heikes, Alabama.*)

WILLING, T. N., Prof. of Natural History, University of Saskatchewan, Saskatoon, Sask. (*Saskatchewan.*)

WILLIS, E. R. B., Reference Librarian, Cornell University Library, Ithaca, N. Y. (*Much help on the Name-list.*)

WILSON, C. P., Station Sec. and Editor Agricultural Publications, State College, New Mex. (*Nut-Culture in New Mexico.*)

WILSON, C. S., State Commissioner of Agriculture, Albany, N. Y. (*Apricot, Cover-Crops. Spraying, Exhibitions.*)

WILSON, WILFORD M., Prof. of Meteorology, New York State College of Agriculture, Ithaca, N. Y. (*Frost.*)

WINSLOW, R. M., Provincial Horticulturist and Inspector of Fruit Pests, Dept. of Agriculture, Victoria, B. C. (*British Columbia.*)

WOODBURY, C. G., Prof. of Horticulture, Purdue University, LaFayette, Ind. (*W. H. Ragan.*)

WOODS, ALBERT F., Dean Colleges of Agriculture and Forestry and Dir. of Experiment Stations, University of Minnesota, University Farm, St. Paul, Minn. (*Variegation.*)

WOOLVERTON, LINUS, Fruit-Grower, Grimsby, Ont. (*Many biographical sketches.*)

WORK, PAUL, Instr. in Vegetable-Gardening, New York State College of Agriculture, Ithaca, N. Y. (*Irrigation, Kitchen-Garden, Vegetable-Gardening.*)

WRIGHT, J. HARRISON, Fruit-Grower, Riverside, Calif. (*Help on palms.*)

*WYMAN, A. PHELPS. (*Many genera of trees and shrubs.*)

YOUNG, ROBERT A., Botanical Asst., Bur. of Plant Ind., U. S. Dept. of Agric., Washington, D. C. (*Taro, Xanthosoma, Yam.*)

ZVOLANEK, ANT. C., Seed-grower, Lompoc, Calif. (*Sweet Pea in California.*)

CULTIVATOR'S GUIDE TO THE ARTICLES

The numerals refer to pages when the articles are not in the regular alphabetic sequence

The articles in the Cyclopedia are of four general classes: (1) cultural directions for the gardener, fruit-grower, vegetable-gardener, florist, and home planter; (2) identification, comprising the botanical accounts of genera, species and varieties; (3) general information about plants, comprising much of the introductory material in Vol. I and articles in the alphabetic text as Autumn Colors, Bull Horn, Color, Standards of Color, Cactus, Cloves, Education, Experiment Stations, Extension Teaching, Gums and Resins, Herbarium, Horticulturists, Horticultural Literature, Names and Nomenclature, Sap, Saprophyte, Transpiration, Variegation, Xenia, and many others; (4) geographical articles, comprising British North America, Island Dependencies, North American States.

The identificational and informational articles appear, for the most part, in regular alphabetic order. The cultural directions, however, are in part contained in class articles of many kinds, inasmuch as they have only indefinite alphabetic designation. With each important generic entry, cultural directions will be found, as under Wisteria, Rhamnus, Ardisia, Pyrola, Ixora, Torenia, and the others throughout the six volumes; aside from these directions, however, are many others of special importance and interest, and these others are here listed and classified in such a way that the cultivator may have the range before him and be aided in finding the advice he desires.

1. Leading or important class articles of a cultural or plant-handling character.

Some of the leading class articles, dealing with the cultivation and handling of plants and products and with arrangement of plant materials, are as follows:

Alpine plants.
Annuals.
Ants.
Aquarium.
Aquatics.
Arboretum.
Arboriculture (symposium), comprising contributed parts on uses, insects and diseases, culture, transplanting, lists.
Autumn-gardening.
Bamboos.
Banks.
Basket plants.
Bedding, or bedding-out.
Bees.
Biennials.
Birds.
Bog-gardening; also page 2666.
Border.
Botanic garden.
Bouquet.
Breeding of plants.
Bulbs.
Conifers; also page 358.
Conservatory.
Culinary herbs.
Cut-flower industry.
Cuttings.
Design, floral.
Diseases and insects (symposium), comprising extensive lists, also fungicides, insecticides, spraying.
Drainage.
Dwarfing.
Electro-horticulture.
Etherization.
Evaporating fruit.
Evergreens.
Everlastings.
Exhibitions (symposium).
Ferns (symposium), with lists and culture.
Fertility.
Fertilizers.
Floral designs: see Designs, floral.
Floriculture.
Florists' plants.
Flower-garden: see Kitchen-garden and flower-garden.
Forcing.
Forestry.
Formal-gardening: see under Landscape gardening, 1793.
Frost.
Fruit-growing.
Fumigation: see under Diseases and insects, 1044.
Fungi.
Grafting.
Grasses.
Greenhouse and management (symposium).
Hedges.
Herbs (symposium), with lists.
Horticulture.
Hotbeds and coldframes.
House plants.
Insects: see under Diseases and insects.
Inspection of horticultural merchandise.
Irrigation, including sub-irrigation.
Japanese gardens: see under Landscape gardening, 1789.
Kitchen-garden and flower-garden (symposium).
Labels.
Landscape gardening (symposium), including formal gardens, cemeteries, parks, lawn-making, and other parts.
Lawns: see under Landscape gardening, 1816.
Lawn planting: see under Landscape gardening, Herbs, Planting, Arboriculture (see List No. 9, page 3564).
Layers.
Light for greenhouses.
Lists of trees (under Arboriculture), herbs (Herb, Herbs), shrubs (Planting); also under Ferns, Orchids, Palms.
Machinery and implements (symposium).
Manure.
Market-gardening.
Marketing.
Muckland-gardening.
Mushroom.
Nursery.
Nut-culture.
Nuts.
Orchids (symposium), comprising different parts; see also the culture under the alphabetic orchid entries.
Orchard: see Fruit-growing.
Packages.
Palms (symposium), comprising different phases of botany and treatment, with list of leading palms and their culture.
Park: see under Landscape gardening, 1801; also 2694.
Perennials.
Perfumery-gardening.
Pergolas.
Planting (symposium), comprising more than twenty articles on special phases of the work, with lists of shrubs.
Pollen, Pollination.
Potting.
Pruning.
Railroad-gardening.
Rock-gardening.
Rustic work: see under Planting, 2677.
Screens: see under Planting, 2681.
Seaside planting: see under Planting, 2670.
Seeds and seedage (symposium).
Shade-loving plants: see under Planting, 2695; 2700; under Herbs, 1467, 1472, 1473, 1475.
Shade trees: see under Arboriculture.
Shrubbery: see under Planting.
Small-fruits: see the separate articles, as Blackberry, Blueberry, Buffalo berry, Currant, Dewberry, Gooseberry, Raspberry; also Fruit-growing.
Spring-gardening.
Storage.
Subtropical gardening: see under planting, 2669.
Succulents: see under Planting, 2672.
Sun-loving plants: see under Planting, 2701; under Herbs, 1471, 1472, 1473, 1476.
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Wall-gardening: see under Planting, 2680.
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Water-gardening: see under Planting, 2668; also Bog-gardening, 519 and 2666; Aquarium; Aquatics; Nymphæa, Victoria, and others.
Watering.
Wild-garden: see under Planting, 2663.
Windbreak.
Window-gardening and window-boxes.
Winter-gardening: see under Planting, 2677.
Winter protection: see under Planting, 2684.
Woods: see under Planting, 2662; also Landscape gardening.
Also articles on the different fruits, flowers, vegetables, trees, shrubs, ornamental plants, in regular alphabetic order.

2. Soil management; fertilizing; cover-crops.

Soils.
Tillage.
Tillage machinery, 1942.
Drainage.
Mulching.
Irrigation.

Manure.
Fertilizers.
Lime, in horticulture.
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3. Insects, diseases, birds, weeds; frost; means of control.

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5. Marketing; transportation; inspection; exhibitions.

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6. Gardening; greenhouse; floriculture; florists' plants; flower-growing. (See List No. 9, on Landscape Gardening, etc.)

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Pampas-grass.
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7. Vegetable-gardening and vegetables; sweet herbs, and the like.

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ADDITIONAL SPECIES

The first volume of this Cyclopedia was published in March, 1914. The lists of plants on which it was founded were brought down to the close of 1912, and it was to this date, as stated on page xi, that the Cyclopedia undertook to cover its task, although subsequent introductions have been inserted up to the closing of the pages so far as possible and as the information has come to hand. Undoubtedly some names were overlooked. Four years and more have passed since the original lists were prepared, and cross-referenced back and forth throughout the letters of the alphabet. Within this time, species have been introduced to cultivation within the United States and Canada, and which may now be described. The present list is not complete for the subtropical parts, and probably not all the introductions have been discovered for the other parts. The commerce in plants is incessant, and the situation is never at rest.

The consultant will probably be disappointed in not finding some of the well-advertised binomials in either the body of the Cyclopedia or this Supplement. The Editor has a long list of such names, but, without the plants themselves before him, he cannot know what the names mean. They are such as have no botanical standing, and the descriptions in the catalogues do not identify them. Probably some of these binomials represent generic and varietal names, with the species-name omitted. This is a prevalent but very faulty practice, as it obscures all relationships and plunges the subject into confusion. So long as this practice prevails, it is impossible to make clear identification of cultivated plants.

Only in one group does there appear to have been any marked extension of species, and this is in the willows (Salix). Some of the very attractive Chinese and other willows are very recently offered, and the account of that genus is therefore much extended. The additions in the willows are made by Alfred Rehder, as are also the additions and modifications in all the articles originally prepared by him.

ÀBIES. Page 172.

Delavàyi, Franch. (*Keteleèria Fàbri,* Mast.). (After No. 11 in the treatment of Abies.) Tall tree, to 120 ft.: young branches yellowish or reddish brown, lustrous, usually glabrous: winter buds obtuse, resinous: lvs. spreading, crowded, usually blunt and emarginate, strongly recurved at the margins, silvery white below, ½–1 in. long: cones oblong-ovate to oblong-cylindric, usually truncate, deep violet, about 2½ in. long; bracts usually slightly exserted. W. China. G.C. III. 39:212 (as *A. Fargesii* on p. 213).

Faxoniàna, Rehd. & Wilson. (After No. 11.) Tall tree, to 120 ft.: young branches brownish villous: winter buds obtuse, very resinous: lvs. crowded, distichously spreading, linear, short-pointed or obtuse to emarginate, ½–1 in. long, silvery white beneath: cones ovoid or ovoid-oblong, usually truncate violet-purple, about 2½ in. long; bracts exserted. W. China.

recurvàta, Mast. (After No. 11.) Tall tree, to 120 ft.: young branches pale yellowish gray, lustrous, glabrous: winter bud slightly pointed, very resinous: lvs. crowded, spreading or recurved, sometimes falcate, pointed, bright green or glaucescent, of about the same color on both sides, about ½in. on fruiting branches, about 1 in. long and more pointed on young plants: cones oblong-ovoid, usually flattened at the apex, violet-purple before maturity, later gray-brown, about 3 in. long; bracts not exserted. W. China.

squamàta, Mast. (After No. 11.) Tall tree, to 120 ft.; bark purplish brown, exfoliating in thin flakes like the river birch: young branches brown, glabrous: winter buds obtuse, very resinous: lvs. very crowded, ascending, mucronate or obtuse, often falcate, glaucous below while young, becoming nearly green, ½–1 in. long: cones oblong-ovoid, obtuse, violet, 2–3 in. long; bracts slightly exserted. W. China. G.C. III. 39:299. —Very remarkable for its bright purplish brown bark, scaling off in thin flakes. It has violet-purple resinous cones, and short relatively broad leaves.

ALEURÌTES. Page 245.

montàna, Wilson, is a new wood-oil tree recently intro. from China, and related to *A. Fordii,* but with the staminate and pistillate fls. tending to be in separate infl., the latter racemose and the fr. egg-shaped with 3 longitudinal and many transverse ridges.

AMPELÓPSIS. Page 278.

Watsoniàna, Wilson (*Vitis leeoides,* Veitch, not Planch.). (After No. 10.) Tall climbing shrub, with slender forked tendrils, glabrous: lvs. simply pinnate; lfts. 5, stalked, ovate to ovate-oblong, acuminate, rounded at the base, remotely serrate, bright green above, glaucescent beneath, 3–4½ in. long: fls. and frs. not known, but probably not much different from those of *A. leeoides* to which this species is closely related, but easily distinguished by the always simply pinnate lvs. with fewer and larger lfts. Cent. China. J.H.S. 28:295, figs. 95, 96, erroneously cited under *A. leeoides* on p. 278 of this work.

ANGÓPHORA. Page 288.

intermèdia, DC. (*Metrosidèros floribúnda,* Smith, not Hort.). Tree, described by Bentham as having rough persistent fibrous bark, the parts nearly or quite glabrous: lvs. lanceolate to ovate-lanceolate, distinctly stalked, 2–4 in. or more long, sharply acuminate: fls. rather small, in loose corymbs or trichotomous panicles; calyx about 2 lines long or longer, with 5 prominent ribs, the teeth short-subulate. Austral.—In Calif. said to be a very fine drought-resisting shade and avenue tree.

lanceolàta, Cav. Described in Calif. as a medium-sized white-fld. tree; by Bentham said to be "a tree of considerable size," with bark deciduous in large smooth flakes, the parts glabrous or essentially so: lvs. lanceolate, acuminate, 3–5 in. long, distinctly petiolate, with numerous parallel pinnate veins: fls. in rather dense terminal clusters, larger and denser than in *A. intermedia;* calyx about 3 lines long, the teeth shorter and thicker than in *A. intermedia.* Austral.

AQUILÈGIA. Page 339.

akitènsis, Huth. St. erect, branched above: radical and lower cauline lvs. twice ternate, uppermost cauline lvs. simple, narrowly lanceolate: sepals oval, longer than the limb of the petals, pale purple when dry; petals with a rather straight spur, limb subtruncate, pale yellow. Japan; intro. as an alpine species, with blue-and-yellow fls.; the author of species does not state its relationships.

ARGRYRÈIA. Page 391.

spléndens, Sweet (*Convólvulus spléndens,* Hornem. *Lettsòmia spléndens,* Roxbg. *Ipomœa spléndens,* Sims). Described by Clarke as "a large climber:" lvs. elliptic and acuminate, never cordate but the base rhomboid or rounded, blade about 7 in. long and petiole 3 in., glabrous above and silky beneath: fls. rose-colored or pale red, in few- or many-fld. pedunculate corymbs; corolla tubular-campanulate, 1½ in. long, the plaits hairy outside; sepals tomentose, ovate and obtuse, ¼in. long: caps. scarlet, papery. India. B.M. 2628.—Doubtful whether known in this country. The plant in cult. as *Convolvulus splendens* may be a form of the common morning-glory, *Ipomœa purpurea.*

BÉRBERIS. Page 487.

Regelìana, No. 2, Fig. 539, represents *B. amurensis* rather than *B. Regeliana,* which is probably better considered a variety of *B. amurensis,* and to be called **B. amurénsis** var. **japónica,** Rehd.

lèvis, No. 24. The species described under this name is **B. atrocárpa,** Schneid. (*B. lèvis,* Hort., not Franchet). The true *B. levis* is not in cult.; it has more closely serrated lvs. and purplish black slightly bloomy fr., while the fr. of *B. atrocarpa* is jet-black.

Sargentiàna, No. 25. The plant described is the true species, but the shrub cult. under this name is often **B. Julianæ,** Schneid., which seems slightly hardier; it has the young branches yellowish and slightly grooved (terete and red while young in *B. Sargentiana*), shorter lvs. hardly exceeding 2½ in., firmer and less reticulate beneath, elliptic bloomy frs. crowned by a short style, on pedicels ¼–½in. long.

B. aggregata, Suppl. List. (page 492). Add as a synonym *B. brevipaniculata,* Hort., not Schneid.; the true *B. brevipaniculata* is not in cult.

B. Wallichiana, Suppl. List. The species cult. under this name and described here is *B. xanthoxylon,* Hassk., to which *B. Wallichiana* var. *latifolia,* Hort., and also *B. Knightii,* Hort., *B. macrophylla,* Hort., and *B. Wallichiana,* Hort., not DC., must be referred as synonyms. The true *B. Wallichiana,* DC., has elliptic lvs. of firmer texture and is not in cult., while the true *B. Wallichiana* var. *latifolia,* Hook f. & Thoms., belongs as a synonym of *B. Hookeri,* Lem.

BÉTULA. Page 497.

Var. **Práttii,** Burkill. (End of No. 3, *B. utilis.*) Lvs. nearly truncate at the base, more gradually acuminate, the secondary veins scarcely pilose, but the veinlets short-pubescent: scales of the catkins with very short lateral lobes. W. China.

álbo-sinénsis, Burkill (*B. ùtilis* var. *sinénsis,* Winkler). (After No. 3.) Tree, occasionally to 100 ft., with orange-red bark: branchlets glabrous, lustrous: lvs. ovate, acuminate, rounded at the base, sharply and doubly serrate, glabrescent beneath, with 9–10 pairs of veins, 1½–3 in. long: cones cylindric, 1½–1¾ in. long; bracts glabrous, scarcely ciliate, slightly glandular; lateral lobes rounded, much shorter than the linear-lanceolate middle one. Cent. and W. China. Var. **septentrionàlis,** Schneid. Branchlets distinctly glandular: lvs. beneath on the veins often silky and bearded. N. W. China.

Potanínii, Batal. (*B. Wilsonii,* Bean). (After No. 7.) Shrub, to 10 ft., usually with spreading and prostrate branches, in its native habitat often hanging down over cliffs: branchlets densely brownish pubescent: lvs. short-petioled, ovate, acute, rounded or cuneate at base, irregularly, often doubly serrate, with 13–20 pairs of veins, dark green above, densely brownish pubescent beneath, ¾–1¾ in. long: cones ¾in. long: scales with the middle lobe at least twice as long as the rounded lateral lobes. W. China.

In *B. pendula,* No. 9, strike out var. *Tauschii* and its description and insert after the end of the paragraph:

japónica, Sieb. (*B. álba* var. *japónica,* Miq. *B. péndula* var. *Taùschii,* Rehd.). Tree: branchlets glabrous or more or less glandular: lvs. broadly or deltoid-ovate, acuminate, truncate or broadly cuneate, sometimes subcordate at the base, simply or doubly serrate, glabrous or puberulous beneath and sometimes bearded in the axils, 2–3 in. long: cone cylindric, its stalk ¼–⅓ in. long; scales with the lateral lobes spreading or recurved, as long or longer than the middle one. Japan. S.I.F. 1:21. Var. **szechuánica,** Schneid. (var. *mandschùrica,* Schneid., not Winkler). Tree with wide-spreading branches: lvs. rounded or broadly cuneate at the base, glabrous or nearly so, dull or bluish green above: lateral lobes of scales spreading, half as long as the lanceolate middle one. W. China.

BUDDLÈIA. Page 585.

Fárquharii, L. Barron (*B. asiática* × *B. officinàlis*). (After No. 5.) Intermediate between the parents. Lvs. lanceolate, 4–6 in. long, white or yellowish white beneath: fls. pale mauve, fragrant, in slender spikes forming large terminal panicles to 1 ft. long; the spikes composed of stalked, 3–7-fld. clusters. Raised by R. & J. Farquhar & Co., Boston, in 1913. Gn.M. 21:155.

CALLISTÈMON. Page 630.

Other names, than those described in Vol. II are listed in California, but their botanical standing is in doubt. The best that can be done at present is to make the following statements:

coccíneus, Muell. Similar to *C. lanceolatus* but lvs. smaller, 1–1½ in. long, pungently acute; midrib and nerve-like margins prominent but lateral veins inconspicuous: stamens ¾–1 in. long, red, with yellow anthers: fr. strongly contracted at summit. Austral.

Cúnninghamii, Koch. Listed in Calif.: "Lvs. extremely narrow. Growth low and compact." Botanically described as follows: Lvs. elliptical, wide-spreading, pale green, pellucid or sometimes roughish, marginal nerves and veins rather prominent, young lvs. reddish, somewhat silky: stamens scarcely 3 times longer than the petals. Austral.

floribúndus péndulus. A trade name used in Calif. for an unknown form recently intro. from European gardens. Described as of compact growth with short slender drooping branches well covered with short broad and rather blunt lvs. Probably a form of *C. lanceolatus.*

hýbridus, DC. Described only from lvs. which are rigid, linear, almost pungent, and with marginal nerve.—Not recognized by recent authors. The plant offered in Calif. under this name is probably a garden hybrid from Eu.

C. robústus, and **C. spléndens** are trade names used in Calif. for forms recently intro. from Eu. Their botanical status is unknown.

HARVEY MONROE HALL.

CÁSSIA. Page 680.

polyántha, Moc. & Sessé. Branches angled: lvs. about 12-paired, glabrous, spreading; lfts. petiolulate, 4 lines long, oval, mucronate: fls. paniculately subcorymbose, 9 lines diam.; calyx-segms. broadly ovate, mucronate; petals unguiculate, obovate: pod compressed, acute at both ends, 2 in. long, 6 lines broad. Mex.—In Calif. said to be a spreading shrub blooming freely and continuously; yellow.

CÉLSIA. Page 709.

Arctûrus, Jacq. Probably perennial, but sometimes perhaps annual or biennial, differing from *C. cretica,* among other things, in its long-pedicelled rather than

subsessile fls.: more or less woolly, especially below: lvs. all alternate, canescent beneath, short-petioled, lyrate, the terminal segm. large and oblong-obtuse with crenate margins, the later segms. smaller and ovate; cauline lvs. few, oblong and slightly clasping: fls. verbascum-like, yellow, the five spreading lobes obtuse, purple-hairy stamens deflexed and ascending. Crete. B.M. 1962.

CENTAURÈA. Page 712.

orientàlis, Linn. (After No. 9.) Perennial, 3 ft., erect and branching, the branches sparsely cobwebby: lvs. coriaceous, glabrous or roughish, pinnatisect into lanceolate or linear divisions: heads yellow-fld. (said to be a red-fld. form), large, ovate; bracts of involucre pale or colored at tip, the intermediate or outer ones ovate and prominently pectinate. Caucasus region.—A handsome species, with long-stalked heads. Centaurea is a large genus, with many ornamental species, and other kinds than those described in the Cyclopedia are likely to come into the trade from time to time as flower-garden and border subjects.

CHÆNOMÈLES. Page 727.

japónica. It has been shown recently that Thunberg, when describing his *Pyrus japonica*, had the species now called *C. Maulei* in mind: therefore the name **C. japonica,** Lindl., must replace the name *C. Maulei*, and the species called here *C. japonica* must bear the name **C. lagenària,** Koidzumi (*Cydònia lagenària* Loisel.); and *C. cathayensis* should be a variety of it: Var. **cathayénsis,** Rehd. (*C. cathayénsis*, Schneid.). Lvs. narrower, lanceolate, pubescent beneath while young. Cent. China. H.T. 27:2657, 2658. Another variety is: Var. **Wilsonii,** Rehd. Lvs. covered beneath with a persistent fulvous woolly tomentum. W. China.

C. Maulei, Schneid., becomes **C. japonica,** Lindl.

CLÉMATIS. Page 787.

No. 14, *C. nutans*. Var. *thyrsoidea* is now considered a distinct species and has been named:

C. Rehderiàna, Craib (*C. nùtans* **var.** *thyrsoídea*, Rehd. & Wilson).

No. 28, *C. montana*, add: forma **platysépala,** Rehd. & Wilson. A form of *C. montana* var. *Wilsonii* with broadly obovate, rounded or truncate sepals: the fls. are very round in shape and appear at the same time as the lvs.

C. Gouriana in the Suppl. List (page 798), add: Var. *Finétii*, Rehd. & Wilson. Achenes glabrous, orbicular-ovoid and compressed, dark brown.

CÒCOS. Page 812.

schizophýlla, Mart. Trunk, 6–9 ft. high: lvs. 6–9 ft. long; segms. 30–40, linear, acuminate, 12–16 in. long: spadix up to 3 ft. long: drupe orange-red. Brazil.—Described as a strong-growing species, useful for planting out in Fla. and Calif.

CÓRNUS. Page 851.

Wálteri, Wang. (After No. 13.) Tree, to 40 ft.: branchlets nearly glabrous: lvs. elliptic, acuminate, broadly cuneate at the base, sometimes nearly rounded, usually crisped at the margin, dark green above, pale green and with appressed hairs beneath, with usually 4 pairs of veins, 2–4 in. long: panicle corymbose, about 3 in. across; style club-shaped: fr. black, about ¼in. across. Cent. China.—This plant has been confused with *C. Wilsoniana* which is apparently not in cult. and is chiefly distinguished by the whitish under side of the lvs. and the cylindric style.

Hémsleyi, Schneid. & Wang. (After No. 14.) Shrub, to 20 ft.: branchlets appressed-pubescent at first, becoming glabrous and reddish brown or purple: lvs. ovate to ovate-elliptic, short-acuminate, rounded at the base, with 6–7 pairs of veins, whitish and appressed pubescent beneath, often with brownish hairs along the midrib and veins, 2–3 in. long: corymb umbel-like, 2–3 in. broad, slightly pubescent or with brownish woolly hairs; style cylindric: fr. ⅓in. across, bluish black. W. China.

CRATÆGUS. Page 878.

coloradénsis, A. Nels. (After No. 35.) Low tree, to 12 ft., with glossy brown, sparingly spiny branches: lvs. broadly oval to orbicular, acute, rounded or somewhat cuneate at the base, incisely and coarsely toothed, sparingly pubescent above, nearly glabrous beneath except pubescent on the midrib and veins, about 2 in. long; petioles rather short: corymbs many-fld.; pedicels and calyx-tube hirsute; stamens 10; styles usually 3: fr. subglobose, about ½in. across, dark scarlet, with juicy pulp. Colo.

erythrópoda, Ashe (*C. cerrònis*, A. Nels.). (After No. 35.) Small tree, to 15 ft.: branchlets glabrous, purplish brown, spiny: lvs. elliptic-ovate or obovate, acute, abruptly narrowed at the base, incisely serrate and slightly lobed above the middle, lustrous and sparingly pubescent above, particularly on the veins, glabrous below, 1½–2½ in. long: corymb glabrous; stamens 5–8, with purple anthers: fr. subglobose, ½in. across, brown. Colo.

salígna, Greene. (After No. 37.) Tree, to 20 ft., with spreading or drooping branches, spiny; branchlets bright red, glabrous: lvs. rhombic-elliptic to rhombic-lanceolate, acute or sometimes rounded at the apex, cuneate at the base, slightly hairy and dark green above, paler green and glabrous beneath, 1¾–2 in. long: corymbs glabrous: fls. ⅔in. across; stamens 20, anthers yellow: fr. globose, blue-black, ½in. across, with 3–5 nutlets. Colo. S.M. 491. B.B. 482.

CÙPHEA. Page 913.

jorullénsis, HBK. (*C. tricolor*, Moc. & Sessé. *C. arvénsis*, Benth.). Herb; branches compressed, viscous-pubescent; lvs. oblong-lanceolate, 2 in. long, ¾in. broad, acute, base rotundate, both surfaces scabrous: peduncles solitary to ternate, alternate: calyx viscid-pubescent, tubular, ventricose below. Mex.—*C. jorullensis*, Hook. B. M. 5232=*C. micropetala.*

Hookeriàna, Walp. (*C. floribúnda*, Hook. & Arn., not Lehm. *C. Roèzlii*, Carr.). Shrubby; branches elongate scabrous; lvs. oblong-lanceolate, acuminate, base attenuate to a rather long petiole, both surfaces somewhat shining, scabrous: calyx deflex-bowed, base obtusely, viscous-pubescent, spurred. Mex.

CYNOGLÓSSUM. Page 939.

nervòsum, Benth. Plant hairy-pubescent, to 3 ft., perennial: lvs. many, nearly sessile, elliptic or oblong, acute, those on the st. 4 in. long and not prominently nerved, the radical ones narrow-oblanceolate and with several pairs of strong nerves: fls. deep cobalt-blue, about ½in. across, in many lax axillary and terminal racemes which are 3–6 in. long; corolla broadly campanulate with a short tube. Himalayan region. B.M. 7513, where it is said to be "the largest-flowered Himalayan Cynoglossum, and a very handsome plant."

CYPÈRUS. Page 940.

adenóphorus, Schrad. About 2 ft. high: culm glabrous: lvs. shorter than the culm, linear, carinate: umbel 9–14-rayed; umbellules 6–9-rayed; rays 10–20-spiked; spikelets linear-lanceolate, many-fld., 3 lines long, the infl. whitish green: fr. obovate, 3-angled punctate-scabrous. Brazil.—Useful for pots.

DÆMÓNOROPS. Page 951.

físsus, Blume. Lf.-segms. many and graceful, 6–8 in. long, lanceolate, subulate-acuminate, plicate, apex penicillate, often bifid; rachis aculeate: spadix erect, contracted: fr. ovoid-globose, about the size of a small cherry. Borneo.—Foliage described as bronzy green.

DECKÈNIA (after Karl von der Decken, German explorer of East Africa, killed in 1864 by the Somalis). Sometimes misspelled *Deckeria:* but there is a genus name Deckeria which, however, is regarded as a synonym of Iriartea. *Palmaceæ.* One species, by some referred to Acanthophœnix, from the Seychelles, now intro. as a warmhouse palm. **D. nóbilis,** Wendl., is a tall palm, reaching 100 ft. and more, and 1 ft. or more in diam.: lvs. pinnate, 10–12 ft. or more long, the sheath 3–6 ft. long and usually spiny; petiole about 1 ft. long, pale green and smooth; pinnæ narrow, hairy beneath, bristly when young; midrib yellow: fls. monœcious, in 3's, the middle one female, the male with 9 stamens and minute perianth, the female with imbricate perianth: spadix with slender pendulous branches which are spiny at the base; spathes 2, spiny, seldom exceeding 1 ft.: fr. much compressed, ovoid-deltoid, ½in. long and ⅓in. thick, black turning to straw-colored.

DELPHÍNIUM. Page 975.

speciòsum. The trade name may apply to a showy garden form of undetermined origin. *D. speciosum,* Bieb., to which the botanical name applies, is a tall gray-tomentose perennial of the Caucasus: st. angled, paniculate above: lvs. palmately parted, the segms. acute and cut, the lower segms. not divergent: spur incurved at the point, equaling the sepals; petals glabrous above; ovary tomentose. Caucasus region, Persia.—*D. speciosum glabratum* is said by Nicholson to be similar in growth and fls. to *D. cashmirianum,* but has larger infl. and the fls. have longer spurs; Himalaya.

DIÁNTHUS. Page 997.

marginàtus. The trade name may represent a marginate or edged form of one of the common annual garden pinks; if *D. marginatus,* Poir., it is a perennial of Europe, with linear marginate lvs. and solitary white fls.; calycine scales or bracts acute and shorter than the calyx.

ÉLYMUS. Page 1111.

gigantèus, Vahl. Giant Siberian Rye-Grass. A tall species resembling *E. condensatus:* spike 1 ft. or more long; glumes narrow below, subulate above, longer than the several florets; lemmas pubescent, awnless. Siberia.—Sometimes cult. as an ornamental.

EREMÙRUS. Page 1128.

turkestánicus, Regel. Plant about 4 ft. high, with very long and dense terminal raceme of reddish brown fls. with long-exserted stamens and white-margined perianth-segms.: lvs. broadly linear, acuminate. Turkestan.

EUCALÝPTUS. Page 1152.

álba, Reinw. (*E. platyphýlla,* F. v. M.). Related to *E. populifolia,* but lvs. much more variable, from lanceolate to broadly ovate or almost orbicular, acute to cordate at base, mostly 3 in. long: umbels in the axils and paniculate, 3–7-fld., pedicels short or almost none, angular: cap hemispherical, low: valves slightly protruding. Austral. Maiden, Crit. Rev. Eucal. 105, 106, 107.—Grown at Los Angeles.

EUPATÒRIUM. Page 1166, after No. 22 (but lvs. stalked).

serótinum, Michx. An attractive species, 4–8 ft. high, with grayish white numerous fls. in a broad cymose infl.: branching, pubescent at least above: lvs. ovate-lanceolate, long-acuminate, 3-nerved, slender-petioled, sharp-serrate, the upper ones alternate: fls. 7–15 in the campanulate involucre, of which the bracts are obtuse or truncate. Minn., south and southeast.

EVÒDIA. Page 1185.

hupehénsis, Dode. (After *E. Henryi.*) Tree, to 60 ft.: lfts. 7–9, short-stalked, elliptic-ovate to elliptic-lanceolate, long-acuminate, rounded or rarely narrowed at the base, glaucescent or pale green beneath and glabrous or nearly so except villous in the axils of the veins, 3–6 in. long: infl. slightly pubescent, 4–8 in. broad: fr. beaked, yellowish gray, slightly hairy. Cent. China.

FÌCUS. Page 1229.

ulmifòlia, Lam. (*F. sinuòsa,* Miq.). Shrub, 9–15 ft. high: lvs. alternate, variable, very harsh, oblong, subentire, undulately lobed or coarsely toothed, sometimes deeply and narrowly lobed, acuminate, base rounded, 3-nerved, 3½–7 in. long, 2½–3¼ in. broad: fr. axillary, solitary or in pairs, orange-red to purplish, ovoid to ellipsoid, about ¾in. long. Philippines.

ùtilis, Sim. Large tree: lvs. elliptic-cordate, 6–10 in. long; 4–5 in. broad, obtuse, leathery; petiole thick, 2–4 in long; stipules membranaceous, 4–6 in. long, 1½–2 in. broad, obtuse, yellowish with brown spots: fr. solitary or clustered, almost globos, pubescent. Natal and Zululand.—Used for the manufacture of native cloth and rough cordage.

GALÈGA. Page 1311.

bícolor, Hausskn. Perhaps a form of *G. officinalis:* lfts. oblong-linear rather than oblong-lanceolate, often retuse: raceme more lax or open: calyx-teeth mostly shorter than the tube rather than longer: standard deep blue, the wings and keel whitish blue. Mesopotamia.

GENTIÀNA. Page 1323.

tibética, King. A Himalayan species of which no close relatives from that region are described in this Cyclopedia, and which now appears as a name in the trade. Described by King as follows: st. very stout, erect, 18-in. high, simple: st.-lvs. 6 in. long, lanceolate, connate at base into a cylindric sheath, the uppermost sessile and whorled and forming an involucre to the infl.: fls. crowded in the uppermost axils, sessile; calyx tubular, membranous, truncate, split on one side, the mouth minutely 5-toothed; corolla nearly 1 in. long, tubular-funnel-shaped, the lobes 5, triangular with a triangular fold in each sinus: caps. included; seeds ellipsoidal.

HELICHRÝSUM. Page 1450, after *H. arenarium.*

angustifòlium, DC. Subshrub, the many virgate sts. appressed-canescent: lvs. linear, odorous, margins revolute: fl.-heads in a compound lax terminal corymb, small, oblong-cylindric, the pale involucre with few imbricate scarious obtuse scales. S. Eu.—Said to be a good plant for edgings, with white foliage.

HIBÍSCUS. Page 1483.

The names *H. cruentus* and *H. Lambertianus* in lists are probably forms of *H. Rosa-sinensis;* however, the botanical species bearing these names may be described, as surety:

cruéntus, Bertol. St. erect, unarmed: lvs. petioled, palmately 3–5-fid, base cuneate, lobes oblong, lanceolate, obtuse, obtusely crenate: fls. racemose, red, 2–3 or solitary; outer calyx half shorter than the inner, many-parted, the segms. lanceolate-linear, acuminate, inner deeply 5-fid, much larger, about 1 in. long; caps. ovate. Guatemala.

Lambertiànus, HBK. Herb: st. simple, 6 ft. high, aculeate, minutely pilose: lvs. petioled, ovate-lanceolate, acuminate, base rounded, serrate, hirsute and green above, below canescent-tomentose, 5 in. or more long; stipules linear-subulate: fls. axillary, solitary, pedunculate, large; calyx double, outer 11-parted, divisions linear, inner campanulate, 5-parted; corolla 5-parted, unequally oblong, apex rotundate, base cuneate. Venezuela.

ÍNULA. Page 1655, after *I. hirta.*

montàna, Linn. Perennial, with erect mostly 1-headed villous st.: lvs. lanceolate, entire, villous, the radical ones narrowed into petiole: outer involucre scales oblong-lanceolate and somewhat obtuse, the inner ones acute: achene hairy: plant about 1–1½ ft. high, the heads bearing many narrow yellow rays. S. Eu.

ÌRIS. Section Evansia, species 1–5, page 1669.

gracílipes, Gray. Rootstock slender and branched: lvs. 3–4, radical, linear and grass-like, becoming 1 ft. long: peduncle filiform, about the length of the lvs., 1–3-headed: fl. solitary and sessile in the scarious 1-lvd. spathe, lilac; tube exceeding the 3-angled ovary, the segms. obcordate-oblong, the exterior lobes glabrous; crest yellow; stigma 2-fid, cut. N. Japan.—Small plant, about 8 in. high, flowering freely in May.

JUNÍPERUS. Page 1728.

chinénsis var. procúmbens, No. 11. Under this name apparently three different forms have been confused; these are:

chinénsis var. japónica, Vilm. (*J. japónica,* Carr.). A dwarf shrub with foliage mostly of the juvenile type; of this two forms are in cult.: Var. **japónica aùrea,** Bean (*J. chinénsis* var. *procúmbens aùrea,* Beiss.). Of more spreading habit with a few long branches, the young growth golden yellow. Var. **japónica aùreo-variegàta,** Bean (*J. chinénsis* var. *procúmbens aùreo-variegàta,* Beiss.). Of more compact and upright habit, the young growth variegated with golden yellow.

chinénsis var. **Sárgentii,** Henry. A prostrate form with long spreading stems, the lateral branchlets ascending, forming dense mats; lvs. on young plants almost all acicular and grass-green, on fruiting plants all or nearly all scale-like and bluish green. Japan.—As a ground-cover this juniper is one of the most valuable. Intro. in 1892 to the Arnold Arboretum by Sargent and subsequently distributed as *J. chinensis* var. *procumbens.*

procúmbens, Sieb. (*J. chinénsis* var. *procúmbens,* Endl.). Low prostrate shrub with the branches ascending at the ends: lvs. bluish green or glaucous, all acicular, in 3's, lanceolate, pungent, with a broad white band above divided near the apex by the green midrib: fr. not known. Japan.—Closely related to *J. squamata* from which it may be distinguished by the branchlets being glaucous-white on the edges of the pulvini.

LÀRIX. Page 1823.

The hybrid between *Larix decidua* and *L. leptolepis* mentioned under *L. decidua* has been named **L. hýbrida.** Its lvs. are much like those of the *L. leptolepis;* the mature branchlets are light brownish yellow and slightly bloomy.

LITHOCÁRPUS (literally *stone fruit*). *Fagàceæ.* The article Pasania (page 2479) is to be referred to this new entry, as Lithocarpus is the older name and is the tenable one under the rules (see note in Sargent, Pl. Wilson. III. 205). Of Lithocarpus the following species are known to be in cult:

densiflòra, Rehd. (*Pasània densiflòra,* Vol. V, p. 2479).

cleistocárpa, Rehd. & Wilson (*Quércus cleistocárpa,* Vol. V, p. 2890).

córnea, Rehd. (*Pasània cornea,* **Vol.** V, p. 2479).

glàbra, Rehd. (*Pasània glàbra,* **p. 2479**).

Hénryi, Rehd. & Wilson (*Quércus Hénryi,* p. 2890).

thalássica, Rehd. (*Pasània thalássica,* p. 2479).

LYSIMÀCHIA. Page 1935.

japónica, Thunb. Annual: st. slender and decumbent, simple, villous or pubescent, the apex erect: lvs. opposite, petiolate, roundish and subcordate to ovate, obtuse, entire: fls. 1 or 2 in the axils, the peduncle shorter than the lvs. and reflexed in fr.; corolla ⅓in. or less across, yellow, the gland-dotted segms. oblong. In moist places and about fields, Japan, China, India, to the Philippines.—Whether the creeping yellow-fld. plant listed under this name is the true *L. japonica* is apparently yet to be determined.

NEPHRÓLEPIS. Page 2131.

To supplement the original account of Nephrolepis, there are published herewith revised lists of varieties. The first list (A) represents the forms now growing in the living collection of the Brooklyn Botanic Garden (1916–1917). It may be accepted as accurate as far as it concerns the varieties of *N. exaltata.* With respect to the varieties of species other than *N. exaltata,* no assurance of accuracy can be given. The proper classification of the wild forms of Nephrolepis is one of the most difficult problems in fern taxonomy, and with the inclusion of horticultural forms the difficulty is increased. The second list of names represents those forms which it has not yet been possible to secure for cultivation at the Botanic Garden. They are listed here merely to make the list of named forms as complete as possible. Most of the list was published in "Horticulture," October 28, 1916, accompanied by names of originators.

Regarding the other forms, it may be said that for American florists the Exaltata group includes practically all forms of commercial value. All these would be classed as greenhouse forms. Most of the species and varieties other than Exaltatas are stove forms. A few, especially the forms of *N. cordifolia* (including *N. tuberosa,* a synonym), and *N. pectinata,* will stand as much cold as the Exaltata varieties. Many of them are worth a place in a collection, but in general they do not make the many-leaved bushy plants so much prized by the American grower.

It may be noted that a form of *N. cordifolia* is apparently invariably now being grown and offered in the United States as *N. exaltata.* The true *N. exaltata* is really a very different form, more like *N. bostoniensis,* but easily distinguished by its greater stiffness and fewer leaves. Another point of distinction between the Exaltata group and the other is that, with the exception of *N. exaltata* itself, none of this group is spore-fertile. Microscopic examination shows no fertile spores, but does show apparently abortive sporangia. It is practically useless, therefore, to attempt to raise these from spores. Notwithstanding this statement, it may be noted that several widely separated raisings have been reported in which the sporelings showed great variation, and it is not at all impossible that a fertile variety might develop from any one of the forms. Practically all the forms of other species (not *N. exaltata*) are spore-fertile, and may be readily raised in this way. In fact most of the new horticultural varieties in Group AA are reported as having originated from spores.

Finally, in Group AA, there are listed below a number of names for which no plants have been yet secured. They are probably mostly if not all of English origin, and likely to fall in the group of varieties of species other than *N. exaltata.*

A. *Nephrolepis exaltata and its varieties.*

B. *Forms with once-pinnate foliage.*

exaltata: wild species, tropics generally.
bostoniensis.
Childsi.
Dreyeri.
Dwarf Boston.
Edmontoniensis. (English.)
falcata. (There is also an English *falcata.*)
Gretnai.
Giatrasi.
Harrisi.
New York.
Randolphi.
Roosevelti.
Schultheisi.
Scotti.
splendida.
Teddy, Jr.
viridissima.
Wagneri.
Wanamakeri.

BB. *Forms with twice-pinnate foliage.*

Anna Foster.
Baby Pierson (parentage uncertain).
Barrowsi.
Clarki.
duplex bernsteili.
Elmsfordi.
Fosterianna (same as Anna Foster).
Kingsessing.
Millsi.
Piersoni.
Piersoni "improved."
robusta.
Schilleri.
Scholzeli.
splendida.
superbissima.

BBB. *Forms with thrice-pinnate foliage (sometimes producing 2-pinnate forms).*

Clarki.
elegantissima.
elegantissima "improved."
elegantissima compacta
elegantissima cristata. (English.)
exaltata cristata. (Eng.)
Galvestoni.
lycopodioides. (English.)
muscosa.
Piersoni compacta (elegantissima compacta).
Pruessneri.
Scholzeli (sport).
superior.
todeoides. (English.)
todeoides compacta. (Eng.)
todeoides superba. (Eng.)
Verona.
Whitmani.
Whitmani "improved."
Whitmani compacta.
Wichersi.
Wredii. (English.)

BBBB. *Forms with 4-pinnate foliage.*

Amerpohli.
dissecta. (English.)
Goodii.
"gracillima" (not certainly the original gracillima of Barrows).
magnifica.
Marshalli. (English.)
Marshalli compacta. (English.)
Neuberti.
pulcherrima. (English.)
Rochfordi. (English.)
Smithi.

BBBBB. *Forms with 5-pinnate foliage.*

Craigi.
Willmotæ. (English.)

AA. *Nephrolepis varieties and species other than exaltata.*

acuminata.
acuta.
Barteri.
Bausei.
biserrata.
biserrata (*davallioides*) furcans.
biserrata furcans minor (*davallioides furcans minor*).
biserrata var. (Undetermined form.)
canaliculata. (English.)
concinna.
cordata compacta: cordifolia compacta.
cordifolia compacta.
cordifolia gigantea.
cordifolia elegans.
cordifolia tesselata.
crispata congesta.
davallioides: biserrata.
davallioides furcans: biserrata furcans.
Duffii.
ensifolia. (English.)
exalta (=cordifolia).
"*exaltata furcans*" = biserrata furcans.
"*exaltata grandiceps*" = biserrata furcans minor.
falcata. (English.)
Faulkneri. (English.)
floccigera.
Golwigheriana (Zollingeriana.)
Hestoni. (English.)
Hestoni cristata. (English.)
hirsutula.
hirsutula tripinnatifida.
Longii (=superba).
Mayii.
Mayii cristata.
Mayii ornata.
pectinata.
philadelphiensis.
philippinensis. (English.)
pluma.
recurvata.
rivularis.
rufescens (=hirsutula).
rufescens amabilis.
rufescens elegans.
rufescens tripinnatifida.
rugosa. (English).
splendens.
superba.
tuberosa.
tuberosa plumosa.
undulata. (English.)
washingtoniensis.
Westoni.
Wittboldii.
Zollingeriana.

R. C. Benedict.

NESTRÒNIA (according to the author, derived from a Greek word for Daphne). Syn., *Darbya. Santalàceæ.* Native deciduous shrub closely related to Buckleya and differing chiefly in its axillary fls., tufts of hairs at the base of the stamens, simple stigma, and in its globose fr. without enlarged persistent sepals. It has no particular ornamental qualities, but is botanically interesting, as it is a parasitic shrub growing like buckleya on the roots of trees, chiefly on those of pines and oaks. For cult. see *Buckleya.* The only species is **N. umbéllula,** Raf. (*Dárbya umbellulàta,* Gray. *Búckleya umbellulàta,* Hieron.). Glabrous shrub, 1–3 ft., spreading by suckers: lvs. opposite, short-petioled, oval or ovate to elliptic-oblong, acute or obtusish, usually narrowed at the base, bright green, 1–2½ in. long: fls. 4-merous, dicœcious, apetalous, greenish white, small; the staminate slender-pedicelled in 3–9-fld., peduncled umbels; stamens 4, short; pistillate fls. solitary, on stalks ⅛–¼in. long, with ovate calyx-lobes much shorter than the tube: fr. globose, about ½in. across, purplish, bloomy, crowned by the remnants of the calyx-limb. May; fr. in June. Va. to Ga. and Ala. S.F. 7:75.

Alfred Rehder.

NYMPHÆA. Page 2310.

ovalifòlia. (After No. 4.) The plant called *Nymphæa ovalifolia,* as intro. into gardens in 1916, is from newly imported African seed, and was first raised by E. T. Harvey, of Cincinnati. It is not the true *N. ovalifolia,* Conard. The new plant has more oval lvs. than *N. cærulea,* and larger and paler fls. It is to be regarded as a form of *N. cærulea,* deserving a personal name rather than a Latin name. In 1908 Gilg of Berlin described 6 new species of African water-lilies, all allied to *N. cærulea.* The new form here mentioned falls between *N. magnifica* and *N. spectabilis* of Gilg, having certain characteristics of both species.—The plant is "a prodigious grower, the lf.-stalks extending 10 or more ft." The fl. is "a rich cream color tipped with blue at the end of the petals." (Quotations from letters from Mr. Harvey.) Petals 20; stamens 92; carpels 21; sepals thickly marked outside with black lines and dots. Fl. 6-8 in. across. (Data from specimens furnished by Mr. Harvey.)

N. ovalifolia, Conard, Monogr. Nymph, 150, is from German E. Afr., apparently not in cult. Lvs. narrowly elliptic, with large irregular brown blotches above but plain green beneath: fls. deep blue, closed in dull weather.

H. S. Conard.

PASÀNIA. Page 2479.

The oldest and tenable name for this genus is Lithocarpus, which is entered on page 3569. The species of Pasania in the supplementary list of Quercus, page 2890, are also to go into Lithocarpus.

PAVÒNIA. Page 2489.

hastàta, Cav. St. pubescent: lvs. short-petioled, orbicular to oblong, sometimes deltoid, sagittate or hastate, dentate, somewhat tomentose beneath, pubescent above; stipules filiform: pedicels axillary and 1-fld., the involucel 5-bracted, the petals rose-colored and veined at the base with purple. Brazil.—Offered in Calif., as a small purplish-fld. shrub.

PELARGÒNIUM. Page 2532.

acerifòlium, L'Her. One of the Pelargium section, allied to No. 20, inserted here because *Geranium citriodorum* is a name in the trade and the *G. citriodorum,* Cav., is considered to be referable to *P. acerifolium:* the species *P. acerifolium* is shrubby or subshrubby, 3–4 ft. tall, glaucous-green, differing from *P. angulosum* (of which Harvey makes it a variety) in having the lvs. more cuneate at base, more deeply lobed, and more scabrous. S. Afr.—Knuth, in his recent Monograph, keeps the species distinct.

PHILADÉLPHUS. Page 2581.

Add to *P. inodorus:* **P. gloriòsus,** Beadle, is probably not specifically distinct from *P. inodorus;* it differs chiefly in the cup of the calyx being abruptly contracted at the base, not gradually narrowed into the pedicel.

PINÁNGA. Page 2626.

decòra, Lind. & Rod. Unarmed: trunk tall: sheaths, margin of petioles and nerves at first brown; lf.-segms tessile, broadly lanceolate, long-acuminate or sometimes with the apex bifid and rotundate. Borneo.

pátula, Blume. Trunk tall: lvs. unequally pinnatisect, 1–1½ ft. long, 9–14 in. broad; segms. falcate-lanceolate, acuminate, the uppermost with their apex truncate-dentate, and their base equally or unequally attenuate: spadix erect or pendulous, 2–3-fid: fr. ellipsoid, acute, obscurely striate. Sumatra.—Said to be a dwarf species as grown in pots and useful for conservatory. This and the above are recently listed.

PÌNUS. Page 2640.

After *P. sylvestris* var. *pumila* add: Var. **Wâtereri,** Hort. (*P. Wateriàna,* Hort.). Dense columnar form with steel-blue short lvs.

POTENTÍLLA. Page 2773.

Add to *P. fruticosa:* Var. **parvifòlia,** Wolf (*P. parvifòlia,* Fisch.). Lfts. usually 7, oblong-elliptic, glabrescent, ⅙–⅓in. long: fls. pale yellow, ¾–1 in. across. Cent. Asia, W. China, Himalayas. It may here be remarked that var. *Veitchii,* Bean, can scarcely be considered a hybrid of typical *P. fruticosa* and var. *dahurica* as formerly supposed, for it is now reported as common in Cent. and W. China, where var. *dahurica* has not yet been found; it was intro. in 1902, while var. **Friedrichsenii,** Rehd. (*P. Friedrichsenii,* Spaeth) was raised about 1895 in Spaeth's nursery from seed of var. *dahurica;* it differs from var. *Veitchii* in the yellowish fls. with narrower outer sepals, narrower and larger lfts. and pale, not lustrous brown stipules.

PTYCHORÀPHIS. Page 2856.

singaporénsis, Becc. (*Drymophlœus singaporénsis,* Hook. *Ptychospérma singaporénsis,* Becc.). Trunk low, about 4½ ft. high: lvs. about 5 ft. long, pinnately pectinate, segms. narrowly lanceolate, acuminate, about 8 in. long: spadices about 1 ft. long, simply branched from the base. Singapore.

RHODODÉNDRON. Pages 2938, 2942.

4. R. arbutifòlium. Two species or hybrids are involved here. The synonyms *R. oleæfolium* and *R. Wilsonii* should be eliminated. *R. arbutifolium* is probably a hybrid of *R. ferrugineum* and *R. carolinianum.* The lvs. are elliptic, not "to elliptic-lanceolate," and the size is 1½–2½ in. After *R. arbutifolium* insert:

lætévirens, Rehd. (*R. Wilsonii,* Hort., not Nutt. *R. Wilsoniànum,* Hort. *R. oleifòlium,* Hort., not Franch.). Probably a hybrid of *R. ferrugineum* and *R. minus.* Very similar to *R. arbutifolium,* but of slenderer, looser habit, with narrower and longer elliptic-lanceolate lvs. of a brighter green. This plant is generally cult. under the name *R. Wilsonii,* while the preceding one is known in English gardens as *R. arbutifolium.*

austrinum, Rehd. (*Azàlea austrina,* Small). (After *R. calendulaceum,* No. 35.) Shrub, to 10 ft.: branchlets pubescent and usually glandular: lvs. oval or obovate to oblong-spatulate, acute or mucronulate, finely pubescent, ciliate, 1–3½ in. long: fls. before the lvs., yellow or orange; calyx-lobes deltoid or triangular-lanceolate: corolla funnelform, about 1 in. long, the tube scarcely dilated up to the limb; lobes broad, acute: caps. finely glandular-pubescent. Fla.

RÌBES. Page 2963.

In the Suppl. List under *R. Culverwellii,* strike out var. *wollense* which has turned out to be nothing but *R. divaricatum* (see Kew Bull. 1914:382).

SÀLIX. Pages 3052.

To No. 6, after var. *decipiens,* W. D. Koch (*S. decipiens,* Hoffm.) add: Var. **bullàta,** Spaeth (*S. bullàta,* Hort.). Forms a compact subglobose bush.

Between Nos. 6 and 7 insert:

rùbens, Schrank (*S. álba* × *S. frágilis. S. Russelliàna,* Smith. *S. viridis,* Fries). Intermediate between the parents. Tree; branchlets less fragile at the base than *S. fragilis:* lvs. silky when young, glabrous at maturity, intermediate in size: stalk of caps. longer than in *S. alba.* Occurs frequently between the parents. Var. **palústris,** Schneid. (*S. palústris,* Hort.). Silky pubescence of lvs. persisting.

To No. 7, add the following variety: Var. **cálva,** G. F. W. Mey. (*S. álba* var. *cærùlea,* Smith). Of pyramidal habit: lvs. larger, at maturity glabrescent, more bluish green above and more glaucous below.

After No. 7 insert:

hexándra, Ehrh. (*S. álba* × *S. pentándra*). Low tree; mature branchlets glabrous: lvs. lanceolate, green on both sides, silky at first, becoming glabrous: catkins like those of *S. alba;* stamens 4–6. In Eu., with the parents.

After Salix No. 17 insert several species and hybrids, as follows:

latifòlia, Forbes (*S. Cáprea* × *S. myrsinifòlia*). Shrub: branchlets pubescent: lvs. oval or obovate to oblong, usually acute, irregularly serrate, dark green and finally glabrous above, glaucescent and silky below at first, finally glabrescent: ovary thinly silky or partly glabrous. Occurs with the parents.

Erdíngeri, Kerner (*S. Cáprea* × *S. daphnoìdes*). Tall, arborescent shrub: young branchlets short-pubescent, older branches glabrous: lvs. obovate-oblong to oblong, acuminate, usually narrowed at base, entire or slightly serrate, pubescent while young, nearly glabrous at maturity: ovary usually glabrous or thinly silky. Occurs with the parents. Var. **creménsis,** Rehd. (*S. creménsis,* Kerner). Closer to *S. Caprea:* lvs. broader, more densely pubescent beneath: ovary silky.

Wimmeriàna, Gren. & Godr. (*S. Cáprea* × *S. purpùrea*). Shrub with upright branches: young branchlets sparingly short-pubescent, later glabrous, brown: lvs. oblong or obovate-lanceolate to lanceolate, acute, narrowed at the base, irregularly serrate, thinly silky-pubescent while young, later glabrous, dark green and lustrous above, glaucescent below: stamens connate at base; ovary grayish pubescent. Occurs with the parents.

cinèrea, Linn. Large shrub or small tree, to 25 ft.: 1- and 2-year-old branchlets tomentose: stipules often persistent: lvs. obovate or elliptic, acute or rounded, narrowed or rounded at the base, irregularly serrate, pubescent on both sides, 1½–2½ in. long: catkins sessile, before the lvs.; staminate ovoid; filaments pilose, free; pistillate cylindric; ovary pubescent; style very short or wanting. April. Eu., N. Afr., W. and N. Asia. Var. **oleifòlia,** Reichb. (var. *angustifòlia,* Döll). Lvs. elliptic-lanceolate.

Læstadiàna, Hartm. (*S. cinèrea* × *S. lappònum. S. canéscens,* Fries). Low or medium-sized shrub: young branchlets pubescent, older glabrous: lvs. obovate to oblong, acute or short-acuminate, narrowed at the base, irregularly serrate or entire, pubescent above, tomentose beneath: fls. before the lvs.; stamens sparingly hairy at the base; ovary pubescent; style to one-third as long as ovary. N. Eu. with the parents.

sórdida, Kerner (*S. cinèrea* × *S. purpùrea. S. Pontederàna,* W. D. Koch, not Willd.). Tall upright shrub: young branchlets tomentose, later glabrous, brown or yellowish: lvs. elliptic to lanceolate, acute, cuneate or rarely obtuse at the base, irregularly serrate, pubescent while young, later glabrous above, glabrescent and glaucous beneath: catkins on short, often leafy stalks; stamens usually connate one-half; ovary pubescent with short style. Eu. with the parents.

aurìta, Linn. Shrub, 3–8 ft.: branches spreading, usually glabrous at maturity: stipules persistent, broad: lvs. short-petioled, obovate to elliptic, obtuse, usually rounded at base, irregularly dentate or nearly entire, pubescent on both sides or nearly glabrous above, glaucous beneath, 1–2, rarely to 3 in. long: catkins short-stalked or nearly sessile, a little before the lvs., the staminate broadly elliptic, with long filaments hairy at base; the pistillate cylindric; ovaries hairy; style very short or wanting. April. Eu., W. Asia to Altai Mts.

ambígua, Ehrh. (*S. aurìta* × *S. rèpens*). Shrub, about 3 ft., with creeping st.: branchlets glabrous: lvs. elliptic to lanceolate, somewhat rugose, pubescent, later glabrescent above, about 1 in. long: catkins a little before the lvs.; ovary pubescent; style rather long. In Eu. with the parents.

ludíficans, White (*S. aurìta* × *S. phylicifòlia*). Shrub: branchlets glabrous at maturity: stipules usually persistent: lvs. elliptic to narrowly obovate, crenulate, glabrous at maturity, glaucous beneath: catkins rather small, on leafy stalks, cylindric; ovary pubescent. N. Eu., with the parents.

sesquitértia, White (*S. aurìta* × *S. phylicifòlia* × *S. purpùrea*). Intermediate in general appearance between *S. aurita* and *S. phylicifolia:* lvs. in shape like the former but with the nervation of the latter and nearly glabrous at maturity: stamens quite connate; ovary pubescent with slender style. Observed in England with the parents.

grandifòlia, Ser. (? *S. appendiculàta,* Vill.). Shrub, to 10 ft., with spreading branches: branchlets tomentose while young; stipules often conspicuous, semi-cordate: lvs. oval to obovate-lanceolate, acute, cuneate or rounded at the base, crenately serrate, glabrous at maturity except the pubescent midrib beneath, dark green above, light green or glaucescent and reticulate beneath, 2–6 in. long: catkins before or with the lvs. on short stalks with small bract-like lvs.; stamens hairy below; ovary long-stalked, pubescent; style short. Higher mountains of Cent. and S. Eu.

neriifòlia, Schleich. (*S. grandifòlia* × *S. purpùrea. S. Pontederàna,* Schleich., not Willd. *S. austrìaca,* Kerner). Shrub, to 6 ft., with upright slender branches: young branchlets pubescent, later glabrous, greenish or brown: stipules rather narrow: lvs. obovate-lanceolate to lanceolate, acute, serrulate, glabrous at maturity, glaucescent and reticulate beneath, 2–3 in. long: catkins shortly before the lvs.; filaments more or less connate; ovary stalked, pubescent, with very short style. Cent. Eu. with the parents.

myrsinifòlia, Salisb. (*S. nígricans,* Smith. ? *S. spadìcea,* Chaix). Shrub, to 12 ft.: branchlets hairy or glabrescent, dull: stipules often rather large, subcordate: lvs. varying from elliptic, or rarely suborbicular to oblong-obovate or broadly lanceolate, usually acute, rounded at the base, serrate to nearly entire, glabrous or glabrescent above, more or less pubescent beneath, 1–3 in. long, usually blackish when dried: catkins with or a little before the lvs., short-stalked, bracted or leafy at the base; staminate rarely exceeding ¾in.; pistillate cylindric; ovary stalked, usually glabrous, style slender. Eu., W. Asia to Kamchatka.—A very variable species.

tetrápla, Smith (*S. myrsinifòlia* × *S. phylicifòlia*). Intermediate between the closely related parents. It can best be recognized by the combination in various degrees of the characters of the two species which are chiefly the duller and more pubescent branches and lvs. and the larger stipules of *S. myrsinifolia* and the more shining and glabrous branches and lvs. and the smaller stipules of *S. phylicifolia.* Occurs in Eu. between the parents.

phylicifòlia, Linn. (*S. bícolor,* Ehrh.). Upright shrub, to 3 or rarely 8 ft., with stiff and rather short branches: branchlets glabrous, polished: stipules small, caducous, or wanting: lvs. short-petioled, elliptic or elliptic-oblong, acute, rounded at base, nearly entire or minutely crenate-serrate, glabrous at maturity, yellowish green and glossy above, glaucous beneath, 1–3 in. long, not black when dried; catkins before or with the lvs., on short leafy stalks; ovaries pubescent or sometimes glabrous, stalked; style rather long. N. and Cent. Eu., N. Asia.

To Salix, No. 24, add: Var. **Gmélinii,** Anderss. (var. *songàrica,* Regel). Fls. with the lvs.; ovary sessile, obtuse with a short and thick style and long stigmas. Russia, N. and Cent. Asia.

After Salix, No. 24, insert three:

stipulàris, Smith (*S. cinèrea* × *S. viminàlis. S. holosericea,* Willd.). Shrub or small tree: branchlets long and stout, persistently pubescent: lvs. lanceolate to oblong-obovate, acute or acuminate, irregularly serrulate or crenulate, hairy on both sides, more densely beneath, 3–7 in. long: catkins before the lvs., short-stalked or nearly sessile; stamens very long; ovary stalked, pubescent, with short style and slender stigmas. Eu., N. Asia, with the parents.

daphnoìdes. Vill. Tall shrub, to 30 ft., rarely tree: branchlets yellowish or brownish, bloomy, glabrous: stipules cordate: lvs. short-stalked, lanceolate, acuminate, glandular-serrulate, glabrous, glaucescent beneath, 1½–3 in. long: catkins sessile, before the lvs.; staminate nearly 2 in. long, filaments sometimes united at the base; pistillate rather shorter; ovary short-stalked, glabrous, with long style. N. and Cent. Eu., N. and Cent. Asia.

acutifòlia, Willd. (*S. daphnoìdes* var. *acutifòlia,* Döll). Closely related to the preceding species: branchlets darker colored, more bloomy: stipules lanceolate, lvs. narrower and longer, lanceolate to linear-lanceolate, long-acuminate: catkins smaller. Eu., N. Asia.

After Salix, No. 27, insert three:

Pìperi, Bebb. Shrub, to 20 ft.: branchlets glabrous, dark brown: lvs. elliptic-oblong, obovate or oblanceolate, acute, undulate crenate or nearly entire, glabrous, glaucous beneath, 4–6 in. long: catkins sessile or short-peduncled; stamens united or free at base; ovary smooth; style rather long. Wash.

hastàta, Linn. Shrub, to 6 ft., young branchlets pubescent, older glabrous, brown: stipules often very large, obliquely ovate: lvs. elliptic or ovate, acute, glabrous, irregularly serrulate, 1½–2½ in. long: catkins with the lvs., in leafy stalks; filaments glabrous; ovary glabrous, style rather long. Eu., N. and Cent. Asia.

glàbra, Scop. Low shrub, to 4 ft., with short, stout branches: young branchlets glabrous, brown: lvs. broadly oval or obovate to oblong, acute, rarely obtuse at the ends, minutely crenulate, glabrous, glaucescent beneath, 1½–3 in. long: catkins with the lvs., on leafy stalks: filaments pubescent at the base; ovary stalked, glabrous, style rather long. Cent. Eu.

After Salix, No. 29, insert two:

Reùteri, Moritzi (*S. daphnoìdes* × *S. incàna. S. Wimmeri,* Kerner). Tall shrub; young branchlets densely pubescent, older brown, glabrous, often bloomy: stipules small, lanceolate; lvs. lanceolate or narrowly

lanceolate, acute at both ends, serrulate, silky pubescent while young, glabrescent at maturity, dark green above, glaucescent beneath, 1½–3 in. long: catkins before the lvs., nearly sessile, cylindric; staminate 1–1½ in. long; ovary short-stalked, glabrous, with short style. Cent. Eu., with the parents.

gracilistỳla, Miq. (*S. Thunbergiàna*, Blume). Shrub: young branchlets tomentose, older reddish brown: stipules cordate: lvs. oblong-obovate to oblong-lanceolate, acute at both ends, serrulate, pubescent when young, later glabrous above, thinly pubescent and glaucescent below with prominent veins, 2–4 in. long: catkins cylindric, before the lvs., sessile; staminate 1–1½ in. long, stamens 2, with connate filaments; pistillate longer; ovary pubescent with long and slender style. Japan.

To Salix, No. 30, add the following varieties:

Var. **Lambertiàna,** W. D. Koch. Lvs. broader, generally obovate-lanceolate, more abruptly acuminate, usually more rounded at the base, up to 4 in. long and ¾in. broad. Var. **sericea,** W. D. Koch. Lvs. silky when young, becoming glabrous. Here belongs the "Kecks Willow" (var. *Kécksii*, Hort.). Var. **amplexicaûlis,** Boiss. Lvs. sessile or subsessile, cordate or rounded at the base, acuminate, oblong to oblong-lanceolate, glabrous.

After Salix No. 30 insert two:

rùbra, Huds. (*S. purpùrea* × *S. viminàlis*. *S. Forbyàna*, Smith). Small shrub: young branchlets short-pubescent, older glabrous: lvs. linear to lanceolate-oblong, acute or acuminate, denticulate, pubescent while young, later glabrescent: catkins subsessile, stamens 2, with more or less connate filaments and red anthers; ovary short-stalked, pubescent, with distinct style. Eu., W. to N. E. Asia, with the parents.

Sieboldiàna, Blume. Upright shrub: young branchlets tomentose, older glabrous: lvs. ovate to oblong, acute, rounded at the base, obtusely serrate, dark green and glabrous above, glaucescent and glabrous below, pubescent only when young, 2–3 in. long: catkins cylindric, short-stalked, with small lvs. at the base; stamens 2, distinct or connate, or only 1; ovary stalked, pubescent, style half as long as ovary or shorter, with short oval stigmas. Japan.

SOLÀNUM. Page 3185.

gigantèum, Jacq. (next to No. 34). An erect shrub-like plant growing to a height of 10–25 ft.: sts. somewhat woody, thickly set with short, stout prickles and white-woolly with stellate pubescence: lvs. oblong or oblong-elliptical, narrowed at both ends, about 8 in. long by 3 in. broad, smooth above, and white-tomentose beneath: fls. cymose, pale violet or blue; calyx small, hoary, unequally 5-cleft; corolla about ¾in. diam., rather deeply lobed; ovary puberulous: fr. red at maturity and about ⅓in. diam. India and Ceylon.—A tender species flowering under cult. when about 4 ft. in height. It is doubtful whether this species is in the American trade, although probably it is as ornamental as other species more or less grown. The *S. giganteum* of lists may be merely a trade name applied to one of the tall-growing species otherwise described under Solanum. W. F. Wight.

NEW COMBINATIONS IN LATIN NAMES

When a species is transferred to another genus, and when a variety is transferred to another species or associated with another species-name or reduced from specific to varietal rank, the names follow them and a "new combination" results. Thus, if an author desires to place the almond in Prunus rather than in Amygdalus, in which Linnæus originally described it as *Amygdalus communis*, the new combination *Prunus communis* results. If *Ribes leiobotrys* of Koehne is considered by Zabel to be only a form of *R. aureum*, the new combination *R. aureum* var. *leiobotrys*, Zabel, results.

To enable botanists and bibliographers to record and trace the different dispositions and properly to understand the varying opinions of relationships, all such new combinations are entered whenever complete synonomies are made.

In the Cyclopedia, it has been the desire to avoid the making of new combinations, as explained on page xi of Vol. I, although, under the exigencies of the work, a very small number has arisen. In Vols. V and VI, many combinations were inevitable, and these were duly published in Rhodora, XVIII, 152–160 (July, 1916); these were largely in the genera Polyscias, Pyrus, Pæonia, Passiflora, Prunus, Statice, Limonium, Saxifraga, Tropæolum.

A list of several incidental scattered new combinations made in the Cyclopedia itself is here given, so far as desired, without histories, for the easy reference of the bibliographer. These are such combinations as the authors designed to make. Undoubtedly other combinations in the use of varietal names, and in the compilatory shift of other names, may be traced by those who have occasion to work over special groups; but these may not be considered here. The new combinations are mostly of horticultural varieties and of species-forms of minor importance. Numberless associations of varietal names cannot be traced to one definite source, as they are found in trade catalogues, periodicals, and other non-botanical publications, or may be customarily employed by horticulturists; these are therefore given the designation "Hort." (hortorum, "of the gardens;" page xvii, Vol. I). In those cases in the Cyclopedia in which no authority is given for varieties, "Hort." is to be understood.

The dates of the new combinations listed below are those of the publication of the six volumes: Vol. I, A-B, March 25, 1914; Vol. II, C-E, July 22, 1914; Vol. III, F-K, May 12, 1915; Vol. IV, L-O, Feb. 23, 1916; Vol. V, P-R, Oct. 4, 1916, Vol. VI, S-Z March 28, 1917. It will be seen that most of the combinations are in the latter part of the alphabet, and among the names of woody plants. No new species have been described in the Cyclopedia, and very few new varieties.

ALLAMANDA CATHARTICA, Linn., var. **nobilis** (T. Moore) Raffill, I. 247.

ALLAMANDA CATHARTICA, Linn., var. **Schottii** (Pohl) Raffill, I. 247.

ALLAMANDA CATHARTICA, Linn., var. **Hendersonii** (Bull) Raffill, I. 247.

ALLAMANDA CATHARTICA, Linn., var. **grandiflora** (Hook.) Raffill, I. 247.

AMARYLLIS BELLADONNA, Linn., var. **pallida** (Rehd.) Bailey, I. 271.

AMARYLLIS BELLADONNA, Linn., var. **Parkeri** (Hort.) Bailey, I. 271.

BRUNFELSIA CALYCINA, Benth., var. **eximia** (Scheidw.) Raffill, I. 581.

BRUNFELSIA CALYCINA, Benth., var. **floribunda** (Hort.) Raffill, I. 581.

BRUNFELSIA CALYCINA, Benth., var. **macrantha** (Lem.) Raffill, I. 581.

BRUNFELSIA AMERICANA, Linn., var. **pubescens**, Raffill, I. 582.

Cissus oligocarpa (Lev. & Van.) Bailey, II. 775.

FUCHSIA MAGELLANICA, Lam., var. **Riccartonii** (Hort.) Bailey III. 1301.

Helenium aromaticum (Hook.) Bailey, III. 1443.

HELIOPSIS HELIANTHOIDES, Sweet, var. **Pitcheriana** (Fletcher) N. Taylor, III. 1452.

HIBISCUS LASIOCARPOS, Cav., var. **californicus** (Kell.) Bailey, III. 1486.

Hosta Fortunei (Baker) Bailey, III. 1604.

HOSTA FORTUNEI, Bailey, vars. **gigantea, robusta, argenteo-variegata** (Hort.) Bailey, III. 1604.

HOSTA LANCIFOLIA, Tratt., vars. **albo-marginata** and **tardiflora** (Hort.) Bailey, III. 1605.

HOSTA LANCIFOLIA, Tratt., var. **undulata** (Otto & Dietr.) Bailey, III. 1605.

Hosta longipes (Franch. & Sav.) Bailey, III. 1605.

Lactuca Bourgæi (Boiss.) N. Taylor, IV. 1766. (*Mulgedium Bourgæi*, Boiss.)

LIRIOPE GRAMINIFOLIA, Baker, vars. **minor** and **koreana** (Wright) Bailey, IV. 1890.

LIRIOPE GRAMINIFOLIA, Baker, var. **intermedia** (Maxim.) Bailey IV. 1890.

Lithocarpus densiflora (Hook. & Arn.) Rehd., VI. 3569.

Lithocarpus cornea (Lour.), Rehd., VI. 3569.

Lithocarpus glabra (Thunb.) Rehd., VI. 3569.

Lithocarpus thalassica (Hance) Rehd., VI. 3569.

Maurandia Lophospermum, Bailey, new name, IV. 2013.

PERILLA FRUTESCENS, Brit., var. **nankinensis** (Decne.) Bailey, V. 2553.

Var. NANKINENSIS, Bailey, subvars. **laciniata, macrophylla, variegata, microphylla** (Hort.) Bailey, V. 2553.

PINUS NIGRA, Arnold, var. **pindica** (Formanek) Rehd.; var. **pendula** (Beiss.) Rehd.; var. **pygmæa** (Rauch) Rehd.; var. **prostrata** (Beiss.) Rehd.; var. **Moseri** (Moser) Rehd.; V. 2641.

POTENTILLA FRUTICOSA, Linn., var. **Friedrichsenii** (Spaeth) Rehd., VI. 3571.

PSEUDOTSUGA TAXIFOLIA, Brit., var. **Fretsii** (Beiss.) Rehd.; var. **Moerheimii** (Ruijs) Rehd.; V. 2847.

PYRUS FUSCA, Raf., var. **levipes** (Nutt.) Bailey; var. **diversifolia** (Bong.) Bailey; V. 2876.

RHODODENDRON OBTUSUM, Planch., var. **amœnum** (Lindl.) Rehd. V. 2944.

Rhododendron candidum (Small) Rehd., V. 2945.

RHODODENDRON QUINQUEFOLIUM, Moore & Bisset, var. **roseum**, Rehd., V. 2947.

Rhododendron lætevirens, Rehd., new name, VI. 3571.

Rhododendron austrinum (Small) Rehd., VI. 3571.

RIBES SANGUINEUM, Pursh, var. **albescens**, Rehd., V. 2958.

RIBES ROEZLII, Regel, var. **cruentum**, Rehd., V. 2962.

ROSA CAROLINA, Linn., var. **villosa** (Best) Rehd.; var. **grandiflora** (Baker), Rehd.; var. **triloba** (Baker) Rehd.; V. 2991.

ROSA SPINOSISSIMA, Linn., var. **inermis** (DC.) Rehd., V. 2995.

RUBUS ODORATUS, Linn., var. **albidus**, Bailey, V. 3024.

RUBUS PROCUMBENS, Muhl., var. **roribaccus** (Bailey) Bailey, V 3031.

SALIX ERDINGERI, J. Kerner, var. **cremensis**, Rehd., n. var., VI. 3571.

SYMPHORICARPOS ALBUS, Blake, var. **ovatus** (Spaeth) Rehd., VI 3293.

TAXUS CUSPIDATA, Sieb. & Zucc., var. **densa**, Rehd., VI. 3316.

THUJA ORIENTALIS, Linn., var. **beverleyensis** (Hort.) Rehd., VI. 3337.

ULMUS FOLIACEA, Gilib., var. **suberosa** (Moench) Rehd.; var. **propendens** (Schneid.) Rehd.; var. **italica** (Henry) Rehd., var. **umbraculifera** (Trautv.) Rehd.; var. **gracilis** (Spaeth) Rehd.; var. **Koopmannii** (Lauche) Rehd.; var. **Ruepellii** (Spaeth) Rehd.; var. **stricta** (Ait.) Rehd.; var. **Wheatleyi** (Simon-Louis) Rehd.; var. **monumentalis** (Ruiz) Rehd.; var. **Dampieri** (Kirchn.) Rehd.; var. **Wredei** (Lauche) Rehd.; var. **pendula** (Rehd.) Rehd.; var. **Webbiana** (Lee) Rehd.; var. **variegata** (Dum.-Cours.) Rehd.; VI. 3412–13.

VIBURNUM WRIGHTII, Miq., var. **Hessei** (Koehne) Rehd., VI. 3461.

VITEX NEGUNDO, Linn., forma **multifida** (Carr.) Rehd., VI. 3481.

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FINDING-LIST

Of Latin or Latinized binomials commonly used in North American literature and commerce, with their equivalents in the Cyclopedia, together with usages that the cataloguer may desire to follow

(*Including a few changes and corrections*)

This List is compiled primarily for the aid of Cyclopedia users, particularly the nurseryman, seedsman, propagator, planter, landscape architect, gardener, labeller, cataloguer, to place before him the commonest names in the catalogues and periodicals of North America and to give him the equivalents of these names. The information given in this List is all contained in the Cyclopedia; but it is more accessible when separated, being placed together in convenient form disconnected from keys and description and from names of plants known as yet only to collectors, students, and specialists. The attention of the consultant is called to the list of additional species beginning on page 3565, in the supplement to Vol. VI, representing trade names not in the body of the Cyclopedia.

The List represents practically the species now in the trade in North America in the usual temperate parts, although it does not pretend to be complete. It does not contain the many Latin names of horticultural forms that may appear in catalogues as species-names (the real species-name being omitted in parts of many trade-lists). Neither does it contain vernacular names: these will be found in alphabetic order in the Index to the Cyclopedia, beginning page 3611.

All generic entries are introduced by **BLACK-FACE CAPITAL TYPE** (name of the genus).

The species-names in **black-face type** are in all cases those used in the Cyclopedia.

The primary or first-given entries under the genus in every case are the trade names or those used commonly in journals and elsewhere; when these names differ from the Cyclopedia name they are in *Italic type;* when the same as the Cyclopedia name, they are in **black-face type.**

A name in parenthesis is one that is used in the trade or in periodicals: thus, "**Acanthophœnix rubra** (Areca)" means that the plant may appear in catalogues under the name Areca. Such entries are cross-references.

The stars (*) denote the names recommended by the American Joint Committee on Horticultural Nomenclature for the use of nurserymen. These markings are made wholly on the responsibility of the Committee, the List being lent for this purpose, and they are not supervised or recommended by the Editor.

While it is desirable that the names used by botanists and horticulturists shall be the same, yet the dealer is confronted with trade conditions which may modify his practice in some cases. The Editor naturally prefers to stand for the accepted botanical names.

To save space, the abbreviation var. (variety) is omitted; but the Editor does not thereby commit himself to the use of trinomials.

STATEMENT OF THE AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE

The American Joint Committee on Horticultural Nomenclature was established by the national organizations named below for the purpose of lessening the confusion, inconvenience, and losses which result to buyers and sellers of plants from the widespread use of different names for the same plant and of the same name for different plants.

The organizations participating, with list of committees, are as follows:

American Association of Nurserymen.—J. Horace McFarland, Harrisburg, Pennsylvania; Harlan P. Kelsey, Salem, Massachusetts; Henry Hicks, Westbury, New York; L. A. Berckmans, Augusta, Georgia; C. J. Maloy, Rochester, New York; Frederick V. Coville (Advisory), United States Botanist, Washington, District of Columbia.

American Association of Park Superintendents.—Herman W. Merkel, Forester Zoölogical Park, New York City; John Dunbar, Assistant Superintendent of Parks, Rochester, New York; Theodore Wirth, Superintendent of Parks, Minneapolis, Minnesota.

American Society of Landscape Architects.—Frederick Law Olmsted, Brookline, Massachusetts; Sid. J. Hare, Kansas City, Missouri; William Pitkin, Jr., Rochester, New York; Warren H. Manning, Boston, Massachusetts.

American Pharmaceutical Association.—Dr. H. H. Rusby, Columbia University, New York City; Oliver A. Farwell, Detroit, Michigan; Dr. Lyman F. Kebler, Washington, District of Columbia.

Ornamental Growers Association.—Harlan P. Kelsey, Salem, Massachusetts; C. J. Maloy, Rochester, New York; Thomas B. Meehan, Philadelphia, Pennsylvania; F. L. Atkins, Rutherford, New Jersey.

The representatives of the American Association of Nurserymen and of the Ornamental Growers Association organized as a Joint Committee in 1915, with J. Horace McFarland as Chairman and Harlan P. Kelsey as Secretary.

At a meeting August 1, 1916, in which the representatives of the American Association of Park Superintendents and of the American Society of Landscape Architects also participated, the same officers were continued and the name American Joint Committee on Horticultural Nomenclature was adopted. The representatives of the American Pharmaceutical Association were added to the committee a few weeks later.

Scope of work.

So far as practicable, it is proposed to secure the standardizing of a single botanical name, together with a single vernacular or "common" name for every tree, shrub, and herbaceous plant in the American horticultural trade.

It is probable also that the Joint Committee will undertake later to recommend a list of *plant-name abbreviations,* as an aid to those who use plant names daily and continually, such as nurserymen, seedsmen, florists, landscape architects, pharmacists, park officials, and others.

The subjoined starred list of Latin binomials should be considered only as a preliminary report. The magnitude and manifest difficulties of the problem, and lack of time occasioned by the early publication of the last volume of this Cyclopedia, have made it necessary for the Joint Committee to confine its recommendations almost wholly to the "botanical" names of woody plants as given in this "Finding-List." The even more important work of endeavoring to standardize popular or "common" names must follow later.

Practical importance of stability in nomenclature.

The confusion of names in the horticultural plant world is at present so great as to clog popular plant knowledge and actually to limit to no small degree the use of certain trees, shrubs and flowers in our American plantings. The

consequent loss to the tradesman is obvious. For example, take the common Virginia creeper: We find this catalogued in 1916 under no less than six Latin binomials—*Ampelopsis quinquefolia, A. virginica, Parthenocissus quinquefolia, P. virginica, Vitis hederacea*, and *Psedera quinquefolia*, while as common names we have *Woodbine, American Woodbine, Virginia Creeper, American Ivy, Common Virginia Creeper, Virginian Creeper, Wild Woodvine*, and *Five-fingered Ivy*. Today both American and foreign nursery catalogues are filled largely with confused and contradictory lists of plant names, while popular books on gardening and horticulture and the horticultural press themselves are at sea, and little if any better off than the tradesman. It is thus often impossible for the buyer to know whether he will get what he has in mind when placing an order, or something entirely different.

Further, owing to the differing names under which both new and old plants are often catalogued, described, and disseminated, the plantsman and buyer become perplexed and discouraged, and proper interest is not awakened. This often results in the over-use of the commoner and less worthy trees and plants to the exclusion of many beautiful things.

Causes of confusion.

Even when there is complete and well-established agreement among botanists as to the classification and naming of any given plant, mistakes by nurserymen or dealers in identification and labeling are liable to occur, giving rise to much confusion. When a dealer, either through ignorance or accident, sends out a comparatively unknown plant labeled with the name of some other little-known plant, the misapplied name is apt to follow the first plant and become established in trade.

A striking case of this sort is that of the tree so widely disseminated for street planting under the common name "*Carolina Poplar.*" Experts on the poplar state that this is probably *Populus Eugenei*, a hybrid originated in Europe, and that the native *Carolina Poplar* practically never passes in the trade under that name. In this extreme case the transferred name is so universally accepted by the trade that an attempt to correct the original mistake would be inadvisable at present.

When, however, a plant has been widely distributed under the name of some other plant, through a mere mistake in identification, and the plant whose name was mistakenly applied to the other is also in cultivation, there is serious confusion, which can usually best be settled by correcting the original mistake even if it has become widely accepted.

Other causes than mistaken identification of plants have contributed to the existing confusion. These involve differences of opinion and of practice among botanists in regard to plant names when there is no question at all about the identity of the plants. For one thing, in doubtful cases they are not yet wholly agreed upon the rules or "code" which shall apply, to decide which of two or more names shall stand; but these differences are comparatively few. Much more important are differences of personal judgment among botanists as to what constitutes in any given case a sufficient difference between two groups of related plants to place them in different genera, for example, whether the known difference between apples and pears is enough to separate them into two genera, *Malus* and *Pyrus*, or is so slight that they should be consolidated into a single genus. The same sort of difference in judgment arises as to what constitutes a sufficient difference to call for separation into distinct species, and as to what are of varietal rank. These differences are inevitable and are independent of rules or other arbitrary decisions.

For example, *Azalea* is now classed under *Rhododendron* by some botanists, yet for trade reasons it seems inexpedient to catalogue the *Azaleas* as *Rhododendrons*.

Probably the most important cause of changes in botanical nomenclature in recent years is the constant collection of new evidence as to the facts. This evidence is of two sorts: evidence found in botanical literature as to the first proper description and naming of each kind of plant, and evidence as to the structure and habits of the plants themselves. When any group of plants is studied more carefully and thoroughly than before, new facts are sure to be discovered which may alter the classification and nomenclature based on previous incomplete or insufficient knowledge.

Absolute and permanent fixity of botanical nomenclature, therefore, cannot be insured by any arbitrary agreement at this time.

Remedy for the confusion.

For the practical convenience of those who use plants or deal in them there can and ought to be, however, a list of standard trade names for plants in commercial use, to be arbitrarily retained without change for a period of several years, regardless of any changes in the practice of scientific botanists. It is the hope of the Joint Committee that provision will be made for a regular periodic revision of this standard list, perhaps at the same decennial periods adopted by the United States Pharmacopœia Convention for revision of their standard nomenclature of drugs, which includes a large number of plant names. These revisions can bring the list into accord with changes which have become well established among botanists in the interval and the accepted changes can be made substantially at one time throughout the trade.

General adherence to the standard trade names as recommended by the Joint Committee will relieve horticulturists of the confusion directly chargeable to instability of botanical nomenclature and will remove the excuse for careless identification and mislabeling. *No agreement about names will cure troubles unless everyone is careful in the identification and labeling of the plants so as to avoid sending out the wrong plant under the right name.*

While the Joint Committee realizes that its recommendations are somewhat arbitrary, existing conditions make this inevitable. "Trade value" and stability have been guiding influences. The Joint Committee is not constituted to pass on undecided or critical questions of botanical nomenclature.

For a clearer understanding of the situation, the Joint Committee urges all who are interested in this subject to read the discussion under "Names and Nomenclature" in Vol. IV, page 2098, of the "Standard Cyclopedia of Horticulture."

Basis of this report.

The Joint Committee has agreed that Latin names should conform so far as possible to good botanical usage, and that Bailey's "Standard Cyclopedia of Horticulture" should be the basis of our technical name-list.

Only weighty reasons, as in the case of exceptionally well-established names or of existing trade names plainly more appropriate for business purposes, have led the Joint Committee to recommend the retention of trade names differing from the Cyclopedia names. It is admitted that the Latin binomials as starred by the Joint Committee in the Finding-List are all too often at variance with the latest botanical usage. Subsequent revisions by botanists and the Joint Committee may make possible a more uniform standard list in which the botanists and the horticulturists will ultimately be brought together.

Common names.

As the work of the Joint Committee progressed it became increasingly evident that each cultivated plant should have a single and distinctive common name, which might readily become stable and fixed through acceptance by the horticultural interests of America.

The giving of an appropriate common name to a plant is permissibly much more arbitrary and the reasons for subsequently changing it less urgent than is often the case with Latin binomials. When a common name is given a plant new in cultivation it is often quite possible to make

it descriptive, euphonious, and short, in distinct contrast to many Latin names. Common names are usually easier to remember by those who are not botanists, and they serve a most useful purpose in linking up the plant with its correct or accepted scientific name. The Joint Committee expects in the near future to publish in connection with the scientific names a list of common names, with recommendations for horticultural use, believing that such a list will serve purposes of plant knowledge and identification even more effectively than the present starred list of botanical names.

Identification.

As has been stated, a leading cause of plant-name confusion lies in the careless dissemination of plants under a wrong name. In doubtful cases when means are not at hand for positively identifying plants and labeling them properly, it is earnestly urged that adequate specimens (including flowers, fruit, leaves, and roots, where possible) be sent to a competent authority for correct identification and naming, such as Dr. L. H. Bailey, Ithaca, New York; the United States Department of Agriculture, Washington; any well-equipped botanical garden; or the Arnold Arboretum, Jamaica Plain, Massachusetts. Specimens should be pressed and dried smooth, and sent flat between cardboards.

Acknowledgment.

The Joint Committee wishes to acknowledge its gratitude to Dr. Bailey for the opportunity afforded of presenting to the American horticultural public its first efforts toward standardizing plant names through the medium of the "Standard Cyclopedia of Horticulture." Moreover, the Committee has enjoyed the earnest coöperation and advice of Dr. Bailey, and thus the work has been made far more complete and helpful than it could possibly have been otherwise.

Recommendations of the Joint Committee on the use of the Finding-List.

1. The stars (*) denote the names recommended for uniform use by the American horticultural trade, for such period of time as shall elapse until a new list is agreed upon.

2 In cases in which the starred name differs from the Standard Cyclopedia name and the cataloguer or writer for any reason does not wish to use it, the Joint Committee urges the use of the Cyclopedia name rather than the use of a third alternative.

3. When no star appears in the list, as in the case of nearly all the herbaceous plants, the Joint Committee has not yet specifically passed on the names.

4. In cataloguing, the Finding-List will enable one to place other names in parentheses with the name recommended by the Joint Committe, and to use them also as cross-references. Customers seeking a plant will thus be enabled to locate it readily under any of its well-known names if cross-reference is freely used. The Joint Committee believes that there is no better method known of educating the tradesman and public alike to a correct knowledge of plant names and to the consequent adoption of the recommended or standardized name.

Examples: If he were cataloguing certain plants formerly known to systematists as *Andromeda*, a good treatment would be as follows:

Andromeda floribunda. See PIERIS.

And under *Pieris* the entry would be:

PIERIS (Andromeda) FLORIBUNDA.

(NOTE: *The genus Andromeda is not entirely obsolete, but now includes in America only two species, A. polifolia and A. glaucophylla.*)

In some cases, it is only the species that is involved, the genus remaining the same. Thus, the name *Magnolia stellata* is now used in place of *M. Halliana*. Perhaps the best entry would be:

Magnolia Halliana. See M. STELLATA.

And again in its proper place carrying description, sizes, and prices—

MAGNOLIA STELLATA (M. Halliana).

Other examples are

AZALEA NUDIFLORA (Rhododendron nudiflorum).

FRAXINUS NIGRA (F. sambucifolia).

HALESIA TETRAPTERA (H. carolina, Mohrodendron carolinum).

CORNUS STOLONIFERA var. FLAVIRAMEA (var. aurea).

ACER PALMATUM (A. polymorphum) var. ATROPURPUREUM.

These examples will suggest how to make up proper entries. It is further recommended that synonyms introduced in cross-reference or in parentheses always be printed in italics or in smaller type than the accepted standardized name.

5. In cataloguing, labeling, etc., the abbreviation "var." (variety) following a species name may be omitted for the sake of brevity.

The name of a variety or horticultural form is often further abbreviated by omitting the species-name (for example: *Acer purpurascens* for *A. pseudoplatanus* var. *purpurascens*); but this practice is liable to cause confusion, as when specific and varietal names in a given genus are similar or alike, and therefore when a varietal name is so contracted the abbreviation "v." or "var." should be retained (for example: *Acer* var. *purpurascens* for *Acer pseudoplatanus* var. *purpurascens*).

6. It is suggested that all tradesmen publishing catalogues or lists print in a conspicuous place a notice similar to the following: "The names of trees and shrubs in this catalogue are based on the recommendations of the American Joint Committee on Horticultural Nomenclature as they appear in Bailey's Standard Cyclopedia of Horticulture, pages 3575 to 3591."

The Joint Committee takes this opportunity to urge all members of the organizations represented in it and all others interested in standardizing plant names to offer criticisms and suggestions for the help and instruction of the Committee in its future work. It is only by persistent effort and coöperation that we may hope to bring reasonable order and understanding out of the existing chaos in plant nomenclature.

AMERICAN JOINT COMMITTEE ON HORTICULTURAL NOMENCLATURE

HARLAN P. KELSEY, *Secretary*,
Salem, Massachusetts.

ABELIA. *A. chinensis.
—*grandiflora.
— *rupestris:* *A. grandiflora; also sometimes applied to A. chinensis.

ABERIA. A. caffra.

ABIES. *A. alba:* *Picea canadensis; perhaps sometimes applied to Abies Picea.
— *Alcockiana:* Picea bicolor; often applied to P. jezoensis hondoensis: *Picea Alcockiana.
—*amabilis; sometimes misapplied to A. grandis.
—*arizonica: A. lasiocarpa arizonica; by some regarded as a distinct species.
—*baborensis.
—*balsamea.
— *brachyphylla:* *A. homolepis is the oldest name for the fir known as A. brachyphylla; the A. homolepsis mentioned on page 175 is A. homolepis umbellata.
— *canadensis:* *Tsuga canadensis.
—*cephalonica.
—*cilicica.
—*concolor.
— *Douglasii:* Pseudotsuga taxifolia: *Pseudotsuga Douglasii.
— *excelsa:* *Picea excelsa.
—*firma.
—*Fraseri.
—*grandis.
—*homolepis.
—*lasiocarpa.
—*magnifica.
—*Mariesii.
— *Menziesii:* *Picea sitchensis.
— *Mome:* *A. firma (the name A. Mome is a *nomen nudum*).
—*nobilis.
—*Nordmanniana.
— *numidica:* *A. baborensis.
— *orientalis:* *Picea orientalis.
—*pectinata: A. Picea.
— Picea: *A. pectinata.
—*Pinsapo.
— *pungens:* *Picea pungens.
—*sacchalinensis.
—*sibirica.
— *subalpina:* *A. lasiocarpa.
— *umbellicata:* *A. homolepis umbellata.
—*Veitchii.

ABOBRA. *A. viridiflora:* A. tenuifolia.

ABRONIA. *A. arenaria:* A. latifolia.
— umbellata.
— villosa.

ABRUS. A. precatorius.

ABUTILON. A. megapotamicum.
— *Savitzii:* form of A. hybridum.
— striatum, but the stock is likely to be A. pictum.
— *Thompsonii:* A. striatum Thompsonii.
— *vexillarium:* A. megapotamicum.

ACACIA. *A. armata.
—*Baileyana.
—*Cavenia.
—*cultriformis.
—*cyanophylla.
—*cyclops.

ACACIA, continued.
— *dealbata:* *A. decurrens dealbata.
—*decurrens.
—*Drummondii.
—*Farnesiana.
— *floribunda:* *A. longifolia floribunda.
— *Julibrissin:* *Albizzia Julibrissin.
—*juniperina.
—*latifolia.
—*longifolia.
— *lophantha:* *Albizzia lophantha.
—*melanoxylon.
— *mollissima:* *A. decurrens mollis.
— *Nemu:* *Albizzia Julibrissin.
—*neriifolia.
—*podalyriæfolia.
—*pravissima.
—*pubescens.
—*pycnantha.
—*Riceana.
—*saligna.
—*verticillata.

ACÆNA. A. microphylla.

ACALYPHA. *A. hispida.
— *Macafeana:* *A. Wilkesiana Macafeana.
— *marginata:* *A. Wilkesiana marginata, not A. marginata of botanists.
— *mosaica:* *A. Wilkesiana musaica.
— *Sanderi:* *A. hispida.
— *triumphans:* *A. Wilkesiana triumphans.

ACANTHOPANAX. *A. pentaphyllum (Aralia).
—*ricinifolium (Aralia).
By some authors, the name Acanthopanax is considered to be masculine, the specific names to end in *-us;* but the prevailing practice with English and American botanists is to regard the Panax combinations as neuter. These names should be pronounced Acanthóp-anax, Oreóp-anax, Tetráp-anax, etc.

ACANTHOPHŒNIX. A. rubra (Areca).

ACANTHORHIZA. A. aculeata.

ACANTHUS. *A. latifolius:* A. mollis latifolius.
— mollis.
— spinosus.

ACER. *A. campestre.
—* circinatum.
— *colchicum:* *A. cappadocicum.
—*dasycarpum (Silver Maple): A. saccharinum.
—*ginnala.
—*glabrum.
—*Heldreichii.
—*japonicum.
—*macrophyllum: sometimes used erroneously for A. japonicum macrophyllum.
—*monspessulanum.
—*Negundo.
—*palmatum.
—*pennsylvanicum.
—*pictum.
—*platanoides.
— *polymorphum:* *A. palmatum.

ACER, continued.
—*pseudoplatanus.
—*rubrum.
— saccharinum. This is the Silver Maple, commonly known in the trade as *A. dasycarpum. Much of the stock listed as A. saccharinum is Sugar Maple, which is now known as A. saccharum.
—*saccharum. Sugar or Rock Maple, formerly known as A. saccharinum, but this name is now applied to Silver Maple.
— *sanguineum:* *A. palmatum sanguineum.
— *Schwedleri:* *A. platanoides Schwedleri.
—*spicatum.
—*tataricum.
— *velutinum:* *A. insigne velutinum; sometimes used erroneously for A. Trautvetteri.

ACERANTHUS. A. diphyllus (Epimedium).

ACHANIA. *A. Malvaviscus:* Malvaviscus arboreus.

ACHILLEA. *A. ægyptiaca:* A. Tournefortii.
— Ageratum.
— aurea.
— *Eupatorium:* A. filipendulina.
— filipendulina.
— Millefolium.
— *mongolica:* A. sibirica.
— Ptarmica.
— tomentosa.

ACHIMENES. *A. Haageana:* A. longiflora.
— longiflora.
— patens major.

ACHRAS. A. Sapota.

ACHYRANTHES. *A. acuminata:* Iresine Lindenii.
— *Emersonii:* Iresine Lindenii.
— *Herbstii:* Iresine Herbstii.

ACIDANTHERA. A. bicolor.

ACONITUM. A. autumnale.
— *bicolor:* plants under this name are either A. Napellus bicolor or A. sinensis bicolor.
— Fischeri.
— Lycoctonum.
— Napellus.
— *pyramidatum:* probably A. pyramidale, which is A. Napellus.
— *pyrenaicum:* A. Anthora.
— uncinatum.
— *Wilsonii:* A. Fischeri Wilsonii.

ACORUS. A. Calamus.
— *japonicus:* probably a form of A. gramineus.

ACROCLINIUM. *A. album:* Helipterum roseum album.
— *roseum:* Helipterum roseum.

ACTÆA. A. alba.
— *rubra:* A. spicata rubra; better kept distinct, as A. rubra. Willd.
— spicata.

ACTINIDIA. *A. arguta.
—*chinensis.
—*Kolomikta.
—*polygama.

ACTINOLEPIS. A. coronaria (Shortia californica).
ADENANTHERA. A. pavonina.
ADENOPHORA. *A. lilifolia:* **A. communis.**
— **Potaninii.**
ADIANTUM. *A. æmulum:* **A. cuneatum.**
— **bellum.**
— **Capillus-Veneris.**
— *Croweanum:* **A. cuneatum Croweanum.**
— **cuneatum.**
— **Farleyense.**
— *Fergusonii:* **A. Capillus-Veneris.**
— *hybridum:* **A. cuneatum.**
— *mundulum:* **A. cuneatum.**
— **pedatum.**
— *rhodophyllum:* a form of **A. tenerum.**
— **Sanctæ-Catharinæ:** a form of **A. trapeziforme.**
— **scutum.**
— **trapeziforme.**
— *Wiegandii:* **A. Wagneri.**
ADLUMIA. *A. cirrhosa:* **A. fungosa.**
ADONIS. A. æstivalis.
— **amurensis.**
— **autumnalis.**
— **pyrenaica.**
— **vernalis.**
ÆGOPODIUM. Æ. Podagraria.
ÆSCULUS. *Æ. californica.
—***carnea.**
—***glabra.**
—***Hippocastanum.**
— *macrostachya:* ***Æ. parviflora.**
—***octandra** (Pavia).
—***parviflora** (Pavia).
—***Pavia** (Pavia).
— *rubicunda:* ***Æ. carnea.**
—***turbinata.**
ÆTHEOPAPPUS. *Æ. pulcherrimus:* **Centaurea pulcherrima.**
ÆTHIONEMA. Æ. coridifolium.
— **grandiflorum.**
— *jucundum:* **Æ. coridifolium** (Iberis).
AGAPANTHUS. A. umbellatus.
AGATHÆA. *A. cœlestis:* **Felicia amelloides.**
AGATHIS. *A. robusta.
AGATHOSMA. A. Ventenatiana (Diosma).
— **villosa** (Diosma).
AGAVE. A. americana.
— **atrovirens.**
— *cærulescens:* **A. lophantha.**
— **ferox.**
— **potatorum** (the more glaucous form of A. Scolymus; very likely something else is really offered under this name; see No. 12, page 233).
— **stricta.**
AGERATUM. *A. album:* Probably **Eupatorium micranthum.**
— *conspicuum:* **Eupatorium glechonophyllum.**
— *Lasseauxii:* **Eupatorium Lasseauxii.**
— *mexicanum:* **A. Houstonianum.**
— *nanum:* probably a dwarf form of **A. Houstonianum.**

AGERATUM, continued.
— *Wendlandii* (identity uncertain; perhaps Alomia Wendlandii, Robins., a genus closely allied to Ageratum; this Alomia, from southern Mexico, is a perennial, 1 foot or more high, with ovate, strongly toothed opposite leaves. Flowers of the plant cultivated under this name are blue or white).
AGLAONEMA. A. costatum.
AGONIS. *A. flexuosa:* ***Leptospermum flexuosum.**
AGROSTEMMA. *A. Cœli:* **Lychnis Cœli-rosa.**
— *Cœli-rosa:* **Lychnis Cœli-rosa.**
— *Flos-Jovis:* **Lychnis Flos-Jovis.**
AGROSTIS. A. nebulosa.
AILANTHUS. *A. glandulosa: **A. altissima,** Swingle (A. glandulosa not tenable, as it is the more recent name).
AIRA. *A. cærulea:* **Molinia cærulea.**
— *foliis variegatis.* **Molinia cærulea variegata.**
AJUGA. A. genevensis.
— **reptans.**
AKEBIA. *A. lobata.
—***quinata.**
ALBIZZIA. *A. Julibrissin.
—***lophantha.**
ALECTRYON. *A. excelsum.
ALEURITES. *A. Fordii.
ALLAMANDA. *A. cathartica.
— *Hendersonii:* ***A. cathartica Hendersonii.**
— *Williamsii:* ***A. cathartica Williamsii.**
ALLIUM. A. ascalonicum (Shallot).
— **Cepa** (Onion).
— **fistulosum** (Welsh Onion).
— **Moly.**
— **Porrum** (Leek).
— **sativum** (Garlic).
— **Schœnoprasum** (Chives).
ALNUS. *A. cordata.
—***glutinosa.**
—***incana.**
— *laciniata:* name probably applied to either ***A. incana pinnatifida** or ***A. glutinosa laciniata.**
—***Mitchelliana** (American Green Alder); either or both **A. viridis** or **A. alnobetula** of American catalogues.
—***rugosa.**
—***tenuifolia.**
—***viridis** (European Green Alder). Often confused with American Green Alder.
ALONSOA. A. acutifolia.
— *albiflora:* **A. acutiflora candida.**
— *grandiflora:* **A. Warscewiczii.**
— **linifolia.**
— **Warscewiczii.**
ALOYSIA. *A. citriodora:* **Lippia citriodora.**
ALPINIA. A. Sanderæ.
ALSINE. A. pinifolia.
ALSOPHILA. A. australis.

ALSTRŒMERIA. A. aurantiaca.
— *aurea:* **A. aurantiaca.**
— **brasiliensis.**
— **chilensis.**
— **pulchella.**
ALTERNANTHERA. *A. aurea:* **Telanthera Bettzickiana aurea.**
— *rosea:* **T. amœna rosea.**
— *versicolor:* **T. versicolor.**
ALTHÆA. *A. frutex:* ***Hibiscus syriacus.**
—***rosea** (Hollyhock).
Many names listed under this genus are probably forms of Hibiscus syriacus, as A. alba, amplissima, argentea, cærulea, carnea, cœlestis, elegantissima, grandiflora, Leopoldii, Meehanii, pæoniflora, punicea, rubra, Van Houttei, and others.
ALYSSUM. A. argenteum.
— *Benthamii:* **A. maritimum Benthamii.**
— **maritimum.**
— *procumbens:* **A. maritimum procumbens.**
— **rostratum.**
— **saxatile.**
AMARANTHUS (the spelling Amarantus, while etymologically correct, is not now much used in this country, the form Amaranthus having been employed by Linnæus). *A. atropurpureus:* probably **A. caudatus atropurpureus,** not A. atropurpureus of botanists.
— *bicolor:* **A. gangeticus melancholicus.**
— **caudatus.**
— *cruentus:* signifies either **A. hypochondriacus sanguineus** or **A. paniculatus cruentus.**
— **gangeticus.**
— **Henderi.**
— *melancholicus:* **A. gangeticus melancholicus.**
— **salicifolius.**
— *tricolor:* **A. gangeticus melancholicus.**
AMARYLLIS. *A. Atamasco:* **Zephyranthes Atamasco.**
— **Belladonna.**
— *equestris:* **Hippeastrum equestre.**
— *formosissima:* **Sprekelia formosissima.**
— *Hallii:* **Lycoris squamigera.**
— *Johnsonii:* **Hippeastrum Johnsonii.**
— *lutea:* **Sternbergia lutea.**
— *solandri:* probably **Hippeastrum solandriflorum.**
— *vittata:* **Hippeastrum vittatum.**
AMBERBOA. *A. muricata:* **Volutarella muricata.**
AMBROSIA. *A. mexicana:* probably an Artemesia.
AMELANCHIER. *A. alnifolia.
— *Botryapium:* ***A. canadensis;** sometimes applied to **A. oblongifolia.**
—***canadensis,** but the stock is probably **A. lævis.**
—***oblongifolia.**
— *vulgaris:* ***A. rotundifolia.**

AMMOBIUM. A. alatum.
— *grandiflorum:* A. alatum grandiflorum.
AMOMUM. A. Cardamon.
AMORPHA. *A. canescens.
— *fragrans:* *A. fruticosa, or an unimportant form of it.
—*fruticosa.
— *montana:* *A. glabra.
— *nana:* *A. microphylla.
AMORPHOPHALLUS. A. Rivieri.
AMPELOPSIS. *A. aconitifolia, but often is A. aconitifolia palmiloba.
—*cordata.
— *dumetorum:* Parthenocissus vitacea. *A. vitacea.
— *Engelmannii:* P. quinquefolia Engelmannii: *A. quinquefolia Engelmannii.
—**Henryana:* P. Henryana.
—*heterophylla.
—*humulifolia.
—*hypoglauca.
— leeoides, but the plant in cultivation is *A. Watsoniana (page 3565); the true A. leeoides is not in cultivation.
— *Lowii:* P. tricuspidata Lowii: *A. tricuspidata Lowii.
—*megalophylla.
— *muralis:* P. quinquefolia murorum: *A. quinquefolia murorum.
—**quinquefolia:* P. quinquefolia.
— *stricta:* probably an error for Cissus striata.
—**Thomsonii:* P. Thomsonii.
— *tricolor:* *A. heterophylla elegans.
—**tricuspidata:* P. tricuspidata.
— *Veitchii:* P. tricuspidata Veitchii: *A. tricuspidata Veitchii.
—**vitacea:* P. vitacea.
AMSONIA. *A. Amsonia:* A. Tabernæmontana.
— angustifolia.
— *salicifolia:* A. Tabernæmontana.
— Tabernæmontana.
AMYGDALUS. *A. chinensis:* *Prunus japonica and *P. glandulosa (Cherry-Almonds; sometimes known as "flowering almonds").
—**communis:* P. communis (Almond).
—**Davidiana:* P. Davidiana.
—**nana:* P. nana (Russian Dwarf Almond).
—**Persica:* P. Persica (Peach).
— *sibirica:* perhaps *P. Armeniaca sibirica (Siberian Apricot) or P. nana (*A. nana).
—**triloba* (Flowering Almond): P. triloba.
ANACARDIUM. A. occidentale.
ANACHARIS. *A. canadensis:* Elodea canadensis.
ANAGALLIS. *A. grandiflora:* A. linifolia.
ANANAS. A. sativus.
ANAPHALIS. A. margaritacea (Antennaria).
ANCHUSA. A. Barrelieri.
— capensis.
— italica.
— mysotidiflora.
— officinalis.
ANDROMEDA. *A. arborea:* *Oxydendrum arboreum.
— *calyculata:* *Chamædaphne calyculata.
— *Catesbæi:* *Leucothoë Catesbæi.
— *floribunda:* *Pieris floribunda.
— *japonica:* *P. japonica.
— *mariana:* *P. mariana.
—*polifolia.
— *speciosa:* *Zenobia pulverulenta.
ANDROPOGON. A. argenteus.
ANEMONE. *A. acutiloba:* Hepatica acutiloba.
— apennina.
— canadensis.
— coronaria.
— fulgens.
— *Hepatica:* Hepatica triloba.
— hortensis.
— hupehensis.
— japonica.
— nemorosa.
— *Nuttalliana:* A. patens Nuttalliana.
— patens.
— *pennsylvanica:* A. canadensis.
— Pulsatilla.
— sylvestris.
— vitifolia.
ANEMONELLA (Syndesmon is the name under the American Code). A. thalictroides.
ANEMONOPSIS. A. macrophylla.
ANGELONIA. A. grandiflora.
ANGOPHORA. *A. intermedia (page 3565).
—*lanceolata.
ANNONA. A. Cherimola.
— glabra.
— muricata.
— reticulata.
— squamosa.
ANOMATHECA. *A. cruenta:* Lapeyrousia cruenta.
ANTENNARIA. A. dioica.
— *margaritacea:* Anaphalis margaritacea.
ANTHEMIS. *A. arabicus:* Cladranthus arabicus.
— Kelwayi.
— nobilis.
— tinctoria.
ANTHERICUM. *A. comosum:* Chlorophytum comosum.
— Liliago.
— *Liliastrum:* Paradisea Liliastrum.
— *vittatum:* Chlorophytum elatum.
ANTHURIUM. A. Andræanum.
— crystallinum.
— regale.
— Scherzerianum.
ANTIGONON. *A. leptopus.
ANTIRRHINUM. *A. album:* A. majus.
— atrococcineum, delicatum, grandiflorum, luteum, maximum, picturatum, striatum. Apparently all forms of A. majus.
APIOS. *A. tuberosa (Glycine Apios in American Code, but not adopted under International Rules).
APIUM. A. graveolens (Celery).
APLECTRUM. A. hyemale.
APONOGETON. *A. distachyon:* A. distachyus.
— fenestralis (Ouvirandra).
AQUILEGIA. A. akitensis (page 3565).
— alpina.
— cærulea.
— *californica:* A. formosa truncata.
— canadensis.
— chrysantha.
— flabellata.
— formosa.
— glandulosa.
— haylodgensis.
— *Helenæ:* A. cærulea Helenæ.
— *Jæschkani:* A. chrysantha Jæschkanii.
— *nivea:* A. vulgaris nivea.
— *olympica:* A. vulgaris olympica.
— oxysepala.
— sibirica.
— Skinneri.
— *truncata:* A. formosa truncata.
— *Vervæneana:* A. vulgaris Vervæneana.
— vulgaris.
ARABIS. A. albida.
— alpina.
— mollis.
— *rosea:* A. muralis.
ARACHIS. A. hypogæa.
ARALIA. *A. Balfouriana:* Polyscias Balfouriana.
— *cashmeriana:* A. cachemirica.
— *Chabrieri:* Elæodendron orientale.
—*chinensis.
—*cordata.
— *elegantissima:* Dizygotheca elegantissima.
— *filicifolia:* Polyscias filicifolia.
— *Guilfoylei:* Polyscias Guilfoylei.
— *japonica:* *Fatsia japonica; stock probably sometimes *A. chinensis.
— *Kerchoveana:* Dizygotheca Kerchoveana.
— *mandshurica:* *A. chinensis mandshurica.
— *Maximowiczii:* *Acanthopanax ricinifolium Maximowiczii.
— *papyrifera:* *Tetrapanax papyriferum.
— *pentaphylla:* *Acanthopanax pentaphyllum.
—*racemosa.
— *Sieboldii:* *Fatsia japonica.
—*spinosa.
— *Veitchii:* Dizygotheca Veitchii.
ARAUCARIA. *A. Bidwillii.
— *brasiliensis:* *A. brasiliana.
—*excelsa.
—*imbricata.
— *robusta:* *A. excelsa robusta.
ARBUTUS. *A. Menziesii.
—*Unedo.
ARCHONTOPHŒNIX. A. Alexandræ (Ptychosperma).
— Cunninghamii (Ptychosperma).
ARCTOSTAPHYLOS. *A. glauca.
—*tomentosa.
—*Uva-ursi.
ARCTOTIS. A. breviscapa.
— grandis.
ARDISIA. *A. crenulata.

ARECA. *A. Baueri:* Rhopalostylis Baueri.
— Catechu.
— *lutescens:* Chrysalidocarpus lutescens.
— *rubra:* Acanthophœnix rubra.
— *sapida:* Rhopalostylis sapida.
— *Verschaffeltii:* Hyophorbe Verschaffeltii.

ARENARIA. *A. cæspitosa:* A. verna cæspitosa.
— grœnlandica.
— montana.

ARENGA. A. saccharifera.

ARETHUSA. A. bulbosa.

ARGEMONE. A. grandiflora.

ARGYREIA. A. splendens (page 3566).

ARISÆMA. A. Dracontium.
— triphyllum.

ARISTOLOCHIA. *A. elegans.
— grandiflora.
— macrophylla; in some cases probably designates A. brasiliensis macrophylla.
—*Sipho:* A. macrophylla.
— *Sturtevantii:* *A. grandiflora Sturtevantii.

ARMERIA. *A. alba:* probably Statice Armeria alba.
— *alpina:* S. alpina.
— *cephalotes:* probably S. pseudoarmeria, but possibly S. mauritanica is meant in the trade.
— *dianthoides:* S. plantaginea leucantha.
— *formosa:* S. pseudoarmeria.
— *Laucheana:* S. Armeria Laucheana.
— *maritima:* S. Armeria.

ARNEBIA. A. cornuta.

ARONIA (Malus. Pyrus). *A. arbutifolia.
—*atropurpurea.
— *erythrocarpa:* *A. arbutifolia.
—*melanocarpa.
— *nigra:* *A. melanocarpa.

ARRHENATHERUM. *A. bulbosum:* A. elatius tuberosum.

ARTEMISIA. A. Abrotanum.
— Absinthium.
— Dracunculus.
— frigida.
— *lactiflora:* a white-flowered form of A. vulgaris.
— *pedemontana:* A. lanata.
— pontica.
— Purshiana.
— sacrorum.
— Stelleriana.
— vulgaris.

ARTOCARPUS. A. incisa (Bread-Fruit).

ARUM. *A. crinitum:* Helicodiceros muscivorus.
— *Dracunculus:* Dracunculus vulgaris.
— italicum.
— maculatum.
— palæstinum.

ARUNCUS. *A. Aruncus:* A. sylvester (Spiræa).
— astilboides, but the plant in cultivation is Astilbe astilboides.
— sylvester (Spiræa).

ARUNDINARIA (Bambusa). *A. auricoma.
—*falcata.
—*Falconeri.
— *foliis variegatis:* probably *A. Fortunei.
—*Hindsii.
—*japonica.
—*Simonii.
—*Veitchii.

ARUNDO. *A. Donax.

ASARUM. A. arifolium.
— canadense.
— virginicum.

ASCLEPIAS. A. Curassavica.
— Hallii.
— incarnata.
— tuberosa.

ASIMINA. *A. triloba.

ASPARAGUS. A. asparagoides (Myrsiphyllum, Florists' Smilax).
— Cooperi.
— *Hatcheri:* probably A. plumosus robustus.
— madagascariensis.
— *medeoloides:* A. asparagoides.
— *nanus:* A. plumosus nanus.
— officinalis (Edible Asparagus).
— plumosus.
— scandens.
— Sprengeri.
— *tenuissimus:* A. plumosus tenuissimus.

ASPERULA. *A. azurea:* A. orientalis.
— hexaphylla.
— odorata.

ASPHODELINE. A. lutea (Asphodelus).

ASPHODELUS. A. albus.
— *luteus:* Asphodeline lutea.

ASPIDISTRA. A. lurida.

ASPIDIUM. *A. achrostichoides:* Polystichum acrostichoides.
— *aculeatum:* P. aculeatum.
— *Braunii:* P. Braunii.
— *cristatum:* Dryopteris cristata.
— *Filix-mas:* D. Filix-mas.
— *Goldieanum:* D. Goldieana.
— *marginale:* D. marginalis.
— *munitum:* P. munitum.
— *noveboracense:* D. noveboracensis.
— *spinulosum:* D. spinulosa.
— *Thelypteris:* D. Thelypteris.
— *Tsus-sinense:* P. Tsus-sinense.

ASPLENIUM. A. acrostichoides.
— angustifolium.
— bulbiferum.
— *ebeneum:* A. platyneuron.
— Filix-fœmina.
— Goringianum.
— *Nidus-avis:* A. Nidus (Neottopteris).
— platyneuron.
— *Thelypteris:* Dryopteris Thelypteris.
— *thelypteroides:* A. acrostichoides.
— Trichomanes.

ASTER. A. acris.
— alpinus.
— Amellus.
— amethystinus.
— azureus.

ASTER, continued.
— *bessarabicus:* A. Amellus bessarabicus.
— Chapmanii.
— cordifolius.
— corymbosus.
— Curtisii.
— *decorus:* A. lævis.
— ericoides.
— formosissimus.
— grandiflorus.
— *himalayensis:* A. himalaica.
— lævis.
— lilacinus.
— longifolius.
— Maackii.
— macrophyllus.
— *Mesa grande:* possibly is Erigeron macranthus.
— multiflorus.
— novæ-angliæ.
— novi-belgii.
— patens.
— puniceus.
— ptarmicoides.
— Shortii.
— *speciosus:* A. alpinus speciosus, not A. speciosus of botanists.
— spectabilis.
— subcæruleus.
— tataricus.
— Thomsonii.
— *Townshendii:* A. Bigelovii.
— Tradescantii.
— trinervius.
— turbinellus.
— umbellatus.
— undulatus.
— versicolor.

ASTILBE. A. Arendsii; hybrids of A. Davidii with other species.
— astilboides (Spiræa).
— chinensis.
— Davidii (Spiræa).
— grandis.
— japonica.
— simplicifolia.

ASTRAGALUS. A. alopecuroides.

ASTRANTIA. A. major.

ATRIPLEX. A. hortensis (Orach).

ATROPA. A. Belladonna.

AUBRIETIA. *A. Bougainvillei:* A. deltoidea Bougainvillei.
— deltoidea.
— *Eyrei:* A. deltoidea Eyrei.
— *græca:* A. deltoidea græca.
— *Hendersonii:* A. deltoidea Hendersonii.
— *Leichtlinii:* A. deltoidea Leichtlinii.
— *olympica:* A. deltoidea olympica.

AUCUBA. *A. himalaica.
— *japonica.

AVENA. A. sterilis.

AZALEA. *A. amœna:* Rhododendron obtusum amœnum.
—*arborescens:* R. arborescens.
— *calendulacea:* R. calendulaceum: *A. lutea.
— *canadensis:* R. canadense: *Rhodora canadensis.
—*canescens:* R. canescens.
—*gandavensis:* R. Morteri.
—*Hinodigiri:* form of R. obtusum.

AZALEA, continued.
—**indica:* **R. indicum.**
—**japonica:* **R. japonicum.**
—**Kaempferi:* **R. Kaempferi.**
—**ledifolia:* **R. ledifolium.**
—**lutea:* **R. calendulaceum.**
—**mollis:* **R. sinense;** possibly sometimes misapplied to **R. japonicum.**
—**nudiflora:* **R. nudiflorum.**
—**occidentalis:* **R. occidentale.**
—**pontica:* **R. luteum.**
— *rosmarinifolia:* **R. ledifolium:** *A. ledifolia.
— *rustica:* **R. Morteri** var.: *A. gandavensis.
— *sinensis:* **R. sinense:** *A. mollis.
—**Vaseyi:* **R. Vaseyi.**
—**viscosa:* **R. viscosum.**
—**yodogawa:* **R. poukhanense yodogawa.**

AZARA. *A. microphylla.

BACCHARIS. *B. halimifolia.

BACTRIS. B. major.

BAMBUSA. *B. Alphonsei:* probably **B. Alphonse Kurri.**
—**argentea.**
— *aurea:* ***Phyllostachys aurea.**
—**aureo-striata.**
— *auricoma:* ***Arundinaria auricoma.**
—**fastuosa.**
— *Fortunei:* ***Arundinaria Fortunei.**
— *Henonis:* ***Phyllostachys Henonis.**
— *nigra:* ***Phyllostachys nigra.**
—**palmata.**
— *Simonii:* ***Arundinaria Simonii.**
— *Veitchii:* ***Arundinaria Veitchii.**
— *viminalis:* ***Phyllostachys rusciifolia.**
— *violescens:* ***Phyllostachys violescens.**
—**vulgaris.**

BAPTISIA. *B. australis.
— **tinctoria.**

BARBAREA. B. præcox.
— **vulgaris.**

BARTONIA. *B. aurea:* **Mentzelia aurea,** Baill. (M. Lindleyi is untenable under the rules).

BEGONIA. B. albo-picta.
— *argentea:* **B. maculata.**
— **corallina.**
— **Credneri.**
— *crispa:* **B. manicata crispa.**
— **Erfordii.**
— **gracilis.**
— **Haageana.**
— **metallica.**
— **Rex.**
— *rubra:* **B. coccinea.**
— *Sandersonii:* **B. Digswelliana.**
— **semperflorens.**
— **Thurstonii.**
— *Warscewiczii:* **B. conchæfolia.**
Trade names of horticultural begonias often appear in Latin form.

BELAMCANDA. B. chinensis.

BELLIS. B. perennis.

BENINCASA. *B. cerifera:* **B. hispida.**

BENZOIN. *B. odoriferum:* ***B. æstivale** (Laurus. Lindera).

BERBERIS (see page 3566). ***B. aggregata.**
— *Aquifolium:* ***Mahonia Aquifolium.**
— **brevipaniculata;** perhaps sometimes applied to **B. aggregata.**
—***buxifolia.**
—***canadensis.**
—***Darwinii.**
—***dictyophylla.**
— *dulcis:* ***B. buxifolia;** sometimes the name for **B. vulgaris dulcis.**
— *fascicularis:* ***Mahonia pinnata.**
—***Fendleri.**
—***ilicifolia,** but often misapplied to **B. Neubertii latifolia.**
— *japonica:* ***Mahonia japonica.**
— *nervosa:* ***Mahonia nervosa.**
— *purpurea:* ***B. vulgaris atropurpurea.**
— *Regeliana:* ***B. amurensis japonica** (page 3566).
— *repens:* ***Mahonia repens.**
— *sanguinolenta:* ***B. sinensis.**
—***Sargentiana;** but the plant in cultivation under this name is often **B. Julianæ** (page 3566).
—***Sieboldii.**
—***stenophylla.**
—***Thunbergii.**
***verruculosa.**
—***vulgaris.**
— **Wallichiana** (the plant erroneously in cultivation under this name may be **B. Sargentiana, B. Julianæ, B. Hookeri,** or **B. xanthoxylon** (page 3566).
—***Wilsonæ.**

BERCHEMIA. ***B. racemosa.**

BESSERA. B. elegans.

BETA. B. vulgaris (Beet).

BETONICA. *B. grandiflora:* **Stachys grandiflora.**
— *officinalis:* **Stachys officinalis.**

BETULA. **B. alba:* **B. pubescens;** also includes **B. pendula,** under the trade name *B. alba pendula.
—***fontinalis.**
—***lenta.**
—***lutea.**
—***nigra.**
— *papyracea:* ***B. papyrifera.**
—***papyrifera.**
— **pendula:** *B. alba pendula.
—***populifolia.**
— *purpurea:* the purple-leaved form of either **B. populifolia** or **B. pendula.**
— *rubra:* ***B. nigra.**
— *Youngii:* ***B. alba pendula Youngii.**

BICUCULLA (name not allowed under International Rules). *B. eximia:* **Dicentra eximia.**
— *spectabilis:* **Dicentra spectabilis.**

BIDENS. *B. atrosanguinea:* **Cosmos diversifolius.**
— **dahlioides.**

BIGNONIA. **B. buccinatoria:* **Phædranthus buccinatorius.**
—***capreolata.**
—**grandiflora:* **Campsis chinensis.**
—**hybrida:* **Campsis hybrida.**
—**radicans:* **Campsis radicans.**
—**speciosa:* **Clytostoma callistegioides.**

BIGNONIA, continued.
— *Tweediana:* ***B. Unguis-cati.**
—**venusta:* **Pyrostegia venusta.**

BIOTA. *B. aurea:* ***Thuja orientalis aurea.**
— *japonica:* ***T. orientalis Sieboldii;** some of the stock in trade is perhaps **T. orientalis gracilis.**
— *orientalis:* ***T. orientalis.**
— *pyramidalis:* ***T. orientalis pyramidalis.**

BLECHNUM. B. brasiliense.
— **occidentale.**

BLETIA. *B. hyacinthina:* **Bletilla hyacinthina.**

BLETILLA. B. hyacinthina (Bletia).

BLUMENBACHIA. B. lateritia (Loasa).

BOCCONIA. B. cordata.
— *japonica:* **B. cordata.**
— **microcarpa.**

BOLTONIA. B. asteroides.
— **latisquama.**

BORAGO. B. officinalis.

BOTRYCHIUM. B. obliquum.
— *ternatum:* **B. obliquum.**
— *virginicum:* **B. virginianum.**

BOUGAINVILLEA. ***B. glabra.**
— *lateritia:* ***B. spectabilis lateritia.**
—***refulgens.**
— *Sanderiana:* ***B. glabra Sanderiana.**
—***spectabilis.**

BOUSSINGAULTIA. B. baselloides.

BOUVARDIA. B. Humboldtii.
— *Jacquinii:* **B. triphylla.**
— **triphylla.**

BRACHYCHITON. B. diversifolium; also perhaps refers to **B. populneum.**

BRACHYCOME. B. iberidifolia.

BRAHEA. *B. filifera:* **Washingtonia filifera.**
— *robusta:* **W. filifera robusta.**

BRASENIA. *B. peltata:* **B. Schreberi.**

BRASSICA. *B. acephala:* **B. oleracea acephala** (Kale).
— **alba** (Sinapis).
— **arvensis** (Sinapis).
— *botrytis:* **B. oleracea botrytis** (Cauliflower).
— **campestris** (Rutabaga).
— *capitata:* **B. oleracea capitata** (Cabbage).
— **chinensis.**
— **japonica** (Sinapis).
— **Napus** (Rape).
— **oleracea.**
— **Pe-tsai** (Brassica Pe-tsai, Bailey, was founded in 1894 on cultivated material. Sinapis pekinensis, Loureiro, 1790, one of the vernacular names of which is Pe-tsai, has been brought over into Brassica as B. pekinensis, Skeels. If B. Pe-tsai, Bailey, and B. pekinensis, Skeels, prove to be identical, the latter name must hold. More than one species may be involved.)
— **Rapa** (Turnip).

BRAUNERIA (the name under the American Code). *B. angustifolia:* Echinacea angustifolia.
— *purpurea:* E. purpurea.

BRAVOA. B. geminiflora.

BRIZA. *B. geniculata:* Eragrostis obtusa.
— *gracilis:* B. minor.
— maxima.

BRIZOPYRUM. *B. siculum:* Desmazeria sicula.

BROMUS. B. brizæformis.
— macrostachys.
— madritensis.

BROUSSONETIA. *B. papyrifera.

BROWALLIA. *B. elata:* B. demissa.
— *Jamesonii:* Streptosolen Jamesonii.
— *Roezlii:* B. grandiflora.
— speciosa.
— viscosa.

BRUCKENTHALIA. *B. spiculifolia.

BRUNELLA. A pre-Linnæan spelling of Prunella (which see), and still widely used.

BRYONIA. *B. laciniosa:* Bryonopsis laciniosa.

BRYONOPSIS. B. laciniosa (Bryonia).

BUDDLEIA. *B. asiatica.
—*globosa.
—*intermedia.
—*japonica.
—*Lindleyana.
— *magnifica:* *B. Davidii magnifica.
—*officinalis.
— *variabilis:* *B. Davidii.
— *Veitchii:* *B. Davidii Veitchiana.

BUPHTHALMUM. *B. cordifolium:* B. speciosum (Telekia).
— salicifolium.

BUXUS. *B. arborescens:* *B. sempervirens arborescens.
—*balearica.
— *Fortunei:* *B. japonica.
— *Handsworthii:* *B. sempervirens Handsworthii.
—*japonica.
— *rotundifolia:* *B. sempervirens rotundifolia.
—*sempervirens.
— *suffruticosa:* *B. sempervirens suffruticosa.

CABOMBA. *C. viridifolia:* C. caroliniana.

CACALIA. *C. aurea:* probably an Emilia.
— *coccinea:* Emilia flammea.

CÆSALPINIA. *C. Gilliesii (Poinciana).
—*C. pulcherrima.

CALADIUM. *C. esculentum:* Colocasia antiquorum esculenta. There are many Latin-named varieties.

CALAMINTHA. *C. alpina:* Satureia alpina.

CALAMPELIS. *C. scaber:* Eccremocarpus scaber.

CALANDRINIA. C. grandiflora.
— *speciosa:* C. Menziesii.
— umbellata.

CALATHEA. Usually listed under Maranta, which see.

CALCEOLARIA (the application of the American Code transfers Calceolaria to Ionidium, one of the Violet family; the calceolaria of florists then becomes Fagelia, and the leguminous Fagelia [Vol. III, page 1201] becomes Bolusafra). *C. hybrida:* C. herbeohybrida.
— pinnata; some of the stock is probably C. scabiosæfolia.
— profusa.
— *rugosa:* C. integrifolia.
— scabiosæfolia.
— Veitchii.

CALENDULA. C. officinalis.
— *pluvialis:* Dimorphotheca annua.
— *Pongei:* D. annua ligulosa.

CALIMERIS. C. incisa.

CALLA. *C. æthiopica:* Zantedeschia æthiopica.
— *Elliottiana:* Z. Elliottiana.
— palustris.

CALLICARPA. *C. americana.
—*japonica.
—**purpurea:* C. dichotoma (the tenable name, under the rules, rather than C. purpurea).

CALLIOPSIS. *C. bicolor:* Coreopsis tinctoria.
— *cardaminefolia:* Coreopsis cardaminefolia.
— *Drummondii:* Coreopsis Drummondii.
— *lanceolata:* Coreopsis lanceolata.
— *marmorata:* Coreopsis tinctoria.
— *nigra:* Coreopsis tinctoria atropurpurea.
— *radiata:* Coreopsis radiata.
— *tinctoria:* Coreopsis tinctoria.

CALLIRHOE. C. involucrata.
— pedata.
— *verticillata:* C. involucrata.

CALLISTEMON. *C. coccineus (page 3566).
—*Cunninghamii (page 3566).
— *floribundus:* *C. lanceolatus.
— *hybridus* (page 3566).
—*lanceolatus (Metrosideros).
— *robustus* (page 3566).
— *splendens* (page 3566).
— *viridifolius:* probably C. salignus viridiflorus.

CALLISTEPHUS. C. chinensis (China Aster).

CALLITRIS. *C. australis:* C. rhomboidea.

CALLUNA. *C. vulgaris (Erica).

CALOCHORTUS. C. flavus (Cyclobothra).

CALONYCTION. C. aculeatum (Ipomœa Bona-Nox).

CALOPOGON. C. pulchellus (Limodorum).

CALTHA. C. palustris.

CALYCANTHUS. *C. floridus.
— *glaucus:* *C. fertilis glaucus.

CALYCANTHUS, continued.
— *macrophyllus:* *C. occidentalis.
— *præcox:* *Meratia præcox.

CALYPSO (under the American Code, Cyatherea replaces this name). *C. borealis:* C. bulbosa, Oakes (C. borealis erroneously).

CALYSTEGIA. *C. pubescens:* Convolvulus japonicus.

CAMASSIA (Quamasia under American Code). *C. Cusickii.*
— *esculenta:* C. Quamash.
— Leichtlinii.

CAMELLIA. *C. japonica.
—*Sasanqua.
— *Thea:* *Thea sinensis.

CAMPANULA. C. alliariæfolia.
— *amabilis:* C. phyctidocalyx.
— *attica:* C. drabifolia.
— barbata.
— *calycanthema:* C. Medium calycanthema.
— carpatica.
— *dahurica:* C. glomerata dahurica.
— glomerata.
— *grandiflora:* Platycodon grandiflorum.
— *grandis:* C. latiloba.
— Grossekii.
— lactiflora.
— latifolia.
— longestyla.
— *Lorei* (Loreyi): C. ramosissima.
— *macrantha:* probably C. latifolia macrantha, but perhaps also C. persicifolia macrantha.
— macrostyla.
— Medium.
— mirabilis.
— *nobilis.* C. punctata.
— persicifolia.
— punctata.
— pyramidalis.
— rapunculoides.
— rhomboidalis.
— rotundifolia.
— *Speculum:* Specularia Speculum.
— Trachelium.
— *turbinata:* C. carpatica turbinata.
— Van Houttei.
— Vidalii.

CAMPHORA. *C. officinalis:* *Cinnamomum Camphora.

CAMPSIS (Bignonia. Tecoma). C. chinensis: *Bignonia grandiflora.
— hybrida: *B. hybrida.
— radicans: *B. radicans.

CAMPTOSORUS. C. rhizophyllus.

CANNA. C. indica.
In garden Cannas the original species are scarcely distinguishable.

CANNABIS. *C. gigantea:* a form of C. sativa.

CAPSICUM. C. annuum.
— frutescens.

CARAGANA. *C. arborescens.
—*Chamlagu.
— *frutescens:* *C. frutex.
—*microphylla.

CARDAMINE. C. pratensis.

CARDIOSPERMUM. C. Halicacabum.

CARDUUS. *C. benedictus:* **Cnicus benedictus.**

CAREX. **C. Fraseri.**
— **Morrowii.**

CARICA. *C. Papaya.

CARISSA. *C. grandiflora.

CARPENTERIA. *C. californica.

CARPINUS. *C. americana:* *C. caroliniana.
—*Betulus.
—*caroliniana.

CARUM. **C. Carvi** (Caraway).

CARYA (Carya, of Nuttall, 1818. Scoria, Rafinesque, 1808, but there is evidence that Hicoria was meant. Hicorius, Raf., 1817. Hicoria, Raf., 1838). **C. alba:** *Hicoria alba (Mockernut).
— *amara:* **C. cordiformis:** *H. cordiformis.
— **cordiformis:** *H. cordiformis.
— **glabra** (Pignut): *H. glabra.
— **laciniosa** (Shellbark Hickory): *H. laciniosa.
— **ovata:** *H. ovata (Shagbark Hickory).
— **Pecan:** *H. Pecan.
— *porcina:* **C. glabra:** *H. glabra (Pignut).
— *sulcata:* **C. laciniosa:** *H. laciniosa (Shellbark Hickory).
— *tomentosa:* **C. alba:** *H. alba.

CARYOPHYLLUS. See Eugenia.

CARYOPTERIS. *C. Mastacanthus:* *C. incana.

CARYOTA. **C. mitis.**
— *sobolifera:* **C. mitis.**
— **urens.**

CASIMIROA. **C. edulis.**

CASSANDRA. *C. calyculata:* *Chamædaphne calyculata.

CASSIA. **C. artemisioides.**
—*corymbosa.
— *floribunda:* *C. corymbosa.
— **lævigata.**
— **marilandica.**
— **polyantha** (page 3566).
— **tomentosa.**

CASTALIA. See Nymphæa.

CASTANEA. *C. americana:* *C dentata.
—*japonica:* **C. crenata.**
—*pumila.
—*sativa.
— *vesca:* *C. sativa.

CASTANOPSIS. *C. chrysophylla (see also page 2891 for other species).

CASTILLEJA. **C. indivisa.**

CASUARINA. *C. Cunninghamiana.
—*equisetifolia.
—*stricta.

CATALPA. *C. bignonioides.
—**Bungei:* **C. bignonioides nana** (C. Bungei of botanists is a good species, apparently not in the trade although likely to appear).
—*hybrida.
—*Kaempferi:* **C. ovata.**

CATALPA, continued.
—*ovata.
—*speciosa.

CATANANCHE. *C. bicolor:* **C. cærulea bicolor.**
— **cærulea.**

CAULOPHYLLUM. **C. thalictroides.**

CEANOTHUS. *C. americanus.
—*azureus.
—*hybridus.
—*thyrsiflorus.

CEDRELA. *C. sinensis.

CEDRONELLA. **C. cana.**

CEDRUS. *C. atlantica.
—*Deodara.
—*Libani.

CELASTRUS. *C. articulatus:* *C. orbiculatus.
—*orbiculatus.
— *punctatus:* *C. orbiculatus punctatus.
—*scandens.

CELOSIA. *C. coccinea:* **C. cristata.**
— **cristata.**
— **Huttonii.**
— *spicata:* perhaps a form of C. cristata, not C. spicata of botanists.

CELSIA. **C. Arcturus** (page 3566).

CELTIS. *C. australis.
— *crassifolia:* *C. occidentalis crassifolia.
—*mississippiensis.
—*occidentalis.
—*reticulata.

CENTAUREA. **C. americana.**
— **babylonica.**
— *candidissima:* **C. Cineraria.**
— **Clementei.**
— **Cyanus.**
— **dealbata.**
— **gymnocarpa.**
— **imperialis.**
— **macrocephala.**
— **montana.**
— **moschata.**
— **nigra.**
— *odorata:* **C. moschata.**
— **orientalis** (page 3567).
— **pulcherrima** (Ætheopappus).
— **ruthenica.**
— *suaveolens:* **C. moschata.**

CENTAURIDIUM. *C. Drummondii:* **Xanthisma texanum.**

CENTRANTHUS. *C. albus:* name likely to apply to either **C. ruber albus** or **C. macrosiphon albus.**
— **macrosiphon.**
— **ruber.**

CENTROSEMA. *C. grandiflora:* **C. virginianum.**

CEPHALANTHUS. *C. occidentalis.

CEPHALARIA. **C. alpina.**
— **tatarica.**

CEPHALOTAXUS. *C. drupacea.
—*Fortunei.
—*Harringtonia** (Taxus).
— *pedunculata:* *C. Harringtonia.

CERASTIUM. **C. Biebersteinii.**
— **tomentosum.**

CERASUS. *C. avium:* *Prunus avium.
— *caproniana:* *P. Cerasus.
— *caroliniana:* **P. caroliniana:** *Laurocerasus caroliniana.
— *chinensis:* *P. glandulosa and *P. japonica (Cherry-Almonds).
— *ilicifolia:* *P. ilicifolia.
— *integrifolia:* *P. Lyonii.
— *japonica:* *P. subhirtella pendula (Flowering Cherry).
— *Mahaleb:* *P. Mahaleb.
— *Padus:* *P. Padus.
— *pennsylvanica:* *P. pennsylvanica.
— *Rhexi:* *P. Cerasus Rhexii.
— *serotina:* *P. serotina.
— *Sieboldii:* *P. Sieboldii.

CERATONIA. *C. Siliqua.

CERATOSTIGMA. **C. plumbaginoides** (Plumbago).

CERCIDIPHYLLUM. *C. japonicum.

CERCIS. *C. canadensis.
—*chinensis.
— *japonica:* *C. chinensis.
—*Siliquastrum.

CERCOCARPUS. *C. parvifolius.

CEREUS. *C. nycticalus:* **Selenicereus pteranthus.**

CERINTHE. **C. retorta.**

CEROPTERIS. **C. sulphurea** (Gymnogramma).

CESTRUM. *C. aurantiacum.
—*elegans** (Habrothamnus).
—*fasciculatum.
—*nocturnum.
—*Parqui.

CHÆNOMELES. **C. japonica** (Chæ. Maulei); *Cydonia Maulei.
— **lagenaria** (the tenable name for the plant generally known as Chæ. japonica; Cy. Maulei now becomes Chæ. japonica. See page 3567). *Cydonia japonica.

CHÆROPHYLLUM. **C. bulbosum** (Turnip-rooted Chervil).

CHAMÆCERASUS. *C. Albertii:* *Lonicera spinosa Albertii.
— *Maackii:* *Lonicera Maackii.

CHAMÆCYPARIS. *C. Lawsoniana (Cupressus).
— *nutkaensis:* *C. nootkatensis (Cupressus).
—*obtusa.
—*pisifera.
— *sphæroidea:* *C. thyoides.

CHAMÆDAPHNE. *C. calyculata (Andromeda. Cassandra).

CHAMÆLIRIUM. **C. luteum.**

CHAMÆPEUCE. *C. diacantha:* **Cirsium diacantha.**

CHAMÆROPS. *C. canariensis:* a form of **C. humilis.**
—*elegans:* a form of **C. humilis.**
— *excelsa:* *Trachycarpus excelsa.
— *Fortunei:* *Trachycarpus Fortunei
—*humilis.
— *nepalensis:* *Trachycarpus Martiana.

CHARIEIS. **C. heterophylla** (Kaulfussia).

CHAYOTA. See Sechium.
CHEILANTHES. C. Fendleri.
CHEIRANTHUS. C. Allionii
— Cheiri.
CHELONE. *C. barbata:* Pentstemon barbatus.
— glabra.
— Lyonii.
— obliqua.
CHENOPODIUM. C. Bonus-Henricus.
— Quinoa.
CHILOPSIS. *C. linearis (the tenable name under the rules, C. saligna being replaced).
CHIMAPHILA. C. maculata.
CHIMONANTHUS. *C. fragrans:* *Meratia præcox.
CHIONANTHUS. *C. virginica.
CHIONODOXA. C. Luciliæ.
CHLIDANTHUS. C. fragrans.
CHLORIS. *C. barbata:* C. polydactyla.
— elegans.
CHLOROPHYTUM. C. comosum (Anthericum).
— elatum (Anthericum).
CHOISYA. *C. ternata.
CHORIZEMA. C. ilicifolium.
CHRYSALIDOCARPUS. C. lutescens (Areca).
CHRYSANTHEMUM. C. arcticum.
— *Burridgianum:* a strain of C. carinatum.
— coccineum (Pyrethrum).
— coronarium.
— corymbosum (Pyrethrum).
— frutescens.
— indicum.
— *inodorum:* Matricaria inodora.
— *japonicum:* C. indicum.
— Leucanthemum.
— maximum.
— multicaule.
— nipponicum.
— Parthenium.
— segetum.
— *sinense:* C. morifolium.
— Tchihatchewii (Pyrethrum).
— *tricolor:* C. carinatum.
— uliginosum (Pyrethrum).
CHRYSOGONUM. C. virginianum.
CHRYSOPHYLLUM. C. Cainito.
CHRYSURUS. *C. aureus:* Lamarckia aurea.
— *cynosurioides:* L. aurea.
CIBOTIUM. C. Schiedei (Cybotium).
CICER. C. arietinum.
CICHORIUM. C. Endivia (Endive).
— Intybus (Chicory).
CIMICIFUGA. C. americana.
— dahurica.
— japonica.
— racemosa.
— *simplex:* C. racemosa simplex.
CINERARIA. *C. grandiflora* and *C. hybrida:* forms or hybrids of Senecio cruentus (Florists' Cineraria).
CINERARIA, continued.
— *maritima:* Senecio Cineraria.
— *stellata:* a race of florists' cinerarias (offshoots of Senecio cruentus).
CINNAMOMUM. *C. Camphora (Camphora officinalis).
—*Cassia.
—*Loureirii.
—*zeylanicum.
CIRSIUM. C. diacantha (Chamæpeuce).
CISSUS (often listed as Vitis. Pages 3482, 3483). *C. capensis.
—*discolor.
—*oblonga.
—*quadrangularis.
—*rhombifolia.
—*striata.
CISTUS. *C. albidus.
—*ladaniferus.
—*laurifolius.
—*monspeliensis.
—*salvifolius.
CITRULLUS. C. Colocynthis (Colocynth).
— vulgaris (Watermelon).
CITRUS. *C. amara:* *C. Aurantium.
—*aurantifolia (Lime).
—*Aurantium (Sour or Seville Orange).
— *Bigaradia:* *C. Aurantium.
— *deliciosa:* *C. nobilis deliciosa (Mandarin Orange).
—*grandis (Grapefruit).
—*Limonia (Lemon).
—*Medica (Citron).
—*nobilis (King Orange).
—*sinensis (Common Orange).
—*trifoliata:* Poncirus trifoliata.
— *unshiu:* *C. nobilis unshiu (Satsuma Orange).
CLADRANTHUS. C. arabicus (Anthemis).
CLADRASTIS. *C. amurensis:* *Maackia amurensis.
—*lutea.
— *tinctoria:* *C. lutea (Virgilia).
CLARKIA. C. elegans.
— pulchella.
CLAYTONIA. C. caroliniana.
— virginica.
CLEMATIS. *C. apiifolia.
—*Armandii.
—*coccinea:* C. texensis.
—*crispa.
— *Davidiana:* *C. heracleæfolia Davidiana.
—*Douglasii.
— *erecta:* C. recta.
—*Flammula.
—*florida.
—*Fremontii.
—*grata.
—*Henryi:* C. Lawsoniana Henryi; a common horticultural variety, but not C. Henryi of botanists.
—*heracleæfolia.
—*indivisa.
—*integrifolia.
—*Jackmanii.
—*lanuginosa.
CLEMATIS, continued.
—*ligusticifolia.
—*montana.
—*orientalis.
—*paniculata.
—*patens.
—*recta.
—*serratifolia.
—*tangutica.
— *tubulosa:* *C. heracleæfolia.
—*Viorna.
—*virginiana.
—*Vitalba.
—*Viticella.
CLEOME. *C. gigantea:* C. spinosa, not C. gigantea of botanists.
CLERODENDRON. *C. trichotomum.
CLETHRA. *C. acuminata.
—*alnifolia.
—*tomentosa.
CLEYERA. *C. japonica.
CLIVIA. C. miniata.
CLYTOSTOMA (Bignonia). C. callistegioides: *Bignonia speciosa.
CNEORUM. *C. tricoccon (see Vol. V, page 2704).
COBÆA. *C. flore-alba:* probably refers to the white-flowered form of C. scandens; also known as *C. alba.*
— *macrostemma:* C. macrostoma.
—*scandens.
COCCINIA. *C. indica:* C. cordifolia.
COCCOLOBA. C. uvifera.
COCOS. *C. australis.
—*Bonnetii,* not known botanically.
—*campestris.
—*Datil.
—*eriospatha.
—*flexuosa.
—*nucifera.
—*plumosa.
—*schizophylla (page 3567).
—*Weddelliana.
CODIÆUM. The proper genus for the horticultural plants known as Croton.
COFFEA. *C. arabica.
COIX. *C. Lacryma:* C. Lacryma-Jobi.
COLCHICUM. C. autumnale.
COLEUS. C. thyrsoideus.
— *Verschaffeltii:* C. Blumei Verschaffeltii.
COLLETIA. C. cruciata.
COLLINSIA. *C. bartsiæ:* probably C. bartsiæfolia.
— bicolor.
— grandiflora.
— *multicolor:* C. bicolor multicolor.
— verna.
COLLOMIA. *C. coccinea:* Gilia coccinea.
— *grandiflora:* Gilia grandiflora.
COLOCASIA. C. antiquorum and var. esculenta (Caladium). See Taro, page 3311.
— neo-guineensis.
COLUTEA. *C. arborescens.
COMMELINA. C. cœlestis.
— *Sellowiana:* C. nudiflora.

COMPTONIA. *C. asplenifolia.
— *C. peregrina:* *C. asplenifolia.

CONOCLINIUM. *C. cælestinum:* Eupatorium cœlestinum.

CONVALLARIA. C. majalis (Lily-of-the-Valley).
— *Polygonatum:* probably Polygonatum officinale.

CONVOLVULUS. C. aureus.
— japonicus.
— *major:* Ipomœa purpurea.
— mauritanicus.
— *minor:* C. tricolor.
— *purpureus:* Ipomœa purpurea.
— *splendens:* possibly Argyreia splendens (page 3566).
— tricolor.

COOPERIA. C. Drummondii.
— pedunculata.

COPROSMA. *C. Baueri.
— *Baueriana:* *C. Baueri.

COPTIS. C. trifolia.

CORCHORUS. *C. japonicus:* *Kerria japonica.

CORDIA. *C. Francisci (not spelled Francisi).

CORDYLINE (see Dracæna). C. australis (Dracæna).
— indivisa (Dracæna).

COREOPSIS (Calliopsis). *C. auriculata:* probably C. pubescens, but perhaps means C. auriculata, Linn.
— *bicolor:* C. tinctoria.
— coronata.
— Drummondii.
— *floribunda:* not identified.
— grandiflora.
— lanceolata.
— palmata.
— radiata.
— rosea.
— *senifolia:* C. major.
— tinctoria.
— verticillata.

CORNUS. *C. alba.
—*alternifolia.
—*Amomum.
—*Baileyi.
—*brachypoda; but the plant in cultivation is probably sometimes C. controversa.
—*canadensis.
— *candidissima:* C. racemosa: *C. paniculata.
—*capitata.
— *circinata:* *C. rugosa.
— *elegantissima:* probably *C. mas elegantissima.
—*florida.
— *Gouchaultii:* *C. alba Gouchaultii.
—*Kousa.
—*mas.
— *mascula:* *C. mas.
—*Nuttallii.
—*officinalis.
—**paniculata:* C. racemosa.
—*sanguinea.
— *sericea:* *C. Amomum.
— *sibirica:* *C. alba sibirica.
— *Spaethii:* *C. alba Spaethii.
—*stolonifera.

CORONILLA. *C. Emerus.
— glauca.
— varia.

CORTADERIA. C. argentea (Gynerium).
— *jubata:* C. Quila.

CORYDALIS. C. nobilis.

CORYLOPSIS. *C. spicata.

CORYLUS. *C. americana.
— *atropurpurea:* *C. Avellana atropurpurea.
—*Avellana.
—*maxima.
— *pendula:* *C. Avellana pendula.
—*rostrata.

CORYNOCARPUS. *C. lævigata.

CORYPHA. *C. australis:* Livistona australis.

COSMIDIUM. *C. Burridgeanum:* Thelesperma hybridum.

COSMOS. C. bipinnatus.
— diversifolius (Bidens).
— sulphureus.

COTINUS. C. americanus: *Rhus cotinoides.
— Coggygria: *Rhus Cotinus.

COTONEASTER. *C. acuminata.
— *angustifolia:* *Pyracantha angustifolia.
— *buxifolia:* the plant usually sold under this name is *C. rotundifolia lanata, not C. buxifolia of botanists.
— *crenulata:* *Pyracantha crenulata.
— *Davidiana:* *C. horizontalis.
—*foveolata.
—*Franchetii.
—*frigida.
—*horizontalis.
—*integerrima.
—*microphylla.
—*pannosa.
—*salicifolia.
—*Simonsii.
— *Wheeleri:* the plant cultivated under this name is probably either C. racemiflora orbicularis or C. rotundifolia lanata.

COTYLEDON. C. secunda: Echeveria secunda (but equally correct as Cotyledon).

CRAMBE. C. cordifolia.
— maritima.

CRANIOLARIA. C. annua (Martynia).

CRASSULA. *C. coccinea:* Rochea coccinea.

CRATÆGUS. *C. arkansana.
—*Arnoldiana.
—*Barryana.
—*Carrieri.
—*coccinea: several species may pass under this name; it is difficult to know to what species the Linnæan name C. coccinea should apply.
—*coloradensis (page 3567).
—**cordata:* C. Phænopyrum.
— *crenulata:* *Pyracantha crenulata.

CRATÆGUS, continued.
—*Crus-galli.
—*cuneata.
—*Ellwangeriana.
— *glandulosa:* *C. rotundifolia.
— *Lalandii:* *Pyracantha coccinea Lalandii.
—*macrantha.
—*mollis.
—*monogyna.
—*nigra.
—*nitida.
—*Oxycantha; also misapplied to C. monogyna.
—*prunifolia.
—*punctata.
— *Pyracantha:* *Pyracantha coccinea.
—*tomentosa.

CRESCENTIA. C. Cujete (Calabash).

CRINUM. C. amabile.
— asiaticum.
— fimbriatulum.
— Kirkii.
— longifolium.
— Moorei.
— Powellii.

CROCOSMIA. C. aurea.

CROCUS. C. biflorus.
— susianus.
— vernus.

CROTON. *C. Andreanus:* Codiæum variegatum Andreanum.
— *Bergmanii:* Codiæum variegatum Bergmanii.
— *Cronstadtii:* Codiæum variegatum Cronstadtii (proper spelling is not Cronstadii).
— *edmontonensis:* Codiæum variegatum edmontonense.
— *Eversianus:* Codiæum variegatum Eversianum.
— *fuscatus:* Codiæum variegatum fuscatum.
— *inimitabilis:* Codiæum variegatum inimitabile.
— *maculatus:* Codiæum variegatum maculatum.
— *musaicus:* Codiæum variegatum musaicum.
— *punctatus:* Codiæum variegatum punctatum.
— *Reedii:* Codiæum variegatum Reidii.
— *superbus:* Codiæum variegatum superbum.
— *Thompsonii:* Codiæum variegatum Thomsonii.
The following trade-names are probably horticultural forms of Codiæum variegatum: Bausei, brilliantissimus, Chartieri, Craigii, delicatissimus, Leonii, Mortii, Pucciana, Wardelii, and others.

CRUCIANELLA. C. stylosa.

CRYPTOGRAMMA. C. acrostichoides.

CRYPTOMERIA. *C. elegans:* *C. japonica elegans.
—*japonica.

CUCUMIS. *C. acutangulus:* **Luffa acutangula.**
— **Anguria** (Gherkin).
— *erinaceus:* **C. dipsaceus.**
— *flexuosus:* **C. Melo flexuosus.**
— *grossulariæformis:* **C. Anguria.**
— **Melo** (Melon).
— *odoratissimus:* **C. Melo Dudaim.**
— *perennis:* **Cucurbita fœtidissima.**
— **sativus** (Cucumber).

CUCURBITA. **C. fœtidissima** (Cucumis).
— **maxima.**
— **moschata.**
— **Pepo.**

CUNNINGHAMIA. *C. sinensis:* ***C. lanceolata.**

CUPHEA. *C. compacta:* **C. miniata compacta.**
— *eminens:* **C. micropetala.**
— **hyssopifolia.**
— **miniata.**
— *platycentra:* **C. ignea.**
— **purpurea.**
— *Roezlii:* **C. Hookeriana** (page 3567).
— *strigulosa:* **C. cyanea,** not C. strigulosa of botanists.
— *tricolor:* **C. jorullensis** (page 3567).

CUPRESSUS. ***C. arizonica.**
—***Benthamii.**
— *elegans:* ***C. Benthamii Knightiana.**
— *excelsa:* ***C. Benthamii.**
—***funebris.**
—**glauca:* either **C. Goveniana glauca** or **C. lusitanica.**
—***Goveniana.**
—***guadalupensis.**
— *horizontalis:* ***C. sempervirens horizontalis.**
— *Knightiana:* ***C. Benthamii Knightiana.**
— *Lambertiana:* ***C. macrocarpa Lambertiana.**
— *Lawsoniana:* ***Chamæcyparis Lawsoniana.**
—***lusitanica.**
—***Macnabiana.**
—***macrocarpa.**
— *majestica:* ***C. torulosa majestica.**
— *nutkaensis:* ***Chamæcyparis nootkatensis.**
— *pyramidalis:* ***C. sempervirens stricta,** Ait. (rather than C. sempervirens fastigiata).
—***sempervirens.**
—***torulosa.**

CYBOTIUM. *C. Schiedei:* **Cibotium Schiedei.**

CYCAS. **C. revoluta.**

CYCLAMEN. **C. europæum.**
— *giganteum:* **C. persicum giganteum.**
— *hederæfolium:* probably **C. persicum,** but possibly **C. neapolitanum.**
— *latifolium:* **C. persicum.**
— **persicum.**
— **repandum.**

CYCLOBOTHRA. *C. flava:* **Calochortus flavus.**

CYCLOPHORUS. **C. Lingua** (Niphobolus).

CYDONIA. *C. alba:* **Chænomeles lagenaria** var. (page 3567) (C. japonica of literature): ***Cydonia japonica alba.**
—***japonica:* Chæn. japonica but more correctly **Chæn. lagenaria** (page 3567).
—***Maulei:* Chæn. Maulei of literature but more correctly **Chæn. japonica** (page 3567).
—***oblonga** (Quince).
— *umbilicata:* Chæn. japonica umbilicata, but more correctly **Chæn. lagenaria umbilicata:** ***Cy. japonica umbilicata.**
— *vulgaris:* ***C. oblonga.**

CYNANCHUM. **C. acuminatifolium** (Vincetoxicum).

CYNARA. **C. Cardunculus** (Cardoon).
— **C. Scolymus** (Artichoke).

CYNOGLOSSUM. *C. linifolium:* **Omphalodes linifolia.**
— **nervosum** (page 3567).

CYPERUS. **C. adenophorus** (page 3567).
— **alternifolius.**
— **esculentus** (Chufa).
— **Papyrus** (Papyrus).

CYPHOMANDRA. **C. betacea.**

CYPRIPEDIUM. **C. acaule.**
— *hirsutum:* **C. reginæ** (known also as C. spectabile).
— **parviflorum.**
— **pubescens.**
— **Reginæ.**
— *spectabile:* **C. reginæ** (C. spectabile is not tenable).

CYRTOMIUM. **C. caryotideum.**
— **falcatum.**
— **Fortunei.**
— **Rochfordianum;** a variation of **C. falcatum.**

CYSTOPTERIS. **C. bulbifera.**
— **fragilis.**

CYTISUS. *C. albus.* Name applied to different plants; likely to be **C. leucanthus** or **C. multiflorus,** or possibly **C. purpureus albus, C. præcox** or **C. scoparius albus.**
— *alpinus:* ***Laburnum alpinum.**
— *Andreanus:* ***C. scoparius Andreanus.**
—***canariensis.**
— *candicans:* ***C. monspessulanus.**
—***fragrans.**
— *hispanicus:* ***Genista hispanica.**
— *Laburnum:* **Laburnum anagyroides:** ***L. vulgare.**
—***multiflorus** (Genista).
—***nigricans.**
—***præcox.**
—***racemosus;** but the plant in cultivation is perhaps **C. maderensis magnifolius.**
— *schipkaensis:* ***C. leucanthus schipkaensis.**
—***scoparius.**
—***sessilifolius.**
—***triflorus.**
— *Watereri:* ***Laburnum Watereri.**

DACTYLIS. **D. glomerata.**

DÆMONOROPS. **D. fissus** (page 3568).

DAHLIA. *D. arborea:* **D. excelsa.**
— **coccinea.**
— **excelsa.**
— **Juarezii.**
— *variabilis:* **D. rosea.**

DALIBARDA. **D. repens.**

DAPHNE. ***D. Cneorum.**
— *Fioniana:* ***D. oleoides Fioniana.**
—***Genkwa.**
—***Mezereum.**
—***odora.**
—***oleoides.**

DAPHNIPHYLLUM. ***D. macropodon.**

DARLINGTONIA. **D. californica.**

DASYLIRION. **D. acrotriche.**
— **glaucophyllum.**
— **graminifolium.**
— *Parryi:* **Nolina Parryi.**
— *quadrangulatum:* **D. longissimum.**
— **serratifolium.**
— **Wheeleri.**

DATURA. **D. arborea** (Brugmansia).
— **cornigera.**
— *cornucopia:* **D. fastuosa.**
— **humilis.**
— **meteloides.**
— **sanguinea.**

DAUCUS. **P. Carota** (Carrot).

DAVALLIA. *D. tenuifolia:* **Odontosoria chinensis.**

DECKENIA (Deckeria). **D. nobilis** (page 3568).

DECUMARIA. ***D. barbara.**

DEERINGIA. *D. celosioides:* ***D. baccata.**

DELPHINIUM. **D. Ajacis.**
— *Barlowii:* **D. hybridum Barlowii.**
— **Brunonianum.**
— **cardinale.**
— **cardiopetalum.**
— **cashmerianum.**
— **caucasicum.**
— *chinense:* **D. grandiflorum chinense.**
— **Consolida.**
— **elatum.**
— **formosum.**
— **grandiflorum.**
— **hybridum.**
— **Maackianum.**
— **Moerheimei.**
— **nudicaule.**
— **speciosum** (page 3568).
— **Zalil.**
Many Delphinium names, as D belladonna, are of garden forms.

DENDRIUM (American Code name). *D. buxifolium:* ***Leiophyllum buxifolium.**
— *prostratum:* ***L. buxifolium prostratum.**

DENDROCALAMUS. **D. latiflorus.**

DENDROMECON. **D. rigidum.**

DENDROPANAX. ***D. japonicum** (see note under Acanthopanax)

DENNSTÆDTIA. **D. cicutaria** (Sitolobium).
— **punctilobula** (Dicksonia).

DENTARIA. **D. diphylla.**

DESMAZERIA. **D. sicula** (Brizopyrum).

DESMODIUM. *D. bicolor:* *Lespedeza bicolor.
—**japonicum:* L. japonica.
—**penduliflorum:* L. formosa, Koehne (L. Sieboldii not tenable under the rules).

DEUTZIA. *D. candidissima:* *D. scabra candidissima.
— *corymbiflora:* *D. setchuenensis corymbiflora.
— *crenata:* *D. scabra crenata.
—**discolor.
— *Fortunei:* *D. scabra Fortunei.
—**gracilis.
—**Lemoinei.
—**myriantha.
—**parviflora.
—**scabra.
—**Schneideriana.
—**Vilmorinæ.
— *Watereri:* *D. scabra Watereri.

DIANTHUS. *D. atrorubens:* D. carthusianorum.
— barbatus.
— cæsius.
— Caryophyllus (Carnation).
— chinensis.
— cruentus.
— deltoides.
— diadematus.
— glacialis.
— *Heddewigii:* D. chinensis Heddewigii.
— imperialis.
— *laciniatus:* D. chinensis laciniatus.
— latifolius.
— marginatus (page 3568).
— *neglectus:* D. glacialis neglectus.
— plumarius.
— *punctatus:* a form of D. Caryophyllus, not D. punctatus of botanists.
— *scoticus:* D. plumarius.
— *Seguieri:* D. chinensis asper.
— semperflorens; some of the stock is probably D. plumarius semperflorens.
Latin names of Dianthus are likely to represent garden forms, as albus plenus, mirabilis, multiflorus, nanus, and others.
— superbus.

DIASCIA. D. Barberæ.

DICENTRA (Bicuculla). D. canadensis.
— chrysantha.
— Cucullaria.
— eximia.
— formosa.
— spectabilis (Dielytra).

DICKSONIA. *D. punctilobula:* Dennstædtia punctilobula.

DICTAMNUS. D. albus.
— *caucasicus:* D. albus caucasicus.
— *Fraxinella:* D. albus.
— *ruber:* D. albus ruber.

DIDISCUS. *D. cærulea:* Trachymene cærulea.

DIEFFENBACHIA. D. magnifica.
— splendens.

DIELYTRA. *D. spectabilis:* Dicentra spectabilis.

DIERVILLA (Weigela). *D. amabilis:* the plant in cultivation is likely to be either D. florida or D. coræensis, probably the former: *Weigela amabilis.
— *candida:* D. hybrida candida: *W. candida.
— *Desboisii:* D. hybrida Desboisii: *W. Desboisii.
— floribunda: *W. floribunda.
— florida: *W. rosea.
— *Hendersonii:* D. hybrida Hendersonii: *W. Hendersonii.
— hybrida: *Weigela hybrida.
— japonica: *W. japonica.
— *Lavallei:* D. hybrida Lavallei: *W. Lavallei.
— Lonicera: *D. trifida.
— *lutea:* the plant in the trade under this name is declared to be *D. sessilifolia.
—**rivularis.
— *rosea:* D. florida: *W. rosea.
—**sessilifolia.
— *Steltzneri:* D. hybrida Steltzneri: *W. Steltzneri.
—**trifida:* D. Lonicera.
— *Van Houttei:* D. hybrida Van Houttei: *W. Van Houttei.
— *Verschaffeltii:* D. hybrida Verschaffeltii: *W. Verschaffeltii.

DIGITALIS. *D. alba:* probably D. purpurea alba.
— ambigua.
— *gloxiniæflora:* D. purpurea gloxiniæflora.
— *grandiflora:* D. ambigua.
— lanata.
— maculata.
— *monstrosa:* D. purpurea monstrosa.
— purpurea.
— sibirica.

DIMORPHANTHUS. *D. mandschuricus:* *Aralia chinensis mandschurica.

DIMORPHOTHECA. D. annua (Calendula).
— aurantiaca.
— sinuata.

DIONÆA. D. muscipula.

DIOSCOREA. D. alata.
— Batatas.
— bulbifera.

DIOSMA. D. ericoides.
— *purpurea:* usually Agathosma villosa, but sometimes A. Ventenatiana.

DIOSPYROS. *D. Kaki.
—**Lotus.*
—**virginiana.*

DIOTIS. D. candidissima (Santolina).

DIPLADENIA. D. splendens.

DIPSACUS. D. fullonum (Teasel).

DIRCA. * D. palustris.

DIZYGOTHECA. D. elegantissima (Aralia).
— Kerchoveana (Aralia).
— Veitchii (Aralia. Panax).

DODECATHEON. D. Clevelandii.
— Hendersonii.

DODECATHEON, continued.
— Jeffreyi.
— Media.
— radicatum.

DODONÆA. *D. cuneata.

DOLICHOS. *D. biflorus.
—**giganteus:* a form of D. Lablab.
— *japonicus:* Pueraria hirsuta: *P. Thunbergiana.
—**Lablab.*
—**lignosus.*
— *sesquipedalis:* *Vigna sesquipedalis.

DORONICUM. D. austriacum.
— caucasicum.
— Clusii.
— *excelsum:* D. plantagineum excelsum.
— magnificum.
— plantagineum.

DRABA. *D. androsacea:* D. fladnizensis.

DRACÆNA. *D. amabilis:* Cordyline amabilis, a form of C. terminalis.
— *australis:* C. australis.
— *Baptistii:* C. Baptistii, a form of C. terminalis.
— deremensis.
— Draco.
— fragrans.
— Godseffiana.
— Goldieana.
— *imperialis:* C. imperialis, a form of C. terminalis.
— *indivisa:* C. indivisa; but often applied to C. australis.
— Knerkii, a form of D. fragrans.
— *Lindenii:* D. fragrans Lindenii.
— *Massangeana:* D. fragrans Massangeana.
— Rothiana.
— Sanderiana.
— Shepherdii, unknown botanically.
— *terminalis:* Cordyline terminalis.
— *Veitchii:* C. australis Veitchii.
— *Youngii:* C. Youngii, a form of C. terminalis.
Other Dracæna names are in the trade, probably forms of species of Cordyline, as Albertii, Doucetii (C. australis Doucetiana), lineata (Cordyline terminalis) Parrei, Storyi, and others.

DRACOCEPHALUM. *D. argunense:* D. Ruyschiana.
— grandiflorum.
— Moldavica.
— Ruyschiana.

DRACUNCULUS. D. vulgaris (Arum).

DROSERA. D. filiformis.
— rotundifolia.

DRYOPTERIS. Accepted name for certain species listed under Aspidium.
— hirtipes (Nephrodium).

DUCHESNEA. D. indica (Fragaria).

DURANTA. D. Plumieri.

ECBALLIUM. E. Elaterium (Momordica).

ECCREMOCARPUS. E. scaber (Calampelis).

ECHEVERIA (see Cotyledon). *E. agavoides:* **Cotyledon agavoides** (but equally correct as **E. agavoides**).
— *metallica:* **E. gibbiflora metallica.**
— **secunda** (Cotyledon).

ECHINACEA (Brauneria). **E. angustifolia.**
— *intermedia:* **E. purpurea serotina.**
— **purpurea.**

ECHINOCACTUS. *E. viridiflorus:* **Echinocereus viridiflorus.**

ECHINOCEREUS. **E.** viridiflorus (Echinocactus).

ECHINOCYSTIS. **E. lobata.**

ECHINOPS. **E. bannaticus.**
— **exaltatus.**
— **humilis.**
— **Ritro.**
— **sphærocephalus.**

ECHIUM. **E. fastuosum.**

EDGEWORTHIA. ***E. Gardneri.**
— *papyrifera:* ***E. chrysantha.**

EICHHORNIA. **E. azurea.**
— **crassipes.**

ELÆAGNUS. ***E. angustifolia.**
—***argentea.**
— *aurea:* ***E. pungens variegata.**
— *edulis:* **E. multiflora:** ***E. longipes.**
—**longipes:* **E. multiflora.**
—***macrophylla.**
— **multiflora.** ***E. longipes.**
—***pungens.**
— *reflexa:* ***E. pungens reflexa.**
— *Simonii:* ***E. pungens Simonii.**
—***umbellata.**

ELÆIS. **E. guineensis.**

ELÆODENDRON. **E. orientale** (Aralia Chabrieri).

ELEUSINE. *E. barcinonensis:* **E. tristachya.**
— **coracana.**
— **indica.**

ELODEA. **E. canadensis** (Anacharis).

ELSHOLTZIA. **E. cristata.**
—***Stauntonii.**

ELYMUS. **E. arenarius.**
— **giganteus** (page 3568).
— **glaucus.**

EMILIA. *E. sonchifolia:* **E. flammea** (Cacalia).

EMMENANTHE. **E. penduliflora.**

ENKIANTHUS. ***E. campanulatus.**
— *japonicus:* ***E. perulatus.**

EOMECON. **E. chionantha.**

EPHEDRA. ***E. altissima.**

EPIGÆA. ***E. repens.**

EPILOBIUM. **E. angustifolium.**
— **hirsutum.**

EPIMEDIUM. **E. alpinum.**
— *colchicum:* **E. pinnatum colchicum.**
— *diphyllum:* **Aceranthus diphyllus.**
— **macranthum.**
— **Musschianum.**
— *niveum:* **E. macranthum niveum.**
— *violaceum:* **E. macranthum violaceum.**

EPIPACTIS. *E. pubescens:* **Goodyera pubescens.**

EPIPHYLLUM. *E. Makoyanum:* **Schlumbergera Russelliana.**
— *truncatum:* **Zygocactus truncatus.**

ERAGROSTIS. **E. abyssinica.**
— **amabilis** (Poa).
— *elegans:* **E. interrupta.**
— **geniculata** (Briza).
— **maxima.**
— **minus.**
— **obtusa.**

ERANTHIS. **E. hyemalis.**

EREMURUS. **E. himalaicus.**
— **robustus.**
— **turkestanicus** (page 3568).

ERIANTHUS. **E. Ravennæ.**

ERICA. ***E. carnea.**
—***ciliaris.**
—***cinerea.**
— *Mackaii:* supposed to be a hybrid of E. ciliaris × E. Tetralix.
—***mediterranea.**
—***melanthera.**
—***persoluta.**
—***stricta.**
—***Tetralix.**
—***vagans.**
— *vulgaris:* ***Calluna vulgaris.**
— *Willmoreana:* ***E. Wilmorei.**

ERIGERON. **E. alpinus.**
— **aurantiacus.**
— *bellidifolius:* **E. pulchellus.**
— **glabellus.**
— **glaucus.**
— *grandiflorus:* **E. speciosus grandiflorus,** not E. grandiflorus of botanists.
— *intermedius:* not identified.
— **mucronatus** (Vittadinia).
— **multiradiatus.**
— **speciosus** (Stenactis).
— *umbellatus:* not identified.

ERINUS. **E. alpinus.**

ERIOBOTRYA. ***E. japonica** (Loquat. Photinia).

ERLANGEA. **E. tomentosa.**

ERODIUM. **E. cicutarium.**
— **Manescavii.**
— **moschatum.**

ERYNGIUM. **E. alpinum.**
— **amethystinum.**
— **cœlestinum:** unknown botanically; possibly **E. amethystinum.**
— **giganteum.**
— **hybridum.**
— **maritimum.**
— **Oliverianum.**
— **planum.**
— *yuccæfolium:* **E. aquaticum.**

ERYSIMUM. *E. arkansanum:* **E. asperum arkansanum.**
— **ochroleucum.**
— **Perofskianum.**
— **pulchellum.**

ERYTHEA. **E. armata.**
— **Brandegeei.**
— **edulis.**
— **elegans.**

ERYTHRÆA. This genus should take the name Centaurium; names little known in the trade.

ERYTHRINA. **E. Crista-galli.**

ERYTHRONIUM. **A. albidum.**
— **americanum.**
— **californicum.**
— **citrinum.**
— *giganteum:* **E. grandiflorum.**
— **grandiflorum.**
— **Hartwegii.**
— **Hendersonii.**
— **purpurascens.**
— **revolutum.**

ESCALLONIA. *E. Berteriana:* ***E. pulverulenta.**
—***leucantha.**
—***montevidensis.**
— *Philippiana:* ***E. virgata.**
— *rosea:* not known botanically.
— *rubra:* ***E. rubra glabriuscula,** not E. rubra of botanists.
—***virgata.**

ESCHSCHOLTZIA. *E. alba:* **a** white form of **E. californica.**
— *aurantiaca:* **a** form of **E. californica.**
— **californica.**
— *crocea:* **E. californica crocea.**
— *Douglasii:* **E. californica Douglasii.**
— *maritima:* the cultivated plant is a form of **E. californica,** not E. maritima of botanists.
— **tenuifolia.**
— *Thorburnii:* **a** form of **E. californica.**

EUCALYPTUS. ***E. alpina.**
—***amygdalina.**
— *angulosa:* ***E. incrassata angulosa.**
—***bicolor.**
—***Bosistoana.**
—***botryoides.**
— *cajaputea:* ***E. odorata.**
—***calophylla.**
— *citriodora:* ***E. maculata citriodora.**
—***coriacea.**
—***cornuta.**
—***corynocalyx.**
—***crebra.**
—***diversicolor.**
—***ficifolia.**
—***globulus.**
—***Gunnii.**
—***hemiphloia.**
—***incrassata.**
—***Lehmannii.**
—***leucoxylon.**
—***macrorhyncha.**
—***maculata.**
—***mellidora.**
—***Muelleriana.**
—***obliqua.**
—***occidentalis.**
— *pauciflora:* ***E. coriacea.**
—***odora.**
—***piperita.**
—***polyanthemos.**
—***resinifera.**
—***robusta.**
—***rostrata.**
—***rudis.**
—***siderophloia.**
—***sideroxylon.**
—***Stuartiana.**
—***tereticornis.**
—***viminalis.**
—***virgata.**

EUCHARIDIUM. **E. grandiflorum.**

EUCHARIS. *E. amazonica:* **E. grandiflora.**
EUCHLÆNA. **E. mexicana.**
EUGENIA. *E. apiculata (Myrtus).
— **E. aromatica** (Clove); by some recent botanists separated as Caryophyllus aromaticus.
— **jambolana;** by some recent authors separated as Syzygium jambolanum.
— **Jambos.**
— *Michelii:* *E. uniflora.
—*microphylla.
—*myrtifolia.
— **operculata:** correctly placed either here or as Syzygium operculatum.
—*uniflora.
EULALIA. *E. gracillima:* **Miscanthus sinensis gracillimus.**
— *japonica:* **M. sinensis.**
— *variegata:* **M. sinensis variegatus.**
— *zebrina:* **M. sinensis zebrinus.**
EUONYMUS: See Evonymus.
EUPATORIUM. *E. ageratoides:* **E. urticæfolium.**
— **album.**
— **aromaticum.**
— **cœlestinum.**
— *Fraseri:* **E. aromaticum melissoides.**
— **glechonophyllum** (Ageratum).
— **Lasseauxii** (Ageratum).
— **micranthum** (Ageratum).
— **perfoliatum**
— **purpureum.**
— **serotinum** (page 3568).
— **urticæfolium.**
EUPHORBIA. **E. corollata.**
— **Cyparissias.**
— **fulgens.**
— **heterophylla.**
— **marginata.**
— *polychroma:* **E. epithymoides.**
— **pulcherrima.** *Poinsettia pulcherrima.
— **splendens.**
— *variegata:* **E. marginata.**
EURYA. *E. latifolia:* **E. japonica.**
EUSTOMA. **E. Russellianus** (Lisianthus).
EUTOCA. *E. multiflora:* **Phacelia linearis.**
— *viscida:* **P. viscida.**
EVONYMUS. (The preference for Evonymus over Euonymus lies in this use of the word by Linnæus. The former is now generally accepted on the continent of Europe and by some American botanists, as in Gray's Manual. A comparable case is the spelling Zanthoxylum rather than Xanthoxylum. The American Joint Committee on Horticultural Nomenclature adopts the spelling *Euonymus. Some treat the name as feminine and others as masculine.)
— **alata:** *Euonymus alatus.
— **americana:** *Euon. americanus.
— **atropurpurea:** *Euon. atropurpureus; sometimes misapplied to **E. europæa atropurpurea.**
EVONYMUS, continued.
— **Bungeana:** *Euon. Bungeanus.
— *Carrierei:* ***Euon. radicans Carrierei.**
— **europæa:** *Euon. europæus.
— **japonica:** *Euon. japonicus.
— *kewensis:* **E. radicans minima:** *Euon. radicans minimus.
— **latifolia:** *Euon. latifolius.
— **nana;** but the plant in cultivation may be **E. europæa nana:** *Euon. europæus nanus.
— **obovata:** *Euon. obovatus.
— **radicans.**
— **radicans reticulata:** *Euon. radicans reticulatus.
— **Sieboldiana:** The true E. Sieboldiana is not introduced; the plants cult. under this name are **E. Bungeana semipersistens, E. patens,** or **E yedoensis.**
— *vegeta:* **E. radicans vegeta:** *Euon. radicans vegetus.
EXACUM. **E. affine.**
EXOCHORDA. *E. Giraldii.
—**grandiflora:* **E. racemosa.**
— *Wilsonii:* *E. Giraldii Wilsonii.

FABIANA. *F. imbricata.
FAGOPYRUM. **F. esculentum** (Buckwheat).
— **tataricum** (India-Wheat).
FAGUS. *F. americana:* **F. grandifolia** (American Beech).
— *ferruginea:* **F. grandifolia:** *F. americana.
—*sylvatica** (European Beech, purple-leaved and weeping forms).
FARFUGIUM. *F. argenteum:* **Ligularia Kaempferi argenteus.**
— *grande:* **L. Kaempferi aureomaculatus.**
FATSIA. *F. japonica** (Aralia).
— *papyrifera:* ***Tetrapanax papyriferum** by preference, although by many retained in Fatsia.
FEIJOA. **F. Sellowiana.**
FELICIA. **F. amelloides** (Agathæa).
FENZLIA. *F. dianthiflora:* **Gilia dianthoides.**
FERULA. **F. communis.**
FESTUCA. **F. elatior.**
— **glauca.**
FICUS. *F. altissima.
—*Carica** (Fig).
—*elastica.
— *lutescens:* *F. diversifolia.
—*macrophylla.
—*pandurata.
—*pumila.
— *repens:* *F. pumila.
—*rubiginosa.
— **ulmifolius** (page 3568).
— **utilis** (page 3568).
FILARIA (misspelling). See Phillyrea.
FILIPENDULA (see Spiræa and Ulmaria.) **F. camtschatica.**
— **hexapetala.**
— **purpurea.**
— **rubra.**
— **Ulmaria.**
FITTONIA. **F. argyroneura.**
FORSYTHIA. *F. Fortunei:* *F. suspensa Fortunei.
—*intermedia.
— *Sieboldii:* *F. suspensa Sieboldii.
—*suspensa.
—*viridissima.
FRAGARIA. **F. chiloensis.**
— *indica:* **Duchesnea indica.**
— **mexicana.**
— **vesca.**
— **virginiana.**
FRANCOA. **F. ramosa.**
FRAXINUS. *F. alba:* *F. americana.
—*americana.
— *aurea:* *F. excelsior aurea.
—*excelsior.
—*lanceolata.
— *lentiscifolia:* *F. rotundifolia.
—*mandschurica.
—*nigra.
—*oregona.
—*Ornus.
—*pennsylvanica.
— *pubescens:* *F. pennsylvanica.
—*quadrangulata.
—*rotundifolia.
— *sambucifolia:* *F. nigra
— *viridis:* *F. lanceolata.
FREESIA. *F. alba:* **F. refracta alba.**
— **refracta.**
FREMONTIA. *F. californica.
FRITILLARIA. **F. Imperialis.**
— **liliacea.**
— **meleagris.**
FUCHSIA. *F. conica:* **F. magellanica conica.**
— *globosa:* **F. magellanica globosa.**
— *gracilis:* **F. magellanica gracilis.**
— *hybrida:* **F. speciosa.**
— **magellanica.**
— **procumbens.**
— *Riccartonii:* **F. magellanica Riccartonii.**
— **speciosa.**
— **triphylla.**
FUNKIA. *F. alba:* **Hosta plantaginea.**
— *aurea:* variegated forms of various species of Hosta.
— *cærulea:* **H. cærulea.**
— *Fortunei:* **H. Fortunei,** commonly cultivated as F. Sieboldiana.
— *gigantea:* **H. Fortunei gigantea.**
— *grandiflora:* **H. plantaginea grandiflora.**
— *japonica:* usually **H. plantaginea,** but may be **H. lancifolia.**
— *lanceolata:* **H. cærulea.**
— *lancifolia:* **H. lancifolia.**
— *ovata:* **H. cærulea.**
— *robusta:* **H. Fortunei robusta.**
— *Sieboldiana:* **H. Sieboldiana,** but much of the stock is **H. Fortunei.**
— *subcordata:* **H. plantaginea.**
— *undulata:* **H. lancifolia undulata.**
— *variegata:* variegated forms of various species of Hosta.

GAILLARDIA. **G. amblyodon.**
— **aristata.**
— *grandiflora:* **G. aristata.**
— **kermesina;** a form of G. aristata.
— **Lorenziana;** a form of G. pulchella picta.

GAILLARDIA, continued.
— *maxima:* G. aristata.
— *picta:* G. pulchella picta.
GALANTHUS. G. nivalis.
GALAX. *G. aphylla.
GALEGA. *G. bicolor;* probably a form of G. officinalis (page 3568).
— *Hartlandii:* G. officinalis Hartlandii.
— officinalis.
GALEORCHIS. See Orchis.
GALIUM. G. boreale.
GALTONIA. G. candicans (Hyacinthus).
GAMOLEPIS. G. Tagetes.
GARCINIA. G. Mangostana (Mangosteen).
GARDENIA. *G. *florida:* G. jasminoides.
—*Fortunei: G. jasminoides Fortuniana.
—*radicans: G. jasminoides.
—*Veitchii; probably a form of G. jasminoides.
GARRYA. *G. elliptica.
GAULTHERIA. *G. procumbens.
—*Shallon.
GAURA. G. Lindheimeri.
GAYLUSSACIA. *G. frondosa.
— *resinosa:* *G. baccata.
—*ursina.
GAZANIA. G. longiscapa.
— splendens.
GELSEMIUM. *G. sempervirens.
GENISTA. *G. ætnensis.
— *alba:* *Cytisus multiflorus.
— *Andreana:* *C. scoparius Andreanus.
— *canariensis:* *C. canariensis.
— *fragrans:* *C. fragrans.
—*hispanica (Cytisus).
— *juncea:* *Spartium junceum.
—*monosperma.
— *racemosa:* *C. racemosus.
— *scoparia:* *C. scoparius.
— tibetica (page 3568).
—*tinctoria.
GENTIANA. G. acaulis.
— Andrewsii.
— asclepiadea.
— crinita.
— Cruciata.
— lutea.
— scabra.
GERANIUM. *G. album:* applies probably to G. ibericum album, G. pratense album or G. maculatum album.
— armenum.
— *citriodorum:* Pelargonium acerifolium.
— collinum.
— Fremontii.
— grandiflorum.
— ibericum.
— *Londesii:* G. collinum.
— maculatum.
— *platypetalum:* G. ibericum platypetalum.
— pratense.
— Robertianum.
GERANIUM, continued.
— sanguineum.
— *zonale:* Pelargonium zonale.
GERARDIA. G. hybrida.
GERBERA. G. Jamesonii.
GESNERIA. *G. macrantha:* G. cardinalis.
GEUM. G. atrosanguineum; probably a form of G. chiloense.
— bulgaricum: botanically unknown.
— chiloense.
— coccineum, but sometimes G. chiloense.
— Heldreichii; probably a form of G. montanum.
— japonicum.
— *miniatum:* G. chiloense miniatum.
GILIA. G. achilleæfolia.
— androsacea (Leptosiphon).
— capitata.
— coronopifolia (Ipomopsis).
— densiflora (Leptosiphon).
— dianthoides (Fenzlia).
— laciniata.
— liniflora.
— micrantha (Leptosiphon).
— *nivalis:* a white form of G. tricolor.
GILLENIA. G. stipulata (Porteranthus).
— trifoliata.
GINKGO (Salisburia). *G. biloba.
GLADIOLUS. G. brenchleyensis.
— Childsii.
— gandavensis.
— Kunderdii.
— nanceianus.
— primulinus.
— princeps.
The cultivated forms of Gladiolus are not clearly referable to botanical species.
GLAUCIUM. *G. luteum:* G. flavum.
GLECHOMA. *G. variegata:* Nepeta hederacea variegata.
GLEDITSIA (Gleditschia). *G. japonica.
—*sinensis.
—*triacanthos.
GLOBULARIA. G. trichosantha.
GLORIOSA. G. Rothschildiana.
— superba.
GLOXINIA (the florists' Gloxinia is Sinningia speciosa). *G. crassifolia:* a strain of Sinningia speciosa.
— *gigantea:* a form of S. speciosa.
GLYCINE. G. Soja (Soybean). (Under the American Code Glycine replaces Apios, and the soybean becomes Soja max, Piper.)
GLYCYRRHIZA. G. glabra.
GNAPHALIUM. *G. lanatum:* Helichrysum petiolatum.
— *Leontopodium:* Leontopodium alpinum.
GODETIA. G. amœna.
— grandiflora.
— *Lindleyi: Œnothera Lindleyi, a form of G. amœna.
— rubicunda: a form of G. amœna.
— Schwaminii: a form of G. amœna.
— *Whitneyi:* G. grandiflora.
GOMPHRENA. *G. aurea:* G. globosa aurea.
— globosa.
GONIOPHLEBIUM. *G. subauriculatum:* Polypodium subauriculatum.
GOODYERA (much difference of opinion exists as to the merits of this name, but it is retained by some recent orchid students and is probably tenable). *G. Menziesii:* G. decipiens (rather than G. Menziesii as on page 1357).
— pubescens.
— repens.
GRAMMANTHES. *G. gentianoides:* G. dichotoma.
GREVILLEA. *G. robusta.
—*Thelemanniana.
GUNNERA. G. manicata.
— *scabra:* G. chilensis.
GYMNOCLADUS. *G. canadensis.* *G. dioica.
GYMNOGRAMMA. *G. sulphurea:* Ceropteris sulphurea.
GYMNOTHRIX. *G. japonica:* Pennisetum japonicum.
— *latifolia:* P. latifolium.
GYNERIUM. *G. argenteum:* Cortaderia argentea.
— *jubatum:* C. Quila.
GYPSOPHILA. G. acutifolia.
— cerastioides.
— elegans.
— muralis.
— paniculata.
—*repens.

HABENARIA. H. biephariglottis.
— bracteata.
— ciliaris.
— dilatata.
— Hookeriana.
— hyperborea.
— psycodes.
HABROTHAMNUS. *H. elegans:* Cestrum elegans.
— *fasciculatus:* C. fasciculatum.
HÆMANTHUS. *H. albiflora:* H. albiflos.
— coccineus.
— puniceus.
HAKEA. *H. elliptica.
—*laurina.
—*saligna.
—*suaveolens.
HALESIA. *H. caroliniana:* H. carolina *H. tetraptera.
—*diptera.
—*tetraptera:* H. carolina.
HAMAMELIS. *H. japonica.
—*mollis.
—*virginiana.
— *virginica:* *H. virginiana.
— *Zuccariniana:* *H. japonica Zuccariniana.
HARDENBERGIA. *H. Comptoniana.
— *hibernica:* *H. helix hibernica.
—*monophylla.
HEDERA. *H. algeriensis:* *H. canariensis.
—*helix.
— *maculata:* *H. helix maculata.

HEDERA, continued.
— *maderensis:* *H. canariensis.
— *Rægneriana:* *H. colchica.
— *variegata:* *H. canariensis variegata.
HEDYSARUM. *H. coronarium.
—*multijugum.
HELENIUM. H. autumnale.
— Bigelovii.
— Hoopesii.
— *pumilum:* probably H. autumnale pumilum.
— tenuifolium.
HELIANTHELLA. H. quinquenervis.
HELIANTHEMUM. *H. alpestre.
— *croceum:* *H. glaucum croceum.
— *multiflorum:* probably H. halimifolium multiflorum.
— *mutabile:* *H. Chamæcistus mutabile.
— *polifolium:* *H. Chamæcistus tomentosum.
— *vulgare:* *H. Chamæcistus.
HELIANTHUS. H. annuus.
— argyrophyllus.
— *californicus:* probably H. californicus, but perhaps means H. annuus californicus in some lists.
— *cucumerifolius:* H. debilis.
— decapetalus.
— giganteus.
— *globosus:* H. annuus globosus.
— *macrophyllus:* H. strumosus macrophyllus.
— *Maximilianus:* H. Maximilianii.
— mollis.
— *multiflorus:* H. decapetalus multiflorus.
— *nanus:* H. annuus nanus.
— *orgyralis:* H. orgyalis.
— *rigidus:* H. scaberrimus.
— *sparsifolius:* H. atrorubens.
— tuberosus.
HELICHRYSUM. H. angustifolium (page 3568).
— bracteatum.
— *monstrosum:* double forms of H. bracteatum.
— petiolatum (Gnaphalium).
HELICODICEROS. H. muscivorus (Arum).
HELICONIA. *H. aurea:* H. aureostriata.
HELIOPSIS. *H. lævis:* H. helianthoides.
— *Pitcheriana:* H. helianthoides Pitcheriana.
— scabra.
HELIOTROPIUM. H. peruvianum.
HELIPTERUM. *H. album:* H. roseum album (Acroclinium).
— corymbiflorum.
— Manglesii (Rhodanthe).
— roseum (Acroclinium).
— *Sanfordii:* H. Humboldtianum.
HELLEBORUS. H. niger.
HELONIAS. H. bullata.
HEMEROCALLIS. H. aurantiaca.
— citrina.
— *disticha:* H. fulva.
— Dumortieri.
— flava.
HEMEROCALLIS, continued.
— fulva.
— *Kwanso:* H. fulva Kwanso.
— luteola.
— Middendorffii.
— minor.
— *Sieboldii:* H. Dumortieri.
— Thunbergii.
HEPATICA. H. acutiloba (Anemone).
— angulosa.
— triloba (Anemone).
HERACLEUM. *H. giganteum:* H. villosum.
HERNIARIA. H. glabra.
HESPERIS. H. matronalis.
HESPEROYUCCA. *H. Whipplei (Yucca).
HETEROCENTRON. *H. mexicanum:* *H. roseum.
HETEROMELES. *H. arbutifolia:* *Photinia arbutifolia.
HEUCHERA. H. americana.
— brizoides.
— *gracillima:* H. sanguinea gracillima.
— *rubrifolia:* H. pubescens.
— sanguinea.
HEVEA. H. brasiliensis.
HIBBERTIA. *H. volubilis.
HIBISCUS. *H. africanus:* H. Trionum.
— coccineus.
— *cruentus:* form of H. Rosa-sinensis probably (page 3568).
— elatus (Paritium).
— esculentus (Okra).
— grandiflorus.
— *Lambertianus:* form of H. Rosa-sinensis probably (page 3569).
— Manihot.
— militaris.
— *miniatus:* a form of H. Rosa-sinensis.
— Moscheutos.
— mutabilis.
— oculiroseus.
— Rosa-sinensis.
— Sabdariffa (Roselle).
— schizopetalus.
— *sinensis:* H. Rosa-sinensis.
— *subviolaceus:* a form of H. Rosa-sinensis.
—*syriacus (Althæa).
— tiliaceus (Paritium).
HICORIA (see Carya). **H. alba* (Mockernut): Carya alba.
—**cordiformis:* C. cordiformis.
—**glabra* (Pignut): C. glabra.
—**laciniosa* (Shellbark Hickory): C. laciniosa.
— *minima:* C. cordiformis: *H. cordiformis.
—**ovata* (Shagbark Hickory): C. ovata.
—**Pecan:* C. Pecan.
— *porcina* (Pignut): C. glabra: *H. glabra.
— *sulcata* (Shellbark Hickory): C. laciniosa: *H. laciniosa.
— *tomentosa* (Mockernut): C. alba: *H. alba.
HIERACIUM. H. aurantiacum.
— villosum.
HIPPEASTRUM. H. equestre (Amaryllis).
— Johnsonii (Amaryllis).
— solandriflorum (Amaryllis).
— vittatum (Amaryllis).
HIPPOPHAË. *H. rhamnoides.
HOLODISCUS. *H. ariæfolius:* *H. discolor ariæfolius.
HORDEUM. H. jubatum.
HOSTA (Funkia). H. cærulea.
— Fortunei.
— lancifolia.
— plantaginea.
— Sieboldiana.
HOUSTONIA. H. cærulea.
— purpurea.
— serpyllifolia.
HOVENIA. *H. dulcis.
HOWEA. H. Belmoreana (Kentia).
— Forsteriana (Kentia).
HOYA. H. carnosa.
HUMEA. H. elegans.
HUMULUS. *H. japonicus.
—*Lupulus (Hop).
— *neo-mexicanus:* *H. Lupulus neomexicanus.
HUNNEMANNIA. H. fumariæfolia.
HYACINTHUS. *H. candicans:* Galtonia candicans.
— orientalis.
HYDRANGEA. *H. arborescens.
—*Bretschneideri.
—*cinerea.
— *grandiflora:* name in trade distinguishes either *H. paniculata grandiflora or *H. arborescens grandiflora, usually the former.
—**hortensis:* plant in trade is probably H. opuloides Hortensia, possibly sometimes H. paniculata grandiflora.
—**monstrosa:* H. opuloides otaksa monstrosa.
— *nivea:* *H. radiata.
—*opuloides.
— *otaksa:* *H. opuloides otaksa.
—*paniculata.
—*petiolaris (see Schizophragma)
—*quercifolia.
—*radiata.
— *ramis pictis:* *H. opuloides cyanoclada.
—**rosea:* H. opuloides otaksa rosea.
— *scandens:* *H. petiolaris.
HYDRASTIS. H. canadensis.
HYDRIASTELE. *H. Wendlandiana.*
HYDROCLEIS. H. nymphoides (Limnocharis).
HYMENOCALLIS. H. calathina (Ismene. Pancratium).
HYMENOSPORUM. *H. flavum.
HYOPHORBE. H. amaricaulis.
— Verschaffeltii (Areca).
HYPERICUM. *H. adpressum.
—*Arnoldianum.
—*aureum.
—*Buckleii.
—*calycinum.
—*densiflorum.
—*elegans.
—*galioides.

HYPERICUM, continued.
—*hircinum.
—*Kalmianum.
—*lobocarpum.
—*Moserianum.
—*patulum.
—*prolificum.

HYPOCHŒRIS. H. uniflora.

HYPOXIS. *H. erecta:* H. hirsuta.

HYSSOPUS. H. officinalis.

IBERIS. *I. affinis:* I. pectinata.
— amara.
— *corifolia:* I. saxatilis corifolia.
— *coronaria:* I. amara coronaria, not I. coronaria of botanists.
— gibraltarica.
— *jucunda:* Æthionema coridifolium.
— odorata.
— pectinata.
— saxatilis.
— sempervirens.
— Tenoreana.
— umbellata.

ILEX. *I. Aquifolium.
—*Cassine.
—*corallina.
—*crenata.
— *Dahoon:* *I. Cassine.
—*decidua.
—*glabra.
—*monticola.
—*opaca.
— *pyramidalis:* *I. Aquifolium pyramidalis.
—*serrata.
—*verticillata.
—*vomitoria.

ILLICIUM. *I. anisatum.

IMPATIENS. I. Balsamina (Garden Balsam).
— *glanduligera:* I. Roylei.
— Holstii.
— platypetala.
— Roylei.
— Sultani.

INCARVILLEA. I. Delavayi.
— grandiflora.
— variabilis.

INDIGOFERA. *I. floribunda:* *I. Gerardiana.
—*tinctoria.

INULA. I. britannica.
— ensifolia.
— glandulosa.
— grandiflora.
— montana (page 3569).
— Oculus-Christi.
— Royleana.

IOCHROMA. *I. fuchsioides.
—*lanceolatum.

IONOPSIDIUM. I. acaule.

IPOMŒA. I. Batatas (Sweet Potato).
— *Bona-nox:* Calonyction aculeatum; sometimes apparently applied to a strain of I. Tuba.
— *coccinea:* Quamoclit coccinea.
— *grandiflora:* probably I. Tuba, but perhaps sometimes applied to I. hederacea grandiflora or Calonyction aculeatum.
— hederacea.
— Learli, but the trade plant may be erroneously I. mutabiiis.
— *limbata:* I. hederacea limbata.
— *mexicana:* I. hirsutula.
— *Nil:* I. hederacea.
— *noctiflora:* Calonyction aculeatum.
— pandurata.
— *paniculata:* I. digitata.
— purpurea (Convolvulus).
— *Quamoclit:* Quamoclit pinnata.
— *rubro-cærulea:* I. tricolor.
— setosa.
— Tuba.

IPOMOPSIS. *I. elegans:* Gilia coronopifolia.

IRESINE (see Achyranthes). I. Herbstii.
— Lindenii.

IRIS. *I. asiatica:* I. pallida.
— *atropurpurea:* probably I. atropurpurea; perhaps also applied to a color form of I. pumila or I. germanica.
— aurea.
— Cengialti.
— cristata.
— *cuprea:* I. fulva.
— *cyanea:* I. reticulata cyanea.
— *dalmatica:* I. pallida dalmatica.
— flavescens.
— florentina.
— fœtidissima.
— germanica.
— gracilipes (page 3569).
— graminea,
— *Kaempferi:* I. lævigata.
— lævigata.
— longipetala.
— macrantha.
— missouriensis.
— *ochroleuca:* I. orientalis.
— orientalis.
— pallida.
— plicata.
— Pseudacorus.
— pumila.
— reticulata.
— sibirica.
— *spectabilis:* I. Xiphium.
— *stylosa:* I. unguicularis.
— verna.
— versicolor.
— *virginica:* I. versicolor.
— Wilsonii.
— xiphioides.
— Xiphium.

ISMENE. *I. calathina:* Hymenocallis calathina.

ISOLEPIS. *I. gracilis:* Scirpus cernuus.

ITEA.* I. virginica.

IXIA. *I. crateroides:* I. speciosa.
The Ixia names are difficult to identify with the botanical species; apparently I. columellaris and I. maculata and others, enter into them.

IXORA. I. coccinea; sometimes misapplied to I. chinensis.
— *Colei:* I. coccinea.
— *Dixiana:* I. coccinea.
— *Fraseri:* I. coccinea.
— javanica.

JACARANDA. *J. mimosæfolia:* *J. ovalifolia.

JACOBÆA. *J. elegans:* Senecio elegans.

JACOBINIA. J. coccinea.
— *magnifica:* J. carnea.
— pauciflora (Libonia).

JAMESIA. *J. americana.

JASMINUM. *J. azoricum.
—*fruticans.
—*gracillimum.
—*grandiflorum.
—*humile.
— *ligustrifolium:* *J. rigidum.
—*nitidum.
—*nudiflorum.
—*officinale.
—*primulinum.
— *revolutum:* *J. humile.
—*rigidum.
—*Sambac.

JUBÆA. J. spectabilis.

JUGLANS. *J. ailanthifolia:* *J. Sieboldiana.
—*californica.
—*cinerea.
— *cordiformis:* *J. Sieboldiana cordiformis.
— *japonica:* the cultivated plant is probably either *J. Sieboldiana or *J. regia.
—*nigra.
— *præparturiens:* *J. regia fertilis.
—*regia.
—*Sieboldiana.
— *Sieboldii:* *J. Sieboldiana.

JUNCUS. J. effusus.

JUNIPERUS. *J. argentea:* *J. chinensis albo-variegata.
— *aurea:* the name is applied to both *J. communis aurea and *J. chinensis aurea.
— *bermudiana:* *J. barbadensis.
—*californica.
— *canadensis:* *J. communis depressa.
—*chinensis.
—*communis.
—*communis montana.
—*excelsa.
— *hibernica:* *J. communis hibernica.
—*horizontalis (see J. Sabina, below).
—*japonica: J. chinensis japonica (page 3569).
—*macrocarpa.
—*monosperma.
— *nana:* *J. communis montana.
— *neoboriensis:* *J. macrocarpa.
— *oblonga:* *J. communis oblonga.
—*pachyphlœa.
— *Pfitzeriana:* *J. chinensis Pfitzeriana.
—*phœnicea.
— procumbens: the cultivated plant is perhaps J. chinensis Sargentii (page 3569).
— *prostrata:* J. horizontalis.
—*rigida.
—*Sabina (J. horizontalis is sometimes cultivated under this name).
—*scopulorum.
— *sibirica:* *J. communis montana.
— *sinensis:* *J. chinensis.
—*squamata.

JUNIPERUS, continued.
— *stricta:* *J. excelsa stricta.
— *suecica:* *J. communis suecica.
— *tamariscifolia:* *J. Sabina tamariscifolia.
—*virginiana.

JUSSIÆA. J. longifolia.

KADSURA. *K. japonica.

KALANCHOË. K. flammea.

KALMIA. *K. angustifolia.
— *glauca:* *K. polifolia.
—*latifolia.

KAULFUSSIA. *K. amelloides:* Charieis heterophylla.

KENNEDYA. *K. cærulea:* probably *Hardenbergia Comptoniana.
— *Comptoniana:* *H. Comptoniana.
— *ovata:* *H. monophylla.

KENTIA. *K. Belmoreana:* Howea Belmoreana.
— *Canterburyana:* Hedyscepe Canterburyana.
— *Forsteriana:* Howea Forsteriana.
— *Macarthuri:* Ptychosperma Macarthuri.
— Sanderiana.
— *Wendlandiana:* Hydriastele Wendlandiana.

KERRIA. *K. japonica (Corchorus).

KNIPHOFIA (see Tritoma). *K. alooides:* K. Uvaria.
— corallina.
— foliosa.
— Macowanii.
— *nobilis:* T. Uvaria nobilis.
— Pfitzeri.
— Saundersii.
— sulphurea.
— Uvaria (alooides).

KOCHIA. K. trichophylla.

KŒLREUTERIA. *K. paniculata.

LABURNUM. *L. alpinum (Cytisus).
—*vulgare:* L. anagyroides (Cytisus).
—*Watereri (Cytisus).

LACINIARIA. *L. pumila:* Liatris spicata montana.
— *pycnostachya:* Liatris pycnostachya.
— *spicata:* Liatris spicata.

LACHENALIA. L. luteola.
— Nelsonii.
— pendula.
— quadricolor.
— tricolor.

LACTUCA. L. sativa (Lettuce).

LAGENARIA. L. leucantha.
— *vulgaris:* L. leucantha.

LAGERSTRŒMIA. *L. indica.

LAGUNARIA. *L. Patersonii.

LAGURUS. L. ovatus.

LAMARCKIA. L. aurea (Chrysurus).

LAMIUM. *L. album:* L. maculatum.
— *purpureum:* probably L. maculatum rather than the true L. purpureum.

LANTANA. *L. delicatissima:* probably L. Sellowiana.
— *hybrida:* dwarf garden forms of L. Camara.
— Sellowiana.

LAPAGERIA. *L. alba.* L. rosea albiflora.
— rosea.

LAPEYROUSIA. L. cruenta (Anomatheca).

LARIX. *L. americana:* *L. laricina.
— decidua. *L. europæa.
—*europæa:* L. decidua.
— hybrida (page 3569).
— *Kaempferi:* *L. leptolepis.
—*laricina.
—*leptolepis.

LASIANDRA. *L. macrantha:* Tibouchina semidecandra.

LASTREA. *L. dilatata:* Dryopteris spinulosa dilatata.
— *Filix-mas:* D. Filix-mas.

LATANIA. *L. borbonica:* L. Commersonii; stock usually Livistona chinensis.

LATHYRUS. L. grandiflorus; also applies to L. latifolius grandiflorus.
— latifolius.
— magellanicus.
— niger (Orobus).
— odoratus.
— vernus (Orobus).

LAUROCERASUS. *L. Bertinii:* Prunus Laurocerasus Bertinii: *L. officinalis Bertinii.
—*caroliniana:* P. caroliniana.
— *caucasica:* P. Laurocerasus caucasica: *L. officinalis caucasica.
— *colchica:* P. Laurocerasus colchica: *L. officinalis colchica.
—*lusitanica:* P. lusitanica.
—*officinalis:* P. Laurocerasus.
— *rotundifolia:* P. Laurocerasus rotundifolia: *L. officinalis rotundifolia.
— *versaillensis:* P. Laurocerasus versaillensis: *L. officinalis versaillensis.

LAURUS. *L. Benzoin:* *Benzoin æstivale.
— *Cerasus:* Prunus Laurocerasus: *Laurocerasus officinalis.
— *lusitanica:* Prunus lusitanica: *Laurocerasus lusitanica.
—*nobilis.

LAVANDULA. **officinalis:* L. vera. *L. Spica.

LAVATERA. *L. alba:* L. trimestris alba.
— arborea.
— *rosea:* L. trimestris.
— *splendens:* L. trimestris splendens.
— trimestris.

LAYIA. L. elegans.

LEDUM. *L. grœnlandicum.
— *latifolium:* *L. grœnlandicum.
—*palustre.

LEIOPHYLLUM (Dendrium). *L. buxifolium.

LEONOTIS. L. Leonurus.

LEONTOPODIUM. L. alpinum (Gnaphalium).

LEPACHYS. L. columnaris (Obeliscaria).
— pinnata.

LEPARGYREA. See Shepherdia.

LEPIDIUM. L. sativum (Cress).

LEPTOSIPHON. *L. androsaceus:* Gilia androsacea.
— *aureus:* G. micrantha.
— *carmineus:* G. micrantha.
— *densiflorus:* G. densiflora.
— *hybridus:* G. micrantha.

LEPTOSPERMUM. L. flexuosum (Agonis).
—*lævigatum.

LEPTOSYNE. L. maritima.
— Stillmanii.

LESPEDEZA. *L. bicolor (Desmodium).
— japonica. *D. japonicum.
— *Sieboldii:* L. formosa, Koehne (L. Sieboldii is not tenable under the rules): *D. penduliflorum.

LEUCÆNA. *L. glauca.

LEUCOCRINUM. L. montanum.

LEUCOJUM. L. æstivum.
— vernum.

LEUCOTHOË. *L. Catesbæi (Andromeda).
—*racemosa.
—*recurva.

LEYCESTERIA. *L. elegans:* *L. formosa.

LIATRIS (Laciniaria). L. elegans.
— ligulistylis.
— punctata.
— pycnostachya.
— scariosa.
— spicata.

LIBOCEDRUS. *L. chilensis.
—*decurrens.

LIBONIA. *L. floribunda:* Jacobinia pauciflora.

LICUALA. L. grandis.

LIGULARIA. L. clivorum (Senecio).
— Kaempferi (Farfugium. Senecio).
— Wilsoniana (see Senecio, page 3153).

LIGUSTRUM. *L. acuminatum.
—*amurense; but misapplied to L. sinense.
— *chinense:* *L. sinense.
—*coriaceum.
—*Ibota.
—*japonicum.
—*lucidum.
— *macrocarpum:* *L. acuminatum macrocarpum.
— *macrophyllum:* *L. lucidum.
— *marginatum:* probably L. vulgare argenteo-marginatum or aureo-marginatum.
— *medium:* *L. acuminatum.
—*nepalense.
—*ovalifolium.
—*Quihoui.
— *Regelianum:* *L. Ibota Regelianum.
—*sinense.
— *spicatum:* the cultivated plant is probably L. Massalongianum, L. japonicum, L. lucidum or L. nepalense.
—*vulgare.

LILIUM. L. auratum.
— Batemanniæ.
— *Bloomerianum:* L. Humboldtii.
— Bolanderi.

LILIUM, continued.
— **Brownii.**
— **canadense.**
— **candidum.**
— **carolinianum.**
— **chalcedonicum.**
— *colchicum:* **L. monadelphum.**
— **columbianum.**
— **concolor.**
— **croceum.**
— **dauricum.**
— **elegans.**
— *excelsum:* **L. testaceum.**
— **giganteum**; applies also to **L. longiflorum giganteum.**
— **Grayi.**
— **Hansonii.**
— **Henryi.**
— **Humboldtii.**
— **japonicum.**
— **Kelloggii.**
— *Krameri:* **L. japonicum.**
— **Leichtlinii.**
— **longiflorum.**
— *maculatum:* **L. medioloides, L. candidum maculatum** or **L. chalcedonicum maculatum.**
— *magnificum:* **L. speciosum magnificum** or **L. Humboldtii magnificum.**
— **maritimum.**
— **Martagon.**
— **Maximowiczii.**
— *myriophyllum:* **L. regale.**
— **pardalinum.**
— **Parryi.**
— **parviflorum.**
— **parvum.**
— **philadelphicum.**
— *puberulum:* **L. Humboldtii puberulum.**
— **rubellum.**
— *rubescens:* **L. washingtonianum rubescens.**
— **Sargentiæ.**
— **speciosum**; perhaps sometimes misapplied to **L. candidum speciosum.**
— **superbum.**
— *Szovitzianum:* **L. monadelphum Szovitzianum.**
— **tenuifolium.**
— **testaceum.**
— *Thomsonianum:* **L. roseum.**
— *Thunbergianum:* **L. elegans.**
— **tigrinum.**
— *umbellatum:* probably **L. dauricum**, but may be true **L. umbellatum.**
— **Wallichianum.**
— **washingtonianum.**

LIMNANTHEMUM. *L. indicum:* **Nymphoides indicum.**
— *lacunosum:* **N. lacunosum.**
— *nymphæoides:* **N. peltatum.**

LIMNANTHES. **L. Douglasii.**

LIMNOCHARIS. *L. Humboldtii:* **Hydrocleis nymphoides.**

LIMODORUM. *L. pulchellus:* **Calopogon pulchellus.**

LIMONIUM. See the names under Statice.

LINARIA. *L. alba:* perhaps **L. Cymbalaria alba** or **L. bipartita alba.**
— **bipartita.**
— **Cymbalaria.**

LINARIA, continued.
— **hepaticæfolia.**
— **macedonica.**
— **maroccana.**
— **reticulata.**

LINDELOFIA. **L. longifolia.**

LINDERA. *L. Benzoin:* ***Benzoin æstivale.**

LINOSYRIS. **L. vulgaris.**

LINUM. **L. austriacum.**
— *coccineum:* **L. grandiflorum coccineum.**
— **flavum.**
— **grandiflorum.**
— **Lewisii.**
— **narbonnense.**
— **perenne.**

LIPARIS. **L. liliifolia.**
— **Lœselii.**

LIPPIA. **L. citriodora** (Aloysia. Verbena).
— *repens:* **L. canescens.**

LIQUIDAMBAR. ***L. Styraciflua.**

LIRIODENDRON. ***L. Tulipifera.**

LISIANTHUS. *L. Russellianus:* probably **Eustoma Russellianum**, although true **L. Russellianus** is sometimes cultivated.

LITCHI. **L. chinensis** (Nephelium).

LITHOCARPUS. See page 3569.

LIVISTONA. **L. australis** (Corypha).
— **chinensis** (Latania).
— **rotundifolia.**

LOASA. *L. aurantiaca:* **Blumenbachia lateritia.**
— **tricolor.**

LOBELIA. **L. cardinalis**; stock is sometimes **L. fulgens.**
— **Erinus.**
— *gracilis:* applies to **L. gracilis** or **L. Erinus gracilis.**
— **heterophylla**; or the stock may be **L. Erinus.**
— *pumila:* **L. Erinus pumila**, not **L.** pumila of botanists.
— *ramosa:* **L. tenuior.**
— *speciosa:* **L. Erinus speciosa**, not **L.** speciosa of botanists.
— **syphilitica.**
— **tenuior.**
— **Tupa.**

LOMARIA. *L. ciliata:* **Blechnum Moorei.**

LONICERA. *L. Albertii:* ***L. spinosa Alberti** (Chamæcerasus).
— *albida:* ***L. bella albida.**
— *aurea.* ***L. Periclymenum aurea**, not **L. aurea** of botanists.
— *belgica:* ***L. Periclymenum belgica.**
—***bella.**
— *brachypoda:* a form of **L. japonica.**
—***Brownii.**
—***canadensis.**
—***Caprifolium**; but the plant cultivated is perhaps sometimes **L. americana.**
— *chinensis:* ***L. japonica chinensis.**
—***chrysantha.**
—***dioica.**
—***flava.**
— *flexuosa:* ***L. japonica flexuosa.**

LONICERA, continued.
—***fragrantissima**; sometimes also used for **L. Standishii.**
— *fuchsioides:* ***L. Brownii fuchsioides**, not **L. fuchsioides** of botanists.
— *gigantea:* either **L. etrusca pubescens** or **L. etrusca superba.**
— *glauca:* ***L. dioica.**
— **grandiflora:** ***L. tatarica grandiflora.**
— *Halliana:* ***L. japonica Halliana.**
—***Heckrottii.**
—***Henryi.**
—***involucrata.**
—***japonica.**
—***Ledebouri.**
—***Maackii** (Chamæcerasus).
—***Morrowii.**
—***muendeniensis.**
—***muscaviensis.**
—***notha.**
—***oblongifolia.**
—***Periclymenum.**
—***pileata.**
—***pyrenaica.**
—***Ruprechtiana.**
—***segreziensis.**
—***sempervirens.**
— *sinensis:* ***L. Standishii.**
—***spinosa** (Chamæcerasus). Name sometimes applied to ***L. spinosa Alberti.**
—***Standishii.**
— *Sullivantii:* ***L. prolifera.**
—***tatarica.**
—***thibetica.**
—***trichosantha.**
— *virginalis:* ***L. tatarica virginalis.**
—***Xylosteum.**

LOPHOSPERMUM. *L. scandens:* **Maurandia Lophospermum.**

LOTUS. **L. Bertholetii.**
— **corniculatus.**
— **Jacobæus.**
— *peliorhynchus:* **L. Bertholetii.**

LUCUMA. **L. mammosa.**
— **nervosa.**

LUFFA. **L. acutangula** (Cucumis).
— **cylindrica.**

LUNARIA. *L. biennis:* **L. annua.**

LUPINUS. **L. affinis.**
— **arboreus.**
— *Cruikshanksii:* **L. mutabilis Cruikshanksii.**
— **Hartwegii.**
— **hirsutus.**
— **luteus**; but also **L. arboreus luteus.**
— **mutabilis.**
— **nanus.**
— **perennis.**
— **polyphyllus.**
— **subcarnosus.**
— *tricolor:* **L. Dunnettii.**

LYCHNIS. **L. alpina.**
— **chalcedonica.**
— **Cœli-rosa** (Agrostemma. Viscaria).
— **Coronaria.**
— **diurna: L. dioica.**
— **Flos-cuculi.**
— **Flos-Jovis** (Agrostemma).
— *fulgens:* probably a form of **L. coronata** rather than the true **L. fulgens.**

LYCHNIS, continued.
— *grandiflora:* **L. coronata.**
— **Haageana.**
— *plenissima:* **L. Flos-cuculi plenissima.**
— *Sieboldii:* **L. coronata Sieboldii.**
— *splendens:* **L. Viscaria splendens.**
— *vespertina:* **L. alba.**
— **Viscaria** (Viscaria).

LYCIUM. *L. barbarum; the plants cultivated as L. barbarum and L. europæum are usually L. halimifolium or L. chinense; the true species (L barbarum and L. europæum) are probably not grown in this country.
—*chinense.
—*europæum.
—*halimifolium.

LYCOPERSICUM. L. esculentum (Tomato).
— **pimpinellifolium.**

LYCOPODIUM. L. clavatum.
— **complanatum.**
— *dendroideum:* **L. obscurum.**
— **lucidulum.**

LYCORIS. L. squamigera (Amaryllis Hallii).

LYGODIUM. L. japonicum.
— **palmatum.**
— **scandens.**

LYONIA. *L. ligustrina: Xolisma ligustrina.

LYONOTHAMNUS. *L. floribundus.

LYSIMACHIA. L. barystachys.
— *ciliata:* **Steironema ciliatum.**
— **clethroides.**
— **Fortunei.**
— **japonica** (page 3569).
— **Nummularia.**
— **punctata.**
— **thyrsiflora.**
— **vulgaris.**

LYTHRUM. L. alatum.
— *roseum:* **L. Salicaria roseum.**
— **Salicaria.**
— **virgatum.**

MAACKIA. *M. amurensis (Cladrastis).

MACADAMIA. M. ternifolia.

MACLURA. *M. aurantiaca:* *M. pomifera: Toxylon pomiferum.

MAGNOLIA. *M. acuminata.
— *alba superba:* *M. Soulangeana alba superba.
— *Alexandrina:* *M. Soulangeana Alexandrina.
—*atropurpurea:* probably a form of M. liliflora.
—*conspicua:* M. denudata.
— **cordata:** *M. acuminata cordata.
— **denudata.**
—*Fraseri.
— *fuscata:* *Michelia fuscata.
—*glauca.
— *gloriosa:* *M. grandiflora gloriosa.
—*grandiflora.
— *Halleana:* *M. stellata.
—*hypoleuca.
—*Kobus.
— *Lennei:* *M. Soulangeana Lennei.
— **liliflora:** *M. obovata.

MAGNOLIA, continued.
—*macrophylla.
— *Norbertiana:* *M. Soulangeana Norbertiana.
—*obovata: M. liliflora.
—*parviflora.
— *purpurea:* M. liliflora: *M, obovata.
— *rustica:* *M. Soulangeana rustica.
—*salicifolia; sometimes misapplied to M. grandiflora angustifolia.
—*Soulangeana.
— *speciosa:* *M. Soulangeana speciosa.
—*stellata.
— *stricta:* *M. grandiflora exoniensis.
—*Thompsoniana.
—*tripetala.
—*Watsonii.
— *Yulan:* M. denudata: *M. conspicua.

MAHONIA (Odostemon under American Code). *M. Aquifolium.
—*Fortunei.
—*japonica.
—*nervosa.
—*pinnata.
—*repens.

MAIANTHEMUM (Unifolium under American Code). M. bifolium (Smilacina).

MALCOMIA. M. maritima.

MALOPE. *M. grandiflora:* M. trifida grandiflora.
— *rosea:* M. trifida rosea.

MALUS. **M. angustifolia:* Pyrus angustifolia.
—**Arnoldiana:* Pyrus pulcherrima Arnoldiana.
—**atrosanguinea:* P. atrosanguinea.
—**baccata:* P. baccata.
— *cerasiformis:* P. cerasifera: *Malus cerasifera.
—**coronaria:* P. coronaria.
— *cratægifolia:* P. florentina: *Malus florentina.
—**Dawsoniana:* supposed hybrid of P. fusca and P. Malus (see page 2876).
— *denticulata:* unidentified; probably P. prunifolia Rinki.
—**florentina:* P. florentina.
—**floribunda:* P. pulcherrima.
—**fusca:* P. fusca.
—**Halliana:* P. Halliana.
—**ioensis:* P. ioensis.
— *Malus:* P. Malus: *M. sylvestris.
—**Niedzwetzkyana:* P. Malus Niedzwetzkyana.
—**Parkmanii:* P. Halliana Parkmanii.
—**prunifolia:* P. prunifolia.
— *Ringo:* P. prunifolia Rinki: *Malus prunifolia Rinki.
—**Sargentii:* P. Sargentii.
—**Scheideckeri:* P. pulcherrima Scheideckeri.
— *Sieboldii:* P. Sieboldii: *M. Toringo.
—**Soulardii:* P. Soulardii.
—**spectabilis:* P. spectabilis.
—**sylvestris:* P. Malus.
—**Toringo:* P. Sieboldii.
—**Zumi:* P. Zumi.

MALVA. M. Alcea.
— **crispa.**
— *miniata:* **Sphæralcea cisplatina.**
— **moschata.**

MALVAVISCUS. M. arboreus (Achania).

MAMMEA. M. americana.

MANDEVILLA. *M. suaveolens.

MANETTIA. M. bicolor: some of the stock is probably M. inflata.

MANGIFERA. M. indica.

MANIHOT. M. utilissima (Cassava).

MARANTA. M. Closonii.
— **Goveniana:** unknown botanically.
— *illustris:* **Calathea illustris.**
— *insignis:* **C. insignis.**
— *Kerchoveana:* **M. leuconeura Kerchoveana.**
— *Makoyana:* **C. Makoyana.**
— *Massangeana:* **M. leuconeura Massangeana.**
— *rosea:* probably **C. roseo-picta.**
— *Sanderi:* probably **C. Sanderiana.**
— *Vandenheckei:* **C. Vandenheckei.**
— *vittata:* **C. vittata.**

MARRUBIUM. M. vulgare (Horehound).

MARSHALLIA. M. trinervia.

MARTINEZIA. M. caryotæfolia.

MARTYNIA. *M. Craniolaria:* **Craniolaria annua.**
— *formosa:* **M. fragrans.**
— **lutea.**
— *proboscidea:* **M. louisiana.**

MATRICARIA. *M. capensis:* **M. Chamomilla parthenoides.**
— *grandiflora:* **M. inodora plenissima,** not M. grandiflora of botanists.
— **parthenoides.**

MATTEUCCIA. M. Struthiopteris (Onoclea).

MATTHIOLA. M. bicornis.
— **incana.**

MAURANDIA. *M. antirrhiniflora:* **Antirrhinum maurandioides.**
— **Barclaiana.**
— *Emeryana:* a color form of **M. Barclaiana.**
— **Lophospermum** (Lophospermum).

MAYTENUS. *M. Boaria.

MECONOPSIS. M. integrifolia.

MEDICAGO. M. arborea.
— **sativa** (Alfalfa).
— **scutellata.**

MEDINILLA. *M. amabilis:* **M. Teysmannii.**
— **magnifica.**

MELALEUCA. *M. alba:* *M. armillaris.
—*decussata.
—*ericifolia.
—*hypericifolia.
—*incana.
—*Leucadendron.
—*nesophila.
— *oppositifolia:* *M. hypericifolia.
—*Wilsonii.

MELIA. *M. Azedarach.
— *umbraculifera:* *M. Azedarach umbraculiformis.

MELIANTHUS. M. major.
MELICOCCA. M. bijuga (Genip).
MELILOTUS. M. alba.
MELISSA. M. officinalis (Balm).
MELOTHRIA. M. punctata (Pilogyne).
— scabra.
MENISPERMUM. *M. canadense.
— dauricum.
MENTHA. M. piperita.
— rotundifolia.
— *viridis:* M. spicata.
MENTZELIA. M. aurea, Baill. (M. Lindleyi not tenable under the rules). (Bartonia).
MENYANTHES. M. trifoliata.
MENZIESIA. *M. pilosa.
MERATIA. *M. præcox (Chimonanthus).
MERTENSIA. M. ciliata.
— virginica.
MESEMBRYANTHEMUM. M. cordifolium.
— crystallinum.
— roseum.
— *tricolor:* M. pyropeum.
MESPILUS. *M. germanica.
METROSIDEROS. *M. floribunda:* *Callistemon lanceolatus.
—*robusta.
— *semperflorens:* *Callistemon lanceolatus.
MICHELIA. *M. fuscata.
MILLA. M. biflora.
MILLETTIA. *M. megasperma (see Vol. V, page 2706).
MIMOSA. M. pudica.
MIMULUS. M. cardinalis.
— cupreus.
— moschatus.
— ringens.
— *Roezlii:* M. luteus alpinus.
— *tigrinus:* a form of M. luteus.
MINA. *M. lobata:* Quamoclit lobata.
— *sanguinea:* Q. coccinea hederifolia.
MIRABILIS. M. Jalapa.
— longiflora.
MISCANTHUS (Eulalia). M. sinensis.
MITCHELLA. M. repens.
MITELLA. M. diphylla.
MOLINIA. M. cærulea (Aira).
MOLUCCELLA. M. lævis.
MOMORDICA. M. Balsamina.
— Charantia.
— *Elaterium:* Ecballium Elaterium.
MONARDA. M. didyma.
— fistulosa.
— *mollis:* M. fistulosa mollis.
MONSTERA. M. deliciosa.
MONTBRETIA. *M. aurantiaca:* Tritonia crocosmæflora aurantiaca.
— *crocosmæflora:* T. crocosmæflora.
— *Pottsii:* T. Pottsii.
— *rosea:* T. rosea.
— *speciosa:* T. crocosmæflora speciosa.
MORUS. *M. alba.
—*mulficaulis.
—*nigra.
— *pendula:* *M. alba pendula.
—*rubra.
— *tatarica:* *M. alba tatarica.
MUCUNA. *M. pruriens:* Stizolobium pruriens.
MUEHLENBECKIA. *M. complexa.
— platyclada.
MUSA. M. Cavendishii.
— Ensete.
— *sapientum:* M. paradisiaca sapientum.
MUSCARI. M. botryoides.
MYOPORUM. *M. lætum.
MYOSOTIS. M. alpestris.
— azorica.
— dissitiflora.
— *elegantissima:* probably M. dissitiflora elegantissima, but has also been applied to forms of M. palustris and M. sylvatica.
— *palustris:* M. scorpioides.
— *stricta:* M. alpestris stricta, not M. stricta of botanists.
— sylvatica.
MYRICA. *M. asplenifolia:* *Comptonia asplenifolia.
— carolinensis (*Northern Bayberry).
— cerifera (*Southern Wax Myrtle). What was formerly considered to be one species and listed as M. cerifera is now known to be two species. Both species range as far south as Florida, but the true M. cerifera extends north only to Maryland and southern New Jersey, whereas M. carolinensis grows wild to Nova Scotia.
—*Gale.
MYRICARIA. M. germanica (Tamarix).
MYRIOPHYLLUM. M. proserpinacoides.
MYRISTICA. M. fragrans (Nutmeg).
MYRSIPHYLLUM. *M. asparagoides:* Asparagus asparagoides.
MYRTUS. *M. communis.
— *Luma:* *Eugenia apiculata.
— *microphylla:* *M. communis microphylla, not M. microphylla of botanists.
—*Ugni.

NANDINA. *N. domestica.
NARCISSUS. The garden forms of Narcissus are not usually sold under the names of the botanical species. The main species-types represented in the common cultures are given here.
— biflorus.
— Bulbocodium.
— incomparabilis.
— Jonquilla.
— *orientalis:* N. Tazetta orientalis.
— *ornatus:* N. poeticus ornatus.
— poetaz (hybrid).
NARCISSUS, continued.
— poeticus.
— Pseudo-Narcissus.
— Tazetta.
NASTURTIUM. *N. officinale:* Roripa Nasturtium (also entered as Radicula Nasturtium-aquaticum).
NEGUNDO. *N. aceroides:* *Acer Negundo.
— *fraxinifolium:* *A. Negundo.
NELUMBIUM. *N. album:* Nelumbo nucifera alba.
— *kermesinum:* Nelumbo nucifera kermesina.
— *luteum:* Nelumbo lutea.
— *pekinensis:* Nelumbo nucifera pekinensis.
— *roseum:* Nelumbo nucifera rosea.
NELUMBO. The proper form of the name; see above.
NEMESIA. *N. compacta:* N. versicolor compacta.
— strumosa.
NEMOPANTHUS. *N. canadensis:* *N. mucronata.
NEMOPHILA. *N. atomaria:* N. Menziesii.
— *crambeoides:* N. Menziesii crambeoides.
— *discoidalis:* N. Menziesii discoidalis.
— *insignis:* N. Menziesii insignis.
— maculata.
NEPENTHES. N. atrosanguinea.
— Courtii.
— *Dominiana:* probably N. Dominii.
— Henryana.
— intermedia.
— Mastersiana.
— *Patersonii:* N. Paradisæ.
— Phyllamphora.
— Sedenii.
NEPETA. N. Cataria (Catnip).
— *Glechoma:* N. hederacea (Glechoma).
— Mussinii.
— Wilsonii.
NEPHELIUM. *N. Litchi:* Litchi chinensis.
NEPHRODIUM. *N. hirtipes:* Dryopteris hirtipes.
NEPHROLEPIS. *N. cordata:* N. cordifolia.
— exaltata.
The Nephrolepis names are now many, representing mutations from N. exaltata. See Nephrolepis, page 2131; also page 3569.
NERINE. N. sarniensis.
NERIUM. N. album: probably a variety of N. Oleander.
— atropurpureum: probably a variety of N. Oleander.
—*Oleander.
NEVIUSIA. *N. alabamensis.
NICANDRA. N. Physalodes.
NICOTIANA. *N. affinis:* N. alata grandiflora.
— alata.
— *atropurpurea:* a horticultural form of N. Tabacum macrophylla.

NICOTIANA, continued.
— *colossea:* **N. tomentosa.**
— **Sanderæ.**
— **sylvestris.**
— **Tabacum** (Tobacco).
— **tomentosa.**

NIEREMBERGIA. N. frutescens.
— **gracilis.**
— **rivularis.**

NIGELLA. N. damascena.

NIPHOBOLUS. *N. lingua:* **Cyclophorus Lingua.**

NOLANA. *N. atriplicifolia:* **N. paradoxa.**
— *grandiflora:* **N. paradoxa.**

NOLINA. N. Beldingii.
— **longifolia.**
— **Parryi** (Dasylirion).

NUPHAR. N. advena.

NYCTERINIA. *N. capensis:* **Zaluzianskya capensis.**
— *selaginoides:* **Z. selaginoides.**

NYMPHÆA (Castalia). **N. alba;** sometimes applied to a white form of **N. gigantea.**
— **Bissetii.**
— **cærulea;** but may sometimes be **N. capensis.**
— *candidissima:* **N. alba candidissima.**
— **capensis.**
— **Daubeniana.**
— **Deaniana.**
— *dentata:* **N. Lotus dentata.**
— **devoniensis.**
— *flava:* **N. mexicana.**
— **flavo-virens.**
— **gigantea.**
— **Gladstoniana.**
— *gracilis:* probably **N. flavo-virens,** possibly form of N. gigantea.
— **kewensis.**
— **Laydeckeri.**
— *Marliacea:* a race of hybrids.
— **mexicana.**
— **odorata.**
— **ovalifolia** (page 3570).
— **pulcherrima.**
— *pygmæa:* **N. tetragona.**
— *Richardsonii:* **N. tuberosa Richardsonii.**
— **Robinsonii.**
— **rubra-rosea.**
— **Sturtevantii.**
— **tetragona.**
— **tuberosa.**
— *zanzibariensis:* **N. capensis zanzibariensis.**

NYMPHOIDES. N. indicum (Limnanthemum).

NYSSA. *N. aquatica.
— *multiflora:* ***N. sylvatica.**
—***sylvatica.**

OAKESIA. O. sessilifolia (Uvularia).

OBELISCARIA. *O. pulcherrima:* **Lepachys columnaris pulcherrima.**

OCIMUM. O. Basilicum (Basil).

ODONTONEMA (page 3342). **O. Schomburgkianum** (Thyrsacanthus).

ODONTOSORIA. O. chinensis (Davallia).

ŒNOTHERA. Œ. acaulis.
— **biennis.**
— **bistorta.**
— **brachycarpa.**
— **cæspitosa.**
— **Drummondii.**
— *Fraseri:* **Œ. glauca Fraseri.**
— **fruticosa.**
— **glauca.**
— **Lamarckiana.**
— *macrocarpa:* **Œ. missouriensis.**
— **Pilgrimii.**
— **rosea.**
— **serrulata.**
— **speciosa.**
— **tetraptera.**
— *Whitneyi:* **Godetia grandiflora.**
— *Youngii:* **Œ. fruticosa Youngii.**

OLEA. *O. europæa (Olive).
— *fragrans:* ***Osmanthus fragrans.**

OMPHALODES. O. linifolia (Cynoglossum).

ONOCLEA. O. sensibilis.
— *Struthiopteris:* **Matteuccia Struthiopteris.**

ONOPORDON. O. tauricum.

ONYCHIUM. O. japonicum.

OPHIOGLOSSUM. O. vulgatum.

OPHIOPOGON. O. Jaburan.

OPLISMENUS. O. hirtellus (Panicum).

OPULASTER (adopted under American Code). *O. bracteatus:* ***Physocarpus bracteatus.**
— *glabratus:* ***P. glabratus.**
— *intermedius:* ***P. intermedius.**
— *monogynus:* ***P. monogynus.**
— *opulifolius:* ***P. opulifolius.**
— *pubescens:* ***P. malvaceus.**
— *Ramaleyi:* **P. bracteatus** or **P. intermedius.**

OPUNTIA. O. arenaria.
— **Camanchica.**
— **Ficus-indica.**
— **humilis.**
— **phæacantha.**
— **polyantha.**
— *Rafinesquii:* **O. humilis.**
— **vulgaris.**

ORCHIS. *O. spectabilis:* **Galeorchis spectabilis** (doubtfully separable from the genus Orchis; under that genus it is O. spectabilis).

OREODOXA. O. regia (Roystonea regia).

ORIGANUM. O. Majorana (Sweet Marjoram).

ORNITHOGALUM. O. arabicum.
— *pyramidale:* **O. narbonense pyramidale.**
— **umbellatum.**

OROBUS. *O. lathyroides:* **Vicia oroboides.**
— *niger:* **Lathyrus niger.**
— *vernus:* **Lathyrus vernus.**

ORONTIUM. O. aquaticum.

ORYZA. O. sativa (Rice).

OSMANTHUS. *O. Aquifolium.
—***Delavayi.**
—***fragrans** (Olea).

OSMUNDA. O. cinnamomea.
— **Claytoniana.**
— **gracilis;** probably a form of **O. regalis.**
— *palustris:* **O. regalis.**
— **regalis.**

OSTRYA. *O. virginica:* ***O. virginiana.**

OTHONNA. O. crassifolia.

OUVIRANDRA. *O. fenestralis:* **Aponogeton fenestralis.**

OXALIS. O. Acetosella.
— *alba:* a white form of either **O. lasiandra** or **O. variabilis.**
— *albiflora:* **O. variabilis.**
— **Bowiei.**
— **cernua.**
— **Deppei.**
— **lasiandra.**
— **rosea;** but **O. enneaphylla rosea** is perhaps sometimes meant.
— *tropæoloides:* **O. corniculata atropurpurea.**
— **valdiviensis.**
— **violacea.**

OXYDENDRUM. *O. arboreum (Andromeda).

PACHISTIMA. *P. Canbyi.

PACHYSANDRA. *P. terminalis.

PÆONIA. *P. alba:* probably **P. decora alba.**
— **albiflora.**
— *anemonæflora:* **P. officinalis albo-plena.**
— *arborea:* **P. suffruticosa.**
— *chinensis:* **P. albiflora sinensis.**
— *edulis:* **P. albiflora.**
— *festiva:* either **P. albiflora festiva** or **P. officinalis festiva.**
— *Humei:* **P. suffruticosa Humei.**
— **lutea.**
— *Moutan:* **P. suffruticosa.**
— **officinalis.**
— *rosea:* Probably **P. suffruticosa rosea,** but possibly **P. officinalis albo-plena.**
— *rubra:* Cf. P. suffruticosa rubro-plena.
— **suffruticosa.**
— **tenuifolia.**

There are many Latin names in the garden forms of Pæonia, as P. amabilis, atrorubra, bicolor, candidissima, chrysanthemiflora, Delachii, delicatissima, elegantissima, formosa, fragrantissima, gigantea, grandiflora, nigricans, papaveriflora, Pottsii, prolifera, pulcherrima, purpurea, rosea, Thorbeckii, triumphans, umbellata, and others.

PALAFOXIA. *P. Hookeriana:* **Polypteris Hookeriana.**

PALIURUS. *P. Spina-Christi.

PANAX. *P. gracillimum:* **Dizygotheca Veitchii gracillima.**
— *monstrosum:* **Polyscias Guilfoylei monstrosa.**

PANAX continued.
— **quinquefolium** (Ginseng).
— *Victoriæ:* **Polyscias Guilfoylei Victoriæ.**

PANCRATIUM. *P. calathinum:* **Hymenocallis calathina.**

PANDANUS. **P. graminifolius**; sometimes misapplied to P. pygmæus.
— **pacificus.**
— **pygmæus.**
— **utilis.**
— **Veitchii.**

PANDOREA. ***P. australis** (Tecoma).
—***jasminoides** (Tecoma).
—***Ricasoliana** (Tecoma).

PANICUM. **P. sulcatum.**
— *variegatum:* **Oplismenus hirtellus.**

PAPAVER. **P. alpinum.**
— **bracteatum.**
— **dubium.**
— **glaucum.**
— *lævigatum:* **P. dubium lævigatum.**
— *Mursellii:* a strain of **P. somniferum.**
— **nudicaule.**
— **orientale.**
— *Parkmanii:* **P. orientale Parkmanii.**
— **pavoninum.**
— **pilosum.**
— **Rhœas.**
— **somniferum.**
— *umbrosum:* **P. Rhœas umbrosum.**

PAPYRUS. *P. antiquorum:* **Cyperus Papyrus.**

PARADISEA. **P. Liliastrum** (Anthericum).

PARDANTHUS. *P. chinensis:* **Belamcanda chinensis.**
— *sinensis:* **B. chinensis.**

PARITIUM. *P. elatum:* **Hibiscus elatus.**
— *tiliaceum:* **H. tiliaceus.**

PARKINSONIA. ***P. aculeata.**

PARNASSIA. **P. caroliniana.**

PARTHENOCISSUS (see Ampelopsis, Cissus, and Vitis). *P. Engelmannii:* **P. quinquefolia Engelmannii:** *Ampelopsis quinquefolia Engelmannii.
— **Henryana:** *A. Henryana.
— *Lowii:* **P. tricuspidata Lowii:** *A. tricuspidata Lowii.
— *muralis:* **P. quinquefolia murorum:** *A. quinquefolium murorum.
— **quinquefolia:** *A. quinquefolia.
— **Thomsonii:** *A. Thomsonii.
— **tricuspidata:** *A. tricuspidata.
— *Veitchii:* **P. tricuspidata Veitchii:** *A. tricuspidata Veitchii.

PASANIA. See Lithocarpus.

PASSIFLORA. **P. alato-cærulea.**
— **cærulea.**
— **coccinea.**
— **edulis.**
— **gracilis.**
— **incarnata.**
— **laurifolia.**
— **ligularis.**
— **lutea.**
— **manicata** (Tacsonia).
— **militaris.**

PASSIFLORA, continued.
— **mollissima** (Tacsonia).
— *Pfordtii:* **P. alato-cærulea.**
— *princeps:* **P. racemosa.**
— **quadrangularis.**
— **Van Volxemii.**
— **violacea.**

PASTINACA. **P. sativa** (Parsnip).

PAULLINIA. **P. thalictrifolia.**

PAULOWNIA. *P. imperialis:* ***P. tomentosa.**

PAVIA. *P. flava:* ***Æsculus octandra.**
— *macrostachya:* ***Æ. parviflora.**
— *nana:* ***Æ. Pavia humilis.**
— *rubra:* ***Æ. Pavia.**

PAVONIA. **P. hastata.** (page 3570).

PELARGONIUM. **P. acerifolium** (page 3570). (Geranium.)
— **domesticum.**
— **graveolens.**
— **hortorum.**
— **odoratissimum.**
— **peltatum.**
— **zonale** (Geranium).

PELLÆA. **P. atropurpurea.**
— **densa.**
— **viridis** (Pteris).

PELTANDRA. *P. virginica:* **P. undulata.**

PENNISETUM. *P. cupreum:* a form of **P. Ruppelii.**
— **japonicum** (Gymnothrix).
— **latifolium** (Gymnothrix).
— *longistylum:* **P. villosum.**
— *macrophyllum:* **P. macrostachyum.**
— *Ruppelianum:* **P. Ruppelii.**
— **villosum.**

PENTSTEMON. **P. acuminatus.**
— **antirrhinoides.**
— *atropurpureus:* a color form of **P. campanulatus.**
— **barbatus** (Chelone).
— *cæruleus:* **P. angustifolius.**
— **campanulatus.**
— **centranthifolius.**
— **Cobæa.**
— **cordifolius.**
— *cyananthus:* **P. glaber cyananthus.**
— **diffusus.**
— *Digitalis:* **P. lævigatus Digitalis.**
— **glaber.**
— **gloxinioides.**
— **grandiflorus.**
— **Hartwegii.**
— **heterophyllus.**
— **hirsutus.**
— **lævigatus.**
— **Murrayanus.**
— **ovatus.**
— *pubescens:* **P. hirsutus.**
— **secundiflorus.**
— **Smallii.**
— **spectabilis.**

PEPEROMIA. **P. maculosa.**

PERESKIA. **P. aculeata.**

PERILLA. *P. atropurpurea:* a color form of **P. frutescens laciniata.**
— *nankinensis:* **P. frutescens nankinensis.**

PERIPLOCA. ***P. græca.**

PERISTROPHE. **P. speciosa.**

PERNETTYA. ***P. mucronata.**

PERSEA. ***P. americana** (P. gratissima not tenable under the rules).
—***indica.**

PERSICA. *P. alba:* **Prunus Persica alba:** *Amygdalus Persica alba
— *chrysanthemum:* **Pr. Persica** var.: *A. Persica chrysanthemum.
— *rubra:* **Pr. Persica** var.: *A. Persica rubra.
— *vulgaris:* **Pr. Persica:** *A. Persica.

PETASITES. **P. fragrans.**

PETROSELINUM. **P. hortense** (Parsley).

PETUNIA. **P. hybrida.**

PHACELIA. **P. campanularia.**
— **congesta.**
— **linearis** (Eutoca).
— **Parryi.**
— **tanacetifolia.**
— **viscida** (Eutoca).
— **Whitlavia** (Whitlavia).

PHÆDRANTHUS. **P. buccinatorius.** *Bignonia buccinatoria.

PHALARIS. **P. arundinacea.**

PHASEOLUS. **P. aconitifolius.**
— **angularis.**
— **aureus.**
— **calcaratus.**
— **Caracalla.**
— **coccineus** (P. multiflorus).
— **lunatus.**
— *macrocarpus:* **P. lunatus macrocarpus.**
— *multiflorus:* **P. coccineus,** Linn. (P. multiflorus not tenable under the rules).
— *nanus:* dwarf form of **P. vulgaris.**
— **retusus.**
— **vulgaris.**

PHEGOPTERIS. **P. Dryopteris.**
— **hexagonoptera.**
— **polypodioides.**

PHELLODENDRON. ***P. amurense.**
—***sachalinense.**

PHILADELPHUS. *P. aureus:* ***P. coronarius fol. aureis.**
— *Billiardii:* ***P. pubescens Souvenir de Billiard.**
— *cordifolius:* ***P. Lewisii.**
—***coronarius.**
— *dianthiflorus:* ***P. coronarius florepleno.**
—***Falconeri.**
— *foliis aureis:* ***P. coronarius foliis aureis.**
— *Gordonianus:* ***P. Lewisii.**
—****grandiflorus:*** **P. coronarius grandiflorus, P. pubescens, or P. inodorus grandiflorus.**
— **hirsutus.**
—***incanus.**
—***inodorus**; but name also applied to **P. hirsutus.**
— *latifolius:* **P. pubescens.**
—***laxus.**
—***Lemoinei.**
—***Lewisii.**
—***Magdalenæ.**
—***microphyllus.**
— *nanus:* ***P. coronarius nanus.**
— **nepalensis**; but perhaps sometimes **P. coronarius tomentosus.**
— *nivalis:* **P. coronarius.**

PHILADELPHUS, continued.
— **pubescens;** sometimes perhaps means **P. laxus.**
—***sericanthus.**
— *speciosissimus:* ***P. coronarius speciosissimus.**
— *speciosus:* ***P. laxus.**
—***Zeyheri.**

PHILLYREA. ***P. angustifolia** (Filaria).
—***decora** (Filaria).
—***latifolia.**

PHILODENDRON. **P. giganteum.**
— **spectabile.**

PHLEBODIUM. **P. aureum** (Polypodium.)

PHLEUM. **P. pratense** (Timothy).

PHLOMIS. **P. tuberosa.**

PHLOX. **P. amœna.**
— **Arendsii.**
— *carolina:* **P. ovata.**
— *cuspidata:* either **P. pilosa** or a form of **P. Drummondii stellaris.**
— *decussata:* probably **P. paniculata,** also **P. paniculata×maculata.**
— **divaricata.**
— **Drummondii.**
— **fimbriata:** a form of **P. Drummondii stellaris.**
— **glaberrima.**
— *grandiflora:* either a form of **P. Drummondii rotundata** or **P. subulata grandiflora.**
— **Heynholdii:** a form of **P. Drummondii rotundata.**
— **hortensiæflora:** a form of **P. Drummondii rotundata.**
— **maculata.**
— **ovata.**
— **paniculata.**
— **pilosa.**
— **Stellaria;** the name stellaris applies to forms of **P. Drummondii** and **P. subulata.**
— **subulata.**
— *suffruticosa:* **P. glaberrima suffruticosa.**
Latin names are applied to garden phloxes, particularly to forms of P. Drummondii and of P. paniculata × maculata.

PHŒNIX. ***P. canariensis.**
—***dactylifera.**
—***humilis.**
— *leonensis:* ***P. reclinata.**
—***pumila.**
—***reclinata.**
—***Roebelenii.**
—***rupicola.**
—***sylvestris.**
— *tenuis:* ***P. canariensis.**
—***zeylanica.**

PHORMIUM. **P. Cookianum.**
— **tenax.**

PHOTINIA. ***P. arbutifolia** (Heteromeles).
— *japonica:* ***Eriobotrya japonica.**
—***serrulata.**
—***villosa.**

PHYLLANTHUS. *P. disticha:* **P. acidus.**
— **nivosus.**

PHYLLITIS. **P. Scolopendrium** (Scolopendrium).

PHYLLOSTACHYS (see Bamboo).
***P. aurea.**
—***Boryana.**
—***Castillonis.**
—***Henonis.**
—***marliacea.**
—***mitis.**
—***nigra.**
—***Quilioi.**
—***ruscifolia.**
—***Veitchii.**
—***violescens.**
—***viridis.**

PHYLLOTÆNIUM. *P. Lindenii:* **Xanthosma Lindenii.**

PHYMATODES. **P. glaucum** (Polypodium).

PHYSALIS. **P. Alkekengi.**
— **Franchetii.**
— **ixocarpa.**
— **peruviana.**
— **pubescens.**

PHYSOCARPUS (Opulaster under the American Code). *P. aureus:* ***P. opulifolius luteus:** O. opulifolius luteus.
—***bracteatus:** O. bracteatus.
—***intermedius:** O. intermedius.
—***monogynus:** O. monogynus.
—***opulifolius** (Spiræa): O. opulifolius.
—***malvaceus:** O. malvaceus: O. pubescens.

PHYSOSTEGIA. *P. speciosa:* **P. virginiana speciosa.**

PICEA (see Abies). *P. ajanensis:* ***P. jezoensis.**
— *alba:* ***P. canadensis.**
—****Alcockiana:** **P. bicolor;** sometimes **P. jezoensis hondoensis.**
—***bicolor.**
—***canadensis.**
— *conica:* ***P. excelsa conica.**
— *Douglasii:* **Pseudotsuga taxifolia:** ***Ps. Douglasii.**
—***Engelmannii.**
—***excelsa.**
—***jezoensis.**
— *koraiensis:* not known botanically.
— *Kosteriana:* ***P. pungens Kosteri.**
—***mariana.**
—***Maximowiczii.**
— *Morinda:* ***P. Smithiana.**
— *nigra:* ***P. mariana.**
—***Omorika.**
—***orientalis.**
—***polita.**
—***pungens.**
—***rubra.**
—***sitchensis.**
—***Smithiana.**

PIERIS. ***P. floribunda** (Andromeda).
—***japonica** (Andromeda).
—***mariana** (Andromeda).

PILOGYNE. *P. suavis:* **Melothria punctata.**

PIMELEA. ***P. ferruginea.**

PIMENTA. **P. officinalis** (Allspice)

PIMPINELLA. **P. Anisum** (Anise).

PINANGA (page 3571). **P. decora.**
— **patula.**

PINUS. *P. aurea:* **P. Strobus aurea, P. densiflora aurea** or **P. sylvestris aurea.**

PINUS, continued.
— *australis:* ***P. palustris.**
— *austriaca:* ***P. nigra austriaca.**
—***Banksiana.**
—***canariensis.**
—***Cembra.**
—***contorta.**
—***Coulteri.**
—***densiflora.**
— *divaricata:* ***P. Banksiana.**
—***echinata.**
—***edulis.**
—***excelsa.**
—***flexilis.**
—***halepensis.**
— *inops:* ***P. virginiana.**
—***Jeffreyi.**
—***koraiensis.**
—***Lambertiana.**
— *Laricio:* ***P. nigra.**
— *maritima:* ***P. Pinaster.**
—***Massoniana;** applied also to **P. Thunbergii** and to **P. sinensis.**
— *mitis:* ***P. echinata.**
—***montana.**
—***monticola.**
— *Mughus:* ***P. montana Mughus.**
—***muricata.**
—****Murrayana:** **P. contorta latifolia.**
—***nigra.**
—***palustris.**
—***Parryana.**
—***parviflora.**
— **pentaphylla:** perhaps a form of **P. parviflora.**
—***Peuce.**
—***Pinaster.**
—***Pinea.**
—***ponderosa.**
—***pungens.**
—***radiata.**
—***resinosa.**
— *rigensis:* ***P. sylvestris rigensis.**
—***rigida.**
—***Sabiniana.**
— *scopulorum:* ***P. ponderosa scopulorum.**
—***Strobus.**
—***sylvestris.**
—***Thunbergii.**
—***Torreyana.**
— *uncinata:* ***P. montana uncinata.**
—***virginiana.**
— *Watereriana:* ***P. sylvestris Watereri** (page 3571).

PIPER. **P. nigrum** (Pepper).

PIQUERIA. **P. trinervia** (Stevia).

PISTACIA. ***P. atlantica.**
— *chinensis:* ***P. sinensis.**
—***Lentiscus.**
—***mutica.**
—***sinensis.**
—***vera.**

PISTIA. **P. Stratiotes.**

PISUM. **P. sativum** (Pea).

PITHECOCTENIUM. *P. clematideum:* ***P. cynanchoides.**

PITTOSPORUM. ***P. crassifolium.**
—***eugenioides.**
—***heterophyllum.**
—***phillyræoides.**
—***tenuifolium.**
—***Tobira.**
—***undulatum.**

PLATANUS. *P. acerifolia (this is the tree usually planted as P. orientalis.)*
—*occidentalis.
—*orientalis.
—*racemosa.

PLATYCERIUM. P. alcicorne.
— *Stemmaria:* P. æthiopicum.
— Willinckii.

PLATYCODON. *P. album:* P. grandiflorum album.
— grandiflorum (Campanula).
— *japonicum:* P. grandiflorum japonicum.
— *Mariesii:* P. grandiflorum Mariesii.

PLATYSTEMON. P. californicus.

PLUMBAGO. *P. capensis.
— *coccinea:* P. rosea coccinea.
— *Larpentæ:* Ceratostigma plumbaginoides.
— rosea.

PLUMERIA. P. acutifolia (Frangipani).

POA. *P. amabilis:* Eragrostis amabilis.
— compressa.
— pratensis.

PODOCARPUS. *P. macrophylla.
—*Nagi.

PODOPHYLLUM. P. emodi.
— peltatum.

POGONIA. P. ophioglossoides.

POINCIANA. *P. Gilliesii:* *Cæsalpinia Gilliesii.
—*regia.

POINSETTIA. **P. pulcherrima:* Euphorbia pulcherrima.

POLEMONIUM. P. cæruleum.
— *grandiflorum:* P. cæruleum himalayanum.
— *himalaicum:* probably P. cæruleum himalayanum.
— reptans.
— *Richardsonii:* P. humile.

POLYGALA. *P. brachypoda.
—*Dalmaisiana.
— paucifolia.
— Senega.
—*virgata.

POLYGONATUM. P. biflorum.
— commutatum.
— *giganteum:* P. commutatum.
— multiflorum

POLYGONUM P. affine.
— amplexicaule.
—*Aubertii.
—*baldschuanicum.
— *Brunonis:* P. affine.
— *compactum:* P. Sieboldii compactum.
—**cuspidatum:* P. Sieboldii.
—**multiflorum:* probably often misapplied to P amplexicaule.
— orientale.
— sericeum.
— Sieboldii.

POLYPODIUM. *P. aureum:* Phlebodium aureum.
— falcatum.
— *glaucum:* Phymatodes glaucum.
— subauriculatum (Goniophlebium).
— vulgare.

POLYPTERIS. P. Hookeriana (Palafoxia).

POLYSCIAS. P. Balfouriana (Aralia).
— filicifolia (Aralia).
— Guilfoylei (Aralia. Panax).

POLYSTICHUM (see Aspidium). P. acrostichoides.
— aculeatum.
— angulare.
— Braunii.
— cristatum.
— munitum.
— Tsus-sinense.

PONCIRUS. P. trifoliata: *Citrus trifoliata.

PONTEDERIA. P. cordata.

POPULUS. *P. acuminata.
—*alba.
—*angulata.
— *angustifolia:* *P. fortissima.
— *aurea:* *P. Van Geertii aurea, a form of P. serotina.
—*balsamifera.
—**Bolleana:* P. alba pyramidalis.
— *canadensis:* *P. deltoides.
—*candicans.
—*canescens.
— *carolinensis* (*Carolina Poplar). P. Eugenei, P. angulata (Hybrid *Carolina Poplar), and probably others; a group of hybrids in need of further study.
—*deltoides.
— Eugenei (Carolina P., in part).
— *fastigiata:* *P. nigra italica.
—*fortissima.
—*Fremontii.
— *græca:* P. grandidentata; perhaps sometimes P. tremuloides.
—*grandidentata.
— *italica:* *P. nigra italica.
—*Maximowiczii.
—**monilifera:* P. deltoides monilifera.
—*nigra.
— *pyramidalis:* usually means *P. nigra italica (Lombardy Poplar), but name likely to be used for other pyramidal forms, as P. alba pyramidalis and P. tremula pyramidalis.
—*Sargentii.
—*Simonii.
—*tremula.
—*tremuloides.
— suaveolens; but the plant in cultivation is *P. Maximowiczii.

PORTERANTHUS (name under American Code). *P. stipulacea:* Gillenia stipulata.

PORTULACA. *P. albiflora:* P. grandiflora albiflora.
— *aurea:* P. oleracea.
— grandiflora.
— oleracea (cultivated form).
— *Thellussonii:* P. grandiflora Thellussonii.
— *Thorburnii:* P. grandiflora Thorburnii.

POTENTILLA. P. atrosanguinea.
— *formosa:* P. nepalensis.
—*fruticosa.
— grandiflora.
— MacNabiana.
— O'Briana.

POTENTILLA, continued.
— pyrenaica.
— rupestris.
— *Russelliana:* hybrid.
—*tridentata.
— *Veitchii:* *P. fruticosa Veitchii.

POTHOS. *P. argyræa:* Scindapsus pictus argyræus.

PRIMULA. P. acaulis.
— Auricula.
— cærulea.
— *cashmeriana:* P. denticulata cachemiriana.
— *chinensis:* P. sinensis.
— cortusoides.
— *Croussei:* probably a garden form of P. acaulis.
— denticulata.
— elatior.
— farinosa.
— *fimbriata:* P. sinensis fimbriata or P. obconica fimbriata.
— Forbesii.
— *grandiflora:* applied to large-flowered forms of different species.
— japonica.
— kewensis.
— *lutea:* P. Auricula.
— malacoides.
— obconica.
— *officinalis:* P. veris.
— Polyantha.
— pulverulenta.
— rosea: P. obconica rosea or P. japonica rosea.
— Sieboldii.
— sinensis.
— veris.
— verticillata.
— *vulgaris:* P. acaulis.

PRITCHARDIA. P. pacifica (Styloma pacifica; see page 3279).

PRUNELLA (see Brunella). P. grandiflora.
— Webbiana.

PRUNUS (see Amygdalus, Cerasus, and Laurocerasus). *P. alleghaniensis.
—*americana.
— *Amygdalus:* P. communis: *Amygdalus communis.
— angustifolia.
—*Armeniaca (Apricot).
—*avium (Sweet Cherry).
—*Besseyi (Sand Cherry).
— caroliniana: *Laurocerasus caroliniana.
—*cerasifera.
—*Cerasus (Sour Cherry).
— communis (Almond): *A. communis.
— Davidiana: *A. Davidiana.
—*demissa.
—*domestica (Common Plum).
—*fruticosa.
—*glandulosa (Cherry-Almond).
—*hortulana.
—*ilicifolia.
— *integrifolia:* *P. Lyonii.
—*japonica (Cherry-Almond); also applied to P. subhirtella pendula, one of the Japanese flowering cherries.
—*Lannesiana (Japanese Flowering Cherry).

PRUNUS, continued.
— Laurocerasus (Laurus): *Laurocerasus officinalis.
— lusitanica: *Laurocerasus lusitanica.
—*Lyonii.
—*Mahaleb.
—*maritima.
— *melanocarpa:* *P. demissa melanocarpa.
—*Mume.
—*Munsoniana.
— *Myrobalana:* *P. cerasifera.
— nana (Russian Dwarf Almond): *Amygdalus nana.
—*nigra.
— *nucipersica:* P. Persica nucipersica (Nectarine): *A. Persica nectarina.
—*Padus (Bird Cherry).
— *pendula:* applied to weeping forms of several species, but oftenest to *P. subhirtella pendula, one of the Japanese flowering cherries.
—*pennsylvanica.
— Persica (Peach): *A. Persica.
— *Pissardii:* *P. cerasifera Pissardii.
— *platycarpa:* P. Persica platycarpa (Flat Peach): *A. Persica platycarpa.
— *Pseudo-Cerasus:* *P. serrulata; also incorrectly used as a general name for other Japanese flowering cherries, as P. Lannesiana, P. Sieboldii, P. yedoensis; the true P. Pseudo-Cerasus is not in commerce in this country, and is tender.
—*pumila; also applied to dwarf forms of other species.
— *Rhexii:* *P. Cerasus Rhexii.
— *sachalinensis:* *P. serrulata sachalinensis.
—*salicina (Japanese Plum. Prunus triflora).
— *Sargentii:* *P. serrulata sachalinensis.
— *semperflorens:* *P. Cerasus semperflorens.
—*serotina.
—*serrulata.
— *sibirica:* *P. Armeniaca sibirica.
—*Sieboldii (Japanese Flowering Cherry).
—*Simonii.
— *sinensis:* probably P. glandulosa and P. japonica (Cherry-Almonds).
—*spinosa.
—*subhirtella (Japanese Flowering Cherry).
—*tomentosa.
— *triflora:* *P. salicina.
— triloba (Flowering Almond). *A. triloba.
—*virginiana (Choke-Cherry).
— *Watsonii:* *P. angustifolia Watsonii (Sand Plum).
—*yedoensis.

PSEUDOLARIX. *P. Fortunei:* *P. Kaempferi.
—*Kaempferi.

PSEUDOTSUGA. **P. Douglasii:* P. taxifolia (Picea. Tsuga).
—*macrocarpa.

PSIDIUM. *P. Cattleianum.
—*Friedrichsthalianum.
—*Guajava.

PTELEA. *P. aurea:* *P. trifoliata aurea.
—*trifoliata.

PTERIDIUM (doubtfully separable from Pteris). P. aquilinum (Pteris).

PTERIS. *P. adiantoides:* not known botanically.
— *aquilina:* Pteridium aquilinum.
— *argyræa:* P. quadriaurita argyræa.
— Childsii: a form of P. cretica.
— cretica.
— *hastata:* Pellæa viridis.
— *internata:* Pt. heterophylla internata.
— *Mayii:* Pt. cretica Mayii.
— *nobilis:* Pt. cretica nobilis.
— *Ouvrardii:* Pt. serrulata Ouvrardii.
— *Rivertoniana:* a form of Pt. cretica.
— serrulata.
— *Sieboldii:* a form of Pt. cretica.
— tremula.
— *Wilsonii:* Pt. cretica Wilsonii.
— *Wimsettii:* a variation of Pt. cretica.

PTEROCARYA. *P. fraxinifolia.
—*stenoptera.

PTEROSTYRAX. *P. corymbosa.
—*hispida.

PTYCHORAPHIS. P. singaporensis.

PTYCHOSPERMA. *P. Alexandræ:* Archontophœnix Alexandræ.
— *Cunninghamii:* A. Cunninghamii.
— *elegans:* A. Alexandræ and A. Cunninghamii; the palm cultivated in California under this name is recently named Loroma amethystina (see Seaforthia, page 3123).
— *singaporensis:* Ptychoraphis singaporensis (page 3571).

PUERARIA. **P. Thunbergiana:* P. hirsuta (Dolichos).

PULMONARIA. P. angustifolia.
— *azurea:* P. angustifolia azurea.
— *maculata:* P. officinalis.
— saccharata.

PUNICA. *P. Granatum.
— *Legrellei:* a form of P. Granatum.
— *nana:* *P. Granatum nana.

PYRACANTHA. *P. angustifolia (Cotoneaster).
—*coccinea.
—*crenulata (Cotoneaster).
— *Lalandii:* *P. coccinea Lalandii.

PYRETHRUM. *P. atrosanguineum:* a variation of Chrysanthemum coccineum.
— *aureum:* C. Parthenium aureum.
— *corymbosum:* C. corymbosum.
— *hybridum:* C. coccineum.
— *parthenifolium:* C. Parthenium.
— *roseum:* C. coccineum.
— *selaginoides:* C. Parthenium selaginoides.
— *Tchihatchewii:* C. Tchihatchewii.
— *uliginosum:* C. uliginosum.

PYROSTEGIA. P. venusta: *Bignonia venusta.

PYRUS. *P. americana:* *Sorbus americana.

PYRUS, continued.
— angustifolia: *Malus angustifolia.
— *arbutifolia:* *Aronia arbutifolia.
— *Arnoldiana:* P. pulcherrima Arnoldiana: *Malus Arnoldiana.
— atrosanguinea: *Malus atrosanguinea.
— *Aucuparia:* *Sorbus Aucuparia.
— baccata: *Malus baccata.
— cerasifera: *M. cerasifera.
—*communis (Pear).
— coronaria: *M. coronaria.
— Dawsoniana (hybrid): *M. Dawsoniana.
— florentina (P. cratægifolia): *M. florentina.
— *floribunda:* P. pulcherrima: *M. floribunda.
— fusca: *M. fusca.
— Halliana: *M. Halliana.
— ioensis: *M. ioensis.
— Malus (Apple): *M. sylvestris.
— *Niedzwetzkyana:* P. Malus Niedzwetzkyana: *M. Niedzwetzkyana.
— *nigra:* *Aronia melanocarpa.
— *Parkmanii:* P. Halliana Parkmanii: *M. Parkmanii.
— prunifolia: *M. prunifolia.
— pulcherrima: *M. floribunda.
— *quercifolia:* Sorbus hybrida: *S. quercifolia.
— *Ringo:* P. prunifolia Rinki: *M. prunifolia Rinki.
— Sargentii: *M. Sargentii.
— *Scheideckeri:* P. pulcherrima Scheideckeri: *M. Scheideckeri.
—*serotina (Japan Pear).
— Sieboldii: *Malus Toringo.
— *Sorbus:* *Sorbus domestica.
— Soulardii: *Malus Soulardii.
— spectabilis: *Malus spectabilis.
— *Toringo:* P. Sieboldii: *M. Toringo.
— Zumi: *M. Zumi.

QUAMOCLIT. Q. coccinea (Ipomœa. Mina).
— lobata (Mina).
— pinnata (Ipomœa).

QUERCUS. *Q. acuta.
—*agrifolia.
—*alba.
— *aquatica:* *Q. nigra.
— *Banisteri:* *Q. ilicifolia.
—*bicolor.
—*Cerris.
—*coccinea.
— *Concordia:* *Q. Robur Concordia.
— *cuspidata:* *Castanopsis cuspidata (see Vol. V, page 2891).
—*dentata; but sometimes applied to Q. glandulifera.
—*Douglasii.
— *Duavessei:* *Q. Robur Dauvessei.
—*falcata.
— *ferruginea:* *Q. marilandica.
—*Garryana.
—*glauca.
—*Ilex.
—*ilicifolia.
—*imbricaria.
—*Kelloggii.
—*laurifolia.
—*lobata.
—*lyrata.
—*macrocarpa.

QUERCUS, continued.
—*marilandica.
—**Michauxii* (Basket Oak): **Q. Prinus.**
— **montana** (see Q. Prinus, below).
—*nigra.
— *obtusiloba:* *Q. stellata.
—*palustris.
— *pannonica:* *Q. conferta.
— *pectinata:* *Q. Robur pectinata.
— *pedunculata:* *Q. Robur.
—*Phellos.
— *platanoides:* *Q. bicolor.
— **Prinus** (Basket Oak); applied in the trade to the *Chestnut Oak only, which is **Q. montana** of the Cyclopedia but for which others retain the name Q. Prinus and apply Q. Michauxii to the Basket Oak: *Q. Michauxii.
—**Prinus* (*Chestnut Oak): **Q. montana.**
— *pyramidalis:* *Q. Robur fastigiata.
—*Robur.
—*rubra.
— *sempervirens:* *Q. virginiana.
—*Suber.
— *tinctoria:* *Q. velutina.
—*velutina.
—*virginiana.

RADICULA. R. Armoracia (Horse-radish). Preferably **Roripa Armoracia.**
— **Nasturtium-aquaticum** (Water-Cress. Preferably **Roripa Nasturtium**).
RAJANIA. R. pleioneura.
RANUNCULUS. R. aconitifolius.
— acris.
— amplexicaulis.
— asiaticus.
— bulbosus.
— gramineus.
— repens.
— *speciosus:* **R. bulbosus.**
RAPHANUS. R. sativus (Radish).
RAPHIOLEPIS. *R. indica.
— *japonica:* *R. umbellata.
— *ovata:* *R. umbellata ovata.
REHMANNIA. R. angulata.
REINWARDTIA. R. trigyna (Linum)
RESEDA. R. odorata.
RETINOSPORA, but properly spelled **Retinispora.** (There is no such genus, the plants referred to it being all juvenile states of the genera Chamæcyparis and Thuja.)
The American Joint Committee has starred the names of the plants under Thuja and Chamæcyparis, but recognizes the value of retaining Retinispora as a trade name for these forms as indicated by stars in parentheses below (*). It is preferable to use Retinispora as a common name in connection with the correct starred botanical name.
—(*)*ericoides:* *Thuja occidentalis ericoides; perhaps sometimes applied to **Chamæcyparis thuyoides ericoides.**
—(*)*filicoides:* *C. obtusa filicoides.

RETINOSPORA, continued.
—(*)*filifera:* **C. pisifera filifera.**
—(*)*leptoclada:* probably the trade plant is *C. thyoides andeleyensis.
—(*)*obtusa:* *C. obtusa.
—(*)*pisifera:* *C. pisifera.
—(*)*plumosa:* *C. pisifera plumosa.
—(*)*squarrosa:* *C. pisifera squarrosa; probably applied also to **Thuja orientalis decussata.**
—(*)*Veitchii.* *C. pisifera squarrosa.
RHAMNUS. *R. Alaternus.
—*alpina; trade plant is probably **R. fallax.**
—*californica.
— *carolina:* *R. caroliniana.
—*cathartica.
—*crenata; name sometimes misapplied to R. dahurica.
—*dahurica; sometimes cultivated as **R. crenata.**
—*Frangula.
—*imeretina.
—*Purshiana.
RHAPIS. R. flabelliformis.
— humilis.
RHEUM. R. Collinianum.
— palmatum.
— Rhaponticum (Rhubarb).
RHEXIA. R. virginica.
RHODANTHE. *R. maculata:* **Helipterum Manglesii maculatum.**
— *Manglesii:* **H. Manglesii.**
RHODOCHITON. R. volubile.
RHODODENDRON. R. arborescens: *Azalea arborescens.
—*arboreum.
—*arbutifolium.
— calendulaceum: *A. lutea.
— canadense: *Rhodora canadensis.
— canescens: *A. canescens.
—*carolinianum.
—*catawbiense.
—*ferrugineum.
—*hirsutum.
— indicum: *A. indica.
— japonicum: *A. japonica.
— Kaempferi: *A. Kaempferi.
— ledifolium: *A. ledifolia.
— luteum: *A. pontica.
—*maximum.
— Morteri: *A. gandavensis.
—*myrtifolium, but also **R. Kotschyi.**
— nudiflorum: *A. nudiflora.
— obtusum amœnum: *A. amœna.
— obtusum Hinodigiri: *A. Hinodigiri.
— occidentale: *A. occidentalis.
—*ponticum.
— poukhanense yodogawa: *A. yodogawa.
—*præcox.
—**punctatum:* **R. minus.**
— racemosum.
— *roseum:* **R. maximum roseum.**
— sinense: *A. mollis.
—*Smirnovii.
— Vaseyi: *A. Vaseyi.
— viscosum: *A. viscosa.
— *Wilsonianum:* *R. lætevirens (page 3571).
RHODORA. **R. canadensis:* **Rhododendron canadense.**

RHODOTYPOS. *R. kerrioides.
RHOPALOSTYLIS. R. Baueri (Areca).
— **sapida** (Areca).
RHUS. *R. ailanthifolia:* possibly R. ailanthoides, which is **Picrasma quassioides.**
— *aromatica:* **R. canadensis.**
—*canadensis.
—*copallina.
—**cotinoides:* **Cotinus americanus.**
—**Cotinus:* **C. Coggygria.**
—*glabra.
— *Osbeckii:* *R. javanica.
—*trilobata.
—*typhina.
RHYNCHOSPERMUM. *R. jasminoides:* *Trachelospermum jasminoides.
RIBES. *R. alpinum.
— *atrosanguineum:* *R. sanguineum atrorubens.
— **aureum**; the fragrant plant cultivated as R. aureum is *R. odoratum.
—*cereum.
—*Cynosbati.
— *floridum:* *R. americanum.
—*glandulosum.
—*Gordonianum.
—*inerme.
— *longiflorum:* *R. odoratum.
—*nigrum (Black Currant).
—*odoratum.
— *prostratum:* *R. glandulosum.
—*sanguineum.
— *saxosum:* the plant in the trade under this name is *R. inerme.
—*vulgare (Red and White Currants).
RICHARDIA. *R. æthiopica:* **Zantedeschia æthiopica.**
— *albo-maculata:* **Z. albo-maculata.**
— *Elliottiana:* **Z. Elliottiana.**
RICINUS. *R. bourboniensis:* **R. communis bourboniensis.**
— *cambogensis:* **R. communis cambogensis.**
— **communis.**
— *Gibsonii:* **R. communis Gibsonii.**
— *hybridus:* **R. communis hybridus.**
— *macrocarpus:* **R. communis macrocarpus.**
— *macrophyllus:* **R. communis macrophyllus.**
— *panormitans:* **R. communis panormitans.**
— *philippinensis:* **R. communis philippinensis.**
— *purpureus:* **R. communis purpureus.**
— *sanguineus:* **R. communis sanguineus.**
— *zanzibarensis:* **R. communis zanzibarensis.**
The common Castor-bean plant, R. communis, gives rise to many marked forms, some of them having received Latin names.
RIVINA. R. humilis.
ROBINIA. *R. Bessoniana:* *R. Pseudacacia Bessoniana.
— *Decaisneana:* *R. Pseudacacia Decaisneana.
—*hispida.

ROBINIA, continued.
— *inermis:* probably *R. Pseudacacia inermis or R. Pseudacacia umbraculifera, but sometimes possibly used to designate R. hispida macrophylla.
—*Kelseyi.
—*neo-mexicana.
—*Pseudacacia.
— *semperflorens:* *R. Pseudacacia semperflorens.
—*viscosa.

ROCHEA. R. coccinea (Crassula).

RODGERSIA. P. podophylla.
— tabularis.

ROMNEYA. *R. Coulteri.

RORIPA. A. Armoracia (Horse-radish. Radicula).
— Nasturtium (Water-Cress. Nasturtium. Radicula).

ROSA. *R. arkansana; the material cultivated under this name may be R. heliophila.
—*Banksiæ.
—*blanda.
—*bracteata (McCartney Rose).
—*canina.
— carolina: *R. humilis.
—*carolina; the plant usually cultivated under this name is R. palustris.
—*cinnamomea.
—*coriifolia.
— *Engelmannii:* *R. acicularis Engelmannii.
— *Fendleri:* *R. Woodsii Fendleri.
— *ferruginea:* *R. rubrifolia.
—*gymnocarpa.
—*humilis:* R. carolina.
—*lævigata (Cherokee Rose).
—*lucida:* R. virginiana.
—*macrophylla.
—*multiflora.
—*nitida.
—*nutkana.
— palustris: *R. carolina.
—*polyantha: hybrids of R. multiflora×R. chinensis.
—*rubiginosa.
—*rubrifolia.
—*rugosa.
— *Sayi:* *R. acicularis Bourgeauiana.
—*setigera.
—*spinosissima.
— virginiana: *R. lucida.
—*Wichuraiana.
—*Woodsii.

ROSMARINUS. *R. officinalis.

ROYSTONEA. See Oreodoxa.

RUBUS. *R. allegheniensis (High-bush Blackberry).
—*argutus (High-bush Blackberry).
—*canadensis; if trade plant is a dewberry, it is probably R. procumbens.
—*cratægifolius.
—*deliciosus.
—*dumetorum.
—*ellipticus.
—*hispidus.
—*idæus.
—*illecebrosus.
—*laciniatus.

RUBUS, continued.
—*leucodermis.
—*Linkianus.
—*neglectus.
—*occidentalis.
—*odoratus.
—*palmatus.
—*phœnicolasius.
—*procumbens (Eastern Dewberry).
—*rosæflorus (this name is sometimes applied to the strawberry-raspberry, R. illecebrosus).
—*strigosus.
—*trivialis (Southern Dewberry).
— *ursinus:* *R. vitifolius.
— *villosus:* *R. procumbens if dewberry is meant, *R. allegheniensis if high-bush blackberry is meant.
—*vitifolius (Western Dewberry).

RUDBECKIA. R. amplexicaulis.
— bicolor.
— californica.
— fulgida.
— hirta.
— laciniata.
— lanceolata.
— maxima.
— *Newmannii:* R. speciosa.
— nitida.
— *purpurea:* Echinacea purpurea.
— speciosa.
— subtomentosa.
— *superba:* R. bicolor superba.
— triloba.

RUELLIA. R. amœna (Stephanophysum).

RUMEX. R. hymenosepalus.
— Patientia.
— scutatus.

RUSCUS. *R. aculeatus.

RUSSELIA. R. elegantissima.

RUTA. R. graveolens (Rue).

SABAL. *S. Adansonii:* S. glabra.
— Blackburniana.
— Ghiesbrechtii.
— *mexicana:* S. texana.
— Palmetto.
— texana.
— *umbraculifera:* S. Blackburniana.

SABATIA. S. campestris.
— *chloroides:* S. dodecandra; but stock is probably mostly S. Kennedyana.

SACCHARUM. S. officinarum (Sugar-cane).

SAGINA. S. subulata.

SAGITTARIA. *S. japonica:* S. sagittifolia flore-pleno.
— montevidensis.
— *natans:* probably S. subulata, but possibly the true S. natans.
— *sinensis:* probably a form of S. sagittifolia, usually known as S. chinensis.

SAINTPAULIA. S. ionantha.

SALISBURIA. *S. adiantifolia:* *Ginkgo biloba.

SALIX (see, also, page 3571). *S. acutifolia.
—*alba; also applied to forms of S. rubens.
—*ambigua.
— *americana:* *S. purpurea pendula.

SALIX, continued.
—*amygdalina.
— *appendiculata:* *S. grandifolia.
— *aurita×phylicifolia:* *S. ludificans
—*babylonica (Weeping Willow).
— *babylonica dolorosa:* *S. blanda.
— *bicolor:* *S. phylicifolia.
—*blanda (Wisconsin Weeping Willow).
— *britzensis:* *S. vitellina britzensis.
— *bullata:* *S. fragilis bullata (page 3571).
— *cærulea:* *S. alba calva.
—*Caprea.
—*cinerea.
—*cordata.
—*daphnoides.
—*discolor.
— *dolorosa:* *S. blanda.
— *Elæagnos:* *S. incana.
—*elegantissima (Thurlow's Weeping Willow); probably also applied otherwise.
—*Erdingeri.
—*fragilis (Brittle Willow).
—*glabra.
— *glabra filicifolia:* *S. gracilistyla.
— *glabra tiliæfolia:* *S. gracilistyla.
—*gracilistyla.
—*grandifolia.
—*hastata.
—*hexandra.
— *holosericea:* *S. stipularis.
—*humilis.
—*incana.
—*irrorata (Colorado Willow).
—*japonica (Japanese Weeping Willow).
— *laurifolia:* *S. pentandra.
—*longifolia.
—*lucida.
—*ludificans.
—*myrsinifolia.
—*myrtilloides.
—*nigra.
— *nigricans:* *S. myrsinifolia.
—*pentandra.
—*petiolaris; but misapplied to S. incana.
— *Petzoldii:* *S. blanda.
—*phylicifolia.
—*Piperi.
— *pontederana:* *S. sordida.
—*purpurea.
—*regalis (Royal Willow): S. alba splendens.
—*repens.
— *rosmarinifolia:* *S. incana, not S. rosmarinifolia of botanists.
—*rubens.
— *sacramentana:* probably a form of *S. fragilis.
—*sericea.
—*sesquitertia.
—*Sieboldiana.
— *Sieboldii:* probably *S. elegantissima.
—*sordida.
—*stipularis.
—*viminalis (Osier Willow).
—*vitellina (Yellow Willow).

SALPIGLOSSIS. *S. azurea:* S. sinuata azurea.
— *grandiflora:* S. sinuata.
— sinuata.

SALVIA. S. argentea.
— azurea.
— bicolor; trade plant possibly S. splendens bicolor or S. coccinea bicolor.
— coccinea; possibly sometimes applied in the trade to S. splendens.
— farinacea.
— globosa.
—*Greggii.
— Horminum.
— involucrata.
— leucantha.
— officinalis (Sage).
— patens.
— *Pitcheri:* S. azurea grandiflora.
— pratensis.
— *rubicunda:* S. pratensis rubicunda.
— Sclarea.
— *spelmina:* probably S. Verbenaca.
— splendens.
— uliginosa.
— Verbenaca.
— verticillata.
— virgata; but may apply also to S. nemorosa.

SAMBUCUS. *S. acutiloba:* *S. canadensis acutiloba.
— *arborescens:* *S. pubens arborescens.
— *aurea:* *S. nigra aurea or S. canadensis aurea.
—*canadensis.
— *glauca:* *S. cærulea.
— *maxima:* *S. canadensis maxima.
—*nigra.
—*pubens.
—*racemosa.
— *tenuifolia:* *S. racemosa tenuifolia.

SANGUINARIA. S. canadensis.

SANGUISORBA. S. canadensis.

SANSEVIERIA. S. zeylanica.

SANTOLINA. S. Chamæcyparissus.
— *incana:* S. Chamæcyparissus incana.
— *maritima:* probably Diotis candidissima.

SANVITALIA. S. procumbens.

SAPIUM. *S. sebiferum.

SAPONARIA. S. calabrica.
— *caucasica:* S. officinalis caucasica.
— ocymoides.
— officinalis.
— Vaccaria.

SARRACENIA. S. Catesbæi.
— Drummondii.
— flava.
— psittacina.
— purpurea.
— rubra; but may be also S. Drummondii rubra.
— *variolaris:* S. minor.

SASSAFRAS. *S. officinale:* *S. variifolium.

SATUREIA. S. alpina (Calamintha).
— hortensis (Summer Savory). (Calamintha).
— montana.

SAURURUS. S. cernuus.

SAXIFRAGA. S. Aizoon.
— Burseriana.
— cordifolia.

SAXIFRAGA, continued.
— Cotyledon.
— crassifolia.
— lingulata.
— *orbicularis:* S. crassifolia orbicularis.
— peltata.
— *pyramidalis:* S. Cotyledon pyramidalis.
— sarmentosa.
— *speciosa:* a confused name; it may be S. ligulata speciosa, S. Burseriana speciosa, S. sancta speciosa, or S. oppositifolia speciosa; most probably S. Burseriana speciosa.
— squarrosa.
— umbrosa.
— *Van Houttei:* a variation of S. crassifolia.
— virginiensis.

SCABIOSA. S. atropurpurea.
— *candidissima:* S. atropurpurea candidissima.
— caucasica.
— japonica.
— *maxima:* S. atropurpurea grandiflora.
— *minor:* S. atropurpurea nana.
— ochroleuca.

SCHINUS. *S. Molle.
—*terebinthifolius.

SCHIZANTHUS. S. Grahamii.
— *grandiflorus:* S. pinnatus.
— *hybridus:* not placed botanically.
— *papilionaceus:* S. pinnatus papilionaceus.
— pinnatus.
— retusus.
— wisetonensis.

SCHIZOPETALON. S. Walkeri.

SCHIZOPHRAGMA. *S. hydrangeoides; but the plant in cultivation very often is Hydrangea petiolaris.
— *integrifolium.

SCHIZOSTYLIS. S. coccinea.

SCHLUMBERGERA. S. Russelliana (Epiphyllum).

SCIADOPITYS. *S. verticillata.

SCILLA. S. bifolia.
— *campanulata:* S. hispanica.
— *maritima:* Urginea Scilla.
— *nutans:* S. nonscripta.
— peruviana.
— sibirica.

SCINDAPSUS. S. pictus argyræus (Pothos).

SCIRPUS. S. atrovirens.
— cernuus (Isolepis).
— Tabernæmontanus; a form of S. lacustris.

SCOLOPENDRIUM. *S. officinarum:* Phyllitis Scolopendrium.
— *vulgare:* P. Scolopendrium.

SCOLYMUS. S. hispanicus.

SCORZONERA. S. hispanica.

SCUTELLARIA. S. baicalensis.
— *cœlestina:* S. baicalensis cœlestina.

SEAFORTHIA. *S. elegans:* Archontophœnix Alexandræ and A. Cunninghamii (see Seaforthia, page 3123).

SECHIUM. S. edule (Chayota).

SEDUM. S. acre.
— Aizoon.
— alboroseum.
— album; but in some cases possibly S. acre album, S. brevifolium album or S. spectabile album.
— Anacampseros.
— *atropurpureum:* S. maximum hæmatodes or S. spectabile atropurpureum.
— brevifolium.
— cæruleum.
— *carneum:* S. sarmentosum carneum.
— *cruciatum:* S. monregalense.
— dasyphyllum.
— Ewersii.
— *glaucum:* may apply to S. reflexum albescens, S. dasyphyllum, S. hispanicum or S. lydium glaucum.
— hispanicum.
— hybridum; but may be S. Middendorffianum hybridum or S. Telephium hybridum.
— japonicum; but material is mostly S. alboroseum.
— kamtschaticum.
— lydium.
— Maximowiczii.
— maximum.
— Middendorffianum.
— monregalense.
— oppositifolium.
— pallidum: probably S. hispanicum, but may be true S. pallidum.
— populifolium.
— pulchellum; but may apply to S. sexangulare.
— reflexum.
— sarmentosum.
— sempervivoides.
— sexangulare.
— Sieboldii.
— *speciosum:* unknown botanically.
— spectabile.
— *spurium:* S. stoloniferum.
— Stahlii.
— stoloniferum.
— telephoides.
— Telephium.
— *turkestanicum:* S. Ewersii turkestanicum.

SELAGINELLA. *S. amœna:* S. caulescens.
— apus.
— *cæsia:* S. uncinata.
— cuspidata.
— Emmeliana.
— flabellata.
— Kraussiana.
— Martensii.
— rupestris.

SELENICEREUS. S. pteranthus (Cereus nycticalus).

SEMPERVIVUM. *S. acuminatum:* S. glaucum.
— arachnoideum.
— arenarium.
— *cornutum:* S. hirtum.
— fimbriatum.
— globiferum.
— Mettenianum.

SEMPERVIVUM, continued.
— **pyrenaicum;** but perhaps **S. tectorum pyrenaicum.**
— **soboliferum;** this name is commonly used for **S. globiferum.**
— **tectorum.**
— *violaceum:* probably **S. tectorum violaceum.**

SENECIO. S. Cineraria.
— *clivorum:* **Ligularia clivorum.**
— **cruentus** (Cineraria).
— **elegans** (Jacobæa).
— *Kaempferi:* **L. Kaempferi.**
— **mikanioides** (German Ivy).
— **pulcher.**
— **scandens;** some of the stock is perhaps **S. mikanioides.**
— **tanguticus.**
— *Wilsonianus:* **L. Wilsoniana.**

SEQUOIA (Wellingtonia). ***S. gigantea.**
—***sempervirens.**

SERENOA. *S. serrulata.

SETARIA. S. italica (Millet).

SHEPHERDIA. (Lepargyrea in American Code). ***S. argentea.**

SHORTIA. *S. californica:* **Actinolepis coronaria.**
—***galacifolia.**

SICANA. S. odorifera.

SIDALCEA. S. candida.
— **malvæflora.**

SILENE. S. acaulis.
— **alpestris.**
— **Armeria.**
— **maritima.**
— **orientalis.**
— **pendula.**
— **pennsylvanica.**
— **Saxifraga.**
— **Schafta.**
— **virginica.**

SILPHIUM. S. laciniatum.
— **perfoliatum.**

SINAPIS. See Brassica.

SINNINGIA. S. speciosa (Gloxinia of florists).

SISYRINCHIUM. *S. bermudianum:* **S. angustifolium.**

SITOLOBIUM. *S. cicutarium:* **Dennstædtia cicutaria.**

SKIMMIA. *S. japonica.

SMILACINA (Vagnera in American Code.) *S. bifolia:* **Maianthemum bifolium.**
— **racemosa.**

SMILAX. *S. hispida.

SMILAX of florists: See Asparagus.

SOJA. See Glycine.

SOLANUM. S. Capsicastrum.
—***Dulcamara** (Bitter-Sweet).
— **giganteum.** (page 3573).
—***Hendersonii.**
— **integrifolium.**
—***jasminoides.**
— **Melongena** (Eggplant).
— *Melvinii:* **S. Capsicastrum Melvinii.**
— **muricatum** (Pepino).
— **nigrum.**

SOLANUM, continued.
—***Pseudo-Capsicum** (Jerusalem Cherry).
—***Rantonettii.**
—***Seaforthianum.**
— **tuberosum** (Potato).
— **Warscewiczii.**
—***Wendlandii.**

SOLIDAGO. S. cæsia.
— **canadensis.**
— **nemoralis.**
— **odora.**
— **spectabilis.**
— **Virgaurea.**
Many native species of Solidago may appear in the lists, for which consult the current manuals of botany.

SOLLYA. *S. heterophylla.

SOPHORA. *S. japonica.
—***tetraptera.**

SORBARIA (mostly sold as Spiræa). ***S. Aitchisonii.**
—***arborea.**
—***Lindleyana.**
—***sorbifolia.**

SORBUS (often named under Pyrus). ***S. americana** (American Mountain-Ash).
—***Aria.**
—***Aucuparia** (European Mountain Ash).
—***domestica.**
— **hybrida: *S.** quercifolia.

SPARAXIS. S. grandiflora (usually not sold under the species-name).

SPARTIUM. *S. junceum.
— *scoparium:* ***Cytisus scoparius.**

SPECULARIA. S. Speculum (Campanula).

SPERGULA. S. sativa (Spurry).

SPHÆRALCEA. S. cisplatina (Malva miniata).

SPHENOGYNE. *S. speciosa:* **Ursinia pulchra.**

SPIGELIA. S. marilandica.

SPINACIA. S. oleracea (Spinach).

SPIRÆA. *S. Aitchisonii:* ***Sorbaria Aitchisonii.**
—***alba;** an American plant usually catalogued as S. salicifolia, which is Asiatic.
— *argentea:* ***S. canescens.**
—***arguta.**
— *ariæfolia:* ***Holodiscus discolor ariæfolius.**
— *Aruncus:* **Aruncus sylvester.**
— *Astilbe* (see Astilbe).
— *astilboides:* **Astilbe astilboides.**
—***Billiardii**
— *bracteata:* ***S. nipponica.**
—***Bumalda.**
—***callosa: S. japonica.**
— **canescens.**
— **cantoniensis: *S.** Reevesiana.
— *carpinifolia:* ***S. latifolia.**
—***chinensis.**
— *Davidii:* Astilbe Davidii.
—***Douglasii.**
— *Filipendula:* Filipendula hexapetala.

SPIRÆA, continued.
— *floribunda:* probably **Astilbe astilboides floribunda.**
—***Fortunei: S. japonica Fortunei.**
—***Froebelii: S. Bumalda Froebelii.**
— *gigantea:* **Filipendula camtschatica.**
—***Henryi.**
— *Humboldtii:* **Aruncus sylvester.**
—***japonica;** often misapplied to Astilbe japonica.
— *kamtschatica:* **Filipendula camtschatica.**
— *Kneiffii:* **Aruncus sylvester Kneiffii.**
—***latifolia;** an American plant usually catalogued as S. salicifolia, which is Asiatic.
— *Lindleyana:* ***Sorbaria Lindleyana.**
— *lobata:* **Filipendula rubra.**
—***Margaritæ.**
—***multiflora.**
— **nipponica.**
— *opulifolia:* **Physocarpus opulifolius: ***Opulaster opulifolius.
— *palmata:* **Filipendula purpurea.**
—***prunifolia.**
—***pyramidata.**
—***Reevesiana: S. cantoniensis.**
—***Rosthornii.**
— *rotundifolia:* ***S. nipponica rotundifolia.**
— **salicifolia;** an Asiatic plant; name often misapplied to ***S. alba** and ***S. latifolia.**
—***semperflorens.**
— *sorbifolia:* ***Sorbaria sorbifolia.**
— **Thunbergii.**
—***tomentosa.**
—***trilobata.**
— *Ulmaria:* **Filipendula Ulmaria.**
—***Vanhouttei.**
— *venusta:* **Filipendula rubra venusta.**

SPIRANTHES. S. cernua.

SPONDIAS. *S. axillaris:* **S. lutea.**

SPREKELIA. S. formosissima (Amaryllis).

STACHYS. *S. Betonica* (Betonica): **S. officinalis.**
— **grandiflora** (Betonica).
— **lanata.**
— **Sieboldii.**

STAPHYLEA. *S. Bumalda.
—***colchica.**
—***pinnata.**
—***trifolia.**

STATICE (see Armeria). *S. arborescens:* **Limonium arborescens.**
— *Bonduellii:* **L. Bonduellii.**
— *Gmelinii:* **L. Gmelinii.**
— *incana:* **L. tataricum angustifolium.**
— *latifolia:* **L. latifolium.**
— *sinuata:* **L. sinuatum.**
— *Suworowii:* **L. Suworowii.**
— *tatarica:* **L. tataricum.**

STEIRONEMA. S. ciliatum (Lysimachia).

STELLARIA. S. Holostea.

STENACTIS. *S. speciosa:* **Erigeron speciosus.**

STENANTHIUM. S. robustum.

STENOTAPHRUM. *S. glabrum:* **S. secundatum.**

STEPHANANDRA. **S. flexuosa:* **S. incisa.**
STEPHANOPHYSUM. *S. longifolium:* **Ruellia amœna.**
STEPHANOTIS. **S. floribunda.*
STERCULIA. **S. acerifolia.*
— **diversifolia.*
— **platanifolia.*
STERNBERGIA. S. lutea (Amaryllis).
STEVENSONIA. *S. grandiflora:* **S. grandifolia.**
STEVIA. *S. serrata* of florists: **Piqueria trinervia.**
STEWARTIA (Stuartia). **S. pentagyna.*
— **Pseudo-Camellia.*
STIGMAPHYLLON. S. ciliatum.
STIPA. S. elegantissima.
— **pennata.**
STIZOLOBIUM. S. Deeringianum (Velvet Bean).
— **pruriens** (Mucuna).
STOKESIA. *S. cyanea:* **S. lævis.**
STRELITZIA. S. Reginæ.
STREPTOPUS. S. roseus.
STREPTOSOLEN. S. Jamesonii (Browallia).
STROBILANTHES. S. Dyerianus.
STUARTIA. *S. plantaginea:* **Stewartia pentagyna.*
— *Pseudo-Camellia:* **Stewartia Pseudo-Camellia.*
STYLOMA. See Pritchardia.
STYLOPHORUM. S. diphyllum.
STYRAX. **S. americana.*
— **japonica.*
— **Obassia.*
SUTHERLANDIA. **S frutescens.*
SWAINSONA. S. galegifolia.
— *grandiflora:* S. Greyana, perhaps applied also to forms of S. galegifolia.
— **Greyana.**
SYMPHORICARPOS. **S. occidentalis.*
— **oreophilus.*
— **pauciflorus:* **S. albus pauciflorus,** but the plant in cultivation is usually **S. albus.**
— **racemosus:* **S. albus,** but the plant in cultivation is usually **S. albus lævigatus.**
— **vulgaris:* **S. orbiculatus.**
SYMPHYTUM. *S. asperrimum:* **S. asperum.**
— **officinale.**
SYMPLOCARPUS (Spathyema in the American Code). **S. fœtidus.**
SYNDESMON. See Anemonella.
SYRINGA. *S. alba:* **S. vulgaris alba.**
— *cærulea:* **S. vulgaris cærulea.**
— **chinensis.*
— **japonica.*
— **Josikæa.*
— **pekinensis.*
— **persica.*
— **pubescens.*
— **rothomagensis:* **S. chinensis.**

SYRINGA, continued.
— **villosa.*
— **vulgaris.*
— **Wilsonii.*
SYZYGIUM (see Eugenia). **S. operculatum.*

TACSONIA. *T. manicata:* **Passiflora manicata.**
— *mollissima:* **P. mollissima.**
TAGETES. T. erecta.
— **lucida.**
— **patula.**
— **signata.**
TAMARINDUS. **T. indica.*
TAMARIX. *T. æstivalis:* **T. pentandra.*
— **africana;* but stock usually **T. gallica** or **T. parviflora.**
— *algerica:* not known botanically; possibly a form of T. gallica.
— *amurensis:* a form of **T. pentandra.**
— **chinensis.*
— **gallica.*
— *germanica:* **Myricaria germanica.**
— **hispida.*
— *indica:* **T. gallica indica.*
— *japonica:* **T. juniperina.*
— **juniperina.*
— **odessana.*
— **parviflora.*
— **pentandra.**
— *plumosa:* **T. juniperina.*
— **tetrandra.*
TANACETUM. T. vulgare.
TARAXACUM. T. officinale (Dandelion).
TAXODIUM. **T. distichum.*
— **mucronatum.*
TAXUS. **T. baccata.*
— **canadensis.*
— **cuspidata.*
— *hibernica:* **T. baccata fastigiata.*
— *koraiensis:* probably **Cephalotaxus Harringtonia fastigiata.*
— *minor:* **T. canadensis.*
— *procumbens:* **T. baccata procumbens.*
— *repanda:* **T. baccata repandens.*
— *repandens:* **T. baccata repandens.*
— *tardiva:* **T. baccata adpressa.*
TECOMA. *T. australis:* **Pandorea australis.*
— *capensis:* **Tecomaria capensis.*
— *capreolata:* **Bignonia capreolata.*
— *grandiflora:* **Campsis chinensis:** **Bignonia grandiflora.*
— *jasminoides:* **Pandorea jasminoides.*
— *Mackenii:* **Pandorea Ricasoliana.*
— *radicans:* **Campsis radicans:** **Bignonia radicans.*
— *Ricasoliana:* **Pandorea Ricasoliana.*
— **Smithii.*
— **stans.*
TECOMARIA. **T. capensis* (Tecoma).
TELANTHERA (Alternanthera). **T. amœna rosea.**
— **Bettzickiana.**
— **versicolor.**
TELEKIA. *T. cordifolia:* **Buphthalmum speciosum.**

TEMPLETONIA. **T. retusa.*
TERMINALIA. T. Catappa.
TETRAGONIA. T. expansa (New Zealand Spinach).
TETRAPANAX. **T. papyriferum* (Aralia. Fatsia).
TEUCRIUM. T. canadense.
— **Chamædrys.*
THALIA. T. dealbata.
THALICTRUM. *T. adiantifolium:* **T. minus adiantifolium.**
— *anemonoides:* **Anemonella thalictroides** (page 3296, under Syndesmon).
— **aquilegifolium.**
— *Cornuti:* either **T. aquilegifolium** or **T. polygamum.**
— **dasycarpum.**
— **dioicum.**
— **dipterocarpum.**
— **glaucum.**
— **minus.**
— **paniculatum.**
— **polygamum.**
THEA. *T. Bohea:* **T. sinensis Bohea* (Camellia).
— **sinensis.*
THELESPERMA. T. hybridum (Cosmidium).
THEOBROMA. T. Cacao.
THERMOPSIS. T. caroliniana.
THESPESIA. T. populnea.
THEVETIA. T. nereifolia.
THRINAX. T. Morrisii.
— **parviflora.**
THUJA (Thuya. See Biota). *T. elegantissima:* **T. orientalis elegantissima;* perhaps also **T. occidentalis lutea.**
— *Ellwangeriana:* **T. occidentalis Ellwangeriana.*
— *ericoides:* **T. occidentalis ericoides.*
— *filiformis:* **T. orientalis pendula;* the stock is perhaps sometimes **T. occidentalis filiformis.*
— *gigantea:* **T. plicata.*
— *globosa:* **T. occidentalis globosa.*
— *japonica:* **T. Standishii.*
— *Lobbi:* **T. plicata.*
— **occidentalis.*
— **orientalis.*
— **plicata.*
— *pumila:* **T. occidentalis pumila.*
— *pyramidalis:* applied both to **T. occidentalis pyramidalis* and to **T. orientalis pyramidalis.*
— *Reidii:* **T. occidentalis Reidii.*
— *sibirica:* **T. occidentalis Wareana.*
— **Standishii* (Thujopsis).
— *Vervæneana:* **T. occidentalis Vervæneana.*
— *Wareana:* **T. occidentalis Wareana.*
THUJOPSIS. *T. borealis:* **Chamæcyparis nootkatensis.*
— **dolobrata.*
— *Standishii:* **Thuja Standishii.*
THUNBERGIA. **T. alata.*
— **coccinea.*
— **fragrans.*
— **grandiflora.*
— *Harrisii:* **T. laurifolia.*

THYMUS. *T. citriodorus:* **T. Serpyllum vulgaris.**
— *coccineus:* **T. Serpyllum coccineus.**
— *lanuginosus:* **T. Serpyllum lanuginosus.**
— **Serpyllum.**
— **vulgaris.**

THYRSACANTHUS. *T. rutilans:* **Odontonema Schomburgkianum.**

TIARELLA. T. cordifolia.
— *purpurea:* **T. cordifolia purpurea.**

TIBOUCHINA. T. semidecandra (Lasiandra macrantha).

TIGRIDIA. *T. canariensis:* **T. Pavonia canariensis.**
— *conchiflora:* **T. Pavonia conchiflora.**
— *grandiflora:* **T. Pavonia grandiflora.**
— *immaculata:* **T. Pavonia alba immaculata** or **lutea immaculata.**
— *lilacea:* **T. Pavonia lilacea.**
— **Pavonia.**
— *rosea:* **T. Pavonia rosea.**

TILIA. *T. alba:* a confused name applying to forms of **T. tomentosa, T. petiolaris,** and **T. neglecta.**
—***americana.**
— *argentea:* ***T. tomentosa.**
— *asplenifolia:* ***T. platyphyllos laciniata.**
—***cordata.**
— *dasystylu:* ***T. euchlora.**
—***euchlora.**
— *europæa:* ***T. vulgaris;** sometimes misapplied to **T. platyphyllos** and **T. cordata.**
—***heterophylla.**
— *macrophylla:* ***T. americana macrophylla.**
— *mississippiensis:* ***T. americana macrophylla.**
—***petiolaris.**
—***platyphyllos.**
—***tomentosa.**
— *ulmifolia:* ***T. cordata.**
—***vulgaris.**

TILLANDSIA. T. usneoides (Spanish Moss).

TIPUANA. T. speciosa.

TORENIA. *T. Baillonii:* **T. flava.**
— **Fournieri.**

TORREYA (Tumion under American Code). ***T. californica.**
—***nucifera.**

TOXYLON. See Maclura.

TRACHELIUM. T. cæruleum.

TRACHELOSPERMUM. T. jasminoides (Rhynchospermum).

TRACHYCARPUS. *T. excelsa (Chamærops).
—***Fortunei** (Chamærops).
—***Martiana.**

TRACHYMENE. T. cærulea (Didiscus).

TRADESCANTIA. *T. multicolor:* **Zebrina pendula quadricolor.**
— *repens:* **T. fluminensis.**
— *virginica:* **T. virginiana.**
— *vulgaris:* unknown botanically.
— *zebrina:* **Zebrina pendula.**

TRAGOPOGON. T. porrifolius (Salsify).

TRAPA. T. natans.

TRICHOLÆNA. T. rosea.

TRICHOSANTHES. *T. colubrina:* **T. Anguina.**

TRICYRTIS. T. macropoda.
— **hirta.**

TRIFOLIUM. T. hybridum (Alsike Clover).
— **incarnatum** (Crimson Clover).
— **medium** (Mammoth Clover).
— *minus:* a form of **T. repens** (White Clover).
— **pratense** (Common Red Clover).
— *suaveolens:* **T. resupinatum.**

TRILLIUM. T. cernuum.
— **erectum.**
— *erythrocarpum:* **T. undulatum.**
— **grandiflorum.**
— **nivale.**
— **ovatum.**
— **petiolatum.**
— **recurvatum.**
— **sessile.**
— **stylosum.**
— **undulatum.**

TRISTANIA. T. conferta.

TRITICUM. T. æstivum (Wheat).

TRITOMA. T. corallina.
— *hybrida:* **Kniphofia hybrida,** a collective trade name.
— *Macowanii:* **K. Macowanii.**
— *nobilis:* **K. Uvaria nobilis.**
— *Pfitzeri:* **K. Uvaria grandis.**
— *Quartiniana:* **K. foliosa.**
— *Saundersii:* **K. Uvaria Saundersii.**
— *sulphurea:* **K. sulphurea.**
— *tricolor:* **K. tricolor.**
— *Uvaria:* **K. Uvaria.**

TRITONIA (Montbretia). **T. aurantiaca.**
— **crocosmæflora.**
— **Pottsii.**
— **rosea.**

TROLLIUS. T. asiaticus.
— **caucasicus.**
— **chinensis.**
— **europæus.**
— **japonicus.**
— **Ledebouri.**
— **pumilus.**

TROPÆOLUM. *T. atropurpureum:* probably a color form of **T. peltophorum,** of **T. majus,** or of **T. majus nanum.**
— *canariense:* **T. peregrinum.**
— *Heinemannii:* a color form of **T. majus.**
— *hemisphericum:* a color form of **T. majus.**
— *Lobbianum:* **T. peltophorum.**
— *luteum:* a color form of **T. minus** or of **T. majus.**
— **majus.**
— **minus.**
— *nanum:* **T. majus nanum.**
— **pentaphyllum.**
— **peregrinum.**
— *Regelianum:* a color form of **T. majus** or of **T. majus nanum.**
— **speciosum.**
— **tricolor.**

TSUGA. *T. canadensis.
—***caroliniana.**
—***diversifolia.**
— *Fretzii:* **Pseudotsuga taxifolia** Fretzii: ***P. Douglasii** Fretzii.
—***heterophylla.**
— *Hookeriana:* ***T. Mertensiana.**
—***Mertensiana;** but sometimes misapplied to **T. heterophylla.**
—***Sieboldii.**

TULIPA. T. Gesneriana.
— **suaveolens.**

TUMION. See Torreya.

TUNICA (Petrorhagia under American Code). **T. Saxifraga.**

TUSSILAGO. T. Farfara.

TYPHA. T. latifolia.

ULEX. *U. europæus.

ULMARIA. *U. Filipendula:* **Filipendula hexapetala.**
— *palmata:* **F. palmata.**
— *purpurea:* **F. purpurea.**
— *rubra:* **F. rubra.**
— *venusta:* **F. rubra venusta.**

ULMUS. *U. alata.
—***americana.**
— *Camperdownii:* ***U. glabra Camperdownii.**
—***campestris** (English Elm); often misapplied to **U. foliacea.**
— *Clemmeri:* ***U. hollandica Klemmer.**
—***foliacea.**
—***fulva.**
—***glabra** (Scotch Elm).
—***hollandica.**
— *horizontalis:* ***U. glabra pendula.**
— *Huntingdonii:* ***U. hollandica vegeta** (Huntingdon Elm).
— *latifolia:* ***U. hollandica belgica.**
— *montana:* ***U. glabra.**
— *plumosa:* ***U. glabra fastigiata.**
—***pumila.**
— *purpurea:* ***U. campestris purpurea.**
—***racemosa.**
— *scabra:* ***U. glabra.**
— *suberosa:* either **U. campestris** or **U. foliacea suberosa.**
— *umbraculifera:* ***U. foliacea umbraculifera.**
— *vegeta:* ***U. hollandica vegeta.**
— *Wentworthii:* ***U. campestris Wentworthii.**

UMBELLULARIA. *U. californica.

UNIOLA. U. latifolia.

URGINEA. U. Scilla (Scilla maritima).

URSINIA. U. pulchra (Sphenogyne).

UVULARIA. U. grandiflora.
— **perfoliata.**
— *sessilifolia:* **Oakesia sessilifolia.**

VACCINIUM. *V. corymbosum.
—***erythrocarpum.**
—***macrocarpon.**
—***pallidum.**
—***pennsylvanicum.**
—***stamineum.**
—***vacillans.**
—***Vitis-Idæa.**

VALERIANA. *V. alba:* probably a white form of Centranthus ruber, but perhaps V. officinalis alba.
— *coccinea:* unknown botanically.
— officinalis.
— *rubra:* Centranthus ruber.

VALERIANELLA. V. olitoria (Corn Salad).

VALLISNERIA. V. spiralis.

VALLOTA. V. purpurea.

VENIDIUM. *V. calendulaceum:* V. decurrens calendulaceum.

VERATRUM. V. viride.

VERBASCUM. V. nigrum.
— olympicum.
— *pannosum:* V. longifolium pannosum.
— phœniceum.

VERBENA. *V. Aubletia:* V. canadensis.
— *citriodora:* Lippia citriodora.
— erinoides.
— hybrida.
— *montana:* either V. bipinnatifida or V. canadensis.
— teucrioides.
— venosa.
There are other Latin names in Verbena, designating garden forms.

VERNONIA. *V. arkansana:* V. crinita.
— noveboracensis.

VERONICA. *V. Allionii.
—*alpina.
— *amethystina:* *V. spuria.
—*Andersonii.
—*carnea; but may apply to a form of V. spuria.
— *decussata:* *V. elliptica.
—*elliptica.
—*gentianoides.
—*imperialis.
—*incana.
— longifolia.
—**maritima:* *V. longifolia.
— pectinata.
—*repens.
—**rosea:* V. longifolia rosea, V. spicata rosea or V. pectinata rosea.
—**rupestris;* a form of V. Teucrium.
—*speciosa.
—*spicata.
— spuria.
— *subsessilis:* *V. longifolia subsessilis.
—*Teucrium.
—*Traversii.
—**verbenacea:* unknown botanically.
—*virginica.

VERSCHAFFELTIA. V. splendida.

VIBURNUM. *V. acerifolium.
—*alnifolium.
—*americanum (American High-bush Cranberry).
—*Carlesii.
—*cassinoides.
—*dentatum.
—*dilatatum.
—*ellipticum.
—*japonicum.

VIBURNUM, continued.
—*Lantana.
— *lantanoides:* *V. alnifolium.
—*Lentago.
—*macrocephalum.
— *macrophyllum:* *V. japonicum.
—*molle; often misapplied to V. venosum and V. venosum Canbyi.
—*nudum.
—*odoratissimum.
—*Opulus (European High-bush Cranberry).
— *Oxycoccus:* *V. americanum, but sometimes misapplied to V. Opulus.
— *plicatum:* V. tomentosum plenum: *V. tomentosum plicatum.
—*prunifolium.
—*pubescens.
— *pyrifolium:* *V. prunifolium.
—*rhytidophyllum.
—*rufidulum.
— *Sandankwa:* *V. suspensum.
—*Sieboldii.
— *sterile:* may be V. macrocephalum sterile or V. Opulus sterile.
—*suspensum.
—*Tinus.
—*tomentosum.
—*utile.
—*venosum.
—*Wrightii.

VICIA. V. Faba (Broad or Windsor Bean).
— *Gerardii:* V. cracca Gerardii.
— oroboides (Orobus lathyroides).
— sativa (Spring Vetch).
— villosa (Hairy Vetch).

VICTORIA. V. regia.
— *Trickeri:* V. Cruziana.

VIGNA. V. Catjang.
— sesquipedalis (Asparagus Bean).
— sinensis (Cowpea).

VINCA. *V. alba:* *V. minor alba.
— *argentea:* *V. minor argentea.
— *aurea:* *V. minor aurea.
— *cærulea:* *V. minor cærulea.
— *elegantissima:* applied either to V. major elegantissima or a form of V. minor.
— herbacea.
—*major.
—*minor.
— *purpurea:* *V. minor purpurea.
—*rosea.

VINCETOXICUM. *V. acuminatum:* Cynanchum acuminatifolium.
— *japonicum:* C. acuminatifolium.

VIOLA. *V. admirabilis:* V. cornuta admirabilis.
— blanda.
— *californica:* V. odorata.
— *canina:* probably V. conspersa; V. canina is a European species and not now recognized as occurring natively in any form in North America.
— cornuta.
— cucullata; the stock in trade, however, is probably V. palmata.
— lutea.
— odorata.
— palmata.

VIOLA, continued.
— *Papilio:* V. cornuta Papilio.
— pedata.
— pedunculata.
— Priceana.
— pubescens.
— rotundifolia.
— septentrionalis.
— tricolor.

VIRGILIA: *V. lutea:* *Cladrastis lutea.

VISCARIA. *V. elegans:* Lychnis Viscaria elegans.
— *oculata:* L. Coeli-rosea oculata.

VITEX. *V. Agnus-castus.
— *incisa:* *V. Negundo incisa.
—*Negundo.

VITIS (see Ampelopsis, Cissus, Parthenocissus). *V. aconitifolia:* *Ampelopsis aconitifolia.
—*æstivalis.
—*amurensis.
—*Berlandieri.
—*bicolor.
— *Bourquiniana:* *V. æstivalis Bourquiniana.
— *brevipedunculata:* *A. heterophylla amurensis.
—*californica.
—*candicans.
— *capensis:* *Cissus capensis (page 3482).
—*Champinii.
—*cinerea.
—*Coignetiæ.
— *cordata:* *A. cordata.
—*cordifolia.
— *discolor:* *C. discolor.
—*Doaniana.
—*Girdiana.
— *Henryana:* Parthenocissus Henryana: *A. Henryana.
— *heterophylla:* *A. heterophylla.
— *humulifolia:* *A. humulifolia.
— *hypoglauca:* *A. hypoglauca (page 3483).
—*Labrusca.
—*Linsecomii.
—*Longii.
— *megalophylla:* *A. megalophylla.
— *oblonga:* *C. oblonga (page 3483).
— *quadrangularis:* *C. quadrangularis (page 3482).
— *rhombifolia:* *C. rhombifolia (page 3483).
— *riparia:* *V. vulpina.
—*rotundifolia.
—*rubra.
—*rupestris.
— *striata:* *C. striata.
— *Thomsonii:* P. Thomsonii: *A. Thomsonii.
—*vinifera.
—*vulpina.

VITTADINIA. V. triloba (Erigeron mucronatus).

VOLUTARELLA. V. muricata (Amberboa).

WAHLENBERGIA. *W grandiflora:* Platycodon grandiflorum.
— *vincæflora:* W. gracilis.

WALDSTEINIA. W. fragarioides.

WASHINGTONIA. W. filifera (Brahea).

WASHINGTONIA, continued.
— **gracilis.**
— *robusta:* **W. filifera robusta** (Brahea).
— **Sonoræ.**

WATSONIA. *W. Ardernei:* **W. viridifolia O'Brienii.**

WEIGELA (if the American and East Asian species are considered to be con-generic, the name becomes Diervilla, and this is the usual disposition; the name Weigela, however, is well established in horticultural practice).
—**amabilis:* **Diervilla florida,** or perhaps sometimes **D. coræensis.**
—**arborea:* **D. coræensis arborea.**
—**candida:* **D. hybrida candida.**
—**Desboisii:* **D. hybrida Desboisii.**
— *florida:* **D. florida:** *W. rosea.
—**floribunda:* **D. floribunda.**
—**Grœnewegenii:* **D. hybrida Grœnewegenii.**
—* *Hendersonii:* **D. hybrida Hendersonii.**
—**hortensis:* **D. japonica hortensis.**
—**hybrida:* **D. hybrida.**
—**japonica:* **D. japonica.**
—**Kosteriana·* **D. hybrida Kosteriana variegata.**
—*Lavallei: **D. hybrida Lavallei.**
—**nana:* **D. hybrida nana variegata.**
—**rosea:* **D. florida.**
— *sessilifolia:* ***D. sessilifolia.**
—**Steltzneri:* **D. hybrida Steltzneri.**
—**Van Houttei:* **D. hybrida Var Houttei.**
—**venosa:* **D. hybrida venosa.**
—**Verschaffeltii:* **D. hybrida Verschaffeltii.**

WELLINGTONIA. *W. gigantea:* ***Sequoia gigantea.**

WHITLAVIA. *W. gloxinioides:* **Phacelia Whitlavia gloxinioides.**
— *grandiflora:* **P. Whitlavia.**

WIGANDIA. W. caracasana.
— **imperialis.**
— *macrophylla:* **W. caracasana macrophylla.**
— **Vigieri.**

WISTERIA. *W. brachybotrys:* ***W. floribunda.**
— *brachybotrys alba:* ***W. venusta.**
— *chinensis:* ***W. sinensis.**
— **floribunda.**
—***frutescens.**
— *magnifica:* ***W. frutescens magnifica.**
—**multijuga:* **W. floribunda macrobotrys.**
—***sinensis;** but often it is **W. floribunda.**
— *speciosa:* ***W. frutescens.**
—***venusta.**

WOODSIA. W. ilvensis.
— **obtusa.**

WOODWARDIA. *W. angustifolia:* **W. areolata.**
virginica.

XANTHISMA. X. texanum (Centauridium).

XANTHOCERAS. *X. sorbifolia.

XANTHORRHIZA. *X. apiifolia:* ***Zanthorhiza apiifolia.**

XANTHOSOMA. X. Lindenii (Phyllotænium).

XANTHOXYLUM. See Zanthoxylum.

XERANTHEMUM. X. annuum.

XOLISMA. *X. ligustrina:* ***Lyonia ligustrina.**

YUCCA. *Y. aloifolia.
— *angustifolia:* ***Y. glauca.**
—***baccata.**
—***filamentosa.**
—***flaccida.**
—***glauca.**
—***gloriosa.**
—***Treculeana.**
— *Whipplei:****Hesperoyucca Whipplei.**

ZALUZIANSKYA. Z. capensis (Nycterinia).

ZANTEDESCHIA (Richardia. Florists' Calla). **Z. æthiopica.**
— **albo-maculata.**
— **Elliottiana.**

ZANTHORHIZA. *Z. apiifolia (Xanthorrhiza).

ZANTHOXYLUM. *Z. americanum.
—***piperitum.**

ZEA. *Z. japonica:* **Z. Mays japonica.**
— **Mays** (Maize. Indian Corn).

ZEBRINA. Z. pendula (Tradescantia).

ZELKOVA. *Z. acuminata:* ***Z. serrata.**

ZENOBIA. *Z. pulverulenta (Andromeda).

ZEPHYRANTHES. Z. alba.
— **Atamasco** (Amaryllis).
— **candida.**
— **rosea.**

ZINGIBER: Z. officinale (Ginger).

ZINNIA. Z. elegans.
— **Haageana.**

ZIZANIA. *Z. aquatica:* **Z. palustris.**

ZIZYPHUS. *Z. Jujuba.

ZYGOCACTUS. Z. truncatus (Epiphyllum).

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Æschynanthus Boschiana, 3377; fulgens, 3377; grandiflora, 3376×; javanica, 3377; Lamponga, 3377; Lobbiana, 3376×; longiflora, 3377; macrocalyx, 3377; marmorata, 3377; miniata, 3377; pulcher, 3376×; pulchra, 3376×; speciosa, 3377; splendens, 3377; tricolor, 3377; zebrina, 3377.
Æschynomene Elaphroxylon, 1477.
Æsculus Hippocastanum, 50, 2299×.
Æstivales (Cratægus), 884×.
Ætheopappus pulcherrimus, 713.
Æthiopis (Salvia), 3060.
Æthusa Cynapium, 62×.
Afrægle, 443.
African Cherry Orange, 779×; Daisy, 1903×; Honeysuckle, 1430; Jessamine, 3361×; Lily, 229×; Marigold, 3305×; Milk Bush, 3296 Millet, 1110, 1497; Oak, 2333; Satin-Bush, 2724; Teakwood, 2333; Valerian, 1204×; Violet, 3049×.
Agallocha, 1189.
Agalma vitiensis, 3108×.
Aganisia, 2401×.
Agar-agar, 5×.
Agarista callopsidea, 1843×; neriifolia, 1851; pulchra, 1851.
Agastache Fœniculum, 1914×; scrophulariæfolia, 1914×.
Agathæa amelloides, 1205×; cœlestis, 1205×; rotundifolia, 1205×.
Agathosma fœtidissima, 454×; Ventenatiana, 1014×; villosa, 1014×.
Agave Alibertii, 1984; argyrophylla, 1305; brachystachys, 1984; brachystachys pubescens, 1983×; bulbifera, 1305×; Cactus, 1848; campanulata, 1306×; carolinensis, 1984; Commelinii, 1306×; cubensis, 1305×; cubensis striata, 1305×; fœtida, 1306; funifera, 1478; gigantea, 1306; guttata, 1984; hexapetala, 1305×; humilis, 1984; inermis, 1305×; maculata, 1983×; maculosa, 1983×; mexicana, 1305×; odorata, 1305×; pallida, 1984; polyanthoides, 1984; potatorum, 3579; protuberans, 1984; pubescens, 1983×; saponaria, 1984; spinosa, 1306×; subinermis, 1305×; Toneliana, 1305; tuberosa, 1306×; variegata, 1984; virginica, 1984; virginica tigrina, 1984.
Ageratum conspicuum, 1166; Lasseauxii, 1165; Wendlandii, 3579.
Aglaia edulis, 45×.
Aglaonema commutatum, 3119.
Agnus-castus incisa var. multifida, 3481; vulgaris alba, 3481.
Agonis flexuosa, 1843, 2704.
Agoseris cuspidata, 3390×.
Agraphis, 3117.
Agrestes (Veronica), 3451.
Agrimony, 240; Hemp, 1164.
Agropyron repens, 15; Richardsonii, 3385.
Agrostemma Cœli-rosa, 1928; Coronaria, 1927×; Flos-cuculi, 1929; Flos-Jovis, 1928; Githago, 1927×.
Agrostis alba, 15.
Agua, 2425×.
Ahate de Panuco, 294×.
Ahgao, 2781×.
Ahuacate, 2556.
Ailanthus flavescens, 698; glandulosa, 357.
Aino Millet, 3158×.
Aipi, 1992.
Aira cærulea, 2059; cæspitosa, 988×; flexuosa, 989.
Air Potato, 1013×.
Aizoaceæ, 30.
Ajax albicans, 2109×; breviflos, 2109×; cernuus, 2109×; cyclamineus, 2110×; Horsfieldii, 2109×; lorifolius, 2110; maximus, 2110; minimus, 2110; muticus, 2110; propinquus, 2110; Pseudo-Narcissus, 2109×; spurius, 2110; Telamonius, 2110.
Aka, 2045.
Akola, 3528.
Alabama, 2237×.
Alangilang, 652×; de China, 397×; Songsong, 397×.
Alaska, 2287×.
Alberta, 572.
Albizzia pruinosa, 2652×.
Albuga candida, 5×.
Alder, American Green, 252×; Black, 253×, 1640×; Dwarf, 1270×; European Green, 252; Smooth, 253; White, 801×.
Alehoof, 2130×.
Aleppo Pine, 2643.
Aletris fragrans, 1070; sarmentosa, 1753; Uvaria, 1752×.
Aleurites cordata, 47; montana, 3565×; spp., 2299×; triloba, 47.
Alexanders, Golden, 3547.
Alexandrian Laurel, 961×.
Alfa, 3243.
Alfalfa, Tree, 2019×.
Alfilerilla, 1136×.
Algæ, Blue-Green, 4.
Algodon de Seda, 637.
Alhenna, 1831.
Alibertia intermedia, 1984.
Alisma flavum, 1883.
Alismaceæ, 13×.
Alkaloid Atropine, 70×; Daturine, 70×; Hyoscyamine, 70×.
Alkanet, 280×.
Alkanna tinctoria, 69.
Allamanda cathartica, 67×, 3574; grandiflora, 3574; Hendersonii, 3574; nobilis, 3574; Schottii, 3574.
Alleghany Plum, 2830.
Allen, C. L., 1563.

Alligator-Apple, 293; Tree, 1889×.
Allium fragrans, 2291; Schœnoprasum, 911×.
Allocarya, 1758×.
Alloplectus Forgetii, 2115; pallidus, 2115.
All-Saints' Cherry, 2837×.
Allspice, 60×, 2626; Carolina, 637×; Wild, 487.
Almendro, 3321×.
Almond, 2295×; Flowering, 2831×; Indian, 3321×; Oriental, 2832; Russian, 2832; Tropical, 3321×.
Alnobetula (Alnus), 252.
Alocasia hybrida, 830×; Jenningsii, 830; Johnstonii, 946; macrorhiza, 17×; Marchallii, 830×; porphyroneura, 617; Roezlii, 614×; violacea, 830.
Aloe 19×; acinacifolia, 1318; acinacifolia venusta, 1318; acuminata, 1317; albicans, 1434×; altlinea, 1435; American, 231; angulata, 1317; angulata truncata, 1317; anomala, 1434×; arachnoides, 1435; arachnoides reticulata, 1435; aspera, 309×; asperula, 1434×; attenuata, 1434; attenuata clariperla, 1434×; bicarinata 309×; Blue, 233; Bourbon, 1903×; Boureana, 1317×; Bowieana, 1317×; Bowieana formosa, 1317×; brevis, 1434; bullulata, 309×; carinata, 1318; carinata lævior, 1318; carinata subglabra, 1318; caroliniana, 1984; coarctata, 1434; concinna, 1433×; congesta, 310×; conspurcata, 1317; crassifolia, 1317×; Creole, 1306×; cuspidata, 1435; cylindrica, 310; cylindrica rigida, 1433×; cymbæfolia, 1435; cymbiformis, 1435; deltoidea, 310×; disticha, 1317; erecta, 1434; excavata, 1318; expansa, 1434; fasciata, 1434; fœtida, 1306; foliolosa, 310×; formosa, 1317×; glabra, 1318; granata, 1434; Green, 1306; guttata, 1317×; hebes, 1435; herbacea, 1435; hybrida, 1433×; imbricata, 310; indurata, 1433×; intermedia, 1317; lingua, 1317; lingua angulata, 1317; lingua crassifolia, 1317; lingua longifolia, 1317; maculata, 1317×; maculata angustior, 1317×; maculata obliqua, 1317×; maculata pulchra, 1317×; Malgache, 1306; margaritifera, 1434; margaritifera media, 1434; margaritifera minima, 1434; margaritifera minor, 1434; marginata, 1434×; marmorata, 1317×; minor, 1434; nigricans, 1317×; nigricans denticulata, 1317×; nitens, 1318; nitida, 1318; nitida major, 1318; nitida minor, 1318; obliqua, 1317×; obscura, 1318; parva, 1434×; pentagona, 310; planifolia, 1317×; pseudonigricans, 1317×; pseudorigida, 1433×; pseudotortuosa, 1433×; pulchra, 1317×; pumila arachnoides, 1435; pumila margaritifera, 1434; racemosa, 1317; radula, 1434×; radula major, 1434; radula media, 1434×; radula minor, 1434; recurva, 1434×; Reinwardtii, 1434; reticulata, 1435; retusa, 1434×; rigida, 1433×; rigida expansa, 1434; rugosa, 1434; scaberrima, 1317; semimargaritifera. 1434; spiralis, 310; spirella, 310×; subnigricans, 1317×; subrigida, 1433×; subtortuosa, 1433×; subulata, 1434; sulcata, 1317; tesselata, 1434×; torquata, 1433×; tortuosa, 1433×; triangularis, 1433; tristicha, 1318; turgida, 1434×; Uvaria; 1752×; venusta, 1318; verrucosa, 1317; verrucula, 1317; virescens, 1434×; virginica, 1984; viscosa, 1433; viscosa indurata, 1433×; viscosa major, 1433×; Water, 3260; yuccæfolia, 1478.
Alophia, 1476×.
Aloysia citriodora, 1888×.
Alpinæ (Veronica), 3450×.
Alpine Currant, 2960; Plum, 2824×; Poppy, 2459×; Strawberry, 1272×.
Alpinia calcarata, 538×; Galanga, 22×; magnifica, 2569.
Alsike Clover, 3379×.
Alsine juniperina, 389×; pinifolia var. gracilis, 389×; Rosanii, 389×; verna, 389×.
Alsomitra sarcophylla, 3534.
Alsophila, 1209×, 1210, 1214.
Alstœmeria oculata, 521.
Alternanthera, 3319; paronychioides, 3319×; spathulata, 3319×.
Althæa cannibina, 52×; frutex, 1488×; officinalis, 52×; Shrubby, 1488×; various names, 3579.
Alum Root, 1482.
Alyxia olivæformis, 1421×.
Amanita, 2086×.
Amarantaceæ, 29.
Amaranth, 269×; Family, 29; Globe, 1355.
Amaranthus or -tus, 3579.
Amarella, 1323×.
Amaryllidaceæ, 20.
Amaryllis Alberti, 1493×; Atamasco, 3542; aurea, 1934; Belladonna, 20×, 3574; Blue, 1413×, 1494; ciliaris, 599×; crocata, 1494; equestris; 1493; erubescens, 3542×; Family, 20; formosissima, 3218; gigantea, 582×; Hallii, 1933×; longifolia, 894; lutea, 3240; maranensis, 1493×; orientalis, 582×; pallida, 3574; Parkeri, 3574; pulverulentum, 1494; radiata, 1934; Rayneri, 1494.
Amatungulu, 664×.
Amazon Lily, 1160.
Ambash, 1477.
Ambatjang, 1984×.
Amber, 12×, 1417; Sweet, 1632×.
Amberboa moschata, 712; muricata, 3492×.
Amblirion, 1280.
Ambrosia artemisifolia, 77×.
Amelanchier racemosa, 1194×.
Amendœira, 3321×.
American Aloe, 231; Aspen, 2757; Beech, 1202×; Black Currant, 2959; Bladder-Nut, 3227×; Cowslip, 1063; Cranberry, Larger, 3425×; Elder, 3067×; Elm, 3409×; Feverfew, 2477×; Frogbit, 1882×; Grape, 2614×; Green Alder, 252×; Holly, 1639×; Hornbeam, 673; Ipecac, 1338; Laurel, 1733; Lotus, 2117; Mint, 2035; Mountain-Ash, 3195; Pasque Flower, 284×; Pennyroyal, 1437; Plane-Tree, 2708; Turk's-Cap Lily, 1871×; Vetch, 3465×; Wayfaring Tree, 3460×; White Hellebore, 3440×; Wild Mint, 2035×.
Ames, F. L., 1563×.
Amianthium muscætoxicum, 19×, 3549×.
Ammoniac Resin, 62×.
Ammyrsine, 1835.
Amole, 751.
Amomis caryophyllata, 2626.
Amomophyllum, 3202.
Amomum Cardamomum, 1109×; magnificum, 2569; Melegueta, 22; vittatum, 265.
Amoor Cork Tree, 2578.
Amorphophallus nivosus, 1071.
Ampelopsis Davidiana, 3490×; dumetorum, 2478; Engelmannii, 2478×; Græbneri, 2478×; hederacea, 2478×; Henryana, 2478×; heptaphylla, 2479; himalayana, 2479; hirsuta, 2478×; Hoggii, 2478×; inconstans, 2478×; japonica, 2478×; Lowii, 2479; macrophylla, 2478; muralis, 2478×; pubescens, 2478×; quinquefolia, 2478×; quinquefolia var. heptaphylla, 2479; quinquefolia var. latifolia, 2478; quinquefolia var. radicantissima, 2478×; quinquefolia var. vitacea, 2478; radicantissima, 2478×; Roylei, 2478; Saint-Paulii, 2478×; sempervirens, 776; Thomsonii, 2479; tricuspidata, 2478×; Veitchii, 2479; Veitchii var. purpurea, 2479; Veitchii var. robusta, 2478×; virginiana, 2478×; Watsoniana, 3565×.
Amphiblemma cymosum, 2024.
Amra, 3217.
Amsonia ciliata, 1472.
Amulet Plant, Indian, 2862×.
Amygdalopis Lindleyi, 2831×.
Amygdalus argentea, 2832; communis, 2832×; communis var. persicoides, 2832×; communis var. tangutica, 2845; glandulosa, 2834×; incana, 2835; nana, 2832; nana var. incana, 2835; nectarina, 2833; orientalis, 2832; pedunculata, 2831×; Persica, 2832×; Persica var. nucipersica, 2833; persicoides, 2832×.
Amyris simplicifolia, 427.
Anacampseros Borderi, 3131×.
Anacardiaceæ, 48.
Anacardium occidentale, 48×, 2300.
Anacharis Alsinastrum, 1110×; canadensis, 1110×.
Anacyclus Pyrethrum, 77.
Anagyris fœtida, 42.
Anamirta Cocculus, 33×.
Ananas sativus, 18×.
Ananassa, 280.
Anastatica Hierochuntica, 36×, 2920.
Anatto, 55×.
Anchistea, 3520.
Anchovy Pear, 1413×.
Anchusa officinalis, 69.
Ancistrochilus Thomsonianus, 2426×.
Anda Assu, 1720×; Gomesii, 1720×.
Andreales, 7.
Andromeda acuminata, 1850×; arborea, 2420; axillaris, 1850×; calyculata, 732; calyculata var. angustifolia, 732; calyculata var. nana, 732; campanulata, 1115; candida, 3541×; cassinifolia, 3541×; Catesbæi, 1850×; cernua, 1115×; coriacea, 2622×; coriacea rubra, 2622×; crispa, 732; dealbata, 3541×; fastigiata, 681; ferruginea, 1935; floribunda, 2622; formosa, 2622; glauca, 3451×; japonica, 2622; ligustrina, 1935; ligustrina var. pubescens, 1935; lucida, 2622×; mariana, 2622×; nitida, 2622×; ovalifolia, 2622×; paniculata, 1935; parabolica, 1935; perulata, 1115; populifolia, 1850×; pulverulenta, 3541×; racemosa, 1850×; rhomboidalis, 1935; rigida, 1935; speciosa, 3541×; speciosa var. nitida, 3541×; speciosa var. viridis, 3541×; tetragona, 681; tomentosa, 1935; vaccinioides, 732.
Andropogon, 15; avenaceus, 3198×; halepensis, 1497; muricatus, 3456; Sorghum, 1497; squarrosus, 3456.
Androsace uniflora, 1068; Vitaliana, 1067×.
Androsæmum officinale, 1632×; Webbianum, 1632×.
Anecphya (Nymphæa), 2310×.
Aneilema medicum, 18×.
Anemia, 1214; californica, 287×.
Anemidictyon Phyllitidis, 284×.
Anemiopsis californica, 287×.
Anemone acutiloba, 1458; angulosa, 1458×; Hepatica, 1458; Rose, 2997; Rue, 3296×; thalictroides, 3296×; triloba, 1458.
Anemonella thalictroides, 3296×, 3580.
Anemopægma clematideum, 2651×; racemosum, 502×.
Anethum graveolens 62×, 911×.
Angadenia nitida, 2320.
Angeleen Tree, 281.
Angelica, 911, 2748×; Garden, 384; Tree, 344; Tree, Chinese, 344; verticillaris, 3359.
Angel's Eyes, 3452×; Trumpet, 971.
Angico Gum, 2647.
Angiopteris, 1214.
Angola Calabash Nutmeg, 2062×.
Angophora intermedia, 3565×; lanceolata, 3565×.
Angræcum antennatum, 1891×; caudatum, 1891×; Chailluanum, 1891×; distichum, 2096×; fragrans, 23; funale, 2745×; Humblotii, 1962×; Leonis, 1962×; pellucidum, 1891×; pertusum, 1891×; Pescatoreanum, 1891×; sesquipedale, 1962×.
Angustifoliæ (Scutellaria), 3122×.
Anhalonium Engelmannii, 391×; Lewinii, 1915; prismaticum, 391×; Williamsii, 1915.
Animated Oats, 435×.
Anisacanthus virgularis, 1730×.
Anise, 911; Chinese, 1641; Star, 1641; Wood, 35×.
Anisocarpus madioides, 1964.
Anisophyllum (Euphorbia), 1169.
Anisostichus capreolata, 503.
Annatto Dye, 510; -Tree, 510.
Annona, 34×; dolabripetala, 2975; longifolia, 1306×; mucosa, 2975×; rhombipetala, 1306×; triloba, 405×; uncinata, 398.
Annonaceæ, 34×.
Annuæ (Veronica), 3451.
Annual Candytuft, 1635×, 1636; Marjoram, 2406×; Poinsettia, 1170.
Annunciation Lily, 1868×.
Ancectochilus, 2401×; Dawsonianus, 1427; Lowei, 1067×; Petola, 1962; Veitchianus, 1962.
Anogra albicaulis, 2330×.
Anomatheca corymbosa, 1821; cruenta, 1821×; grandiflora, 1821×; juncea, 1821×.
Anon, 294×.
Anona Colorada, 294.
Anonas, 294.
Anonidium, 291.
Anonilla, 2976×.
Anonymus aquaticus, 2655×.
Anoplobatus (Rubus), 3024×.
Ansellia, 2401×.
Anthemis Aizoon, 206×; arabica, 785; coronaria, 754×; montana, 3071; nobilis, 77; parthenoides, 2011.
Anthericum californicum, 751; Hookeri, 766×; Liliago, 2473×; Liliastrum, 2473×; picturatum, 751×; serotinum, 1896; variegatum, 751×; vittatum, 751×; Williamsii, 751×; yedoense, 244×.
Anthocerotales, 6×.
Antholyza revoluta, 1343; spicata, 1345.
Anthoxanthum odoratum, 15.
Anthriscus Cerefolium, 62×, 911×.
Anthurium insigne, 2585.
Anthyllis Erinacea, 1133×; Vulneraria, 41×.
Antiaris toxicaria, 26×.
Anticlea elegans, 3549×.

Antiphylla oppositifolia, 3102.
Antirrhinum Coulterianum, 1474; Cymbalaria, 1883×; Linaria, 1884; purpureum, 1884×; triornithophorum, 1884; various names, 3580.
Ant-Tree, 599.
Antwerp Hollyhock, 268×.
Anychia argyrocoma, 2476.
Apache Beads, 287×.
Apera arundinacea, 3242×.
Aphelandra cristata, 1714; Ghiesbreghtiana, 1715.
Aphelexis humilis, 1450×.
Aphylax, 283×.
Aphyllon, 1824×.
Apicra albicans, 1434×; arachnoides, 1435; attenuata, 1434; cymbæfolia, 1435; expansa, 1433×; fasciata, 1434; margaritifera, 1434; margaritifera major, 1434; mirabilis, 1434×; patula, 1434; pseudorigida, 1433×; radula, 1434×; recurva, 1434×; reticulata, 1435; retusa, 1434×; rigida, 1433×; tortuosa, 1433×; viscosa, 1433.
Apiifoliæ (Cratægus), 886×.
Apios tuberosa, 41×, 2300, 3580.
Apium graveolens, 62×.
Apocarpiæ (Nymphæa), 2310×.
Apocynaceæ, 67×.
Apogon (Iris), 1675.
Aponogetonaceæ, 13×.
Aponogeton Family, 13×.
Aposeris fœtida, 1629.
Appalachian Tea, 3459×.
Apple, Adam's, 3304; Alligator-, 293; Balsam, 2060; Bitter-, 780; Blade, 2547; Bloomless, 2871; Carib, 1306×; Cashew, 279×; Chinese, 2873; Chinese Flowering, 2873×; Custard-, 291, 294; Haw, 884×; History, 1513; Kei, 172; Love-, 1982×, 2474; Mammee-, 1975×; May, 2725×; Melon, 908; Monkey-, 293; -of-Peru, 2140; Otaheite-, 3216×; Paradise, 2870; Pond-, 293; Prairie, 2849×; Prairie Crab-, 2877×; Rose-, 1163; -scented Gum, 1157; Star-, 767; Sugar-, 294; Thorn-, 970; Western Crab-, 2877×; Wild Balsam-, 1096; Wood-, 1219.
Appleseed, Johnny, 1563×.
Apricot, Black, 2824×; Japanese, 2824×; Plum, 2827; Purple, 2824×; Santo Domingo, 1975×; Siberian, 2824×.
Aqua-auri, 38×.
Aquifoliaceæ, 48×.
Aquilaria Agallocha, 59.
Aquilegia akitensis, 3565×.
Arabian Coffee, 823×; Jasmine, 1717; Primrose, 395×.
Arabis Carduchorum, 1068×.
Araca do Campo, 2848×.
Araceæ, 17.
Arachis hypogæa, 41×, 2300.
Aragallus angustatus, 2421; atropurpureus, 2421; deflexus, 2421; Lambertii, 2421; patens, 2421; villosus, 2421×.
Aralia Balfouriana, 2748; Chabrieri, 2746; concinna, 974×; crassifolia, 2846; Deleauana, 2748×; elegantissima, 2746×; filicifolia, 2748; fruticosa, 2747×; gracilina, 1062; Guilfoylei, 2747×; japonica, 1204; latifolia, 2747×; Maximowiczii, 192×; monstrosa, 2748; nudicaulis, 62×; papyrifera, 1204; pentaphylla, 193; quinquefolia, 2447×; regina, 1062×; reticulata, 2405×; Sciadophyllum, 3108×; Sieboldii, 1204; spectabilis, 2748; splendidissima, 2748×; trifolia, 2447×; Victoriæ, 2748; vitiensis, 3108×.
Araliaceæ, 62.
Arar-Tree, 631.
Araticú, 291, 2974×; do Brejo, 293; do Mato, 2977×; Mirim, 2977; Ponhé, 292×.
Araujia albens, 2610; graveolens, 2610, 3115×; hortorum, 2610; sericofera, 2610.
Arbol de las Hormigas, 599; Hormiguero, 599.
Arbor, 2551.
Arbor cornigera, 599.
Arbutus mucronatus, 2555; pilosa, 2555×; Trailing, 1120; Uva-ursi, 385×.
Arceuthobium, 2595.
Archangelica hirsuta, 288; officinalis, 911.
Archangel, Yellow, 1777.
Archelirion, 1870.
Archontophœnix, 2444×.
Arctium Lappa, 77; minus, 77.
Arctocrania, 855.
Arctostaphylos alpina, 386×; Uva-Ursi, 64.
Areca, 2445; alba, 1004×; aurea, 1004×; Baueri, 2950; Catechu, 16×, 2300×; crinita, 194; furfuracea, 1004×; gigantea, 2626×; gracilis, 1078×, 1084×, 2626×; lutescens, 753; monostachya, 441×; Nibung, 2348; oleracea, 2405; pumila, 2121; rubra, 194, 1004×; sapida, 2950; speciosa, 1628×; tigillaria, 2348; Verschaffeltii, 1628×.
Arenga mindorensis, 3049; saccharifera, 16×, 2445.
Aretia spectabilis, 2788; Vitaliana, 1067×.
Argemony, 390×.
Argentine Thistle, 2354.
Arguta (Acer), 202.
Argyreia capitata, 1846; splendens, 3566.
Argyrolobium Andrewsianum, 1357.
Aria Chamæmespilus, 3198; Decaisneana, 3197; græca, 3197; Hostii, 3198; nivea, 3197; suecica, 3197.
Arisæma maculatum, 17×; triphyllum, 17×.
Aristolochiaceæ, 28.
Aristolochia reticulata, 28×; Serpentaria, 28×.
Aristotelia Maqui, 52.
Arizona, 2269×.
Arkansas, 2243.
Armeniaca brigantiaca, 2824×; Mume, 2824×; sibirica, 2824×; vulgaris, 2824.
Armeria alpina var. alba, 3229; arborea, 3229×; bella, 3229; bracteata, 3229×; bracteata var. rubra, 3229×; cæspitosa, 3229; cæspitosa var. vera, 3229; cephalotes var. alba, 3229; cephalotes var. grandiflora, 3229; cephalotes var. rubra, 3229; cephalotes var. splendens, 3229; fasciculata, 3229; formosa var. alba, 3229×; formosa var. hybrida, 3229×; labradorica, 3229; leucocephala, 3229×; leucophylla, 3229×; magellanica, 3229×; majellensis, 3229; maritima var. variegata, 3229; plantaginea var. alba, 3229; plantaginea var. gigantea, 3229; plantaginea var. grandiflora, 3229; plantaginea var. rosea, 3229; plantaginea var. rubra, 3229; plantaginea var. splendens, 3229; Welwitschii, 3229.
Armeriastrum dianthifolium, 192.
Armillaria mellea, 2086×.
Armoracia rusticana, 2895×.
Arnica Clusii, 1066×; japonica, 1859; montana, 77.
Arnold, Chas., 1564.
Aromo, 439.
Aronia densiflora, 3197; Willdenowii, 3197.
Arpophyllum, 2401×.
Arrack, 16×.
Arrow Arum, 2536.
Arrowhead, 3048×; Giant, 3048×; Old-World, 3049.
Arrowroot, Bermuda, 1995; Family, 22×; Fiji, 3304×; Portland, 18.
Arrow-Wood, 3461×.
Arroyo Willow, 3055.
Artanthe geniculata, 2646×.
Artemisia Abrotanum, 912; Absinthium, 77; Cina, 77; Dracunculus, 912; vulgaris, 77.
Artichoke, Chinese, 3220×; Japanese, 3220×.
Artillery Plant, 2623.
Artocarpus incisa, 26; odoratissima, 1994.
Art Pumpkin, 2060.
Arum Arisarum, 392×; Arrow, 2536; bicolor, 615; crinitum, 1450×; Dragon, 391×; Family, 17; Hairy, 1450×; maculatum, 17×; Root, False, 3320×; sagittifolium, 3523; tenuifolium, 500; Water, 627×.
Arundo Donax, 15.
Asafetida, 63, 1228×.
Asarabacca, 403×.
Asarum canadense, 28×.
Asclepiadaceæ, 67×.
Asclepias gigantea, 637; procera, 637; tuberosa, 68.
Ascomycetes, 5×, 2088×.
Ash, American Mountain-, 3195; Black, 1276×; Blue, 1276×; European Mountain-, 3195×; Green, 1275×; -leaved Maple, 204×; Prickly, 3537×; Red, 1275×; Wafer, 2851; Water, 1276; White, 1275×.
Asimina costaricensis, 938; triloba, 34×.
Asparagopsis, 406×.
Asparagus Bean, 3469×; Fern, 1218; officinalis, 19×.
Aspasia, 2401×.
Aspen, 2753×; American, 2757; European, 2756×; Large-toothed, 2757.
Asperula ciliata, 902×; glomerata, 902×; odorata, 74×.
Asphodel, Bog-, 2113×; Branching, 412×.
Asphodelus luteus, 412.
Aspidium, 1217×; acrostichoides, 2749; aculeatum, 2749×; Boottii, 1079×; cristatum, 1079×; Filix-mas, 1079×; Goldieanum, 1709×; Lonchitis, 2749; marginale, 1079×; munitum, 2749; noveboracense, 1079; spinulosum, 1079×; Thelypteris, 1079.
Asplenium, 1217; arboreum, 1019; decussatum, 629×; latifolium, 1019; Nidus, 2122; Shepherdii, 1019.
Asprella Hystrix, 1634×.
Assafœtida disgunensis, 1228×.
Assai Palm, 1176×.
Asses' Thistle, 2354.
Assonia, 1065×.
Aster albescens, 2047×; altaicus, 627×; Beach, 1133; Bellidiastrum, 485×; capensis, 1205×; hispidus, 1480; incisus, 627×; petiolatus, 1205×; rotundifolius, 1205×; Stokes', 3245; Tree-, 2333×; umbellatus, 1019×.
Asteracantha longifolia, 73×.
Asteriscus pygmæus, 2820×.
Asterostigma Luschnathianum, 3233×.
Astragalus gummifer, 42; tennesseensis, 1471×.
Astrapæa tiliæfolia, 1065×; Wallichii, 1066.
Astrophytum myriostigma, 1092×.
Asystasia gangetica, 73×.
Ataccia cristata, 3304×.
Atalantia buxifolia, 3158×; glauca, 1127×; Hindsii, 1270; missionis, 2446×.
Atamasco Lily, 3542.
Atamosco, 3541×.
Athamanta Meum, 2045×.
Athanasia annua, 1903×.
Athenian Poplar, 2757×.
Atherosperma moschatum, 35.
Athyrium Goringianum var. pictum, 415×.
Atis, 294×.
Atragene alpina, 792; americana, 792; sibirica, 792×.
Atrageneæ (Clematis), 792.
Atriplex hortensis, 29.
Atropa Belladonna, 70×; Mandragora, 1982×; physalodes, 2140.
Atta, 294×.
Attalea, 2445; amygdalina, 2016; Cohune, 2300×; funifera, 2300×; Maripa, 2016.
Atte, 294×.
Atuketiya, 3527×.
Aubergine, 1101×, 3182×.
Aucuparia (Sorbus), 3195.
Aulizeum, 1118.
Auricula lutea, 2787×.
Australes (Pinus), 2642×.
Australian Beech, 1152×; Bluebell Creeper, 3189; Brush Cherry, 1163; Daisy-Bush, 2334; Desert Kumquat, 1127×; Gray Box, 1153×; Pea, 1065; Rye-Grass, 1902×; Sword Lily, 290; Violet, 3473.
Austrian Briar, 2995×; Briar, Copper, 2995×; Pine, 2641.
Autumn Aconite, 210×; Adonis, 221; Crocus, 824×; Snowflake, 1849; Squill, 3117×.
Ava, 24, 2646×.
Avena flavescens, 3384.
Averrhoa acida, 2606×.
Avery, Robert, 1564.
Avocat, 2556.
Avocato, 2556.
Awnless Brome-Grass, 578×.
Axillifloræ (Saxifraga), 3089.
Ayer Ayer, 1818×.
Ayrshire Rose, 2987.
Azadirachta indica, 2025.
Azalea alba, 2943×; albiflora, 2941; Albrechtii, 2944×; amœna, 1439×, 2944×; arborescens, 2942; aurantiaca, 2942; austrina, 3571; balsaminæflora, 2944; calendulacea, 2942; californica, 2941×; calyciflora, 2944×; canadensis, 2943; candida, 2945; canescens, 2942; Championæ, 2945; crispiflora, 2944; dahurica, 2938×; Danielsiana, 2944; dilatata, 2945×; Eeckhautei, 2945×; Farreræ, 2945×; Flame-colored, 2942; gandavensis, 2942×; hispida, 2942; indica, 2944; indica var. alba, 2944; indica var. calycina, 2944; indica var. lateritia, 2944; japonica, 2942×; japonica alba-grandiflora Van Noordt, 2944; kamtschatica, 2946×; ledifolia, 2943×; ledifolia Noordtiana, 2944; ledifolia var. phœnicea, 2944; liliiflora, 2943×; linearifolia, 2946×; lutea, 2942; macrantha, 2944; macrosepala, 2946×; mollis, 2942×; Mortieriana, 2942×; myrtifolia, 2947; narcissiflora, 2944; nudiflora, 2942; obtusa, 2944×; obtusa alba, 2944×; occidentalis, 2941×; ovata, 2947; pontica, 2942×; procumbens, 1902; punicea, 2944; rhombica, 2943×; Rollissonii, 2944; rosiflora, 2944; rosmarinifolia, 2943×; Schlippenbachii, 2943×; semibarbata, 2947×; serpyllifolia, 2947×; sinensis, 2942×; Smooth, 2942; speciosa, 2942; squamata, 2945×; sublanceolata, 2947×; Tschonoskii, 2947×; Vaseyi, 2943; viscosa, 2942; yodogawa, 2943×.

Azaleastrum albiflorum, 2941.
Azaleodendron, 2941.

Babci, 232×.
Babies' Breath, 283×; Slippers, 1917×.
Baby Blue-Eyes, 2121; Orchid, 2322×; Primrose, 2796.
Baby's Breath, 1312, 1422×.
Bachang, 1984×.
Bachelor's Button, 711, 1355; White, 2907×; Yellow, 2909.
Bacopa Monnieria, 1477×.
Bacteria, 4.
Bactris, 2445.
Badiera acuminata, 2739.
Bael Fruit, 222×.
Baeria coronaria, 213×.
Baguilumbang, 245×.
Bahia lanata, 1135.
Bairnwort, 486.
Bakeapple-Berry, 3023×.
Balantium, 1209×.
Bald Cypress, 3314×.
Balfourianæ (Pinus), 2639×.
Balisier, 1451.
Balloon Flower, 2711; -Vine, 661×.
Balm, 911, 2027; Bee-, 2061; Field, 2130×; Fragrant, 2061; Molucca, 2059×; of Gilead, 2763; of Gilead Fir, 173×.
Balocanad, 245×.
Balsa, 2319.
Balsam, 1418; -Apple, 2060; -Apple, Wild, 1096; Canada, 12×; Canadian, 174; Family, 50×; Fir, 173×; Garden, 997, 1642×; Mecca, 45×; Night, 3532×; of Copaiba, 42; of Fir, 174; of Tolu, 42; Pear, 2060; Peru, 1418; Poplar, 2762×; Seaside, 902; She, 174; Star, 3532×.
Balsamea, 3538×.
Balsamina coccinea, 1642×; hortensis, 1642×.
Balsaminaceæ, 50×.
Balsamita vulgaris, 757.
Balucanag, 245×.
Bamboo Brier, 3174; Giant, 3342×; Palm, 2910×.
Banana, Abyssinian, 2077; Baracoa, 2078×; Chinese Dwarf, 2078; Chotda, 2078×; Cooking, 2078×; Dwarf Jamaica, 2078; Family, 21×; Golden Early, 2078×; Japanese, 2078×; Lady Finger, 2078×; Letondal, 2078×; Red Jamaica, 2078×; Red Spanish, 2078×; Shrub, 2046.
Bancroft, George, 1564.
Bandura Zingalensium, 2124.
Baneberry, 212; Red, 212×.
Banksianæ (Rosa), 2988×.
Banks' Rose, 2988×.
Bankul Oil, 245.
Banucalag, 245×.
Banyan Tree, 1233×.
Baobab Tree, 214×.
Baptisia nepalensis, 2647.
Baracoa Banana, 2078×.
Barbacenia gracilis, 966.
Barbadine, 2481×.
Barbadoes Aloes, 255×; Gooseberry, 2547.
Barbados Cherry, 1973; Flower-Fence, 613; Lily, 1493; Nut, 1720; Pride, 613.
Barberry Family, 33; Fig, 2363.
Barilla, 3050.
Barkeria elegans, 1118×; Lindleyana, 1118×; Skinneri, 1118×; spectabilis, 1118×.
Bark, Georgia, 2626×.
Barley, 1500; -Grass, 1500.
Barnardia japonica, 3118×; scilloides, 3117×.
Barrel Gentian, 1326×; Palm, 2810.
Barren Strawberry, 3486; -wort, 205×.
Barry, Patrick, 1564; W. C., 3554.
Bartonia aurea, 2037, 3582; decapetala, 2037.
Bartram, John, 1564×.
Barwood, 453.
Baryxylum dubium, 2536×; inerme, 2536×.
Basella alba, 31; Family, 30×; variegata, 3306×.
Basellaceæ, 30×.
Basidiomycetes, 5×, 2087×.
Basil, 911×, 2863.
Basilima Lindleyana, 3193×; sorbifolia, 3193×.
Basket Flower, 712×, 1627×; Oak, 2886×.
Bassia latifolia, 2300×.
Basswood, 3345×; Family, 52.
Bastard Box Tree, 1155; Indigo, 275×; Pennyroyal, 3377; Sandalwood, 2090×; Speedwell, 3449×.
Batatas edulis, 1662; Jalapa, 1662.
Batemannia, 2401×; Burtii, 1615; meleagris, 1615.
Batidæa, 3021.
Batodendron (Vaccinium), 3422.
Batoko Plum, 1241.
Batrachium hederaceum, 2906×.
Bauno, 1985.
Bayberry, 2093, 2626.
Bay, Bull, 1968, 2556; -Leaf Willow, 3052; Red, 2556; Rose, 2139; -rum Tree, 2626; Swamp, 1967×; Sweet, 1827, 1967×; White, 1967×.
Beach Aster, 1133; -Grass, 274×; Heather, 1613; Palm, 441; Pea, 1826; Plum, 2831; Wormwood, 399×.
Beadle, D. W., 1565.
Bead-Plant, 2139×; -Tree, 1107, 2024×.
Beam-Tree, White, 3197.
Bean, Adzuki, 2575×; Asparagus, 3469×; Broad, 3464×; -Caper, Syrian, 3551×; Castor, 2965×; Civet, 2577; Coffee, 1352; Common, 2576×; Dutch Case-Knife, 2576; English Dwarf, 3464×; Goa, 2849; Horse, 3464×; Hyacinth, 1065; Indian 684×; Jumping, 829; Kidney, 2576×; Lima, 2577; Magothy Bay, 680×; Metcalf, 2575; Mexican Jumping, 3124; Moth, 2575; Mung, 2575×; Rice, 2575×; Scarlet Runner, 2576; Screw, 2811; Sieva, 2577; Soja, 1352; Soy, 1352; -Tree, 1763; Vanilla, 3434; Velvet, 3243; Wild, 310×; Windsor, 3464×; Yam, 2425×.
Bearberry, 385×; Blueberry, 3424; Oak, 2884×.
Beard-Grass, 282; -Grass, Silver, 282×; -Tongue, 2539.
Bear's Breech, 194×; -ear Primrose, 2794; -foot Fern, 1614.
Beatonia, 3345.
Beaucarnea glauca, 2147×; gracilis, 2147×; guatemalensis, 2147×; Hookeri, 2148; longifolia, 2147×; oedipus, 2147×; Purpusi, 2147×; recurvata, 2147×; recurvata stricta, 2147×; stricta, 2147×; tuberculata, 2147×.
Beauty of Glazenwood, 2987×.
Beaver Tree, 1967×.
Bebeeru Wood, 35×.
Beccabunga (Veronica), 3451×.
Bedding Geranium, 2531; Pansy, 3474.
Bedstraw, 1311×; Great Hedge, 1312; Ladies', 1311×; Northern, 1311×; White, 1312; Yellow, 1311×.
Bee-Balm, 442×, 2061; Larkspur, 977; Orchis, 2356; -Plant, Rocky Mountain, 799.
Beech, American, 1202×; Australian, 1152×; Blue, 673; European, 1202×; Family, 25×; -drop, 1824×; Fern, 2577×.
Beefsteak Geranium, 469.
Beefwood, 683×.
Beet, Chilian, 496×; -Leaf, 496×; Sea-Kale, 496×; Sicilian, 496×; Spinach, 496×.
Beethovenia cerifera, 726.
Beetle-weed, 1310.
Beet-root, 269×, 496.
Beggarweed, Florida, 991.
Begonia Family, 57×; Trailing, 776×.
Begoniaceæ, 57×.
Beleric Myrobalan, 3322.
Belgaum Walnut, 245×.
Belgian Elm, 3412.
Belladonna, 70×, 428; Lily, 271.
Bella sombra, 2614×.
Bellflower, 642; Chilean, 1820; Chinese, 176×, 2711; Family, 76; Giant, 2414×; Japanese, 2711.
Bell-flowered Squill, 3117×; Heather, 1130×; Isle Cress, 454; -wort, 3419×.
Bellyache Bush, 1719×.
Belou Marmelos, 222×.
Belvedere, 1755×.
Ben, 2067×.
Bencaode Deos, 178×.
Bene, 3157.
Bengal Coffee, 823×; Kino, 601; Rose, 2988.
Benincasa hispida, 76.
Benjamin Bush, 487.
Benne Oil, 72, 3157.
Ben-nuts, 2068.
Bent-Grass, Brown, 241; Fine, 240×; Purple, 617.
Benthamia fragifera, 855; japonica, 854×.
Benthamidia, 854×.
Berberidaceæ, 33.
Berberine, 33.
Berberis aggregata, 3566; amurensis var. japonica, 3566; Aquifolium, 1970×; Aquifolium var. fascicularis, 1970×; arguta, 1971; atrocarpa, 3566; Bealii, 1971; brevipaniculata, 3566; brevipes, 1971; Fortunei, 1971; Fremontii, 1971; gracilis, 1971; hæmatocarpa, 1971; heterophylla, 1971; Hookeri, 3566; Hutchinsonii, 1971; japonica, 1971; Julianæ, 3566; Knightii, 3566; levis, 3566; macrophylla, 3566; nana, 1970×; nepalensis, 1971; nervosa, 1971; pallida, 1971; pinnata, 1970×; pumila, 1971; Regeliana, 3566; repens, 1970×; rotundifolia Herveyi, 1970×; Sargentiana, 3566, 3582; tenuifolia, 1971; Thunbergii, 1439×; toluacensis, 1971; trifoliata, 1971; trifoliolata, 1971×; trifurca, 1971; vulgaris, 33, 1439×; Wallichiana, 3566, 3582; Wallichiana var. latifolia, 3566; Wilcoxii, 1971×; xanthoxylon, 3566.
Berckmans, P. J., 1565.
Bergamot, 784×; Mint, 2035; Wild, 2061.
Bergenia ciliata, 3086×; cordifolia, 3086; crassifolia, 3086; Fortunei, 3093×; ligulata, 3086; Milesii, 3086×; orbicularis, 3086; ornata, 3086×; purpurascens, 3086; Schmidtii, 3086×; Stracheyi, 3086×.
Berkheya membranifolia, 3244×; purpurea, 3244×; Radula, 3244×.
Bermuda Arrow-root, 1995; Buttercup, 2418×; Easter Lily, 1867×; -Grass, 939×.
Berrya, 494.
Berseem, 3379.
Bertholletia excelsa, 59×, 2300×.
Bertolonia guttata, 1395; Legrelleana, 1395; longifolia, 3056×; margaritacea, 1395, 3056×; primulæflora, 2062×.
Beschorneria floribunda, 1305; multiflora, 1305×.
Besleria inodora, 581×
Bessey, C. E., 3554.
Beta vulgaris, 29.
Betel, 2646×; Nut, 387×, 388.
Bethlehem Sage, 2857.
Betonica carnea, 3221; grandiflora, 3219; grandiflora robusta, 3219; grandiflora superba, 3219×; incana, 3219; nivea, 3219×; officinalis, 3219; orientalis, 3219×; rosea, 3219; rubra, 3221; spicata, 3219; spicata robusta, 3219; superba, 3219×; superba alba, 3219×.
Betony, 3219; Wood, 2524×.
Betula alba var. japonica, 3566×; albo-sinensis, 3566; albo-sinensis var. septentrionalis, 3566; Bhojpattra, 25; japonica, 3566×; japonica var. mandschuria, 3566×; japonica var. szechuanica, 3566×; papyrifera, 25; pendula var. Tauschii, 3566×; Potaninii, 3566; utilis var. Prattii, 3566; utilis var. sinensis, 3566; Wilsonii, 3566.
Betulaceæ, 25.
Bhang, 26×.
Bichea acuminata, 2301×.
Bicuculla, 1001×.
Bidens atrosanguinea, 862; dahlioides, 862; ferulæfolia, 1474×.
Bifrenaria, 2401×.
Bigarreau Cherry, 2838.
Big-bud Hickory, 677×.
Bignay, 304.
Bignonia adenophylla, 1480×; æquinoctialis, 936; æsculifolia, 3303×; alba, 2651×; buccinatoria, 2568×; callistegioides, 806; Cherere, 2568×; chinensis, 651×; echinata, 2651×; Family, 71×; Fraseri, 1939×; jasminoides, 2452; Kerere, 2568×; leucoxyla, 3303; leuoxylon, 3303; Lindleyi, 806; pallida, 3303; Pandoræ, 2452; picta, 806; purpurea, 806; radicans, 651×; speciosa, 806; Tweediana, 1939×; venusta, 2865; Yellow, 3317.
Bignoniaceæ, 71×.
Big Shellbark-Hickory, 678; -Tree Plum, 2828; Tree, Weeping, 3154; Trees of California, 3153×.
Bikue, 3528.
Bikukulla, 1001×.
Bilberry, 3421, 3424×; Bog, 3424; Dwarf, 3424.
Bilimbi, 435×.
Billbergia bivittata, 903; Carolinæ, 388×; fasciata, 222; olens, 388×; Quesneliana, 2891×; rhodocyanea, 222; sphacelata, 1412; tinctoria, 18×; variegata, 2121×; vittata, 903.
Billion-dollar Grass, 1096.
Bilsted, 1889×.
Biltia Vaseyi, 2943.
Bimlipitam Jute, 1485.
Bindweed, 838×.
Binjai, 1984×.
Biota orientalis, 3336×.
Birch, Black, 497×; Canoe, 499; Cherry, 497×; Family, 25; -leaved Poplar, 2758; Paper, 499; Red, 497×; River, 497×; Sweet, 497×; West Indian, 600×; White 498; Yellow, 498.
Bird Cactus, 2524×; Cherry, European, 2843; Flower, 1481; -Foot Violet, 3474×; Grape, 3484×; -lime, 27×; of Paradise, 613; -of-Paradise Flower, 3271×.
Bird's-Eye Maple, 49×; Eyes, 3452×; -foot Trefoil, 1917×; -nest Fern, 414; -nest Moss, 2920×; -nest Orchid, 2122.
Biriba, 2974×, 2976.
Birthroot, 3380×; -wort, 392×; -wort Family, 28.
Bish, 209×.
Bishop's-Cap, 2058.
Bistort, 2742.
Bistorta, 28×; officinalis, 2742.
Bitter Aloes, 255×; -Apple, 780; Cassava, 1991×; Dock, 3037; -nut, 676×; Pecan, 676×; -Root, 1851×; -sweet, 3186; -sweet, False, 701; Vetch, 3466; -wood, Smaller, 3526×.

Bixa Family, 55×; Orellana, 55×.
Bixaceæ, 55×.
Black Alder, 253×, 1640×; Apricot, 2824×; Ash, 1276×; Bamboo, 447; Bead, 2652; Birch, 497×; Bitter Vetch, 1826×; Blood, 1937×; Box, 1103; Boys, 3522; Bryony, 3309; Caladium, 830; Calla, 402×; Cherry, Wild, 2842×; Chokeberry, 396×; Cosmos, 862; Cottonwocd, 2762, 2764; Currant, American, 2959; Currant, Californian, 2959; Currant, European, 2959; Currant, Swamp, 2960×; Gum, 2316×; Haw, 3459×; Italian Poplar, 2761×; Jack, 2885; Lily, 1282; Locust, 2967; Mangrove, 436; Maple, 203; Medick, 2019×; Mint, 2035; Mulberry, 2071; Mustard, 544×; Nightshade, 3182; Oak, 2883×, 2884; Oak, Californian, 2884; Pea, 1826×; Pepper, 2646×; Pine, Japanese, 2642; Poplar, 2757×; Salsify, 3121; Sloe, 2830×; Snakeroot, 3070; Spruce, 2619×; Sumac, 2954; Walnut, 1722×; Wattle, 188; Wattle, Sydney, 188; Willow, 3052.
Blackberry, Cut-leaved, 3030×; Evergreen, 3030×; history, 1516; Lily, 485; Oregon Everbearing, 3030×; Running, 3032; Sand, 3031×; Wild Thornless, 3031×.
Blackbutt, 1155×; -cap, Common, 3028×; -eyed Pea, 3469×; -eyed Susan, 3034×, 3338×; -thorn, 2825×; -throated Calla, 3536; -wood Acacia, 185×.
Bladder Campion, 3165×; Catchfly, 3165×; Cherry, 2608×; Ketmia, 1484×; -Nut, 3227; -Nut, American, 3227×; -Nut Family, 49; Senna, 834; -wort, 3417×; -wort Family, 73.
Blade Apple, 2547.
Blandfordia cordata, 1310.
Blattaria (Verbascum), 3442×.
Blattarioidea (Verbascum), 3443×.
Blazing-Star, 733, 1852×, 2037, 3385.
Blechnum, 1214.
Bleeding-Heart, 1001×.
Blehparis edulis, 73×.
Blessed Thistle, 806, 3169.
Bletia, 2401×; Tankervilliæ, 2570.
Bletilla, 2401×.
Blind Gentian, 1326×.
Blinding Tree, 1189.
Blinking Chickweed, 2065.
Blinks, 2065.
Blitum Bonus-Henricus, 737; capitatum, 737.
Blood Drops, 2017×; Lily, 1425×; -root, 3069×; -wood, 1152; -wood, Mountain, 1152×.
Bloomless Apple, 2871.
Blue Aloe, 233; Amaryllis, 1413×, 1494; Ash, 1276×; Bamboo, 449; Beech, 673; -bell, 642, 3116; -bell, California, 2566×; -bell Creeper, Australian, 3189; -bells, 2039; Bells of Scotland, 649×; -bottle, 711×; Cohosh, 695; Couch-Grass, 939×; Curls, 3377; Daisy, 1205×; Dawn-Flower, 1660; -eyed Grass, 3171; Fescue, 1228×; Gentian, 1323×; Grape, 3489×; Grass, Canada, 2723×; -Grass, English, 2723×; -Grass, Kentucky, 2723×; -Grass, Texas, 2723×; Gum, 1153×; Gum, Dwarf, 1154; Huckleberry, 1320; Jack, 2890; -Joint, 617; -leaved Wattle, 184×; Lotus, 2310×, 2311; Lupine, 1923; Marguerite, 1205×; Myrtle, 3471; Oxalis, 2475×; Palm, 1140×, 3045; Palmetto, 2926; Spirea, 679; Squill, Common, 3117.
Blueberry, Bear, 3424; Canada, 3423; Downy Swamp, 3423; Hairy, 3424; High-Bush, 3423; Low, 3423×; Swamp, 3423.
Bluet, 711×, 1611; Mountain, 712×.
Board publications, 1553.
Boat Orchid, 289×.
Bœhmeria nivea, 26×.
Bog-Asphodel, 2113×; Bilberry, 3424; -Gardening, 2666×.
Bohea Amherstiana, 526.
Bois d'Ecorce, 3527×; de fer, 3221×; -flot, 293.
Bokhara Clover, 2026.
Bolboxalis cernua, 2418×.
Boldea, 2565×.
Boldo, Chilean, 2565×.
Boldoa fragrans, 2565×.
Bolelia, 1068.
Boletus, 2088.
Bolle's Poplar, 2756.
Bolusafra, 1201.
Bolusanthus speciosus, 1904.
Bombacaceæ, 53.
Bombax Family, 53; Gossypium, 2016×; guineense, 700; pentandrum, 700.
Bonapartea filamentosa, 238; flagelliformis, 238×; glauca, 238×, 966; gracilis, 966; histrix, 238×; juncea, 238×; juncea rigidifolia, 238×; rigida, 238×; rigidifolia, 238×; robusta, 238×; striata, 238×; striata pulverulenta, 238×; stricta, 238×; tenuifolia, 238×.
Bonatea speciosa, 1424.
Bone Flower, 486; -set, 1164; -set, Upland, 1167; -wort, 486.
Bongardia Rauwolfii, 1839×.
Books, 1520×.
Boot-jack Bur, 500.
Boottia, 14×.
Borage, 911×; Family, 69.
Boraginaceæ, 69.
Borago officinalis, 69, 911×.
Boraphila, 3092.
Borassus flabelliformis, 16×; Sonnerati, 1899×.
Boretta cantabrica, 950; cantabrica rosea, 950.
Boschniakia, 1824×.
Bosia, 526.
Bossekia, 3021; deliciosa, 3024×; odorata, 3024×; parviflora, 3024×.
Boston Ivy, 2478×.
Boswellia Carteri, 45×.
Bothriocline Schimperi var. tomentosa, 1136.
Botryanthus, 2080×.
Botryodendrum Sinclairii, 2040.
Bottle-Brush, 630, 2044; -brush Grass, 1634×; Gentian, 1326×; Gourd, 1774×; Palm, 2810; -Tree, 3239×.
Bottom Shellbark-Hickory, 678.
Boucerosia campanulata, 660×; Simonis, 661.
Bougueria, 2656×.
Bouncing Bet, 3075.
Bourbon Aloe, 1903×; Lily, 1868×; Rose, 2988×; Tea, 23.
Bourdon, 2911.
Bower Plant, 2452; Brazilian, 216×.
Bowman's Root, 1338.
Bowstring Hemp, 3070.
Box, Australian Gray, 1153×; -berry, 1319; Black, 1153; Brisbane, 3384; Elder, 204×; -leaved Milkwort, 2738; Poplar, 1152×; Red, 1152×; -Thorn, 1929×; Tree, Bastard, 1155; Victorian, 2654; White, 1153×; Yellow, 1158×.
Boykinia occidentalis, 1475.
Brabeium stellatifolium, 27.
Brachyacanthæ (Cratægus), 886×.
Brachyanthæ (Salvia), 3062×.
Brachycarpæ (Pachira), 2423×.
Brachyceras (Nymphæa), 2310×.
Brachychiton acerifolium, 3239×; Bidwillii, 3239; Gregorii, 3239×; populneum, 3239×.
Brachyloma erianthum, 1706.
Bracken, 2851×.
Brackett, G. B., 3554; G. C., 1565×.
Bracteatæ (Rosa), 2996×.
Bradburya virginiana, 714.
Bradleia, 2606; frutescens, 3518.
Brahea armata, 1140×; edulis, 1140×; filamentosa, 3507; filifera, 3507; glauca, 1140×; Roezlii, 1140×.
Brain Cactus, 2525.
Brake, Cliff, 2535; Rock-, 903×.
Brakes, 2851×.
Bramble, 3021; fruits, history, 1515×.
Bramia, 1477×.
Branching Asphodel, 412×.
Brasiletto, 612×.
Brassaiopsis, 1438×.
Brassavola, 2401×; Digbyana, 1770×; glauca, 1770×.
Brassia, 2401×.
Brassica, 36×; pekinensis, 3582; Pe-tsai, 3582.
Brauneria angustifolia, 1088; purpurea, 1088.
Brayodendron texanum, 1015×.
Brazil Cress, 3205×; -Nut, 494; Rubber, 1482×.
Brazilian Bower-Plant, 216×; Guava, 2848×; Morning-Glory, 1661.
Braziline, 42.
Bread-and-cheeses, 2652; -But, 579; -Fruit, 401×; -root, Indian, 2849×; -root, Missouri, 2849×.
Breath of Heaven, 214×.
Breck, Joseph, 1566.
Breiapfelbaum, 3073×.
Breynia fruticosa, 281×; nivosa, 2606.
Briar, Austrian, 2995×; Copper Austrian, 2995×.
Bridal Rose, 3029.
Bride, The, 286×.
Bridgesia spicata, 1127.
Bridgeman, Thomas, 1566.
Brier, Bamboo, 3174; Cat-, 3174×; False China, 3175; Horse-, 3174; Rose, 3029; Saw-, 3174×; Sensitive, 3115.
Brinckle, W. D., 1566.
Brisbane Box, 3384; Lily, 1175×.
Bristly Sarsaparilla, 344×.
British Columbia, 573×.
Brittle Willow, 3052.
Briza geniculata, 1126.
Brizopyrum siculum, 991.
Broad Bean, 3464×; -leaved Garden Anemone, 285×; -leaved Ironbark, 1152×; -leaved Wattle, 184×; -Thorn Acacia, 599.
Brodiæa coccinea, 558×; uniflora, 3384×; volubilis, 3278.
Brome-Grass, 578×; Awnless, 578×; Schrader's, 579.
Bromelia exsudans, 1395; longifolia, 3272×; Pinguin, 18×; pyramidalis, 504; sphacelata, 1412; variegata, 2121; zebrina, 503×.
Bromeliaceæ, 18.
Bromus pratensis, 1228×.
Broom, 946×; Butcher's, 3037×; Climbing Butcher's, 3142×; -corn, 1497; -corn Millet, 2452×; Crowberry, 844; Leafless Rush-, 3470×; Pink, 2291; -Rape, 1824×, 2409×; Scotch, 948; Sedge, 282×; Spanish, 3201×; Wattel, 181×.
Brosimum Alicastrum, 2300×.
Broughtonia, 2401×.
Browallia Jamesonii, 3276.
Brown Bent, 241; -flowered Shrub, 2046; Mustard, 544×.
Brown, J. G., 1566×.
Brugmansia, 970; arborea, 971; cornucopia, 971; Knightii, 971.
Bruisewort, 486.
Brunella, 3583.
Bruner, T. K., 1566×.
Brunfelsia americana, calycina, eximia, floribunda, macrantha, pubescens, 3574.
Brunia Family, 39×.
Bruniaceæ, 39×.
Brunsvigia ciliaris, 599×; toxicaria, 599×.
Bryales, 7.
Bryant, Arthur, 1567.
Bryanthus Breweri, 2607×; cæruleus, 2607×; empetriformis, 2607×; erectus, 2607×; glanduliflorus, 2607×; taxifolius, 2607×.
Bryonia alba, 76; punctata, 2033×; scabrella, 2034.
Bryony, 583×; Black, 3309.
Bryophyta, 6.
Bucare, 1142.
Buchnera canadensis, 3446×.
Buchu, 44×, 454×.
Buckbean, 2037; -berry, 1320.
Buckeye, 226; California, 227; Mexican, 3414; Ohio, 227×; Red, 228; Sweet, 227×.
Buckleya umbellulata, 3570×.
Buck's-horn Plantain, 2656×.
Buckthorn, 599, 2923; Family, 51; Sea, 1494×.
Buckwheat Family, 28×; Tree, 803.
Budd, J. L., 1567.
Buddleia Farquaharii, 3566×.
Buffalo Currant, 2958; Horn, 599; -Nut, 2865; Pea, 3332; Thorn, 398×.
Bugbane, 769×.
Bugle-Weed, 242.
Buist, Robert, 1567.
Bulbinella Hookeri, 766×; yedoensis, 244×.
Bulbophyllum, 2401×; amplum, 3078; bufo, 2021; falcatum, 2021×; lepidum, 774×; paleaceum, 1656.
Bullace, 2826; Grape, 3484.
Bull Bay, 1968, 2556; Grape, 3484; Pine, 2642×, 2645×; Thistle, 774×; -Thorn, 599.
Bull, E. W., 1567×.
Bullatæ (Primula), 2796×.
Bullit Grape, 3484.
Bullock's-Heart, 294.
Bull's Blood, 2007.
Bulrush, 3119; Great, 3119×.
Bumbum, 1984×.
Bunch-Flower, 2023; Grape, 3489×.
Bundy, 1155.
Bungulan, 2079.
Bunium Bulbocastanum, 2300×.
Bunya-bunya, 346×.
Buphane toxicaria, 20×.
Bur Cucumber, 908×, 3161×; -Marigold, 500; N. Zealand, 190; Oak, 2887; -Reed, 3200×.
Burdock, 385.
Burgundian Rose, 2989×.
Burlingtonia candida, 2974 decora, 2974; decora var. picta, 2974; fragrans, 2974; pubescens, 2974×; venusta, 2974.
Burmese Rosewood, 2853×.
Burnet, 2776×, 3070.
Burnet, Robert, 1567×.
Burning-Bush, 1004, 1187×.
Burpee, W. Atlee, 3554.
Burr, Fearing, 1567×.
Burrielia gracilis, 442.
Bursera Family, 45; serrata, 2812×.
Burseraceæ, 45.
Bush Clover, 1844×; Grape, 3485; Moonflower, 1658×.
Bush, Isador, 1568.
Bushman's Poison, 209; -tick Berry, 2414×.
Bushukan, 781×.

Butea frondosa, 42.
Butcher's Broom, 3037×; Climbing, 3142×.
Butneria, 637×.
Butomaceæ, 14.
Butryospermum Parkii, 2300×.
Butter-and-Eggs, 1884.
Buttercup, 2905; Bermuda, 2418×; Family, 32; Primrose, 2791.
Butterfly Flower, 3111; Lily, 1441; Orchid, 1119×, 2346×; Orchis, 1424×; -Pea, 714, 803×; Tulip, 634×; -Weed, 404×.
Butternut, 494, 678×, 1721.
Butterwort, 2631×; Mexican, 2631×.
Buttonball, 2708; Bush, 714×; Snakeroot, 1138, 1852×; -wood, 2706×.
Butz, G. C., 1568.
Buxaceæ, 47.
Buxus Family, 47; sempervirens, 47×, 1439×; suffruticosa, 1439×.
Byttneria, 587.

Cabbage, Caraibe, 18; Deer, 1922×; Kerguelen's Land, 2809; Palm, 1176×, 2405; Palmetto, 3044×; Rose, 2989; St. Patrick's, 3096; Skunk, 3295; Tree, 281, 843.
Cabeza de Negro, 292×.
Cabuya, 1305×, 1306×.
Cacalia coccinea, 1112; ovalis, 1422; radicans, 3150; sagittata, 1112; sonchifolia, 1112.
Cacao, 3331.
Cacara erosa, 2425×.
Cachibou Resin, 600×.
Cachiman, 2974×; -Cochon, 293; Montagne, 2975×; Morveux, 2975×.
Cactaceæ, 57×.
Cactus, Agave, 1848; Bird, 2524×; Brain, 2525; chiloensis, 722×; Christmas, 3550; Crab, 3549×; Dahlia, 952×; Easter, 3113×; Family, 57×; Foxtail, 1979; Hatchet, 2534; Hedge, 723; lanatus, 2404; Old Man, 715; pentagonis, 191×; Pereskia, 2547; Rainbow, 1095; Rat-tail, 312×; Redbird, 2524×; Sea-Urchin, 1097; Snake, 2525; stellatus, 1979×; Vine-, 1271.
Cæsalpinia echinata, 42; inermis, 2536×; kauahiensis, 2045×; kavaiensis, 2045×; lacerans, 2854×.
Caffir Thorn, 1930.
Cafta, 686.
Cahum, 1305×.
Caimito, 767.
Caja, 3217; Manga, 3216×.
Cajophora lateritia, 518.
Cajuput Tree, 2022×.
Calaba Tree, 636×.
Calabash Gourd, 1774×; Nutmeg, 2062; Tree, 890.
Calabazilla, 910.
Calabrian Pine, 2641×.
Caladium, Black, 830; esculentum, 830; violaceum, 830; zamiæfolium, 3533×.
Calamintha Acinos, 3082×; alpina, 3082×; corsica, 3082×; hortensis, 3082×; montana, 3082×; officinalis, 3082×.
Calamondin Orange, 784×.
Calampelis scaber, 1085×.
Calamus calicarpus, 951; Draco, 17; Lewisianus, 951; Verschaffeltii, 194.
Calanchoë, 1731×.
Calandrinia columbiana, 1852; Cotyledon, 1852; Howellii, 1852; Leana, 1852; oppositifolia, 1852; pygmæa, 1852; Tweedyi, 1851×.
Calanthe, 2401×; rosea, 1879×.
Calathea bambusacea, 1688×; bella, 1995×; bicolor, 1995×; major, 1688×; smaragdina, 2063; splendida, 1995; undulata, 1995×.
Calboa vitifolia, 2879×.
Calceolaria, nomenclature, 3583.
Calendula officinalis, 77, 911×; pluvialis, 1011; Pongei, 1011.
Calibanus cæspitosus, 2148; Hookerii, 2148.
Calico Bush, 1734; Flower, 394.
California, 2284×; Big Tree, 3154; Black Currant, 2959; Black Oak, 2884; Bluebell, 2566×; Buckeye, 227; Dewberry, 3032×; Fuchsia, 3538×; Geranium, 3152×; Laurel, 3413×; Live Oak, 2889×; Nutmeg, 3360×; Okra, 1921; Pepper-Tree, 3109; Phlox, 1883; Poppy, 1145×, 2712; Privet, 1861; Redwood, 3153×; Rose, 839; Yellow- or Golden-Bells, 1112.
Calimeris tatarica, 1480.
Calisaya Bark, 770.
Calla æthiopica, 3536×; Black, 402×; Black-throated, 3536; Common, 3536×; Elliottiana, 3536; Fringed, 392; Golden, 3536; Little Gem, 3536×; oculata, 3536×; palustris, 17×; Pentlandii, 3536×; Pink, 3536; Rose, 3536; Spotted, 3536; Yellow, 3536×.
Calliandra geminata, 2653; latifolia, 2653.
Callianthæ (Primula), 2807.
Calliea Dichrostachys, 1003×.
Calliglossa Douglasii, 1832×.
Calligonum Pallasia, 28×.
Calliopsis marmorata, 845.
Calliphruria subedentata, 1161.
Callistachys, 2420.
Callistemon coccineus, 3566×; Cunninghamii, 3566×; floribundus pendulus, 3566×; hybridus, 3566×; robustus, 3566×; splendens, 3566×.
Calloosa Grape, 3490.
Calobotrya sanguinea, 2958.
Calocarpum mammosum, 1919.
Calocephalus, 1849×.
Calodendrum capensis, 2301.
Calompit, 3322.
Calonyction grandiflorum, 1661×.
Calophanes, 1084×.
Calopogon pulchellus, 1883.
Calosanthes indica, 2410×.
Caloseris rupestris, 2354×.
Calosphace (Salvia), 3062.
Calospira (Spiræa), 3210×.
Calostachydes (Stachys), 3220.
Calothyrsus (Æsculus), 227.
Caltrop Family, 44.
Calotropis procera, 68.
Caltrops, Water, 3371×.
Calumba, 1719×.
Calumbang, 245×.
Calycanthaceæ, 34.
Calycanthus Family, 34; floridus, 34×; præcox, 2037×.
Calypso, name of, 3583; bulbosa, 3583.
Calyptrion Aubletii, 860×.
Calyptrogyne Swartzii, 1330.
Calyptronoma Swartzii, 1330.
Calyptropsidium Friedrichsthalianum, 2848.
Calyptrostigma, 1009.
Calysaccion, 2319.
Calystegia dahurica, 840; pubescens, 839; Sepium, 839×; villosa, 839.
Camaba, 1915.
Camass, 639×.
Camassia esculenta, 19×.
Camel Hay, 938×.
Camellia cuspidata, 3328×; euryoides, 3328×; maliflora, 3328×; rosæflora, 3328×; spectabilis, 3405; Thea, 3328×; theifera, 3328×.
Camel's Thorn, 246.
Camel-thorn, 189×.
Cammarum, 1127.
Campanula aurea, 2089×; grandiflora, 2711; serpyllifolia, 3495; Speculum, 3203×.
Campanulaceæ, 76.
Campanumæa gracilis, 1842; lanceolata, 819×.
Campbell, G. W., 1568.
Campderia, 807×.
Campeachy Wood, 1427×.
Camperdown Elm, 3410×.
Campernelle Jonquil, 2111.
Campestria (Acer), 198.
Camphire, 1831.
Camphor, 35×, 1418; Tree, 773.
Camphora officinarum, 773.
Campion, 3163×; Bladder, 3165×; Evening, 1928×; Morning, 1928×; Moss, 3167×; Red, 1928; Starry, 3166; White, 1928×.
Campsidium filicifolium, 2452.
Campteria Wallichiana, 2853.
Camptosorus rhizophyllus, 1217.
Campylobotrys chinensis, 1845×; discolor, 1496; Gliesbreghtii, 1496; macrocarpa, 1845×; regalis, 1496.
Campyloneuron Phyllitidis, 2745.
Camwood, 453.
Canada, 559×; Balsam, 12×, 1418; Blueberry, 3423; Blue-Grass, 2723×; Leaf-Cup, 2744; Lyme-Grass, 1111×; Plum, 2828; Snakeroot, 404.
Canadian Balsam, 174.
Canaigre, 3037.
Canal Zone, 2150.
Cananga odorata, 652×.
Canarium luzonicum, 2301.
Canary-bird Flower, 3389×; -Grass, 2573×; -Grass, Reed, 2573×; -Grass, Toowoomba, 2574.
Cancer-root, 1824×.
Cancho Blanco, 3072×.
Candelabrum Tree, 2451×.
Candelillo, 1169×.
Candleberry Tree, 245×.
Candlenut, 245×; Plant, 3149×; -stick Lily, 1877; -tree, 2475; -wood, 1271; -wood Family, 55.
Candollea adnata, 3279; Brunoniana, 3279; ciliata, 3279; dichotoma, 3279; graminifolia, 3279.
Candytuft, 1635; Annual, 1635×, 1636; Fragrant, 1635×; Rocket, 1635×; Sweet-scented, 1635×.
Cane, Large, 446; Scutch, 446; Small, 446; Switch, 446.
Caninæ (Rosa), 2990.
Canistel, 1919.
Canistrum, 221×; Lindenii, 1419×.
Cankrienia (Primula), 2805.
Canna coccinea, 22×; edulis, 22×; Family, 22×.
Cannabis indica, 26×; sativa, 26×.
Cannaceæ, 22×.
Cannon-ball Tree, 871.
Canoe Birch, 499.
Canon Grape, 3488.
Canterbury Bells, 644.
Cantharellus cibarius, 2087×.
Caoutchouc, 67×, 266×; Lagos, 1305; Tree, 1482×.
Cape Blue Water-Lily, 2311×; Chestnut, 635×; Cod Water-Lily, 2312×; Cowslip, 1764×; Fuchsia, 2604×; Gooseberry, 2609; Gooseberry, Dwarf, 2609; Honeysuckle, 3318; Ivy, 3150; Jasmine, 1315×; Marigold, 1011; Periwinkle, 3471×; Pittosporum, 2654; Pond-weed, 311×; Primrose, 3272×.
Caper Family, 36×; Spurge, 1173.
Capitatæ (Primula), 2800.
Capnorchis, 1001×.
Capnoreæ nana, 1479×; pumila, 1479×.
Capparidaceæ, 36×.
Capparis spinosa, 37.
Caprifoliaceæ, 74×.
Caprifolium Fraseri, 1912×; Hallianum, 1910×; hortense, 1912×; Niaguarilli, 1908; perfoliatum, 1912×; Periclymenum, 1913; proliferum, 1912; pubescens, 1911×; sempervirens, 1911.
Capriola dactylon, 939×.
Capsella Bursa-pastoris, 36×.
Capsicum annuum, 71.
Caracol, 2574×.
Caraguata cardinalis, 1419×; Devansayana, 1419×; lingulata, 1419×; lingulata splendens, 1419×; Melinonis, 1419×; splendens, 1419×.
Caraibe Cabbage, 18.
Carambola, 435×.
Carara didyma, 3148×.
Caraunda, 664.
Caraway, 911×.
Carbenia benedicta, 806.
Carbao's Teats, 3419×.
Cardamomum officinale, 1109×.
Cardamons, 274×, 275, 1109.
Cardiaca vulgaris, 1840×.
Cardinal Flower, 1898×; Salvia, 3063×.
Cardiocrinum, 1877×.
Carduus afer, 775; arvensis, 774×; benedictus, 806; Casabonæ, 775; Diacantha, 775; lanceolatus, 775; Marianus, 3169; muticus, 775; oleraceus, 775; tinctorius, 675.
Carib Apple, 1306×.
Carica Papaya, 57.
Caricaceæ, 57.
Caricature Plant, 1393.
Carludovica palmata, 17.
Carman, E. S., 1568.
Carnauba Palm, 840×; Wax, 16×.
Caroá, 2121×.
Carob, 717×.
Carolina Allspice, 637×; Hemlock, 3391×; Moonseed, 808×; Poplar, 2759; Poplar, Hybrid, 2760; Vanilla, 3380×; Vetch, 3465×; Yellow Jessamine, 1321×.
Carolinæ (Rosa), 2991.
Carolinea princeps, 2423×.
Carolinella (Primula), 2797.
Carosella, 1252.
Caroubier, 717×.
Carpet-Grass, 2479×; -weed Family, 30.
Carpinus Betulus, 1439×; caroliniana, 1439×.
Carr, Robert, 1568×.
Carragheen, 5×.
Carrion Flower, 3224×.
Carthamine, 77×.
Carthamnus tinctorius, 77×.
Carum Carui, 62×, 911×; Petroselinum, 2563×.
Carumbium populifolium, 1499.
Carya, 25; nomenclature, 3584; spp., 2301.
Caryocar spp., 2301.
Caryocedrus, 1727.
Caryophyllaceæ, 31.
Caryophyllus aromaticus, 1163×, 3589.
Caryopitys edulis, 2639.
Caryota, 2445.
Caryotaxus, 3360.
Cas, 2848.
Cascara segrada, 51, 2924×.
Cascarilla, 902; Bark, 47.
Cascaria esculenta, 56×.
Cashew, 279×; Apple, 279×; Family, 48.
Casicta, 2620.
Cassabanana, 3161.
Cassandra calyculata, 732.
Cassava, 1991; Bitter, 1991×; Bread, 47; Sweet, 1992.
Cassebeeria, 3189×.
Cassena, 1640.
Cassia-Bark Tree, 773×; Cinnamon, 35×; -Flower Tree, 773×; lignea, 808×; nictitans, 41×; polyantha, 3566×.
Cassie, 188×.
Cassine, 1640; Maurocenia, 2013.
Castalia, 2306.
Castanea chrysophylla, 682×; spp., 2301.
Castanopsis ceratacantha, 2891; cuspidata, 2479×, 2891; cuspidata var. latifolia, 2891; cuspidata var. variegata, 2891; Fargesii, 2891; platyacantha, 2891×; sclerophylla, 2891×.
Castanospermum australe, 41×, 2301×.

Castor Bean, 2965×; Oil, 46×; -Oil Plant, 2965×.
Casuarina equisetifolia, 23×; Family, 23.
Casuarinaceæ, 23.
Catalonian Jasmine, 1718×.
Catasetum, 2402.
Cat-Brier, 3174×; Grape, 3486×; -tail, 3405×; -tail Family, 13; -tail, Red-hot, 191.
Catchfly, 3163×; Bladder, 3165×; German, 1928×; Royal, 3167; Sweet William, 3165.
Catecu, 74×.
Catevala arborescens, 260.
Catgut, 3321×.
Catha edulis, 49.
Cathartolinum virginianum, 1887.
Cathcartia integrifolia, 2018×.
Cathea, 636×.
Catjang, 3469×.
Catmint, 2130.
Catnip, 70, 911×, 2130.
Cat's-claw, 189, 2652; -Ear, 299; -Foot, 2130×; Valerian, 3426×.
Cattleya, 2402; Brysiana, 1771; crispa, 1771; elegans, 1772×; exoniensis, 1773×; lobata, 1771; marginata, 1770; Perrinii, 1771×; pumila, 1770.
Caulanthon, 2653.
Caulescentes (Streptocarpus), 3273×.
Cavan, Espino, 188×.
Cayenne Cherry, 3281×; Pepper, 658×.
Cayratia japonica, 775×; oligocarpa, 775×.
Cayul, 293.
Cayures, 293.
Ceanothus africanus, 2148.
Ceara Rubber Tree, 1992.
Cebatha carolina, 808×; orbiculata, 808×.
Cedar Elm, 3413; Incense, 1854; Pine, 2645×; Red, 1728×; White, 730×, 1854, 3335; Yellow, 730×.
Cedrela odorata, 45×.
Celandine Poppy, 736, 3279; Tree, 518.
Celastraceæ, 49.
Celastrus buxifolius, 1420×; edulis, 686; nutans, 2894×; Orixa, 2407; serratus, 1420×.
Celery, Wild, 3428.
Celosia cristata, 29×.
Celsia Arcturus, 3566×; urticæfolia, 261.
Celtis mississippiensis, 357; occidentalis, 357; orientalis, 3372×.
Cembra (Pinus), 2637.
Cembroides (Pinus), 2638×.
Cemeteries, 1807.
Centaurea benedicta, 806; conifera, 1851; cynaroides, 2927; orientalis, 3567; Rhapontícum, 2927.
Centauridium Drummondii, 3521.
Centaurium, 3589.
Centaury, 711.
Centroclinium adpressum, 2354; reflexum, 2354×.
Centrostemma Lindleyanum, 1613; multiflorum, 1613.
Century Plant, 231.
Cephalandra palmata, 807.
Cephalophora, 1371; aromatica, 1443.
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Cephalotus Family, 38×.
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Ceratolobus Forgetiana, 3177×.
Ceratonia Siliqua, 41×.
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Ceratopteris Family, 8×.
Ceratostylis himalaica, 2966×.
Cerbera dichotoma, 3304; parviflora, 2319.
Cereus, 58; acifer, 1093×; adustus, 1095; alamosensis, 2914; amecaensis, 1451×; Baumannii, 787; baxaniensis, 191×; Berlandieri, 1093; Blankii, 1093×; cæspitosus, 1094×; candelabrum, 1836×; candicans, 1095; chiotilla, 1146; chloranthus, 1094; Cochal, 2096; conoideus, 1094; ctenoides, 1094×; Cumengei, 1836×; cylindricus, 2363×; dasyacanthus, 1094×; Donkelæri, 3141×; dubius, 1095×; Dumortieri, 1836×; eburneus, 1836×; Emoryi, 494; Engelmannii, 1095; enneacanthus, 1095×; eruca, 1836; extensus, 1626; Fendleri, 1095; flagelliformis, 312×; gemmatus, 2425; geometrizans, 2096; giganteus, 672×; gonacanthus, 1093×; grandiflorus, 3141×; Greggii, 2536×; griseus, 1836×; gummosus, 1836×; hamatus, 3142; inermis, 3142; longisetus, 1094; MacDonaldiæ, 3142; marginatus, 2425; mojavensis, 1095; napoleonis, 1626; Nickelsii, 715; nycticalus, 3142; obtusangulus, 1123; paucispinus, 1093×; pecten-aboriginum, 2425; pectinatus, 1095; phœniceus, 1094; polyacanthus, 1093×; princeps, 191×; Pringlei, 2425; procumbens, 1093; pteranthus, 3142; queretarensis, 1836; repandus, 1432×; rigidissimus, 1095; Rœtteri, 1094×; rostratus, 3142; Russellianus, 715×; Scheeri, 1093; serpentinus, 2306; speciosus, 1451×; spinulosus, 3141×; stellatus, 1836×; stramineus, 1096; Thurberi, 1836; triangularis, 1626; tricostatus, 1626; triglochidiatus, 1093×; tuberosus, 3513; vagans, 3141×; variabilis, 191×; viridiflorus, 1094×; Weberi, 1836×.
Cerezo de Cayena, 3281×.
Ceriman, 2064.
Cerothamnus cerifera, 2092×.
Ceroxylon andicolum, 16×; niveum, 1019×.
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Chænopetalum, 866×.
Chætochloa, 3158.
Chain Fern, 3519×.
Chaiota, 3124×.
Chalcas exotica, 2076; Kœnigii, 2076; paniculata, 2076.
Chamæcerasus, 1906×.
Chamæcistus procumbens, 1902.
Chamærista nictitans, 680.
Chamæcyparis decussata, 3337; obtusa var. ericoides, 2922; pisifera var. plumosa, 2922×; pisifera var. squarrosa, 2922; thyoides var. andeleyensis, 2922×; thyoides var. ericoides, 2922×.
Chamædorea, 2445.
Chamædryon (Spiræa), 3208.
Chamædrys (Teucrium), 3325; (Veronica), 3451×.
Chamæledon, 1902.
Chamæmorus, 3023×.
Chamænerion angustifolium, 1121; latifolium, 1121×.
Chamænymphæa, 2313.
Chamæpericlymenum suecicum, 855.
Chamæpeuce afra, 775; Casabonæ, 775; Diacantha, 775.
Chamærops, 2445; Biroo, 1895×; Byrrho, 1895×; cochinchinensis, 2927; excelsa, 3362; Fortunei, 3362; hystrix, 2926; Martiana, 3362; stauracantha, 194×.
Chamæsyce, 1169.
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Chamomilla officinalis, 2011.
Champney Rose, 2988.
Chañal, 1362.
Chandelier Tree, 2451×.
Characeæ, 5.
Charity, 2731.
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Chaste-Tree, 3481.
Chaulmugra Oil, 56×.
Chavica officinarum, 2646×.
Chawstick, 1361×.
Chayota edulis, 3124×.
Chayote, 3124×.
Chayotli, 3124×.
Cheat, 578×.
Checkerberry, 1319.
Checkered Lily, 1280.
Cheddar Pink, 999.
Cheeses, 1974×.
Cheilanthes, 1214, 1217; pedata, 216×.
Cheiranthus capitatus, 1140; Menziesii, 2476×.
Cheirostemon platanoides, 749×.
Chelem, 232×.
Chelone barbata, 2540; centranthifolia, 2540×; Digitalis, 2452×; glabra, 71; hirsuta, 2543; Pentstemon, 2542×.
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Cherimoyer, 293×.
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Cherokee Rose, 2996×.
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Chervil, 911×.
Chess, 578×.
Chestnut, 2296×; Cape, 635×; Moreton Bay, 683; Oak, 2886×; Oak, Rock, 2886×; Oak, Yellow, 2886; Water, 3371×; Wild, 635×.
Chibou Resin, 600×.
Chickasaw Lima, 653; Plum, 2829×.
Chicken Grape, 3487.
Chick-Pea, 769.
Chickweed, 3234×; Blinking, 2065; Silver, 2476; Water, 2065; -Wintergreen, 3378×.
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Childsia Wercklei, 1490×.
Chile Hazel, 1335.
Chilean Bellflower, 1820; Boldo, 2565×; Crocus, 3318; Guava, 2096×; Jasmine, 1982×; Laurel, 1827; Nut, 1335;
Chilian Beet, 496×; Lily, 267.
Chilopsis linearis, saligna, 3585.
Chimney Campanula, 645×.
Chimonanthus fragrans, 2037×; fragrans var. grandiflora, 2037×; nitens, 2037×.
China-Berry, 2024×; Orange, 784×; Rose, 2988; Tree, 1756×, 2024×; Tree, Wild, 3072×; Wood-oil Tree, 245×.
Chincapin Oak, 2886.
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Chino, 2652×.
Chirimoya, 293×.
Chittam-Wood, 864×.
Chittim Wood, 599×.
Chives, 911×.
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Chloroleucon, 2653.
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Choco, 3124×.
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Choke Cherry, 2843.
Choko, 3124×.
Cholla, 2365×.
Chondrophylla americana, 1327.
Chondrosea, 3094×, 3096×; Aizoon, 3097×.
Chondrus crispus, 5×.
Chopag, 2319.
Chorogi, 3220×.
Chotda Banana, 2078×; Dama, 2079; Tandaque, 2079.
Chou, 542.
Chouchoute, 3124×.
Christmas Berry, 2596×; Cactus, 3550; Fern, 2749; -Flower, 1169×; Rose, 1454×; -Tree, 2045.
Christophine, 3124×.
Christ's-Thorn, 664, 2436×.
Chrosperma muscætoxicum, 3549×.
Chrysalidocarpus lutescens, 2445.
Chrysanthæ (Limonium), 3231×.
Chrysanthemum inodorum, 2010×; Leucanthemum, 77×; parthenoides, 2011; vulgare, 3309.

Chrysobotrya intermedia, 2958; Lindleana, 2958; revoluta, 2958.
Chrysocoma vulgaris, 1886×.
Chrysogonum Dioscoridis, 1839×.
Chrysophyllum Cainito, 65×; imperiale, 2004×.
Chrysopogon nutans, 3198×.
Chrysurus aureus, 1776×; cynosuroides, 1776×.
Chuchu, 3124×.
Chucumci, 232×.
Chumpa, 2078×.
Chusquea, 449×.
Cibotium, 1209×.
Cicca disticha, 2606×.
Cicely, Sweet, 2095×.
Cicer arietinum, 41×.
Cichorium Endivia, 77×; Intybus, 77×.
Ciconium, 2531.
Cider Gum, 1158×.
Cienkowskya Kirkii, 1731×.
Cinchona Ledgeriana, 74×; succirubra, 74×.
Cineraria amelloides, 1205×; cruenta, 3153; macrophylla, 3153×; maritima, 3152; Petasites, 3152×; sibirica, 1859; Webberiana, 3153.
Cinnamomeæ (Rosa), 2991×.
Cinnamomum, 35×; Camphora, 1439×.
Cinnamon Fern, 2413×; Rose, 2993; Tree, 773; -Vine, 1013.
Cinquefoil, 2771×; Marsh, 835.
Ciotat, 3485.
Circassian Seeds, 215.
Circinaria (Limonium), 3232×.
Cirrhosæ (Clematis), 795.
Ciruela, 3217.
Cissus Ampelopsis, 277×; Bainesii, 3491×; capensis, 3482×; Curori, 3491×; hypoglauca, 3483; oblonga, 3483; obtecta, 3324; oligocarpa, 3574; porphyrophylla, 2646×; quadrangularis, 3482×; rhombifolia, 3483; serrulata, 3324; stans, 278.
Cistaceæ, 55.
Cistus algarvensis, 1444×; formosus, 1444×; ladiniferus, 55×; monspeliensis, 55×; umbellatus, 1444×.
Citharexylon cyanocarpum, 2926.
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Citrullus Colocynthis, 76; vulgaris, 76.
Citrus angulata, 2038×; australasica, 2047; australis, 2047×; buxifolia, 3158×; fusca, 2751×; Garrowayi, 2047×; Hystrix, 2462; inodora, 2047×; japonica, 1270; margarita, 1269×; paniculata, 443×; trifoliata, 2751×; trifoliata var. monstrosa, 2752; triptera, 2752.
Civet Bean, 2577.
Cladonia rangiferina, 6.
Cladrastis amurensis, 1938; amurensis var. floribunda, 1938; Tashiroi, 1938.
Clandestina rectiflora, 1824×.
Clarkia Breweri, 1160; concinna, 1160; grandiflora, 1160; Saxeana, 1160.
Clary, 911×, 3060.
Clavaria, 2088.
Claviceps purpurea, 5×.
Claytonia parviflora, 2065; parvifolia, 2065; perfoliata, 2065; tuberosa, 30×.
Clearing-Nut, 3278.
Cleisostoma Dawsoniana, 3374.
Cleistanthus collinus, 1832×.
Clemanthus senensis, 2058×.
Clematis Gouriana var. Finetii, 3567; montana forma platysepala, 3567; nutans var. thyrsoidea, 3567; Rehderiana, 3567; Vitalba, 32×.
Cleome speciosa, 1421.
Clethraceæ, 63.
Cleyera japonica, 3322.
Cliff Brake, 2535.
Climbing Butcher's Broom, 3142×; Dahlia, 1490×; Fern, 1934×; Fumitory, 220×; Hempweed, 2050; Lily, 1349×; Ylang-ylang, 397.
Clintonia pulchella, 1068.
Clistoyucca arborescens, 3530.
Clitocybe, 2087.
Clitoria polyphylla, 454.
Closed Gentian, 1326×.
Closterostylæ (Potentilla), 2773×.
Cloth of Gold Crocus, 898.
Cloudberry, 3023×; -Grass, 241.
Clove-cassia Pepper Wood, 35×; Pink, 999×.
Clover, Alsike, 3379×; Bokhara, 2026; Bush, 1844×; Common Red, 3379×; Crimson, 3379; Egyptian, 3379; Holy, 2353; Hop-, 3379; Hungarian, 3379; Japan, 1845; Low Hop-, 3379; Mammoth, 3379×; Musk-, 1136×; Pea-Vine, 3379×; Pin-, 1136×; Rabbit-foot, 3379; Sand, 303×; Scarlet, 3379; Silky Prairie, 2561×; Swedish, 3370×; Sweet, 2026; Violet Prairie, 2561×; White, 3379; White Prairie, 2561; Yellow, 3379; Yellow Suckling, 3379; Zigzag, 3379×.
Club-Moss, 1932, 3137×; Moss-Family, 10×.
Clusia flava, 54×; rosea, 54×.
Cluster Fig, 1233; Pine, 2643×.
Clypearia, 2652.
Cneorum tricoccon, 2704×.
Cnidoscolus stimulosus, 1719×.
Coach-whip, 1271.
Coast Myall, 187; Wallflower, 1140.
Cobbett, William, 1568×.
Cobnut, 859, 2340.
Coburgia incarnata, 3236.
Cobweb Houseleek, 3146.
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Cocaine, 44.
Coccineæ (Cratægus), 883.
Coccoloba platyclada, 2074×.
Coccos Oil, 56×.
Coccothrinax, 2445; argentea, 3334; barbadensis, 3333×; radiata, 3333×.
Cocculus diversifolius, 3170; heterophyllus, 3170; japonicus, 3237×; palmatus, 1719×; variifolius, 3170.
Cochemiea, 1977.
Cochil Sapota, 680.
Cochineal, 58.
Cochlearia acaulis, 1656; Armoriacia, 2895×; saxatilis, 1736×.
Cochlioda, 2402.
Cochlospermum Gossypium, 2016×; hibiscoides, 2016×; serratifolium, 2016×.
Cockscomb, 709.
Cock's Eggs, 3055×.
Cockspur Thorn, 884.
Cocoa, 53, 3331; -butter, 53; -Plum, 766×.
Coco-cola, 53; de Mer, 1899×; -Grass, 942×; Palm, 815.
Coconut, 2298×; Double, 1899×; -Monkey's, 1721.
Cocos, 2445; maldivica, 1899×; nucifera, 16×, 2301×; schizophylla, 3567.
Cocuiza, 1306×; brava, 1306; mansa, 1306.
Codiæum, names, 3586.
Codonocrinum, 894.
Codonopsis gracilis, 1842.
Codonoraphia, 1333×.
Cœlanthus complicatus, 1765.
Cœlogyne, 2402; Gardneriana, 2121×.
Coffea arabica, 74×; Kraussiana, 3373.
Coffee Bean, 1352; Berry, 1352, 2924×; Fern, 2535; Negro, 680×; Tree, 2747×; Tree, Kentucky, 1420; Wild, 2747×.
Cogswellia, 1903.
Cohosh, 212.
Cohune Palm, 428×.
Coir, 811×.
Coix Lacryma-Jobi, 15.
Cola acuminata, 53, 2301×; Nut, 53.
Colax, 2402.
Colchicum officinale, 19×.
Cold pits, 2686.
Cole, S. W., 1569.
Coleman, N. J., 1569.
Coleosanthus, 559.
Coleus Godefroyæ, 3187×.
Collomia coccinea, 1336; grandiflora, 1336.
Colobogynium tecturatum, 3109×.
Colocasia æthiopica, 3536×; antiquorum, 17×; caracasana, 3523×; Mafaffa, 3523×.
Colocynthis officinalis, 780.
Colonial Pine, 346.
Colophony, 1417×.
Colorado, 2263; -Grass, 2452×; Spruce, 2620; Willow, 3054×.
Colpoon, 27×.
Colpothrinax Wrightii, 2810.
Colts-foot, 1310, 3405; Sweet, 2562.
Columbea, 345.
Columbine, 339×, 340×, 341; Feathered, 3326×; Munstead's White, 341×.
Columbo, 1273×.
Colutea arborescens, 42; galegifolia, 3282×.
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Commelinaceæ, 18×.
Commelina Rumphii, 18×; zebrina, 3540.
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Comparettia, 2402.
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Comptie, 3533×.
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Condalia Parryi, 3548.
Condurango, 68; Bark, 2003×.
Cone-Flower, 3033; Purple, 1087×.
Confederate Jessamine, 3361×; Rose, 1488; Violet, 3473.
Confervæ, 4×.
Congo Pea, 613×.
Conium maculatum, 62×.
Conjugatæ, 4×.
Connatæ (Clematis), 792.
Connecticut, 2164.
Conocephalus niveus, 973×.
Conoclinium cœlestinum, 1166×; ianthinum, 1165; Lasseauxii, 1165.
Conopholis, 1824×.
Conostylæ (Potentilla), 2774.
Conradia, 1333×.
Consolida arvensis, 976.
Constantinople Nut, 859×.
Convallaria majalis, 19×.
Convolvulaceæ, 68.
Convolvulus capitatus, 1846; floridus, 2948×; majus, 1659; muricatus, 636; pentanthus, 1715×; purpureus, 1659; Scammonia, 68×; scoparius, 68×, 2948×; Sepium, 68×; splendens, 3566.
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Coonam, 346.
Coontie, 3533×.
Coorong, 346.
Copaiba, 840×; Balsam, 1418; Langdorfii, 42.
Copal, 1417, 1626; Varnish, 42.
Copernicia, 2445; cerifera, 16×.
Copper Austrian Briar, 2995×; -leaf, 190×.
Copra, 811×.
Coprinus, 2086.
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Coquitos, 1721.
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Corallobotrys acuminata, 3332×.
Corazon, 294.
Corbularia, 2109.
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Cordatæ (Cratægus), 886.
Cord-Grass, Fresh-water, 3201.
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Cordyline reflexa, 19×; various names, 3588.
Corema album, 47×.
Coreopsis aristosa, 500×; aurea, 500; calliopsidea, 1843×; Douglasii, 1843×; gigantea, 1843×; integrifolia, 1473; maritima, 1843×; trichosperma, 500×.
Corethrogyne detonsa, 1435×.
Coriander, 62×, 911×.
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Corn-cockle, 1927×; Egyptian Rice, 1497; -field Pea, 3469×; -flower, 711; Guinea, 1497; Jerusalem, 1497; Kafir, 1497; Marigold, 754×; Poppy, 2457; Salad, Italian, 3427×; Water-, 3468.
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Cornish Elm, 3412×; Heath, 1130×.
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Coronaria Cœli-rosa, 1928; Flos-cuculi, 1929; Flos-Jovis, 1928; tomentosa, 1927×.
Coronopus didymus, 3148×.
Corossol, 292; Cœur-de-Bœuf, 294.
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Corothamnus, 947×.
Corozo, 211×.
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Cortisso, 293.
Cortusina, 2531×.
Corylus spp., 2301×.
Corynophallus, 1625×; Afzellii, 276×.
Corypha, 2445; australis, 1896; Gebanga, 1895×; minor, 3045.
Cosmanthus fimbriatus, 2566×.
Cosmetic Bark Tree, 2076.
Cosmidium Burridgeanum, 3329.
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Cotoneaster angustifolia, 2864; crenulata, 2863×; 2864; Pyracantha, 2863×; Pyracantha leucocarpa var. fructoalbo, 2864.
Cotton, 1361×; Fern, 2290×; Gum, 2317; Lavender, 3071; -Rose, 1335×, 1488; -Weed, 1016.
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Cotyledon atropurpurea, 1086; carnicolor, 1086×; coccinea, 1086; elegans, 2339×; fulgens, 1087; glauca, 1086×; lurida, 1086×; Peacockii, 1086×; Pringlei, 1086; pubescens, 1086; pulvinata, 1086; Scheerii, 1087; secunda, 1087; subrigida, 1087.

Couch-Grass, Blue, 939×.
Cougnerecou, 3526×.
Countess' Powder, 770.
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Courantia rosea, 870×.
Courbaril, 1626.
Couroupita guianensis, 59×.
Cowage, 3244.
Cowbane, 2420×; -bell, 3165×; -berry, 835, 3425; -Grass, 3379×; -herb, 3074×; -itch, 3244; -itch, Twining, 3365; Lily, 2291×; Oak, 2886×; -Parsnip, 1458×.
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Crab-Apple, Prairie, 2877×; -Apple, Western, 2877×; Cactus, 3549×; Flowering, 2875; -Grass, 1109×; Siberian, 2871×; Soulard, 2871.
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Cracca virginiana, 3321×.
Craig, John, 1570.
Cranberry-Bush, 3463; -Bush, European, 3462×; High, 3463; history, 1516×; Larger American, 3425×; Mountain, 3425; Small, 3425×.
Crane-fly Orchis, 3352.
Cranesbill, 1330; Gray, 1331; Iberian, 1331×; Meadow, 1331×; Siberian, 1332; Silver-leaved, 1331; Spotted, 1332; Wild, 1332.
Craniolaria annua, 72×.
Crape Jasmine, 3304; Myrtle, 1775×.
Crassina, 3544×.
Crassula coccinea, 2969; jasminea, 2969.
Crassulaceæ, 38×.
Cratægus arbutifolia, 2596×; cerronis, 3567×; coloradensis, 3567×; crenulata, 2864; Crus-galli, 1439×; erythropoda, 3567×; florentina, 2878; glabra, 2596; indica, 2911; Oxyacantha, 1439×; Pyracantha, 2863×; saligna, 3567×; spicata, 273.
Cratæ-mespilus grandiflora, 888×.
Craterellus cornucopioides, 2088.
Crateva Marmelos, 222×.
Cream-Cups, 2712; -Nut, 494.
Creek Plum, 2829.
Creeper, Virginia, 2478×.
Creeping Charlie, 1936, 2130×; Fig, 1231×; Forget-me-not, 2340×; Jenny, 1936; Thyme, 3341×.
Creme de Creole, 1976.
Creole Aloe, 1306×; Scorzonera, 877×.
Creosote, 25×.
Crepis barbata, 3353.
Crescentia Cujete, 2301×.
Cress, 1841; Bell Isle, 454; Brazil, 3205×; Common Winter, 454; Early Winter, 454; Para, 3205×; Penny, 3333; Rock-, 343; Upland, 454; Water-, 2895×.
Crested Dog's-tail, 940.
Crete Dittany, 2046×.
Crimean Linden, 3347; Pine, 2641×.
Crimson Bells, 1482; Chinese Rose, 2988; Clover, 3379; -Eye Rose-Mallow, 1486×; Flag, 3113; -flowered Eucalypt, 1152; Fountain Grass, 2537×; Glory Vine, 3491×; Rambler Rose, 2985.
Crinodendron dependens, 3377×; Hookerianum, 3377×; Patagua, 52, 3377×.
Crinum quitense, 2568; zeylanicum, 20×.
Crispæ (Clematis), 790×.
Cristaria coccinea, 1975.
Crithmum maritimum, 912.
Crocus, Autumn, 824×; Chilean, 3318; sativus, 21.
Crosnes du Japan, 3220×.
Cross-leaved Heath, 1130×; -Vine, 503; -wort, 902×.
Crossyne ciliaris, 599×.
Croton, 815×; bicolor, 1189; Eluteria, 47; Oil, 46×; pictus, 816×; sebiferus, 3073; Tiglium, 46×; tinctorius, 753; variegatus, 816×; various names, 3586.
Crowberry, 1112×; Broom, 844; Family, 47×.
Crow-Foot, 950×, 2905; -Vituals, 2130×.
Crownbeard, 3446×; Virginia, 3447.
Crown Imperial, 1282; of Thorns, 1170; Vetch, 855×.
Crozophora tinctoria, 47.
Cruciata verticillata, 1328.
Cruciferæ, 36×.
Cruel Plant, 938×, 2610.
Crula cissifolia, 204.
Crus-galli (Cratægus), 884.
Cryptanthe, 1758×.
Cryptogramma acrostichoides, 1217.
Cryptophragmium ceylanicum, 1421.
Cryptopyrum Richardsonii, 3385.
Ctenostachys (Limonium), 3231.
Cuban Lily, 3117×.
Cubeb, 2646×.
Cubeba officinalis, 2646×.
Cubebs, 24.
Cubelium concolor, 1618.
Cuckoo Flower, 661, 1929; -Pint, 403.
Cucubalus latifolius, 3165×.
Cucumber, Bur, 908×, 3161×; -leaved Sunflower, 1448; Mandera, 909; Melon, 908; -Root, Indian, 2019; Snake, 908; Squirting, 1085; Tree, 435×, 1967×; Tree, Large-leaved, 1966×; Wild, 1096;
Cucumis Colocynthis, 780; maderaspatanus, 2034; Melo, 76; perennis, 910; sativa, 76.
Cucurbita, 76; Lagenaria, 1774×; leucantha, 1774×.
Cucurbitaceæ, 75×.
Cudrania javanensis, 26×.
Cuernitos, 599; de Veracruz, 599.
Culcita, 1209×.
Cultivated Oats, 435×.
Culver's Root, 3449×.
Cumburtu, 346.
Cumin, 911×.
Cuminum odorum, 911×.
Cunninghamia eupressoides, 427; selaginoides, 427.
Cunonia Family, 39×.
Cunoniaceæ, 39×.
Cup-and-Saucer, 644; -Flower, 2144×; Plant, 3169.
Cupang, 2474×.
Cupania sapida, 515.
Cuphea arvensis, floribunda, Hookeriana, jorullensis, Roezlii, tricolor, 3567×.
Cupressus disticha, 3314×; formosensis, 732; Hodginsii, 1252×; Lawsoniana, 730×; Lawsoniana argentea, 731; nootkatensis, 730×; obtusa, 731; pisifera, 731×; thyoides, 730×; thyoides variegata, 730×.
Curare, 67.
Curatella americana, 53×.
Curcuma, 22; angustifolia, 397; longa, 22.
Curled Mallow, 1974×.
Curly Dock, 3037; -Grass, 3110×; -Grass Family, 9; Palm, 1612×.
Curmeria picturata, 1499×; Wallisii, 1499.
Currant, 2956; Alpine, 2960; American Black, 2959; Buffalo, 2958; Californian Black, 2959; Cherry, 2960; European Black, 2959; Fetid, 2959; Garden, 2960; Golden, 2958; Grape, 3485; Indian, 3293; Missouri, 2958; Northern Red, 2960; Red, 2960; Skunk, 2959; Swamp Black, 2960×; Swamp Red, 2959×; Tomato, 1932.
Currawang, 189×.
Curtis, Joseph, 1570×.
Curuba, 3161.
Cururu, 50×.
Cuscuaria marantifolia, 3119.
Cuscuta Epilinum, 68×.
Cushaw, 910.
Cushion Pink, 3167×.
Custard-Apple, 291, 294; Family, 34×.
Cut-leaved Blackberry, 3030×, Lavender, 1829.
Cyamopsis tetragonoloba, 1414×.
Cyanitis sylvatica, 1003×.
Cyanococcus (Vaccinium), 3422×.
Cyanophyceæ, 4.
Cyanophyllum magnificum, 2047; spectandum, 2047.
Cyanotis axillaris, 18×; vittata, 3540.
Cyanus arvensis, 711×.
Cyathea, 1209×, 1210, 1214; Family, 8.
Cyatheaceæ, 8, 1209.
Cycadaceæ, 11.
Cycas, 11; Family, 11; Lehmannii, 1113×.
Cyclanthaceæ, 17.
Cyclanthus bipartitus, 17; Family, 17.
Cyclobalanopsis acuta, 2890; glauca, 2889×; Vibrayana, 2890.
Cyclobothra alba, 632×; flava, 635; pulchella, 632×; purpurea, 635×.
Cyclone Plant, 935.
Cyclophorus, 2745.
Cycnoches, 2402; barbatum, 2737×; Lehmannii, 1920×; musciferum, 2737×; Pescatorei, 1920×.
Cydonia cathayensis, 727×; japonica, 728; lagenaria, 728×; Maulei, 728×; Sargentii, 728×; sinensis, 727×. See also 3587.
Cylactus (Rubus), 3023×.
Cymbalaria, 1883×; (Saxifraga), 3086×.
Cymbia occidentalis, 1758.
Cymbidium, 2402; Huttonii, 1371×; Mastersii, 940×; Sandersonii, 299; triquetrum, 2346×.
Cymophyllus Fraseri, 663.
Cynanchum sarcostemmoides, 68.
Cynara Cardunculus, 77×; Scolymus, 77×.
Cynodon Dactylon, 15.
Cynoglossum apenninum, 3187; longiflorum, 1885; nervosum, 3567×; nobile, 2091; officinale, 69.
Cynorchis, 2042.
Cynosurus ægyptius, 950×.
Cynoxylon floridum, 854×.
Cynthia virginica, 1758.
Cypella plumbea, 2574.
Cyperaceæ, 15×.
Cyperorchis, 2402.
Cyperus, 16; adenophorus, 3567×; esculentus, 2301×; Papyrus, 2472×; syriacus, 2472×.
Cyphokentia Vieillardii, 943×.
Cypress, Bald, 3314×; Deciduous, 3314×; Hinoki, 731; Italian, 915; Lawson's 730×; Mock, 1755; Monterey, 915; Montezuma, 3315; Pine, 631; Sawara, 731×; Spurge, 1173×; Standing, 1337; Summer, 1755; -Vine, 2879.
Cypripedium, 2402; Ainsworthii, 2604; albopurpureum, 2604; Appletonianum, 2468; Argus, 2469×; barbatum, 2470; barbatum var. Argus, 2469×; barbatum Hookeræ, 2468×; barbatum var. superbiens, 2469×; barbatum var. Veitchii, 2469×; barbatum var. Warnerianum, 2470; bellatulum, 2463×; Boissierianum, 2603×; Boxallii, 2466×; Bullenianum, 2468; Bullenianum Appletonianum, 2468; callosum, 2470×; Cannærtianum, 2464×; cardinale, 2604; caricinum, 2603; caudatum, 2603×; Chamberlainianum, 2466; Charlesworthii, 2467×; ciliolare, 2469×; concolor, 2463×; concolor Godefroyæ, 2463×; Crashawæ, 2467×; Crossii, 2470; cruciforme, 2466; Curtisii, 2469×; Dayanum, 2469; Dominianum, 2604; Drurii, 2467×; Elliottianum, 2464; exul, 2467×; Fairieanum, 2468; glanduliferum, 2464; Godefroyæ, 2463×; grande, 2604; Hartwegii, 2603×; Haynaldianum, 2466; hirsutissimum, 2466; Hookeræ, 2468×; Hookeræ Bullenianum, 2468; Hookeræ Volonteanum, 2468×; insigne 2466×; javanicum, 2469; javanicum virens, 2469; lævigatum, 2464×; Lawrenceanum, 2470×; Lindeni, 2603×; Lindleyanum, 2603; longifolium, 2603×; Lowei, 2466; magniflorum, 2603×; Mastersianum, 2469; Moensianum, 2469×; neo-guineense, 2464; nigritum, 2470; niveum, 2464; orbum, 2470×; pardinum, 2468×; Parishii, 2465×; parviflorum, 23; Pearcei, 2603; Petri, 2469; philippinense, 2464×; Pitcherianum, 2469×; porphyreum, 2604; Poyntzianum, 2468; præstans, 2464; præstans var. Kimballianum, 2464×; purpuratum, 2469, 2470; reticulatum, 2603×; Roebbelenii var. Cannærtianum, 2464×; Roezlii, 2603×; Rothschildianum, 2464; Sanderianum, 2464×; Schlimii, 2602×; Schmidtianum, 2470×; Schomburgkianum, 2603; Schroederæ, 2604; spectabile Dayanum, 2469; Spicerianum, 2468; Stonei, 2465; superbiens, 2469×; superbiens Dayanum, 2469; tonkinense, 2464; tonsum, 2468×; Veitchianum, 2469×; venustum, 2468×; Victoria-Mariæ, 2466; villosum, 2466; virens, 2469; vittatum, 2603; Volonteanum, 2468×; Wallisii, 2603×; Warscewiczianum, 2603×.
Cyprus, 1831; Turpentine, 48.
Cyrilla Family, 48×.
Cyrillaceæ, 48×.
Cyrtanthera chrysostephana, 1714×; Ghiesbreghtiana, 1715; magnifica, 1714×; Pohliana, 1714×; Pohliana var. velutina, 1714×.
Cyrtanthus breviflorus, 298×.
Cyrtoceras floribundum, 1613; multiflorum, 1613.
Crytodeira chontalensis, 1125×; coccinea, 1125×.
Cyrtomium, 1214.
Cyrtopera Woodfordii, 946.
Cyrtopodium, 2402.
Cystopteris, 1217.
Cytisus Adamii, 1763×; alpinus, 1763×; Cajan, 613×; fragrans, 2563×; Laburnum, 1763; Laburnum purpurascens, 1763×; pinnata, 2753; ramantaceus, 2563×; sagittalis, 1323; scoparius, 41×, 42; Weldenii, 2563×.
Czackia Liliastrum, 2473×.

Dactylis glomerata, 15.
Dactyloides (Saxifraga), 3087×.
Dæmonorops, 2445; fissus, 3568.
Daffodil, Hoop-petticoat, 2109; Sea-, 1626; Trumpet, 2109×.
Dagger Fern, 2749.
Dahlia, Climbing, 1490×; Zimapanii, 862.
Dahoon, 1640.

Daisy, African, 1903×; Blue, 1205×; -Bush, Australian, 2334; Childing, 486; Double-Orange, 1133; Easter, 3361; English, 485×; Giant, 758; March, 486; Michælmas, 416; of New Zealand, 1775; Ox-eye, 758; Paris, 756; Swan River, 539; True, 486; Turfing, 756; White, 1832; Yellow, 3034×.
Dalbergia nigra, 42.
Dalea candida, 2561; purpurea, 2561×.
Dalibarda pedata, 3024.
Dalibardastrum, 3024.
Damask Rose, 2989×.
Dame's Violet, 1479.
Dammar, 1417; Resin, 12×, 230×.
Dammara australis, 230×; Brownii, 230×; robusta, 230×.
Damask Violet, 1479.
Damson, 2826.
Dandelion, 3311; Dwarf, 1758; Fall, 1840.
Dangleberry, 1320.
Daphnanthes, 963.
Daphne cannabina, 59; Gnidium, 58×; Mezereum, 58×; papyrifera, 1099; Tartonraira, 3340×.
Daphnidium gracile, 487.
Darbya umbellulata, 3570×.
Darea (Asplenium), 415.
Darling Plum, 2922×.
Darlington, E. D., 1570×.
Darlingtonia californica, 37×.
Darnel, 1902×.
Dartt, E. H. S., 1571.
Darwin Potato, 3181.
Dasheen, 3312×.
Dasylirion cæspitosum, 2148; flexile, 2148; Hookerii, 2148; junceum, 238×; longifolium, 2147×.
Dasystephana, 1323×.
Datura Stramonium, 70×.
Daubentonia punicea, 3157×; Tripetiana, 3157×; Tripetii, 3157×.
Daucus Carota, 62×.
Davallia, 1214; alpina, 1614; angustata, 1614; brasiliensis, 3047; bullata, 1207; chinensis, 2328×; concinna, 1918; fœniculacea, 1918; Mariesii, 1207; Tyermannii, 1614.
David's Harp, 2739×.
Davilla, 53×.
Dawn-Flower, Blue, 1660.
Dawson, Jackson, 3554.
Dawson Rose, 2985.
Day-Flower, 835×.
Deadman's Fingers, 1423.
Dead Nettle, 1776×.
Deane, Samuel, 1571.
Dearborn, H. A. S., 1571.
Deciduous Cypress, 3314×.
Deckenia nobilis, 3568.
Deckeria, 3568.
Decostea, 1414.
Deerberry, 3421, 3422; D. Cabbage, 1922×.
Deguelia, 988×.
Delabechea rupestris, 3239×.
Delaware, 2210.
Delphinium speciosum, 3568; speciosum glabratum, 3568.
Deltoides (Cratægus), 882×.
Demerara Copal, 1417.
Dempsey, P. C., 1571×.
Dendrium, 1835; buxifolium, 1835×; Hugeri, 1835×; prostratum, 1835×.
Dendrobium acuminatum, 3078; amplum, 3078; Cœlogyne; 3078; cymbidioides, 3078; muricatum var. munificum, 1647×; polystachyon, 2749; Treacherianum, 3078; triflorum, 3078.
Dendrochilum Cobbianum, 2710×; cucumerinum, 2710×; filiforme, 2710×; glumaceum, 2710×.
Dendrophylax funalis, 2745×; Lindenii, 2745×.
Dendropogon usneoides, 3350.
Dennstædtia, 1214×, 1217; cicutaria, 3171×.
Densifloræ (Limonium), 3232.
Deparia, 1214×.
Depressa Gourd, 1774×.
Desert Gum, 1156×; Willow, 747×.
Design in landscapes, 1783×.
Desmanthus plenus, 2136×.
Desmodium japonicum, 1845×; penduliflorum, 1845.
Detarium senegalense, 41×.
Deutzia corymbosa, 2581×; scabra, 39×; spp. 1439×.
Devil-in-a-Bush, 2145×; Tree, 266×; -Wood, 2412×.
Devil's-Bit, 733, 1491; Boots, 3078×; Claws, 189; Hand, 749×; Tongue, 276×; Walking-stick, 344.
Dewberry, California, 3032×; history, 1516; Southern, 3032; Swamp, 3032.
Dewdrop, 479; -Plants, 1077.
Deyeuxia, 617.
Dhak, 59.
Dhal, 613×.
Dhoura, 1497.
Diacanthium (Euphorbia), 1170.
Dianella nemorosa, 20.
Dianthus marginatus, 3568; various names, 3588.
Diapensia Family, 64×.
Diapensiaceæ, 64×.
Diastema gracile, 1005.
Diatomeæ, 4×.
Diatoms, 4×.
Dibrachya, 2530.
Dicentranthera, 425×.
Dichelostemma capitata, 578.
Dichorisandra Warscewicziana, 3364×.
Dicksonia, 1209×, 1214×, 1217; cicutaria, 3171×; pilosiuscula, 987×.
Dicksonieæ, 1209×.
Dicranopteris, 1348.
Dictogramma, 837.
Dictyosperma, 2445.
Dicypellium caryophyllatum, 35×, 805×
Didiscus cærulea, 3362×.
Didymochlæna, 1214×.
Didymosperma caryotoides, 3500×.
Dieffenbachia Seguine, 17×.
Dierama pulcherrima, 3200.
Diervilla, 3588, 3610.
Diffusæ (Veronica), 3450×.
Digger Pine, 2645×.
Digitalis purpurea, 71.
Dilivaria ilicifolia, 195.
Dill, 911×.
Dillenia Family, 53×; speciosa, 53×.
Dilleniaceæ, 53×.
Dilly, Wild, 2056.
Dimocarpus Lichi, 1891×.
Dimorphanthus elatus, 344; mandschuricus, 344×; mandschuricus elegantissimus fol. var., 344×.
Dioscorea Batatas, 21; villosa, 21.
Dioscoriaceæ, 20×.
Diosma fragrans, 214×.
Diospyros Lotus, 66; virginiana, 66.
Diplacus glutinosus, 2055×.
Dipladenia Harrisii, 2320.
Diplazium, 1214×.
Diplecthrum, 3083.
Diplopappus, 416.
Diploxylon, 2635.
Dipper Gourd, 1774×.
Dipsacaceæ, 75.
Dipsaceous Gourd, 908×.
Dipsacus ferox, 75×; sylvestris, 75×.
Diptera (Saxifraga), 3093×.
Dirca palustris, 58×
Dircæa cardinalis, 1333×.
Disa grandiflora, 2402.
Disemma, 2480.
Dish-cloth Gourd, 1921.
Distegia involucrata, 1908.
Distegocarpus Carpinus, 673×.
Ditch-Moss, 1110×.
Dittany, 1004; Crete, 2406×; Maryland, 912×.
Dixon, J. N., 1571×.
Dizygotheca crassifolia, 2846; elegantissima, 2746×.
Dock, 3036×; Bitter, 3037; Curly, 3037; Great Water-, 3037; Prairie, 2477×, 3169; Spinage, 3036×; Yellow, 3037.
Dockmackie, 3462×.
Dodder, 922.
Doekoe, 1818×.
Dœllingeria umbellata, 1019×.
Dog-bane, 311; -bane Family, 67×; -bane, Spreading, 311×; -berry, 3195; Fennel, 300; Rose, 2990×.
Dog's-tail-Grass, 940; -Tongue, 3380×.
Dogwood Family, 63; Flowering, 854×; Jamaica, 2648×; Red-Osier, 852×.
Dolichandra cynanchoides, 1939×.
Dolichocarpæ (Pachira), 2424.
Dolichodeira, 3169×; tubiflora, 208.
Dolicholus, 2955×.
Dolichos bulbosus, 2425×; erosus, 2425×; japonicus, 2856×; Lablab, 41×; multiflorus, 3244; palmatiloba, 2426; phaseoloides, 2856×; pruriens, 3244; sesquipedalis, 3469×.
Domba Oil, 636×.
Donaldia ulmifolia, 482.
Dondia, 1425×.
Dondisia, 1425×.
Doodia, 1214×.
Dooja, 2047×.
Doorweed, 2740×.
Dorema Ammoniacum, 62×.
Dorner, Frederick, 1571×.
Doryalis, 172.
Double Coconut, 1899×; -Orange Daisy, 1133; Snowdrop Anemone, 286.
Douglas, Robert, 1572; T. H., 1572.
Douglas Spruce, 2847.
Douglasianæ (Cratægus), 886.
Doura, 1497.
Dove-Flower, 2554; -wood, 244×.
Down Thistle, 2354.
Downer, J. S., 1572.
Downing, A. J., 1572×; Chas., 1573.
Downton Elm, 3412.
Downy Myrtle, 2948; Poplar, 2762; Swamp Blueberry, 3423.
Doxantha capreolata, 503.
Dracæna Boscii, 238×; Draco, 19×; Ehrenbergii, 3531×; filamentosa, 238×; Fintelmanni, 3531×; graminifolia, 1890×; Lenneana, 3531×; Lennei, 3531×; various names, 3588; yuccoides, 3531×.
Dracocephalum canariense, 698×; canescens, 1776×; denticulatum, 2612; virginianum, 2611×.
Dracontium spinosum, 1823×.
Dracunculus crinitus, 1450×.
Dragon Arum, 391×; -Head, False, 2611×; -Root, 392; -Tree, 1069×.
Dreer, H. A., 1573.
Drejera puberula, 1730×; Willdenowiana, 1715.
Drimys aromatica, 3313×; Winteri, 34.
Driveways, 3496×.
Dropseed, 3217×; -wort, 1239; -wort, Water, 2328×.
Drosera rotundifolia, 38×.
Droseraceæ, 38.
Drymophlœus singaporensis, 3571.
Drymosphace (Salvia), 3059×.
Drynaria, 1214×; musæfolium, 2607×.
Dryopteris, 1214×, 1217; Filix-mas, 8×.
Duchartrea, 1333×.
Duck-Flower, 393×.
Duck's-Meat, 1836×.
Duckweed, 1836×; Family, 18; Tropical, 2650.
Duckwheat, 1201×.
Duc van Thol Tulip, 3398.
Dudaim Melon, 908.
Dudleya Cotyledon, 871; lanceolata, 871; pulverulenta, 870×; Purpusii, 870×.
Dufour, J. J., 1573×.
Dugaldia Hoopesii, 1443×.
Duguetia longifolia, 1306×.
Duke Cherry, 2838.
Duku, 1818×.
Dumb Plant, 1006×.
Duranta Ellisia, 69×.
Durie Caraboa, 398×.
Durio zibethinus, 53, 2301×.
Durra, 1497.
Dusty Miller, 399×, 711, 1928, 3152.
Dutch Case-Knife Bean, 2576; Crocus, 898; Elm, 3411×.
Dutchman's Breeches, 1002; Pipe Family, 28.
Duvaua dependens, 3109.
Dwarf Alder, 1270×; Bilberry, 3424; Blue-Gum, 1154; Cherry, 2833×, 2836×; Dandelion, 1758; Golden Yellow-flowering Pea, 901×; Jamaica, 2078; Palmetto, 3045; Poinciana, 613; Pomegranate, 2862; Squill, 3118; Willow, 3054.
Dyckia Glaziovii, 2121×.
Dyer's Greenweed, 1323; Weed, 2918; Woad, 1688; Woodruff, 411×.

Earflower, 938.
Easter Bell, 3234×; Cactus, 3113×; Daisy, 3361; Flower, 1169×; Lily, 1867×.
East Indian Copal, 1417; Lotus, 2117; Rosebay, 3304×.
Eatonia Dudleyi, 3205×; pennsylvanica, 3205.
Eau-d'ange, 60×; de Creole, 1976.
Ebenaceæ, 65×.
Ebony, 1014×, 2652×; Family, 65×; Mountain, 456×.
Ecballium Elaterium, 76.
Echeveria agavoides, 870; bracteosa, 2425; californica, 871; coccinea, 870×; farinosa, 870×; fulgens, 870; gibbiflora, 870×; lanceolata, 871; metallica, 870×; Peacockii, 870; pulverulenta, 870×; Purpusii, 870×; rosea, 870×; sanguinea, 870; Scheerii, 870; secunda, 870; secunda var. glauca, 870.
Echinocactus Fiebrigii, 2915; Lewinii, 1915; Pentlandii, 1097×; Poselgerianus, 1978; Sellowii, 1971×; Williamsii, 1915.
Echinocereus tuberosus, 3513.
Echinosphace (Salvia), 3065.
Echinostachys, 221×.
Echites funiformis, 1982×; nutans, 2782×; splendens, 1018.
Echium formosum, 1899×; grandiflorum, 1899×; perætum, 2059; rubrum, 2355; vulgare, 69.
Edelweiss, 1840.
Edraianthus dalmaticus, 3495; Pumilio, 3495; serpyllifolius, 3495.
Edwardsia chilensis, 3192×; chrysophylla, 3192×; grandiflora, 3192; Macnabiana, 3192×; tetraptera, 3192.
Edwinia americana, 1716.
Eeldea, 3278×.
Eel-Grass, 3428.
Egg-Fruit, 1919.
Eggplant, Chinese Scarlet, 3184×; Ethiopian, 3184×; Ornamental, 3184×.
Eglantine, 2990×.
Egyptian Clover, 3379; Onion, 248; Paper Plant, 941; Privet, 1831; Rice Corn, 1497; Willow, 3053.
Eichhornia crassipes, 19.
Elæagnaceæ, 59.
Elæagnus angustifolia, 59, 1440; latifolia, 59; parvifolia, 1440.
Elæis, 2445; guineensis, 16×, 2301×.
Elæocarpaceæ, 51×.
Elæocarpus Family, 51×; sphæricus, 52; tuberculatus, 52.

Elaterium, 76, 1085; cordifolium, 1085.
Elder, American, 3067×; Box, 204×; European, 3067×; Marsh, 1708; Poison, 2953×; Red-berried, 3068; Sweet, 3067×; Wild, 344×; Yellow, 3317.
Elecampane, 1654×.
Elemi, 1418.
Eleocharis tuberosa, 16.
Elephant-ear Fern, 1108.
Elephant's Ear, 469, 830; Foot, 3322.
Elettaria Cardamomum, 22.
Eleusine ægyptiaca, 950×.
Eleutherococcus Henryi, 193; senticosus, 193.
Elichrysum bicolor, 1449×.
Eliot, Chas., 1573×; Jared, 1573×.
Elliot, Wyman, 1574.
Elliott, F. R., 1574.
Ellisia acuta, 1081.
Ellwanger, Geo., 1574.
Elm, American, 3409×; Belgian, 3412; Camperdown, 3410×; Cedar, 3413; Chinese, 3413; Cork, 3410; Cornish, 3412×; Downton, 3412; Dutch, 3411×; English, 3411; Family, 25×; Guernsey, 3412×; Huntingdon, 3411×; Jersey, 3412×; Red, 3410×; Rock, 3410; Scotch, 3410×; Slippery, 1279, 3140×; Smooth-leaved, 3412; Wahoo, 3410; Water-, 2655×, 3409×; Wheatley, 3412×; White, 3409×; Winged, 3410; Wych, 3410×.
Elodea campanulata, 1632×; canadensis, 14×; virginica, 1632×.
Elymus giganteus, 3568.
Embira, 3526×.
Emblica, 2606.
Embothrium coccineum, 27; speciosissimum, 3320×.
Emerus major, 855×.
Emlic, 2606.
Emory, R. S., 1574.
Empetraceæ, 47×.
Empress of Brazil, 1494.
Empusa muscæ, 5×.
Enalus, 14×.
Enchanter's Nightshade, 773×.
Encholirium Saundersii, 3493.
Enckea, 2646.
Encyclium, 1117×.
Endymion, 3117.
Engelmann Spruce, 2620.
Englerophœnix Maripa, 2016; regia, 2016.
English Blue-Grass, 2723×; Daisy, 485×; Dwarf Bean, 3464×; Elm, 3411; Holly, 1638; Ivy, 1437×; Laurel, 2843×; Oak, 2888; Walnut, 1722.
Ensete edule, 2077.
Enterolobium Saman, 2653, 3066×.
Eopepon vitifolius, 3376.
Epacridaceæ, 64.
Epacris Family, 64.
Epapulosa, 2041.
Ephemerum bicolor, 2950.
Epibaterium carolinum, 808×.
Epidendrum, 2402; bicornutum, 996×; bidentatum, 996×; Hügelianum, 692; Mathewsii, 2105×; Medusæ, 2105×; tibicinis, 3114; triquetrum, 2346×.
Epifagus, 1824×.
Epigynium acuminatum, 3332×.
Epilobium latifolium, 61.
Epimedium diphyllum, 205×.
Epipactis, 1357×; latifolia, 23.
Epiphyllum Gærtneri, 3113×; Russellianum, 3113×; Russellianum var. Gærtneri, 3113×; truncatum, 3550.
Equisetaceæ, 10.
Equisetales, 1208.
Equisetum, 10×.
Eranthemum Andersonii, 2845; bicolor, 951, 2845×; cinnabarinum, 2845; igneum, 733×; laxiflorum, 2845; malaccense, 2845; nervosum, 951; pulchellum, 951, 2845×; reticulatum, 2845×; rubronervum, 1240×; rubrovenium, 1240×; rubrovenosum, 1240; Schomburgkii, 2845×; seticalyx, 2845×; tuberculatum, 2845×.
Eremanthe (Hypericum), 1630×.
Eremurus turkestanicus, 3568.
Eria coronaria, 3376.
Erianthæ (Salvia), 3062×.
Erica spiculifolia, 581; vulgaris, 631×.
Ericaceæ, 64.
Erigeron canadense, 77.
Erinosma vernum, 1849.
Erinus gracilis, 3532×; lychnidea, 3532×.
Eriodendron anfractuosum, 700; occidentale, 700; orientale, 700.
Eriodictyon glutinosum, 69; Parryi, 2097×.
Eriogynia cæspitosa, 2563×; pectinata, 1921.
Eriolobus kansuensis, 2874; yunnensis, 2874.
Eriophorum, 16.
Eriopsis, 2402.
Eriostomum, 3219×.
Eriotrichæ (Potentilla), 2774.
Eritrichium barbigerum, 902×, 1758×; glomeratum, 1758×; nothofulvum, 2655×.
Ernst, A. H., 1574×.
Erodium cicutarium, 245×; moschatum, 43.
Erpetion hederaceum, 3473; petiolare, 3473; reniforme, 3473; spathulatum, 3473.
Ervum Ervilia, 3466; Lens, 41×, 1839.
Eryngo, 1137×.
Erythea, 2445.
Erythræa Centaurium, 67.
Erythrina piscipula, 2648×.
Erythrobalanus, 2883.
Erythrochæte palmatifida, 1858×.
Erythrodes querceticola, 2612.
Erythrospermum hypoleucum, 701×.
Erythroxylaceæ, 44.
Erythroxylon Coca, 44.
Escorzonera, 72×.
Esparcet, 2353.
Esparto, 1934×; -Grass, 3243.
Espino Blanco, 599; Cavan, 188×.
Estragon, 399.
Ethiopian Eggplant, 3184×.
Eusagave, 232.
Eusaizoonia (Saxifraga), 3096×.
Euasparagus, 406×.
Euatalantia, 426.
Eubatus (Rubus), 3029×.
Eubotrys, 1850×.
Eucalochortus, 632×.
Eucalyptus alba, platyphylla, 3568.
Eucastalia, 2313.
Eucharis Clibranii, 3415×.
Euconvolvulus, 839×.
Euepidendrum, 1118.
Eufortunella, 1269×.
Eufritillaria, 1280.
Eufurcræa, 1305×.
Eugene Poplar, 2760.
Eugenia myriophylla, 514×; operculata, 3302×; Pimenta, 2626; Ugni, 2096×.
Euhypericum, 1632.
Eulalia, 2057; gracillima univittata, 2057×; japonica, 2057×; japonica gracillima, 2057×.
Eulimonium, 3231×.
Eulirion, 1867.
Eumaurandia, 2012×.
Eumelothria, 2033×.
Eumorpha, 2530×.
Eumusa, 2078.
Eumycetes, 5×.
Euonymus. See Evonymus, below.
Eupatorium perfoliatum, 77; serotinum, 3568.
Euphorbia, 46×; canaliculata, 2524×; carinata, 2524×; pendula, 3078; tithymaloides, 2524×.
Euphorbiaceæ, 46×.
Euphorbiodendron, 1173×.
Euphorbium, 1170.
Euphotinia, 2596.
Euphrasia officinalis, 71.
Eupicea, 2618.
Eurhododendron, 2937×.
European Aspen, 2756×; Beech, 1202×; Bird Cherry, 2843; Black Currant, 2959; Cranberry-Bush, 3462×; Elder, 3067×; Evening Primrose, 2329×; Goldenrod, 3188×; Grape, 3484×; Green Alder, 252; Hornbeam, 673×; Larch, 1822×; Mountain-Ash, 3195×; Raspberry, 3028; Turk's-Cap Lily, 1873; White Hellebore, 3440×; Yellow Pond-Lily, 2292.
Eurosa, 2984×.
Eurya microphylla, 1188.
Euryale ferox, 31×, 2302.
Euryangium, 1228.
Eusiphonantha (Limonium), 3232×.
Euspathiphyllum, 3202.
Eusphace (Salvia), 3058×.
Eustachys, 3220.
Eustoma Russellianum, 1890×.
Eusyringa, 3300.
Eutacta, 345.
Eutassa, 345.
Euterpe caribæa, 2405; vinifera, 2846×.
Euthapsi (Verbascum), 3442.
Eutoca divaricata, 2567; glandulosa, 2567×; Menziesii, 2567; mexicana, 2567; multiflora, 2567; viscida, 2566×; Wrangeliana, 2567×.
Euvaccinium, 3424.
Euvitalbæ (Clematis), 796×.
Evans, J. C., 1574×.
Evansia (Iris), 1669.
Evening Campion, 1928×; Primrose, 2328×; Primrose Family, 61; Star, 840.
Everbearing Grape, 3484×; Strawberry, 1273.
Everblooming Cherry, 2837×.
Evergreen Blackberry, 3030×; Cherry, 2844; Grape-Vine, 3482×; Wisteria, 2706×.
Everlasting, 280×, 299; Grape 3484×; Pea, 1825×; Thorn, 2863×; Yellow, 1450.
Evi, 3216×.
Evodia hupehensis, 3568×.
Evonymus japonica, 1440; name of, 3590.
Ewe-gowan, 486.
Exaratæ (Saxifraga), 3091.
Excœcaria Agallocha, 47; sebifera, 3073.
Exocarpus, 27×.
Exogonium Purga, 68×.
Eyebright, 1175.

Faba sativa, 3464×; vulgaris, 3464×.
Fabiana imbricata, 71.
Fadyenia Hookeri, 1316×.
Fagaceæ, 25×.
Fagara, 3537.
Fagopyrum cymosum, 2744; esculentum, 28×.
Fagus grandifolia, 2302; obliqua, 2290; procera, 2290; sylvatica, 1440.
Faham, 23.
Fair Maids of France, 2907×.
Fairy Bells, 1060×; -Grass, Himalaya, 2057×; Lily, 3541×; Primrose, 2795×; Rose, 2988.
Falcata comosa, 278×.
Fallaces (Primula), 2797.
Fall Dandelion, 1840; Grape, 3487.
False Acacia, 2967; Arum Root, 3320×; Bitter-sweet, 701; Chamomile, 520; China Brier, 3175; Dragon-Head, 2611×; Gromwell, 2355; Hellebore, 3440×; Indigo, 275×, 453; Mallow, 1974×; Mitrewort, 3343; Pareira, 775; Saffron, 675; Sandalwood, 3525; Shagbark, 677; Sisal, 232×; Solomon's Seal, 3172×.
Fancy Geranium, 2532×.
Fanwort, 608×.
Farewell-to-Spring, 1353×.
Farfugium grande, 1858×; Kaempferi, 1858×; maculatum, 1859.
Farinosæ (Primula), 2801×.
Farkleberry, 3422.
Fascicularia pitcairniifolia, 2949.
Fatsia horridum, 1096×; papyriferum, 3323×.
Faya fragifera, 2093×.
Feathered Columbine, 3326×; Hyacinth, 2080×.
Featherfoil, 1607×; Geranium, 737; -Grass, 3243.
Feathery Bamboo, 448×.
Fedegosa, 680×.
Fedia rupestris, 2487×.
Fendlera utahensis, 3512×.
Fendlerella utahensis, 3512×.
Fennel, 911×; Dog, 300; Florence, 911×; Flower, 911×, 2145×.
Fenzlia alba, 1337×; dianthiflora, 1337×.
Ferdinanda eminens, 2724.
Fern, Bear's-foot, 1614; Coffee, 2535; Cotton, 2290×; Elephant-ear, 1108; Grape, 3352×; Hartford, 1934×; Holly, 945×; Interrupted, 2413×; King, 2413×; Lace, 735, 2135×, 2290×; -leaved Lily, 1874×; New York, 1079; Palm, 931×; Resurrection, 2744×; Strawberry, 1457×; Wood-, 1078×.
Ferns, 7.
Feronia lucida, 1220.
Ferraria, 3344×.
Ferula canadensis, 1859.
Fescue, Blue, 1228×; -Grass, 1228×; Hard, 1229; Meadow, 1228×; Red, 1228×; Sheep's, 1228×; Tall, 1228×; Various-leaved, 1228×.
Fessenden, T. G., 1575.
Festuca ovina, 15; quadridentata, 15.
Fetid Currant, 2959; Till, 35×.
Fetish-Tree, 1738.
Fetter-Bush, 2622×.
Fetticus, 3427.
Feuillæa pedata, 3320.
Fever Bush, 487; -few, 756; -few, American, 2477×; -Plant, Chinese, 2430×; Tree, 2626×; -wort, 3382×.
Fiber, Gomute, 390; Kapok, 521×; Lechuguilla, 236×.
Ficaria Ficaria, 2906.
Ficus, 26×; dealbata, 871×; sinuosa, 3568×; subtriplinervia, 3417; ulmifolia, 3568×; utilis, 3568×.
Field Balm, 2130×; Pea, 2650×; Sorrel, Common, 3037×.
Fieldia lissochiloides, 3233×.
Fiery Thorn, 2863×.
Fig, Adam's, 2078×; Barberry, 2363; Cluster, 1233; Country, 3077; Creeping, 1231×; Indian, 2361; -Marigold, 2040; Mistletoe, 1232×; Moreton Bay, 1232×; Pharaoh's, 1234; -wort, 3121; -wort Family, 71.
Fiji Arrowroot, 3304×.
Filago germanica, 1335×.
Filaree, 1136×.
Filaria, 2583.
Filicales, 1208.
Filicinæ, 7.
Filmy-Fern Family, 8.
Fine Bent-Grass, 240×.
Finger-Comb Grass, 950×; Grass, 750×; -Lime, 2047; -Lime, Garroway's, 2047×.

Finocchio, 911×.
Fir, 172; Balm of Gilead, 173×; Balsam, 173×; Red, 174×, 2847; Silver, 173; Spanish, 174×; Summer, 400×; White, 173, 174.
Fire King, 477; -on-the-Mountain, 1170; Pink, 3167; Raspberry, 3024×; -thorn, 2863×; -Weed, 1121.
Firmiana plantanifolia, 3239.
Fish Geranium, 2531; -Grass, 608×; -Poison Tree, 2648×; -tail Palm, 679.
Fischeria Martiana, 1356.
Fistulina hepatica, 2088.
Five-finger, 2771×.
Flacourtia Family, 56.
Flacourtiaceæ, 56.
Flag, Crimson, 3113; Spiral, 864; Sweet, 210×.
Flagellata, 4.
Flame-colored Azalea, 2942; -Flower, 1751×; Tree, 3239×.
Flaming Poppy, 2017×.
Flat Palm, 1612×; Pea, 1825×; Peach, 2833; -topped Yate, 1154×.
Flavæ (Cratægus), 885.
Flax, 1886×; Family, 43×; Flowering, 1886×; Mountain, 2738; New Zealand, 2595; Prairie, 1887×.
Fleabane, 1132×.
Fleece, Mountain, 2742×.
Flexiles (Pinus), 2637.
Floating-Heart, 2315×; Star, 2051.
Floerkea Douglasii, 1882×.
Flomboyant, 2727.
Flooded Gum, 1158.
Floral Fire-Cracker, 558×.
Flora's Paint-Brush, 1112.
Flor de Isabal, 1118×; de la Oreja, 938.
Floribundæ (Primula), 2791.
Florida, 2229; Beggarweed, 991; Moss, 3350×; Olea, 2412×; Smilax, 3174×; Swamp Lily, 893×.
Flos Adonis, 221; indicus, 1220.
Floss Silk Tree, 752.
Flower-Garden, 1747×.
Flowering Almond, 2831×; Apple, Chinese, 2873×; Crab, 2875; Dogwood, 854×; Fern, 2413×; Flax, 1886×; Maple, 176×; Moss, 2878×; Raspberry, 3024×; Rush, 601; Spurge, 1169; Willow, 747×; Wintergreen, 2738.
Flower-of-an-Hour, 1484×; of Jove, 1928; of St. Sebastian, 692; of the Gods, 1020×.
Fluellen, 3452×.
Fluggea suffruticosa, 3125.
Fly Orchis, 2356; -Poison, 3549×.
Flying Dragon, 2752.
Foam-Flower, 3343.
Fœniculum dulce, 911×; vulgare, 62×, 911×.
Forcing-houses, 1400×.
Forefather's Cup, 3078×.
Forest Gray Gum, 1158.
Forget-me-not, 2091; Creeping, 2340×; Giant, 2090×.
Formal Gardens, 1793.
Forsteropsis, 3278×.
Fortunæa sinensis, 2708×.
Fortune's Double Yellow Rose, 2987×; Palm, 3362.
Fo Shu Kan, 781×.
Fothergilla involucrata, 2476×.
Fountain Grass, Crimson, 2537×.
Fouquieria splendens, 55.
Fouquieriaceæ, 55.
Fourcræa, 1305.
Fourcroya, 1305.
Four-leaved Grass, 2474×; -O'clock, 2056×; -O'clock Family, 29×.
Fowl Meadow-Grass, 1352.
Foxberry, 3425; -Brush Orchid, 225×; -glove, 1009×; -glove, Mexican, 3323×; Grape, 3490×; Grape, Southern, 3484; -tail, 1500; -tail Cactus, 1979; -tail, Green, 3158; -tail Pine, 2639×; -tail, Yellow, 3158.
Fragaria indica, 1080.
Fragrant Balm, 2061; Candytuft, 1635×.
Franciscea calycina, 581×; confertiflora, 581×; eximia, 581×; Hopeana, 582; latifolia, 582; pauciflora, 581×; uniflora, 582.
Frangipani, 2723.
Frangula Alnus, 2925; californica var. tomentella, 2924×.
Frankincense, 45×, 1417×; Pine, 2643.
Franklinia alatamaha, 1361.
Fraxinaster, 1276×.
Fraxinella, 1004; alba, 1004×; Dictamnus, 1004×.
Fraxinus americana, 357; Ornus, 66×.
Fremontodendron californicum, 1278×.
French Honeysuckle, 1442; Marigold, 3305; Physic Nut, 1720; Pink, 711×; Sorrel, 3037×; Vetch, 3464×.
Frenela rhomboidea, 631; robusta, 631.
Fresh-water Cord-Grass, 3201; Soldier, 3260.
Freycinetia, 2449.
Fringe, Mountain, 220×; Tree, 748.
Fringed Calla, 392; Galax, 3112; Gentian, 1326; Milkwort, 2738; Polygala, 2738.
Fritillaria Thomsoniana, 1878.
Fritillary, 1279.
Frogbit, 1624; American, 1882×.
Frog's-bit, American, 1882×; Family, 14×.
Frost Flower, 2051; Grape, 3486; Grape, True, 3487; -weed, 1444×.
Fructa de Macaco, 2977×.
Fruit-Growing, history, 1511×.
Fruta da Condessa, 294×; de bomba, 2460×; del Burro, 3526.
Fruticulosæ (Veronica), 3450×.
Fuchsia, California, 3538×; Cape, 2604×; magellanica var. Riccartonii, 3574.
Fuller, A. S., 1575.
Fuller's Teasel, 1020.
Fulton, J. A., 1576.
Fumana, 1444.
Fumaria officinalis, 36.
Fumariaceæ, 36.
Fumigation, 1044×.
Fumitory, Climbing, 220×; Family, 36.
Funifera utilis, 58×.
Funium piliferum, 1306.
Funkia alba, 1604; albo-marginata, 1605; cærulea, 1604×; cordata, 1604; cucullata, 1604×; Fortunei, 1604×; glauca, 1604×; glaucescens, 1604×; grandiflora, 1604×; japonica, 1604, 1605; lanceolata, 1604×; lancifolia, 1605; lancifolia var. undulata, 1605; liliiflora, 1604; longipes, 1605; marginata, 1605; ovata, 1604×; Sieboldiana, 1604×; Sieboldii, 1604×; Sieboldii elatior, 1604×; sinensis, 1604×; sinensis marmorata, 1604×; subcordata, 1604; tardiflora, undulata, 1605.
Furcræa cubensis, 233.
Furcroya, 1305.
Furze, 3407×.
Fusanus, 27×; acuminatus, 2302.
Fustic, 751×.

Galactia pinnata, 454.
Galam Butter, 65×.
Galangal, 22×.
Galatea plicata, 1110.
Galax aphylla, 64; Fringed, 3112.
Galbanum, 63, 1417×.
Gale, Eldridge, 1576.
Gale palustris, 2093×.
Galedupa indica, 2783.
Galega bicolor, 3568×; grandiflora, 3321×.
Galeobdolon luteum, 1777.
Galeorchis (Orchis), 3598.
Galericularia, 3122×.
Galinsoga trilobata, 3378×.
Galium triflorum, 74×; verum, 74×.
Gallicæ (Rosa), 2988×.
Galphimia angustifolia, 3334×; brasiliensis, 3334×; glauca, 3334×; hirsuta, 3334×.
Gama-Grass, 3383×.
Gambir, 74×.
Gamboge, 54×; Tree, 1313.
Gamnoge, 1417×.
Gano, W. G., 1576.
Ganymedes albus, 2110×; concolor, 2110×; nutans, 2110×; pulchellus, 2110×.
Garbanzo, 769.
Garcinia Family, 54×; Mangostana, 54×; Morella, 54×.
Garden architecture, 2675.
Gardener's Garters, 2574.
Gardenia citriodora, 2058×; jasminoides, 1440; macrantha, 2904×; Stanleyana, 2904×; tubiflora, 2419×.
Gardoquia betonicoides, 698×.
Garey, T. A., 1576×.
Garget, 2614.
Garidella, 2145×.
Garland Flower, 1441.
Garlic Pear, 889; Streak-leaved, 2291; Yellow False, 2291.
Garroway's Finger-Lime, 2047×.
Garugandra amorphoides, 1347×.
Gas-Plant, 1004.
Gastonia palmata, 3372×.
Gastronema, 945.
Gaultheria procumbens, 64.
Gaussia princeps, 2445.
Gaywings, 2738.
Geblera suffruticosa, 3125.
Geiger Tree, 842.
Gelsemium sempervirens, 67.
Gemmiferæ (Saxifraga), 3090.
Gemmingia chinensis, 485.
Genetyllis fuchsioides, 965×.
Genip, 2025×.
Genipop, 1322.
Genista Andreana, 948; candicans, 948×; canariensis, 948×; formosa, 948×; Hillebrandtii, 949×; juncea, 3201×; Spachiana, 949×; tinctoria, 42.
Genkwa, 963.
Gentian, 67; Barrel, 1326×; Blind, 1326×; Blue, 1323×; -Blue Gromwell, 1893×; Bottle, 1326×; Closed, 1326×; Family, 67; Fringed, 1326; Horse, 3382×; Soapwort, 1326×; Stemless, 1328.
Gentiana, 67; tibetica, 3568×.
Gentianaceæ, 67.
Gentianella, 1328.
Genuinæ (Limonium), 3231×; (Scutellaria), 3122×; (Stachys), 3220×.
Geodorum plicatum, 2570×.
Geonoma, 2445; glauca, 639×; Ghiesbreghtiana, 639×; magnifica, 639×; Verschaffeltii, 639×.
Georgia, 2226; Bark, 2626×.
Georgina, 951×.
Geraniaceæ, 42×.
Geraniospermum, 2526.
Geranium angulosum, 2532×; Bedding, 2531; Beefsteak, 469; betulinum, 2532; California, 3152×; capitatum; 2533; citriodorum, 3570×; cucullatum, 2532×; daucifolium, 2529×; denticulatum, 2533×; Family, 42×; Fancy, 2532×; Feather, 737; Fish, 2531; fragrans, 2532; fulgidum, 2529×; graveolens, 2533×; hispidum, 2533×; Horseshoe, 2531; inquinans, 2531×; Ivy-leaved, 2530; Lady Washington, 2532×; Lemon, 2534; Mint, 757; Nutmeg, 2531×; Oak-leaved, 2533; odoratissimum, 2531×; odoratissimum erectum, 2532; pastinacæfolium, 2529×; peltatum, 2530; quercifolium, 2533; Radula, 2533×; revolutum, 2533×; Rose, 2533; Scarlet-flowering Rose, 2533; Show, 2532×; Strawberry, 3093×; triste, 2529×; vitifolium, 2533; Zonal, 2531; zonale, 2531.
Gerardianæ (Pinus), 2639.
German Catchfly, 1928×; Ivy, 3150; Millet, 3158.
Germander, 3324×; Speedwell, 3452×.
Gesneria amabilis, 2097×; cinnabarina, 2097; eriantha, 1706; Family, 72×; pardina, 3433×; regalis, 2097; Regina, 3169×; splendens, 2097; zebrina, 2097.
Gesneriaceæ, 72×.
Gesnouinia, 2474.
Gethyllis lanceolata, 311×.
Gevuina Avellana, 27, 2302.
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Hortulana Plum, 2828×.
Hose-in-hose, 2055×.
Hoskins, T. H., 1580×.
Hosta, various combinations, 3574.
Hoteia barbata, 423; chinensis, 423; japonica, 423.
Hottentot Cherry, 681, 2013.
Hottentot's Bread, 3322.
Houlettia, 2402×; vittata, 2737×.
Houseleek, 869×, 3143; Cobweb, 3146; Spider-web, 3146.
Houttea pardina, 3433×.
Houttuynia californica, 287×.
Hove, 2130×.
Hovey, C. M., 1580×.
Howea, 2445.
Hoya campanulata, 2612.
Huajillo, 2653.
Huamuchil Tamarind, 2652.
Huanhuan Tree, 1827.
Huatari, 1915.
Huckleberry, 1319×, 1320; Garden, 3182×; Squaw, 3422.
Hugelia, 1335×.
Huisache, 188×.
Huitzmamaxalli, 599.
Hulthemia, 2984×.
Humble Plant, 2053×.
Humming-bird's Trumpet, 3538×.
Hungarian Clover, 3379; Grass, 3158.
Hunnewell, H. H., 1581.
Hunter's-Nut, 2340.
Huntingdon Elm, 3411×.
Huntleya violacea, 519×.
Huntsman's Cup, 3078×.
Hura crepitans, 47.
Husk Tomato, 2608.
Husmann, Geo., 1581.
Hyacinth Bean, 1065; Feathered, 2080×; Giant Summer, 1312; Musk, 2080×; Nutmeg, 2080×; of Peru, 3117×; Squill, 3118; Star, 3118×; Starry, 3117×; Water, 1105; Wild, 3116.
Hyacinthus candicans, 1312; nonscriptus, 3117.
Hyalolepideæ (Limonium), 3232.
Hybanthus ipecacuanha, 56.
Hydnum, 2088.
Hydrastis carolinensis, 3372.
Hydriastele Wendlandiana, 2445.
Hydrocallis (Nymphæa), 2315×.
Hydrocaryaceæ, 61×.
Hydrocharis Spongia, 1882×.
Hydrocharitaceæ, 14×.
Hydrolea urens, 3513.
Hydromystria stolonifera, 1882×.
Hydrophyllaceæ, 68×.
Hydrophyllum canadense, 69; lineare, 2567.
Hydrosme Leopoldiana, 276×.
Hyena Poison, 1618.
Hylogne, 3320×.
Hymenodium, 1108.
Hymenolobus, 1615×.
Hymenophyllaceæ, 8, 1208×.
Hymenophyllum, 1214×.
Hymenosphace (Salvia), 3059.
Hyophorbe, 2445; Commersoniana, 753; indica, 753.
Hyoscyamus niger, 70×; Scopolia, 3120×.
Hyospathe elata, 2623; pubigera, 2782.
Hypericaceæ, 54×.
Hyphæne crinita, 2302; Schatan, 2445.
Hypnum triquetrum, 7.
Hypocrite Plant, 1170.
Hypolepis, 1215; californica, 735; meifolia, 735.
Hypolytrum Pandanophyllum, 1994.
Hyssop, 911×; Giant, 1914×.
Hyssopus Lophanthus, 1914×; officinalis, 911×.

Iberian Cranesbill, 1331×.
Iberis jucunda, 229.
Iboza riparia, 2072.
Icaco, 766×.
Icacorea paniculata, 387×.
Iceland Poppy, 2459×.
Ice-Plant, 2042×; Family, 30; New Zealand, 3323.
Ichthyomethia piscipula, 2648×.
Idæobatus (Rubus), 2026.
Idaho, 2257×.
Ifit, 229.
Ilama, 293×.
Ilamatzapotl, 293×.
Ilangilang, 652×.
Ilex Aquifolium, 48×, 1440; crenata, 1440; gongonha, 3470; opaca, 48×, 1440; Orixa, 2407; paraguariensis, 48×.

Ilicoides mucronata, 2120.
Illicium anisatum, 34; verum, 34.
Illinois, 2182.
Illipe butyracea, 65×.
Ill-scented Sumac, 2953.
Imantophyllum Aitoni, 804×; cyrtanthiflorum, 804×; miniatum, 804×.
Imbricaria coriacea, 2056×.
Imbu, 3217.
Immortelle, 3495×.
Impatiens, 51.
Imperata sacchriflora, 2057×.
Imperialis coronata, 1282.
Implements, 1939×.
Inarching, 1370×.
Incense Cedar, 1854.
India Rubber, 47; Rubber Plant, 1232; -Wheat, 1201×.
Indian Almond, 3321×; Amulet Plant, 2862×; Bean, 684×; Bread-root, 2849×; Cherry, 2924×; Cucumber-Root, 2019; Cup, 3169; Currant, 3293; Fig, 2361; Grass, 3198×; Hawthorn, 2911; Hemp, 311; Mulberry, 2067×; Paint, 1893×; Pink, 1898×, 2879; -Pipe Family, 63×; Pitcher-Plant, 3078×; Poke, 3440×; Potato, 1448×; Rice, 3546×; Satinwood, 751×; Shot, 656×; Tobacco, 1899; Tree Spurge, 1170; Turnip, 391×, 392; Walnut, 245×.
Indiana, 2179.
Indicæ (Rosa), 2987.
Indigo, 42; Bastard, 275×; False, 275×, 453; West Indian, 1646×; Wild, 453×.
Indigofera tinctoria, 42.
Indivisa (Acer), 201×.
Infrarosulares (Stachys), 3220×.
Inga angulata, 2652×; dulcis, 2652; fragrans, 2653; guadalupensis, 2652; latifolia, 2653.
Inkberry, 1640×.
Innocence, 1611.
Inocarpus edulis, 2302.
Inodes Blackburniana, 3044×; causiarum, 3044×; exul, 3044×; Palmetto, 3044×; texana, 3044×; uresana, 3044.
Inside-out Flower, 3429.
Insignes (Pinus), 2643.
Integrifolia (Acer), 201×.
Intermediate Stock, 2012.
Interrupted Fern, 2413×.
Intricatæ (Cratægus), 883.
Inula Helenium, 77; montana, 3569.
Ionidium concolor, 1618.
Ionoxalis Deppei, 2418×; lasiandra, 2418×; Martiana, 2418×; tetraphylla, 2418×.
Iowa, 2193×.
Ipecac, 714; American, 1338; Emetic, 74×; Spurge, 1169×.
Ipecacuanha, White, 56.
Ipomœa Batatas, 68×; Bonanox, 635×; Childsii, 635; coccinea, 2879×; coccinea var. hederifolia, 2879×; coccinea var. lutea, 2879×; Funis, 2879×; grandiflora, 635×; hederifolia, 2879×; luteola, 2879×; mexicana, 636; muricata, 636; noctiflora, 636; noctiphyton, 636; Pes-capræ, 68×; Quamoclit, 2879; splendens, 3566; Star, 2879×; tastense, 636; versicolor, 2879×.
Ipomopsis aurantiaca, 1337; elegans, 1337; sanguinea, 1337.
Iriartea andicola, 726; Klopstockia, 726.
Iridaceæ, 21.
Iris, 21; Family, 21; gracilipes, 3569; Mourning, 1477; Pavonia, 2066; Robinsoniana, 2066×; Snake's Head, 1477; tuberosa, 1477; villosa, 2066; Wedding, 2066×; Widow, 1477.
Irish Heath, 950; Moss, 5×.
Ironbark, Broad-leaved, 1152×; Narrow-leaved, 1153; Red, 1153, 1159; Silver-leaved, 1152×; White, 1153, 1159.
Ironweed, 3447.
Ironwood, 599, 1935, 2051, 2339, 2476×, 3221×; Red, 2922×.
Isatis tinctoria, 36×.
Ischarum Pyramii, 500.
Ischnosiphon smaragdinum, 2063.
Isika (Lonicera), 1907.
Islands Cherry, 2844.
Islay, 2844.
Ismene calathina, 1627×; Macleana, 1627×.
Isnardia palustris, 1920.
Isolepis gracilis, 3120.
Isolirion, 1875×.
Isoloma Warszewiczii, 3115×.
Isotypus onoseroides, 2354×.
Isoxylosteum, 1906×.
Italian Corn Salad, 3427×; Cypress, 915; Jasmine, 1718×; Plum, 2825×; Poplar, 2758×; Poplar, Black, 2761×; Rye-Grass, 1902×; Squill, 3118×.
Ita Palm, 2013.
Ivesia Gordonii, 2776.
Ivory-Nut Palm, 2612.
Ivy, Boston, 2478×; Cape, 3150; English, 1437×; German, 3150; Ground, 2130×; Japanese, 2478×; Kenilworth, 1883×; -leaved Geraniums, 2530; Marine, 776; Poison, 2953×.
Ixia chinensis, 485; corymbosa, 1821.
Ixora caffra, 2489.
Ixtle, 236×.

Jaborandi, 2623×.
Jaca, 402.
Jacana, 1919.
Jacaranda Copaia, 72.
Jacinth, Japanese, 3118×; Peruvian, 3117×; Spanish, 3117×.
Jack-Fruit or Tree, 402; -in-a-Box, 1477; -in-the-Pulpit, 392; Oak, 2885; Pea, 653; Pine, 2644.
Jack, Mrs. A. L., 1581×.
Jacobæa elegans, 3150×; macrophylla, 3150×.
Jacobæan Lily, 3218.
Jacobinia ciliata, 997.
Jacob's Ladder, 2729×; Staff, 1271.
Jaeger, Herman, 1581×.
Jalap, 30, 68×, 1660.
Jamaica Dogwood, 2648×; Honeysuckle, 2484; Sorrel, 1485.
Jambolan, 1163×; Plum, 1163×.
Jambos, 1163.
Jambosa caryophyllus, 60×, 1163×; Jambos, 1163; malaccensis, 60×, 1163×; myrtifolia, 1163; vulgaris, 60×, 1163.
Jamestown Weed, 970×.
Jamrosade, 1163.
Jancæa Heldreichii, 2904.
Janipha Manihot, 1991×.
Jankæa Heldreichii, 2904.
Japan Clover, 1845; Maple, 200; Pagoda Tree, 3191×; Poplar, 2763×; Quince, 728; Wood-oil Tree, 245×.
Japanese Apricot, 2824×; Artichoke, 3220×; Banana, 2078×; Barnyard Millet, 1096; Bellflower, 2711; Black Pine, 2642; Easter Lily, 1867×; Flowering Cherry, 2838, 2840; Garden, 1789×; Horse-Chestnut, 227; Iris, 1679; Ivy, 2478×; Jacinth, 3118×; Millet, 3158; Mint, 2035×; Pear, 2869; Pepper, 2646×; Pittosporum, 2654; Plum, 2826×; Raisin Tree, 1611×; Red Pine, 2640; Rose, 1736×; Snowball, 3461; Turk's-Cap Lily, 1873; Varnish Tree, 3239; Weeping Rose-flowered Cherry, 2841; Wisteria, 3517.
Japonica, 728.
Jarrah, 1159.
Jasmine, 1716×; Arabian, 1717; Cape, 1315×; Catalonian, 1718×; Chilean, 1982×; Crape, 3304; Italian, 1718×; Native, 2964×; Night, 2305×; Rock, 282×; Royal, 1718×; Spanish, 1718×; Star, 3361×; West Indian Red, 2723.
Jateorhiza palmatus, 33×.
Jatropha carthaginensis, 1992; Curcas, 46×, 47, 2302; dulcis, 1992; Manihot, 1991×; officinalis, 46×; palmata, 1991×.
Jatrorrhiza, 1719×.
Jaumea, 1751×.
Jeffrey's Pine, 2642×.
Jejerecou, 3526×.
Jelinjoche, 2423.
Jenkinsonia, 2530.
Jequirity, 42.
Jericho, Rose of, 2920.
Jersey Elm, 3412×; Pine, 2644.
Jerusalem Artichoke, 1449; Cherry, 3183; Corn, 1497; Cross, 1927×; Oak, 737; Sage, 2585×; Thorn, 2436×, 2475.
Jessamine, 1716×; African, 3361×; Carolina Yellow, 1321×; Confederate, 3361×; Malayan, 3361×; Night-blooming, 727; Orange, 729, 2076.
Jesuit's Bark, 770; -Nut, 3371×.
Jew Bush, 2524×.
Jewel-weed, 1642×.
Jews' Mallow, 841×.
Jicama, 2425×.
Jimbling, 2606×.
Jimson Weed, 970×.
Jobo, 3217.
Job's Tears, 824.
Joe-Pye Weed, 1164.
Johnson-Grass, 1497.
Jointed Charlock, 2910.
Jointweed, 2740.
Jojoba, 3169×.
Jonquil, Campernelle, 2111.
Jonquilla minor, 2112×.
Joseph's Coat, 270.
Joshua Tree, 3530.
Journals, 1559.
Jovellana violacea, 627.
Juania australis, 2444.
Jubæa, 2445; spectabilis, 2302×.
Judas Tree, 720.
Juglandaceæ, 25.
Juglans, 25; obcordata, 677; ovalis, 677; Pecan, 676; porcina var. obcordata, 677; spp., 2302×.
Jujube, 3547.
Jumping Beans, 829; Mexican, 3124.
Juncaceæ, 19.
Juncoides niveum, 1924; sylvaticum, 1924.
Juncus zebrinus, 3119×.
Juneberry, 272; Grape, 3486×; -Grass, 2723×.
Jungermanniales, 6×.
Jungia (Salvia), 3062.
Juniperus chinensis var. japonica, 3569; chinensis var. japonica aurea, 3569; chinensis var. japonica aureo-variegata, 3569; chinensis var. procumbens, 3569; chinensis var. procumbens aurea, 3569; chinensis var. procumbens aureo-variegata, 3569; chinensis var. Sargentii, 3569; japonica, 3569; japonica chinensis var. 3569; procumbens, 3569; Sanderi, 731, 2922; virginiana, 1440.
Juno (Iris), 1679.
Jupiter's Beard, 303×, 713×.
Jussieua pilosa, 61.
Justicia atramentaria, 1715; carnea, 1714×; coccinea, 1714×; cristata, 309; flava, 3107×; flavicoma, 3107×; gangetica, 426; Gendarussa, 73×; Ghiesbreghtiana, 1715; Lindenii, 1715×; magnifica, 1714×; Mohintli, 1715; pectoralis, 73×, 997; picta, 1393; secunda, 997; speciosa, 2554×; spicigera, 1715; tetragona, 309; thyrsiflora, 2585×; velutina, 1714×.
Jute, 841×; Bilipitam, 1485.

Kabschia (Saxifraga), 3099.
Kafir Bread, 1113; Corn, 1497; Plum, 1432.
Kaki, 1015.
Kale, Roman, 496×.
Kalmiella hirsuta, 1735.
Kalopanax ricinifolius, 192×.
Kalosanthes coccinea, 2969.
Kamala, 47; Dye, 1972×.
Kamassi Wood, 1346.
Kamila Tree, 1972×.
Kangaroo Thorn, 182; Vine, 776×.
Kansas, 2207×.
Kapok, 637, 700; Fiber, 521×.
Karatas amazonica, 653×; Binotii, 388×; Carolinæ 388×; Innocentii, 2144×; Meyendorfii, 388×; Morreniana, 338×; neglecta, 2144×; princeps, 388×; Scheremetiewii, 2144×; spectabilis, 388×; tristis, 388×.
Karo, 2653×.
Karoub, 717×.
Karri, 1157×.
Kaukenia Kauki, 2056.
Kaulfussia amelloides, 734.
Kauri Copal, 1417; Resin, 22×.
Kava, 2646×; -kava, 24.
Kavista Batu, 1220.
Kawri Gum, 230×; Pine, 230×.
Keffersteinia, 2811.
Kei Apple, 172.
Keibi-ran, 244×.
Kekuna oil, 245.
Kelun oil, 245.
Kenilworth Ivy, 1883×.
Kennedya Comptoniana, 1432; cordata, 1432; longiracemosa, 1432; macrophylla, 1432; monophylla, 1432; ovata, 1432.
Kennicott, John A., 1582.
Kenrick, Wm., 1582.
Kentia Baueri, 2950; Belmoreana, 1612×; Canterburyana, 1442×; divaricata, 1736×; elegans, 943; Exorrhiza, 1195; Forsteriana, 1612×; fulcita, 943; Lindenii, 1736×; Luciani, 1736×; monostachya, 441×; Mooreana, 803×; sapida, 2950; Van Houttei, 3439×; Wendlandiana, 1624.
Kentucky, 2232; Blue-Grass, 2723×; Coffee Tree, 1420.
Kerguelen's Land Cabbage, 2809.
Kerr, J. W., 1582×.
Keschia, 294×.
Keteleeria Fabri, 3565.
Kew Tree, 1338×.
Khas Khas Grass, 3456.
Khat, 49, 686.
Khus Khus Grass, 3456.
Kickxia, 1305.
Kidjeroekan, 2714.
Kidney Bean, 2576×; Vetch, 303×.
Kigerukkan, 2038×.
Kilmarnock Willow, 3053×.
King-Fern, 2413×; -Nut, 678; Orange, 784; -weed, 271×.
King's Spear, 412.
Kinkan, 1758×.
Kino, 601; Eucalypt, 1156.
Kirtland, Jared P., 1582×.
Kleinia Anteuphorbium, 3150; articulata, 3149×; Grantii, 2291; pendula, 3150; radicans, 3150; spinulosa, 3150; suspensa, 3150.

Klopstockia cerifera, 726.
Knapweed, 711.
Kneiffia Allenii, 2331×; fruticosa, 2331; glauca, 2331; linearis, 2331×; pratensis, 2331×; pumila, 2331.
Knightia excelsa, 27.
Knot-cone Pine, 2645; -root, 3220×; -weed, 2740.
Koa, 186.
Kodiastigma, 407.
Koellia, 2863.
Kohl, 542.
Kohleria bogotensis, 1706; eriantha, 1706; Warszewiczii, 3115×.
Kola, 824.
Kolpakowskia ixiolirioides, 1710×.
Kordofan Gum, 1417.
Korean Lawn-Grass, 3549.
Korolkowia, 1280.
Korra, 824.
Kowhai, Red, 802×.
Krassang, 1219×.
Kraunhia brachybotrys, 3517; frutescens, 3518; japonica, 3518×; macrostachys, 3518; sinensis, 3517×.
Kraussia coriacea, 3373; floribunda, 3373; lanceolata, 3373.
Krishna Bor, 1231×.
Krynitzkia barbigera, 902×; glomerata, 902×.
Kudzu Vine, 2856×.
Kuhnistera, 2561.
Kukui, 245×
Kumara disticha, 260×.
Kumquat, Australian Desert, 1127×; Hongkong Wild, 1270; Marumi, 1270; Meiwa, 1270; Nagami, 1269×; Oval, 1269×; Round, 1270.
Kunzia tridentata, 2862.
Kursk Millet, 3158×.
Kuwini, 1984×.

Labiatæ, 70.
Lablab cultratus, 1065.
Labrador Tea, 1833; Violet, 2632×.
Laburnocytisus Adamii, 1763×.
Laburnum ramantaceum, 2563×; Weldenii, 2563×.
Lacatan, 2079.
Lacebark, 1319×, 1775×; -bark Pine, 2639; Fern, 735, 2135×, 2290×; -leaf, 312.
Laciniaria, 1852×.
Lacquer Tree, 2953×.
Lactarius, 2087×.
Lactuca alpina, 2075×; Bourgæi, 3574; gigantea, 2076; Plumieri, 2076; sativa, 77; virosa, 77.
Lactucarium, 77.
Ladies' Bedstraw, 1311×; Ear-Drops, 1301; Tobacco, 299; Tresses, 3215×.
Ladlewood, 681.
Lady Ardilaun, 287; Finger Banana, 2078×; Slipper, 442×; Washington Geranium, 2532×.
Lady's Mantle, 244×; Seal, 2739×; Slipper, 943×; Thumb, 2741.
Lælia amanda, 1772×; callistoglossa, 1772×; Dominyana, 1772×; Dormaniana, 1773; elegans, 1772×; Schilleriana, 1773.
Lævigatæ (Rosa), 2996×.
Lagenandra toxicaria, 17×.
Lagetta funifera, 59; lintearia, 59.
La-kwa, 2060.
Lama, 1938×.
Lambkill, 1734×.
Lamb's Lettuce, 3427; Quarters, 737.
Laminaria, 5.
Lampasas Mulberry, 2071×.
Lamprococcus, 221×.
Lamp-Wick Plant, 2586.
Landreth, David, 1583.
Langsat, 1818×.
Lansa, 1818×.
Lanseh, 1818×.
Lantern Plant, Chinese, 2608×.
Lanzon, 1818×.
Laportea canadensis, 26×; stimulans, 26×.
Lappa major, 385.
Larch, European, 1822×; Golden, 2845×.
Lardizabala Family, 33.
Lardizabalaceæ, 33.
Large Cane, 446; -leaf Tomato, 1932; -leaved Cucumber Tree, 1966×; -leaved Lime, 3346×; -leaved Maple, 201; Snapdragon, 304×; -toothed Aspen, 2757; White Petunia, 2565.
Larger American Cranberry, 3425×.
Laricione (Pinus), 2640.
Laricopsis Kaempferi, 2846.
Larix hybrida, 3569; Kaempferi, 2846.
Larkspur, 975; Bee, 977; Musk, 976×.
Lasiagrostis splendens, 3242×.
Lasiandra lepidota, 3344; macrantha, 3344; splendens, 3344.
Lastrea aristata, 1080; membranifolia, 1080; opaca, 1079.
Latania, 2445; borbonica, 1895×.
Late Tulip, 3398×.
Laterifloræ (Scutellaria), 3123.
Lathyrus tuberosa, 41×.
Lattice-leaf, 312.
Laumaile, 1421×.
Lauraceæ, 35.
Laurel, Alexandrian, 961×; American, 1733; California, 3413×; Camphor, 1418; Cherry, 2843×; Chilean, 1827; Chinese, 304; English, 2843×; Family, 35; Great, 2941; -Leaf Willow, 3052; Mountain, 1734; New Zealand, 860×; Oak, 2885; Portugal, 2843×; Sabino, 1967×; Seaside, 2606×; Sheep-1734×; Variegated, 815×.
Laurestinus, 3458×.
Laurocerasus caroliniana, 2844; ilicifolia, 2844; lusitanica, 2843×; Lyonii, 2844; Maackii, 2842×; officinalis, 2843×; sphærocarpa, 2844.
Laurus Camphora, 773; nobilis, 35×; Sassafras, 3082.
Laurustinus, 3458×.
Lavandula angustifolia, 911×, officinalis, 70; Spica, 70, 911×.
Lavanga-lata, 1829×.
Lavauxia brachycarpa, 2332×.
Lavender, 70, 757, 911×; Cotton, 3071; Sea, 3229×.
Lawn-Grass, Korean, 3549.
Lawsonia inermis, 59.
Lawson's Cypress, 730×.
Laymi, 16×.
Lead-Plant, 275×; -wort, 2721×; -wort Family, 65.
Leaf-Beet, 496×; -Cup, Canada, 2744; -Cup, Small-flowered, 2744.
Leafless Rush-Broom, 3470×.
Leather-Jacket, 1155×; -Leaf, 732; -Leaf Grape, 3490; -wood, 944×, 1020.
Lebbeck Tree, 243×.
Leche, 2425×.
Lechenaultia, 1844.
Lechosa, 2460×.
Lechuguilla Fiber, 236×.
Lecythia Family, 59×.
Lecythidaceæ, 59×.
Lecythis spp., 2302×.
Ledenbergia roseo-ænea, 3377.
Ledum buxifolium, 1835×.
Leechee, 1891×.
Leek, Common Wild, 248×.
Legaux, Pierre, 1583×.
Leguminosæ, 41.
Leiantha (Verbascum), 3443×.
Leichtlinia commutata, 1984; protuberans, 1984.
Leighia speciosa, 3352.
Leiorhodium, 2939.
Lembotropis nigricans, 948×.
Lemnaceæ, 18.
Lemon Balm, 442×; Garden, 908; Geranium, 2534; Lily, 1456×; -scented Gum, 1152×; Thyme, 3341×; Verbena, 1707, 1888×; Vine, 2547; Water, 2484.
Lemonia spectabilis, 2915.
Lentibulariaceæ, 73.
Lent Lily, 1868×, 2109×.
Leonia (Salvia), 3065.
Leontodon, 3311.
Leonurus Cardiaca, 70.
Leopard Flower, 485; Lily, 1872; Plant, 1859.
Leopard's Bane, 1066×, 3151.
Leopoldia, 2080×.
Lepargyræa argentea, 3159×; canadensis, 3159×.
Leperiza eucrosioides, 3276.
Lepicystis sepulta, 2745.
Lepidium didymum, 3148×; sativum, 36×.
Lepidobalanus, 2885×.
Lepidorhodium, 2937×.
Lepiota, 2086×.
Lepismium commune, 2929×; myosurus, 2929×.
Leptalix, 1275.
Leptamnium, 1824×.
Leptandra virginica, 3449×.
Leptasea aizoides, 3095; austromontana, 3095; cherleroides, 3095; chrysantha, 3094×; flagellaris, 3095×; Hirculus, 3094×.
Leptaxis Menziesii, 3353.
Leptinella dioica, 868; lanata, 868; plumosa, 868; potentillina, 868; squalida, 868.
Leptodactylon, 1335×.
Leptopteris, 3352×.
Leptosiphon androsaceus, 1337×; aureus, 1337×; carmineus, 1337×; densiflorus, 1337; hybridus, 1337×; roseus, 1337×.
Leptostylæ (Potentilla), 2775×.
Leskea sericea, 7.
Letondal Banana, 2078×.
Letter Plant, 1372.
Lettsomia splendens, 3566.
Lettuce, Lamb's, 3427; Opium, 77; Pastor's, 3189×; Water-, 2650.
Leucadendron argenteum, 27.
Leucanthemum nipponicum, 758; vulgare, 758.
Leucoium vernum, 20×.
Leucorchis, 1005×.
Leucospermum conocarpum, 27.
Leucostegia, 1215.
Leucothoë mariana, 2622×.
Levisticum officinale, 62×, 911×.
Lewelling, Henderson, 1584; Seth, 1584×.
Liatris odoratissima, 3380×.
Liberian Coffee, 823×.
Libertia azurea, 2410×.
Libonia floribunda, 1715; penrhosiensis, 1715.
Lichenes, 6.
Lickorice, 1352×.
Licorice, 176, 1352×.
Licuala, 2445×.
Ligeria, 1350×; speciosa, 3169×.
Lignumvitæ, 44.
Ligularia, 2530; clivorum, 3153×; macrophylla, 3153×; stenocephala, 3153×; Veitchiana, 3153×; Wilsoniana, 3153×.
Ligusticum peloponnesiacum, 2059.
Ligustrina amurensis, 3301×; amurensis var. japonica, 3301×; amurensis var. mandshurica, 3301×; amurensis var. pekinensis; 3301×; pekinensis, 3301×.
Ligustrum amurense, 1440; Ibota, 1440×; japonicum, 1440×; ovalifolium, 1440×.
Lilia regia, 1305.
Liliaceæ, 19.
Liliorhiza, 1280.
Lilium regium, 1305.
Lily, African, 229×; Annunciation, 1868×; Australian Sword, 290; Blood, 1425×; Butterfly, 1441; Candlestick, 1877; Chilian, 267; Chinese Sacred, 2112; Chocolate, 1282; Climbing, 1349×; Coral, 1874×; Cow, 2291×; Cuban, 3117×; Day, 1604; European Turk's-Cap, 1873; Family, 19×; Fern-leaved, 1874×; Florida Swamp, 893×; Giant Prairie, 840×; Ginger, 1441; Golden Spider, 1934; Golden Turk's-Cap, 1873; Ground, 3380×; Japanese Turk's-Cap, 1973; Lemon, 1456×; Lent, 1868×, 2109×; Leopard, 1872; Little Turk's-Cap, 1874; Long-tubed White, 1867×; Madonna, 1868×; Meadow, 1875; Milk-and-Wine, 892×; Nankeen, 1875; -of-the-Nile, 229×, 3536×; -of-the-Palace, 1493; Panther, 1872; Plantain, 1604; Pond-, 2306; Queen, 917; Queensland,- 1067; Ricc-root, 1281×; Rush, 3171; St. John's, 893; Sand, 1848×; Scarborough, 3428; Scarlet Turk's-Cap, 1874; Sego, 635; Showy, 1870×; Solomon's, 402×; Southern Red, 1876; Spear-, 1067; Spider-, 1626; Spotted, 1876; Star, 1877×; Tiny, 1874×; Toad-, 3377×; Tom Thumb, 1874×; Torch-, 1751×; Trumpet, 1867×; Turban, 1873; Water-, 2306; Wheel, 1876; White Mountain, 1848×; White Wood, 3380×; Wild Red, 1876; Wild Yellow, 1875; Wood, 1876; Yellow Day, 1455×; Yellow Pond, 2291×; Yellow Turk's-Cap, 1874.
Lima Bean, 461, 2577.
Limber Pine, 2637×.
Lime, 3345×; -Berry, 3383; Finger-, 2047; Large-leaved, 3346×; Russell River, 2047×; Spanish, 2025×.
Limnanthaceæ, 48.
Limnanthemum indicum, 2316×; lacunosum, 2316×; nymphæoides, 2316×; trachyspermum, 2316×.
Limnanthus Family, 48.
Limnocharis Commersonii, 1624×; Humboldtii, 1624×; nymphoides, 1624×.
Limodorum tuberosum, 636×.
Limonia acidissima, 1219, 1478×; alata, 2714; aurantifolia, 782; bilocularis, 3158×; crenulata, 1478×; Demeusei, 779×; diphylla, 2714; dubia, 2714; gabonensis, 779×; glutinosa, 729; missionis, 2446×; monophylla, 426; pentaphylla, 1352; Preusii, 779×; scandens, 1830; Schweinfurthii, 779×; trichocarpa, 2752; trifolia, 3383; ugandensis, 779; Warneckii, 443×.
Limonium, species of, 3229×.
Linaceæ, 43×.
Linanthus, 1335×; densiflorus, 1842.
Linaria vulgaris, 71.
Linden, 3345×; Common, 3347; Crimean, 3347; Family, 52; Small-leaved, 3347; Weeping White, 3348×; White, 3348.
Lindera Benzoin, 487; hypoglauca, 487.
Lindsæa, 1885.
Ling, 3372.
Linnæa Engleriana, 171×; Perringiana, 171×; Spæthiana, 171×.
Linum catharticum, 43×; trigynum, 2917; usitatissimum, 43×
Lion's Ear, 1839; Leaf, 1839×; Tail, 1839.
Lippia citriodora, 69×.
Liquidambar orientalis, 40; Styraciflua, 40, 357×.
Liquid Storax, 1889×.
Liquorice, 1352×.
Liriodendron Tulipifera, 34, 357×.

Liriope graminifolia vars., 3574.
Lissochilus, 2402×.
Listera convallarioides, 2356×; cordata, 2356×; Smallii, 2356×.
Listrostachys, 2402×.
Litchi chinensis, 2303.
Literature, 1509×, 1520×.
Lithocarpus cleistocarpa, 3569×; cornea, 3569×; densiflora, 3569; glabra, 3569×; Henryi, 3569×; thalassica, 3569×; see also 3574.
Lithophragma affinis, 3320; parviflora, 3320×.
Lithospermum graminifolium, 2059; officinale, 69; petræum, 2059.
Lithræa laurina, 2953.
Litobrochia leptophylla, 2853.
Litorella, 1894×.
Littæa, 235×; dealbata, 238×; filamentosa, 238; geminiflora, 238×; glauca, 238×; gracilis, 966; histrix, 238×; Roezlii, 238×.
Littea geminiflora, 238×.
Little Gem, 3536×; Pickles, 2415×; Shellbark-Hickory, 678; Turk's-Cap Lily, 1874.
Littorella, 2656×.
Littsæa geminiflora, 238×.
Live-forever, 3131×; Oak, 2889×; Oak, Calif., 2889×.
Liver-Leaf, 1458.
Liverworts, 6.
Living Rock, 391×.
Livistona, 2445×.
Lizard's Tail, 3083×; Family, 23×.
Loasa Family, 57.
Loasaceæ, 57.
Lobelia, 76×; littoralis, 2781.
Loblolly Bay, 1361; Pine, 2643.
Lobster Flower, 1169×.
Loco-weed, 424, 2420×.
Locust, 2955×; Black, 2967; Honey, 1346×; Swamp, 1347; Sweet, 1347; Water, 1347; Yellow, 2967.
Lodeman, E. G., 1584×.
Lodewort, 2909×.
Lodge-Pole Pine, 2644×.
Lodhra cratægoides, 3296.
Lodoicea sechellarum, 16×.
Loduson lahe, 1421×.
Logania Family, 67.
Loganiaceæ, 67.
Logwood, 42, 1427.
Lolium temulentum, 15.
Lomaria Boryana, 514; ciliata, 514; costaricensis, 2655×; nipponica, 514×.
Lombardy Poplar, 2758×.
Lonchocarpus maculatus, 1348×.
London Plane, 2707×; Pride, 3096.
Longan, 2131.
Longifloræ (Salvia), 3063.
Longifoliæ (Pinus), 2639×.
Long-Leaf Pine, 2643; Moss, 3350×; -tubed White Lily, 1867×.
Longworth, Nicholas, 1585.
Lonicera Caprifolium, 75; Xylosteum, 75.
Lonsdale, Edwin, 3554.
Looking-Glass Orchis, 2356; Tree, 1476×.
Loosestrife, 1935×, 3233×; Family, 59; Purple, 1937×; Spiked, 1937×; Swamp, 974; Yellow, 1936×.
Lophospermum erubescens, 2012×; scandens, 2013.
Lophostemon arborescens, 3384.
Lopseed, 2604×; Family, 74.
Loranthaceæ, 27.
Lord Anson's Blue, 1826; White, 1826.
Lord, O. M., 1585.
Lords-and-Ladies, 403.
Lorinseria, 3519×.
Loroma amethystina, 3123×.
Lotos (Nymphæa), 2315.
Lotus, American, 2117; Bark, 66; Blue, 2310×, 2311; corniculatus, 41×; crassifolius, 1604; Douglasii, 1604; East Indian, 2117; Magnolia, 2117×; pinnatus, 1604; siliquosus, 3323×; White, 2315.
Lousewort, 2524; Swamp, 2524×.
Louisiana, 2246.
Lovage, 911×, 1851.
Love-Apple, 1982×, 2474; Entangle, 3127; -Grass, 1126; -in-a-Mist, 2145×; -lies-bleeding, 269×; Plant, 279.
Love's Chain, 304×.
Low Blueberry, 3423×; Hop Clover, 3379.
Lowea berberifolia, 2984×.
Lucerne, 2019×.
Lucuma mammosa, 65×; spinosa, 1362.
Lueddemannia Sanderiana, 1764.
Luetkea cæspitosa, 2563×.
Luhea, 1920×.
Luisia teres, 3077.
Lungwort, 2039, 2857.
Lupine, 1922; Blue, 1923; Tree, 1922×; White, 1923×; Yellow, 1923.
Lupulinaria, 3121×.
Luteæ (Rosa), 2995×.
Luvunga, 1829×.
Lycaste, 2402×; cristata, 2462; jugosa, 824×.
Lychnis Lagascæ, 2563; pyrenaica, 2563; Vaccaria, 3074×.
Lychnitidea (Verbascum), 3443.
Lychnitis (Verbascum), 3442×.
Lycium, 3596.
Lycoperdon, 2088×.
Lycopersicum esculentum, 71.
Lycopodiaceæ, 10×.
Lycopodiales, 1208.
Lycopodium, 10×; cæsium, 3139×; cordifolium, 3140; densum, 3139×.
Lygodium, 1215; palmatum, 9, 1217×.
Lyman, H. M., 1585×.
Lyme-Grass, 1111; Canada, 1111×; Sea, 1111×.
Lyon, T. T., 1585×; Wm. S., 3554.
Lyonia calyculata, 732; lucida, 2622×; mariana, 2622×; nitida, 2622×; racemosa, 1850×.
Lysimachia ciliata, 3234; hybrida, 3234; japonica, 3569×; lanceolata, 3234; longifolia, 3234; quadriflora, 3234.
Lythraceæ, 59.
Lythrum Salicaria, 59.

Macadamia ternifolia, 27, 2303.
Macartney Rose, 2996×.
Macassar oil, 653.
Machærium Tipu, 3351×.
Mackaya bella, 425×.
Maclura aurantiaca, 26×; pomifera, 1440×; tinctoria, 751×; tricuspidata, 911.
Macpalxochiquahuitl, 749×
Macrantha (Acer), 201×.
Macrocarpæ (Pinus), 2645×; (Primula), 2808×.
Macrocarpium, 854.
Macrolobium bifolium, 3493; Vuapa, 3493.
Macropiper excelsum, 2646; methysticum, 2646×.
Macrostigma tupistroides, 3403×.
Macrothyrsus (Æsculus), 228×.
Macrotomia echioides, 395×.
Madagascar Periwinkle, 3471×.
Madder, 74×, 3021; Family, 74×; Wild, 1312.
Madeira Mahogany, 35×.
Madhuca indica, 2300×.
Madia sativa, 77×.
Madonna Lily, 1868×.
Madrona, 383×.
Magnolia acuminata, 357×; compressa, 2046; Family, 34; fuscata, 2046; grandiflora, 357×; Lotus, 2117×; tripetala, 357×; Yulan, 34.
Magnoliaceæ, 33×.
Magothy Bay Bean, 680×.
Maguey, 1306×; Ceniso, 234×; de Cocui, 1306; Manso, 234×; Mapisaga, 234×; Verde, 234×.
Mahaleb Cherry, 2835×.
Mahoe, Mountain, 1487.
Mahogany, 3292; Family, 45×; Gum, White, 1155×; Madeira, 35×; Mountain, 721; Red, 1156; Swamp, 1155.
Mahon Stock, 1972.
Maidenhair Fern, 216×, 218×; Tree, 1338×.
Maiden Pink, 999×.
Maile, 1421×.
Maine, 2152×.
Mairania alpina, 386×.
Maire, 1421×.
Maize, Milo, 1497.
Majorana hortensis, 2406×; Onites, 2406×.
Makimbeira, 2121×.
Malabar Nightshade, 455; Vine, Sweet, 455.
Malachobatus (Rubus), 3025.
Malachodendron ovatum, 3241×.
Malagueta brava, 3526×; hembra, 3526×; macho, 3526.
Malagunto chico, 3526×; grande, 3526.
Malanga, 3523.
Malapoenna, 1894×.
Malayan Jessamine, 3361×.
Maldive-Nut, 1899×.
Male Bamboo, 449; Fern, 1079×.
Malgache Aloe, 1306.
Mallotus philippinensis, 47.
Mallow, Curled, 1974×; False, 1974×; Family, 52; Globe, 3204; Jews', 841×; Marsh, 268; Musk, 1974; Rose-, 1483×; Tree, 1974×.
Malocchia, 653.
Maltese Cross, 1927×.
Malpighia Family, 45×.
Malpighiaceæ, 45×.
Malus acerba, 2870×; angustifolia, 2876; angustifolia var. puberula, 2876; astracanica, 2870×; baccata, 2871×; baccata var. himalaica, 2871×; baccata var. mandshurica, 2871×; baccata var. sibirica, 2871×; bracteata, 2878; communis, 2870; coronaria, 2876, 2877; coronaria var. elongata, 2877; coronaria var. Hoopesii, 2876×; coronaria var. ioensis, 2877×; coronaria var. puberula, 2876; cratægifolia, 2878; Dawsoniana, 2876; florentina, 2878; floribunda, 2875; floribunda var. Arnoldiana, 2875×; fragrans, 2877; fragrans var. elongata, 2877; fusca var. diversifolia, 2876; fusca var. levipes, 2876; glabrata, 2877; glaucescens, 2876×; Halliana, 2872; Hartwigii, 2872; hybrida, 2873; ioensis, 2877×; ioensis var. Bushii, 2877×; ioensis var. creniserrata, 2877×; ioensis var. Palmeri, 2877×; ioensis var. spinosa, 2877×; ioensis var. texana, 2878; kansuensis, 2874; lancifolia, 2876×; Malus, 2870; Matsumuræ, 2873; microcarpa var. baccata, 2871×; microcarpa var. floribunda, 2875; microcarpa var. Kaido, 2873×; microcarpa var. sempervirens, 2876; microcarpa var. Torringo, 2874×; micromalus, 2873×; platycarpa, 2876; platycarpa var. Hoopesii, 2876×; Prattii, 2873; prunifolia, 2873; prunifolia var. Rinki, 2873; pumila, 2870×; pumila var. Rinki, 2873; Ringo, 2873; rivularis, 2875×; rivularis var. diversifolia, 2876; rivularis var. levipes, 2876; Sargentii, 2874×; Scheideckeri, 2875; sempervirens, 2876; Sieboldii, 2874×; Sieboldii var. arborescens, 2874×; Sieboldii var. calocarpa, 2874×; sinensis, 2873×; Soulardii, 2871; spectabilis, 2873×; spectabilis var. Kaido, 2873×; spectabilis var. micromalus, 2873×; sylvestris, 2870×; theifera, 2872×; Toringo, 2874×; transitoria, 2874; Tschonoskii, 2874; yezoensis, 2873; yunnanensis, 2874; Zumi, 2875.
Malva campanulata, capensis, coccinea, lateritia, 1975; miniata, 3204×; purpurata, 1975; rotundifolia, 52×; sylvestris, 52×; umbellata, 3204.
Malvaceæ, 52.
Mamain, 293.
Mamao, 2460×.
Mamey, 1975×; Colorado, 1919; de Santo Domingo, 1975×; Sapote, 1919.
Mamillaria, 1976×.
Mamin, 293.
Mammea americana, 54×.
Mammee-Apple, 1975×.
Mammoth Clover, 3379×.
Mamoeiro, Tree, 2460.
Mamon, 294.
Mamoncillo, 2026.
Manchineel, 1494×.
Mandarin Orange, 784.
Mandera Cucumber, 909.
Mandioca, 1991×.
Mandirola, 2097.
Mandragora, 70×.
Mandrake, 2725×.
Mangifera indica, 48×.
Mango, 1984×; Grape, 3198×; Melon, 908.
Mangrove-Annona, 293; Black, 436; Family, 59×; Honey, 436; White, 436.
Maniguette, 3527×.
Manihot diversifolia, 1720; palmata, 47; utilissima, 47.
Manila Copal, 1417; Hemp, 171, 2078.
Manilla Tamarind, 2652.
Manioc, 1991×.
Manisoba, 1992.
Manisuris, 3020×; granularis, 15.
Manitoba, 569.
Manketti Nuts, 2303.
Manna, 66×; Gum 1156×.
Mannensei, 2974×.
Manning, J. W., 1586×; Robert, 1587.
Mano de Mico, 749×.
Man-of-the-Earth, 1661×; Orchis, 2356.
Manuka, 1843.
Manzanillo, 1494×.
Manzanita, 385.
Maple, 195; Ash-leaved, 204×; Black, 203; Family, 49×; Flowering, 176×; Hornbeam, 201×; Japan, 200; Large-leaved, 201; Mountain, 200×; Norway, 198×; Red, 202×; Rock, 203; Scarlet, 202×; Silver, 202×, 2756; Striped, 202; Sugar, 203; Swamp, 202×; Sycamore, 201; White, 202×.
Mappa Porteana, 1939.
Maracujá melao, 2481×.
Maranta Albertii, 621; albolineata, 621, 623×; arundinacea, 22×; Chantrieri, 623×; conspicua, 622×; discolor, 620; Gouletii, 622; Goveniana, 3596; gracilis, 622×; illustris, 622; imperialis, 623×; leopardina, 623; Louisæ, 622; major, 1688×; Makoyana, 621×; Marcellii, 621; micans, 620; musaica, 624×; Neubertii, 622×; noctiflora, 622×; olivaris, 621×; ornata, 623×; picta, 622×; Porteana, 3277; prasina, 624×; princeps, 623; regalis, 623×; roseo-picta, 620; Sagoreana, 621; Sanderiana, 624; smaragdina, 2063; spectabilis, 3277; tigrina, 624×; Wagneri, 620; Wallisii, 621; Wiotii, 620×; zebrina, 624.

Marantaceæ, 22×.
Marattia, 1215; Douglasii, 7×; Family, 7×; fraxinea, 7×.
Marattiaceæ, 7×, 1208×.
Marbleberry, 387×.
Marchantiales, 6×.
March Daisy, 486.
Marcgravia dubia, 2064; paradoxa, 2064.
Marguerite, 756; Blue, 1205×; Glaucous, 756; Golden, 299×.
Mariana lactea, 3169.
Marica californica, 3171; striata, 3171.
Marigold, 911×, 3305; African, 3305×; Cape, 1011; Corn, 754×; Fig-, 2040; French, 3305; Marsh, 637×; Pot, 627; Sweet-scented, 3305×.
Marine Ivy, 776.
Mariposa Lily, 631×; Tulip, 633×.
Maritzgula, 664×.
Marjoram, 911×, 2406.
Markery, 737.
Marking-Nut Tree, 3142×.
Marlea begoniifolia, 243; platanifolia, 243.
Marmalade-Box, 1322; Fruit, 1919.
Marmeliera de Campo, 1994.
Maroochie Nut, 1939.
Marram-Grass, 274×.
Marrubium vulgare, 70, 911×.
Marsh Cinquefoil, 835; Elder, 1708; Fern, 1079; Mallow, 268; Marigold, 637×; Pea, 1826; -Pea, Myrtle-leaved, 1826; Pine, 2644×; St. John's Wort, 1632×; Samphire, 3050; Spike-Grass, 1061; Valerian, 3426×.
Marsdenia Condurango, 68; tinctoria, 68.
Marsilea Drummondii, 10; Family, 9×; Nardu, 10.
Marsilcaceæ, 9×, 1209.
Martagon, 1871.
Martinezia caryotæfolia, 2445×.
Martynia Craniolaria, 877×; Family, 72×; louisiana, 72×.
Martyniaceæ, 72.
Marumi Kumquat, 1270.
Marvel of Peru, 2056×.
Maryland, 2212×; Dittany, 912×.
Masdevallia, 2402×; Dayanus, 904; fenestrata, 904; gibberosa, 3107; punctata, 3107.
Massachusetts, 2159×.
Massangea, 1419×.
Massowia, 3202.
Masterwort, 424×.
Mastic, 48×, 1417×; Tree, 2650; -Tree, Peruvian, 3109.
Maté, 48×.
Mathiola, 2011×.
Matilija Poppy, 2979.
Matisia cordata, 53.
Mato Colorado, 653×; de la Playa, 653×.
Matricaria Chamomilla, 77.
Matricary, 2010×.
Matrimony-Vine, 1929×.
Maul Oak, 2889×.
Maurandia antirrhiniflora, 305, Lophospermum, 3574.
Mauritia flexuosa, 2303; vinifera, 16×.
Mauritius Hemp, 1306.
Maw Seed, 2455×.
Maxillaria, 2402×; bractescens, 3525; decolor, 3525; densa, 2407×; elongata, 3525×; galeata, 1355; jugosa, 824×; leontoglossa, 3525×; squalens, 3525×.
Maximilianea Gossypium, 56.
Maximowiczia sinensis, 3110×.
May, 886×; -Apple, 208, 2725×; -berry, 3026×; -flower, 1120, 1458; -gowan, 486; Haw, 884×; -pop, 2484×; -weed, 300.
Mayten, 2016×.
Mazzard, 2837×.
McIntosh, John, 1586.
M'Mahon, Bernard, 1586.
Meadia caroliniana, 1063×; Dodecathea, 1063×; Jeffreyi, 1064.
Meadow Beauty, 2928×; Cranesbill, 1331×; Fescue, 1228×; Foam, 1882×; -Grass, 1351×; -Grass, Rough-stalked, 2723×; -Grass, Wood, 1723×; Lily, 1875; Parsnip, 3328; Rue, 3326; Rue, Tall, 3327×; Saffron, 824×; Saxifrage, 3087×, 3157×; -Sweet 1238×, 3214×; Tulip, 633.
Mecca Balsam, 45×.
Medemia, 510.
Medicago lupulina, 41×; sativa, 41×.
Medick, 2019; Black, 2019×; Hop, 2019×.
Mediterranean Hemp, 1306.
Medium grandiflorum, 644.
Medlar, 2043×.
Medusa, Philippine, 191.
Medusa's Head, 1173.
Meehan, Thomas, 1587.
Meelalla, 522.
Megapterium missouriensis, 2331.
Megarrhiza californica, 1096×.
Megasea afghanica, 3086×; ciliata, 3086×; compacta, 3102×; cordifolia, 3086; cordifolia var. alba, 3086; cordifolia var. purpurea, 3086; cordifolia var. rosea, 3086; corrugata, 3102×; crassifolia, 3086; hybrida splendens, 3103; Leichtlinii, 3086×; ligulata, 3086; ligulata var. biliata, 3086×; orbicularis, 3086; purpurascens, 3086; speciosa, 3086×; splendens 3103; Stracheyi, 3086×; Stracheyi var. Milesii, 3086×.
Meibomia, 991.
Meiracyllium Wettsteinii, 2121×.
Meiwa Kumquat, 1270.
Melaleuca Leucadendron, 60×.
Melandrium, 3163×.
Melanorrhœa usitata, 48×.
Melastoma denticulatum, 2047; Family, 60×.
Melastomaceæ, 60×.
Melegueta, Wild, 3526×.
Melia Azedarach, 45×, 357×.
Meliaceæ, 45×.
Melianthaceæ, 50×.
Melianthus Family, 50×.
Melic Grass, 2025×.
Melissa officinalis, 911.
Melocactus communis, 612.
Melon Apple, 908; Chinese Preserving, 486×; Cucumber, 908; Dudaim, 908; Mango, 908; Netted, 908×; Nutmeg, 908×; Orange, 908; Pear, 3182×; Pineapple, 908×; Pomegranate, 908; Queen Anne's Pocket, 908; Rock, 908×; Shrub, 3182×; Snake, 908; Spurge, 1172×; Tree, 2460×; Winter, 908; Zapote, 2460×.
Memorial Rose, 2986×.
Meniscium, 1215.
Menispermaceæ, 33.
Menispermum acutum, 3170; Columba, 1719×; palmatum, 1719×.
Mentha perilloides, 2553; piperita, 911×; Pulegium, 70, 911×; spicata, 70, 911×.
Menthol, 1418.
Mentzelia aurea, 3582, 3597; bartonioides, 1161×; hispida, 57×.
Menudito, 1994.
Menyanthes exaltata, 3470×; indica, 2316×; nymphæoides, 2316×; sarmentosa, 3470×.
Menziesia cærulea, 2607×; empetriformis, 2607×; polifolia, 950; polifolia nana, 950; polifolia pygmæa, 950.
Mercury, 737, 2038; Three-seeded, 190×.
Meriolix serrulata, 2329×.
Mertensia, 1348.
Mesacal, 20×, 231; Button, 1915; Tequila, 232×.
Mesembryanthemum, 2921; crystallinum, 30×; edule, 30×.
Mesocarpæ (Pachira), 2423×.
Mespilus arbutifolia var. erythrocarpa, 396×; Pyracantha, 2863×.
Mesquit, 2811.
Mesquite, 2811.
Metcalf Bean, 2574.
Methonica grandiflora, 1349×.
Metrosideros floribunda, 3565×; semperflorens, 630.
Metroxylon elatum, 1481, 2623; Rumphii, 16×.
Mexicanæ (Cratægus), 884×.
Mexican Buckeye, 3414; Butterwort, 2631×; Coral Drops, 496; Earflower, 938; Fire Plant, 1170; Flame-Leaf, 1169×; Foxglove, 3323×; Jumping Bean, 3124; Orange, 751×; Red Salvia, 3063×; Star, 2051; Star of Bethlehem, 2051; Tea, 737; Tulip Poppy, 1614×; Twin-Flower, 545; White Oak, 2890×.
Meyenia erecta, 3339; Vogeliana, 3339×.
Mezcal-button, 1915.
Mezereum, 963; Family, 58×.
Michælmas Daisy, 416.
Michelia Champaca, 34.
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Micrampelis, 1096.
Micranthes æstivalis, 3093; arguta, 3093; californica, 3098; davurica, 3092×; Geum, 3096; integrifolia, 3093; Lyallii, 3092×; micranthidifolia, 3092×; pennsylvanica, 3092×; virginiensis, 3093.
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Microcerasus, 2833×.
Microgenetes, 2566.
Microlepia, 1215.
Micromeles alnifolia, 3197×; caloneura, 3197×; Decaisneana, 3198; Folgneri, 3197×; japonica, 3198.
Micromeria varia, 3082×.
Microphyllæ (Rosa), 2997.
Micropteryx Poeppigiana, 1142.
Microrhamnus franguloides, 2923.
Microstephium niveum, 904×.
Mida acuminata, 2302.
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Milanji Cedar, 631; Cypress, 631.
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Milium Thomasii, 2411×.
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Millet, African, 1110, 1497; Aino, 3158×; Broomcorn, 2452×; Common, 3158; German, 3158; Golden Wonder, 3158; -Grass, 2050×; Hog, 2452×; Japanese, 3158; Japanese Barnyard, 1096; Kursk, 3158×; Pearl, 2537; Siberian, 3158×; Texas, 2452×; True, 2452×; Turkestan, 3158×.
Millettia japonica, 3518×; megasperma, 2706×.
Million-dollar Weed, 1105.
Milo, 1497.
Miltonia, 2402×.
Miltoniopsis Bleui, 2053.
Mimbres, 747×.
Mimosa acle, 2653; arborea, 3066×; campeachiana, 599; caracasana, 628; divaricata, 1935×; dulcis, 2652; filicifolia, 2653, 3066×; filicoides, 188×; glauca, 1848; heterophylla, 2652×; illinoensis, 990×; latifolia, 2653; paradoxa, 182; plena, 2136×; pudica, 41×; Saman, 2653, 3066×; scutifera, 2652; Texas, 189; umbellata, 2653; Unguis-cati, 2652; verticillata, 186×.
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Mimusops Elengi, 65×.
Mina lobata, 2879×; sanguinea, 2879×.
Miniature Bottle Gourd, 1774×.
Minnesota, 2190×.
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Mispelboom, 3073×.
Mississippi, 2240×.
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Mitrewort, 2058; False, 3343.
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Moldavica punctata, 1071.
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Molka, 3023×.
Molles (Cratægus), 881×.
Mollucella, 2059.
Molucca Balm, 2059×.
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Monkey's Bread, 214×; Coconuts, 1721; Hand, 749×.
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Monk's Pepper-Tree, 3481.
Monniera, 1477×.
Monocarpicæ (Primula), 2795×.
Monochoria vaginalis, 19.
Monocodon, 1280.
Monotropaceæ, 63×.
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Moon, James, 1588; Mahlon, 1588; Samuel C., 1588×; Wm. H., 1588×.
Moonseed, 2034; Carolina, 808×; Family, 33.
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Moore, Jacob, 1588×.
Moosewood, 202, 1020×.
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Moræa chinensis, 485; collina, 1499×; Sisyrinchium, 1682.
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Morella, 3182; carolinensis, 2093; cerifera, 2092×.
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Morindin, 74×.
Moringa arabica, 37×; Family, 37; oleifera, 37×, 2303; pterygosperma, 2303.
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Morongia uncinata, 3115.
Morus, 26; papyrifera, 579×.
Moscharia, 2080×.
Moschatæ (Saxifraga), 3091×.
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Moto'oi, 652×.
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Mourning Bride, 3105×; Iris, 1477, 1674×.
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Mozinna spathulata, 1720.
Mucor mucedo, 5×.
Mucuna pruriens, 42, 3244.
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Mulberry, 2069, 3024×; Black, 2071; Family, 26; Indian, 2067×; Lampasas, 2071×; Native Red, 2071; Russian, 2070×; Skeleton-leaved, 2070×; White, 2070.
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Multifloræ (Veronica), 3452×.
Munchausia speciosa, 1775×.
Mundi, 751.
Mung Bean, 2574×.
Munson, T. V., 1588×.
Munstead's White Columbine, 341×.
Murræa exotica, 729.
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Myginda myrtifolia, 2424×.
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Myricaceæ, 24×.
Myricaria germanica, 55.
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Myristicaceæ, 35.
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Myrsine Family, 64×.
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Nabalus Fraseri, 2782.
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Nagami Kumquat, 1269×.
Nageia japonica, 2725.
Naiadaceæ, 13×.
Naibel, 1478×.
Naio, 2090×.
Nama affine, 1625; corymbosum, 1625; ovatum, 1625; quadrivalvis, 1625.
Nanago, 1421×.
Nanche, 602×.
Nankeen Lily, 1875.
Nanny-Berry, 3459×.
Napæa dioica, 3161×; hermaphrodita, 3161×.
Napoleon's Willow, 3052×.
Narbonne Vetch, 3464×.
Narcissus Pseudo-Narcissus, 20×.
Nardosmia palmata, 2562.
Narrow-leaved Cottonwood, 2762×; Ironbark, 1153; Pittosporum, 2654×.
Narthex Asafœtida, 1228×.
Naseberry, 3073×.
Nasturtium, 3388; Armoracia, 2895×; Family, 43; indicum, 2896, 2981×; officinale, 2895×; Tom Thumb, 3389×.
Natal-Grass, 3374×.
Nathusia swietenioides, 3115.
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Naumburgia guttata, 1936×.
Navarretia minima, 1336.
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Nelumbo lutea, 2303.
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Nemexia herbacea var. melica, 3174.
Neottia gracilis, 1636×; lucida, 1636×; plantaginea, 1636×.
Neowashingtonia filamentosa, 3507; Sonoræ, 3507×.
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Nepeta Cataria, 70, 911×.
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Nephrophyllidium crista-galli, 2037.
Nephrophyllum (Saxifraga), 3087×.
Nerine aurea, 1934; japonica, 1934.
Nerium grandiflorum, 904×.
Nesæa salicifolia, 1442×; verticillata, 974.
Nestronia umbellula, 3570×.
Netawu, 3527×.
Netted Melon, 908×.
Nettle, 3417×; Dead, 1776×; Family, 26×; Hemp, 1311; Spurge, 1719×; -Tree, 710.
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Newfoundland, 559×.
New Hampshire, 2154×.
New Jersey, 2170×.
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Nidularium amazonicum, 653×; Binotii, 388×; carolinæ, 388×; eximium, 388×; Lindenii, 653×, 1419×; Makoyanum, 388×; marmoratum, 388×; Meyendorfii, 388×; Morrenianum, 388×; princeps, 388×; spectabile, 388×; triste, 388×.
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Nigella sativa, 911×.
Niger Copal, 1417.
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Ninebark, 2610.
Nintoa, 1904.
Nintooa, 1910×.
Nipa, 2445×.
Niphobolus Lingua, 935×.
Nispero, 3073×.
Niter, 36×; -bush, 2146×.
Nivales (Primula), 2807×.
Nivenia corymbosa, 3519; fruticosa, 392×.
Nobiles (Limonium), 3230×.
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Nolanaceæ, 70×.
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Nonesuch, 2019×.
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Nothocalais cuspidata, 3390×.
Notholæna sinuata, 1215.
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Nothopanax cochleatum, 2748×; crispatum, 2748×; fruticosum, 2747×; fruticosum var. plumatum, 2747×; fruticosum var. Victoriæ, 2748; Guilfoylei, 2747×; ornatum, 2748×.
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Nycterinia capensis, 3532×; lychnidea, 3532×; selaginoides, 3532×.
Nymphæaceæ, 31×.
Nymphæa ovalifolia, 3570×.
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Obeliscaria Drummondii, 3035×; pulcherrima, 1841.
Obione lentiformis, 428.
Oceanorus leimanthoides, 3549×.
Ochnaceæ, 53×.
Ochna Family, 53×.
Ochranthe arguta, 3404×.
Ocimum frutescens, 2553.
Ocotea, 35×.
Ocotillo, 1271.
Ocymum, 2319×; basilicum, 911×.
Odontoglossum, 2402×; Phalænopsis, 2052; planifolium, 1354×; Roezlii, 2051×; Roezlii var. album, 2052; vexillarium, 2052; Warneri, 2345×; Warscewiczii, 2052; Weltonii, 2053.
Odontolepideæ (Limonium), 3230×.
Odontonema callistachyum, 3342×; Schomburgkianum, 3342.
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Oleaster, 1105×; Family, 59.
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Olpidium brassicæ, 5×.
Omorika, 2620×.
Omoto, 2974×.
Omphalea triandra, 47.
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Onagraceæ, 61.
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Ontario, 567×; Poplar, 2763.
Onychium, 1215×.
Oomycetes, 5×.
Operculina aurea, 1616; Turpethum, 68×.
Ophelia diluta, 3291×.
Ophianthe libanensis, 1333×.
Ophiocaryon paradoxum, 2303.
Ophioglossaceæ, 7, 1208.
Ophiopogon japonicus, 19×.
Ophiorrhiza lanceolata, 2538×.
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Opopanax, 188×.
Opulaster, 3600; amurensis, 2610×; bracteatus, 2611×; capitatus, 2611; glabratus, 2611; intermedius, 2610×; monogynus, 2611; opulifolius, 2610×; pubescens, 2611; Ramaleyi, 2610, 2611.
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Orania, 486×.
Orchard-Grass, 950×.
Orchiastrum, 1766×.
Orchid, Baby, 2322×; Bird's-nest, 2122; Boat, 289×; Butterfly, 1119×, 2346×; Family, 22×; Fox-brush, 225×; Serpent-Head, 3223; Tree, 456×.
Orchidaceæ, 22×.
Orchiops, 1766×.
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Orejuela, 938.
Oreobatus, 3021; deliciosus, 3024×.
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Oreocarya, 1758×.
Oreocoma Candollei, 3142.
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Oreodoxa, 2445×.
Oreophila myrtifolia, 2424×.
Oriental Almond, 2832; Plane, 2707×; Poppy, 2459.
Orientales (Clematis), 797×; (Cratægus), 887.
Origanum, 170; Marjoram, 911×; Majorana, 70; vulgare, 911×.
Orithya dasystemon, 3397×.
Ornamental Eggplant, 3184×.
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Poison Elder, 2953×; Ivy, 2953×; Oak, 2953; Sumac, 2953×; Tree, 3073.
Poivrea coccinea, 835.
Poivre des Negres, 3527×.
Poke, 2614; Indian, 3440×.
Poker-Plant, 1752×.
Pokeweed, 2614; Family, 30.
Polemoniaceæ, 68×.
Polemonium cæruleum, 68×; Family, 68×.
Polianthes maculata, 1983×.
Polium (Teucrium), 3325.
Polyactium, 2529×.
Polyanthus Narcissus, 2111×.
Polycalymma Stuartii, 2093×.
Polycarpa Maximowczii, 1627.
Polygalaceæ, 46.
Polygala Senega, 46×.
Polygonaceæ, 28×.
Polygonum, 28×; crispulum, 427×; Fagopyrum, 1201×; tataricum, 1201×.
Polymnia grandis, 2064×.
Polypodiaceæ, 8×, 1209.
Polypodium, 1215×, 1217×; aureum, 2585; Feei, 3142×; glaucum, 2608; hexagonopterum, 2577×; Mandaianum, 2585; musæfolium, 2607×; nigrescens, 2607×; Schneideri, 2585; Swartzii 2607×.
Polypody, 2744×; Family, 8×.
Polyporus, 2087×.
Polyscias odorata, 3108.
Polystachya, 2403.
Polystichum, 1215×, 1217×.
Pome-Fruits, 2865.
Pomegranate, Dwarf, 2862; Family, 59×; Melon, 908.
Pomme Blanche, 2849×; -Cannelle, 294×; Cythere, 3216×; -Liane, 2481×.
Pompon Rose, 2989×.
Poncirus trifoliata, 1440×.
Pond-Apple, 293; -Lily, 2306; -Lily, Yellow, 2291×; Pine, 2644×; -weed, 2767; -weed, Cape, 311×; -weed Family, 13×; -weed, Horned, 3534.
Pongam pinnata, 2753.
Pongelion excelsum, 242; Vilmorinianum, 241×.
Pontederiaceæ, 18×.
Pontederia crassipes, 1105.
Poor Man's Weatherglass, 279×; Robin's Plantain, 1133×.
Popinac, 188×; White, 1848.
Poplar, Athenian, 2757×; Balsam, 2762×; Birch-leaved, 2758; Black, 2757×; Black Italian, 2761×; Bolle's, 2756; Box, 1152×; Carolina, 2759; Downy, 2762; Eugene, 2760; Gray, 2756; Hybrid Carolina, 2760; Italian, 2758×; Japan, 2763×; Lombardy, 2758×; Ontario, 2763; Queensland, 1499; Swiss, 2761×; White, 2755×, 2756×; Yellow, 34, 1890.
Pop-Nut, 2340.
Poppy, 2455×; Alpine, 2459×; California, 1145×, 2712; Celandine, 736, 3279; Corn, 2457; Family, 35×; Flaming, 2017×; -flowered Anemone, 285; Horned, 1346; Iceland, 2459×; Matilija, 2979; Mexican Tulip, 1614×; Oil, 35×; Opium, 2458; Oriental, 2459; Peacock, 2458; Plume, 518; Prickly, 390×; Satin, 2017×; Sea, 1346×; Shirley, 2457×; Tulip, 2458×; Water,- 1624×; Welsh, 2017×; Wind, 2017×; Yellow Chinese, 2018×.
Populus, 24; deltoides var. caroliniana, 357×; carolinensis, 3601; nigra var. fastigiata, 1440×; nigra var. italica, 357×.
Porcupine-Grass, 3242×.
Porophyllum 1751×.
Porphyrion (Saxifraga), 3102.
Porteranthus, 1337×.
Portland Arrow-root, 18.
Porto Rico, 1689; Hat-Palm, 3044×.
Portugal Laurel, 2843×.
Portulaca oleracea, 30×.
Portulaceæ, 30×.
Portuna floribunda, 2622.
Posidonia, 13×.
'Possum Grape, 3487.
Post Oak, 2887, 3490; Swamp, 2887.
Potato, Air, 1013×; Chinese, 1013; Darwin, 3181; Indian, 1448×; Vine, 3185×; -Vine, Wild, 1661×.
Potentilla Friedrichsenii, 3571; fruticosa var. Friedrichsenii, 3571, 3574; fruticosa var parvifolia, 3571; fruticosa var. Veitchii, 3571; palustris, 835; parvifolia, 3571; Salesoviana, 835.
Poterium Sanguisorba, 600×, 3070.
Pot-herb Mustard, 544.
Pothomorphe umbellata, 1437.
Pothos argyræus, 3119; cannæfolia, 3202; celatocaulis, 2064×; pertusus, 2925×; spinosus, 1823×.
Pothuava, 221×.
Pot Marigold, 627.
Potosina, 232×.
Potting soils, 3178×.
Pourthiæa arguta, 2596; villosa, 2596.
Pouteria Caimito, 1919.
Pouzolzia tuberosa, 26×.
Poverty Pine, 2643×.
Powder-flask, 444.
Prairie Apple, 2849×; Clover, Silky, 2561×; Clover, Violet, 2561×; Clover, White, 2561; Crab-Apple, 2877×; Dock, 2477×, 3169; Flax, 1887×; Rose, 2985×; Turnip, 2849×; Vetchling, 1826×; Willow, 3054.
Precooling, 3369×.
Prescott, C. R., 1590×.
Prickle-cone Pine, 2644×.
Prickly Ash, 3537×; Comfrey, 3294×; Lettuce, 1766×; Poppy, 390×; Thrift, 191×.
Pride of California, 1826×; of India, 1756×, 2024×; of the Congo, 3536×.
Prim, 1859.
Primavera, 3303×.
Primrose, Arabian, 395×; Baby, 2796; Bear's-ear, 2794; Buttercup, 2791; Cape, 3272×; Chinese, 2791×; Evening, 2328×; Fairy, 2795×; Family, 64×; Peerless, 2112×; Willow, 1730.
Primulaceæ, 64×.
Primula officinalis, 65; Vitaliana, 1067×; vulgaris, 65.
Prince Edward Island, 563×.
Prince, Wm., 1590×; Wm. Robert, 1591.
Prince's Feather, 270, 2741.
Pringle, C. G., 1591×.
Prinos deciduus, 1640×; lævigatus, 1640×; verticillatus, 1640×.
Pritchardia, 2445×; filamentosa, 3507; filifera, 3507; grandis, 1855; pacifica, 3279.
Privet, 1859; Egyptian, 1831.
Proboscidea Jussieui, 2005.
Proboscis Flower, 2005.
Prophet-Flower, 395×.
Prosartes lanuginosa var. Hookeri, 1061; Menziesii, 1060×; oregana, 1061, trachycarpa, 1061.
Protea argentea, 1847×; Family, 27; grandiflora, 27.
Proteaceæ, 27.
Protium braziliense, 279.
Protocitrus, 1270.
Provincial horticultural societies, 1553.
Pruinosæ (Cratægus), 882×.
Prumnopitys elegans, 2725; spicata, 2725; taxifolia, 2725.
Prunella, 581.
Prunier d'Espagne, 3217.
Prunophora, 2824.
Prunopsis Lindleyi, 2881×.
Prunus Amygdalus, 2303×; caroliniana, 1440×; Pseudo-Cerasus, 3602; serotina, 41.
Prussic acid, 249×.
Psamma, 274×.
Psedera, 2477×.
Pseudægle sepiaria, 2751×; trifoliata, 2751×.
Pseudanemone(Clematis),792×.
Pseudocydonia sinensis, 727×.
Pseudodracontium Lacourii, 276×.
Pseudolysimachia (Veronica), 3449×.
Pseudo-Martagon (Lilium), 1875.
Pseudophœnix Sargentii, 2445×.
Pseudoregelia (Iris), 1673.
Pseudosassafras Tzumu, 3082.
Pseudotsuga Davidiana, 1737×; jezoensis, 1737×; taxifolia vars., 3574.
Psidium Guajava, 60×.
Psilanthemum, 1118.
Psoralea esculenta, 41×; hypogæa, 41×.
Psychotria Ipecacuanha, 714; leucocephala, 3035×.
Psylliostachys (Limonium), 3232×.
Ptæroxylon obliquum, 45×.
Ptarmica, 205×.
Pteridium, 3602; aquilinum, 1217×.
Pteridophyta, 7.
Pterilomioideæ (Scutellaria), 3123.
Pteris, 1215×, 3602.
Pterocarpus, 42.
Pterocarya fraxinifolia, 2303×.
Pteroclados(Limonium),3230×.
Pteroneuræ (Euphorbia), 1170.
Ptilotus exaltatus, 3373×.
Ptychoraphis singaporensis, 3571.
Ptychosperma alba, 1004×; Alexandræ, 385; Cunninghamii, 385; elegans, 385; Kuhlii, 2626; Macarthuri, 2445×; paradoxa, 2856; Seemannii, 442×; singaporensis, 3571. See also 3602.
Puccoon, 1893; Red, 3069×.
Pucha-pat, 2726×.
Pudding-Pipe Tree, 680×.
Puka, 2040.
Pulassan, 2131.
Pulay, 904×.
Pulmonaria maritima, 2039; officinalis, 69.
Pulque, 20×, 231, 234×.
Pulsatilla hirsutissima, 284×; vernalis, 284×; vulgaris, 285.
Pumpkin, Art, 2060.
Punctatæ (Cratægus), 884×.
Punicaceæ, 59×.
Punk Tree, 2022×.
Purdy, A. M., 1592.
Purging Croton, 902; Nut, 1720.
Purple Apricot, 2824×; Bells, 2930×; Bent-Grass, 617; -Cane Raspberry, 3028×; Chokeberry, 396×; Cone-Flower, 1087×; -disk Sunflower, 1448×; -King, 1672×; Loosestrife, 1937×; Mullein, 3443×; Osier, 3054×; Ragwort, 3150×; Rock-Cress, 429; Vetch, 3466; Wreath, 2563.

Purslane, 2766; Family, 30×; Sea, 427×; Water, 1920; Winter, 2065.
Pusætha, 1115×.
Pusley, 2766×.
Pussy's Toes, 299.
Pussy Willow, 3053×.
Putty Root, 311.
Puya heterophylla, 2651.
Pycnocoma macrophylla, 2303×.
Pycnoloba (Primula), 2792×.
Pycnosphace (Salvia), 3065.
Pyramidata (Verbascum), 3443.
Pyrethrum aureum, 756; Balsamita, 757; caucasicum, 733; corymbosum, 755×; fœniculaceum var. bipinnatifidum, 756×; hybridum, 757; inodorum, 2010×; Pallasianum, 758×; Parthenium, 756; roseum, 757; uliginosum, 758.
Pyrola, One-flowered, 2061×; uniflora, 2061×.
Pyrolaceæ, 63×.
Pyrolirion, 3543×.
Pyrophorum, 2867×.
Pyrrheima Loddigesii, 3363×.
Pyrularia pubera, 2303×.
Pyrus americana, 3195; arbutifolia, 396×; arbutifolia var. nigra, 396×; Aria, 3197; Aria var. latifolia, 3196×; Aria var. majestica, 3197; Aucuparia, 3195×; caloneura, 3197×; cathayensis, 727×; Chamæmespilus, 3198; crenata, 3198; Cydonia, 936; Decaisneana, 3197; Delavayi, 1063; discolor, 3198; domestica, 3196; Doumeri, 1063; edulis, 3197; fennica, 3196; floribunda, 396×; Folgneri, 3197×; Folgneri var. pendula, 3197×; fusca combinations, 3574; gracilis, 3198; grandifolia, 396×; heterophylla, 3196×; Hostii, 3198; indica, 1063; intermedia, 3197; intermedia var. latifolia, 3196×; japonica, 728; lanata, 3198; Matsumurana, 3198; Maulei, 728×; Miyabei, 3197×; Mougeotii, 3198; nigra, 396×; pinnatifida, 3196; rotundifolia, 3196×; sambucifolia, 3195×; sinensis, 727×; sitchensis, 3195×; Sorbus, 3196; thianschanica, 3196; thuringiaca, 3196×; torminalis, 3196×; vestita, 3198.
Pythium de Baryanum, 5×.
Pyxie, 2878×.

Quadria heterophylla, 1335.
Quaker Lady, 1611.
Quaking Grass, 576.
Quamasia, 639×.
Quarantine laws, 1650×.
Quarter-Vine, 503.
Quassia, 67; amara, 45; Family, 44×; Wood, 45.
Quauhtzapotl, 294.
Quebec, 566.
Queen Anne's Pocket Melon, 908; Lily, 917; Mary's Thistle, 2354; of Lilies, 1870; of Orchids, 1372; of the Meadow, 3214×; of the Meadows, 1239×; of the Prairie, 1239.
Queen's Delight, 3242×; -Root, 3242×.
Queensland-Lily, 1067; Nut, 1939; Poplar, 1499; Pittosporum, 2654×.
Queltia fœtida, 2110×; juncifolia, 2111; orientalis, 2112.
Quercitron, 25×.
Quercus, 25×; alba, 358; bicolor, 358; cleistocarpa, 3569×; coccinea, 358; cornea, 2479×; cuspidata, 2479×; densiflora, 2479; glabra, 2479×; Henryi, 3569×; laurifolia, 358, macrocarpa, 358; Michauxii, 358; nigra, 358; palustris, 358; phellos, 358; Prinus, 3603; rubra, 358; thalassica, 2479×; virginiana, 358.
Quesnelia Van Houtteana, 1098.
Quillaja Saponaria, 41.
Quinaria, 2477×; Lansium, 786.
Quince, Japan, 728.
Quinine, 774×.
Quinoa, 737.

Rabbit-foot Clover, 3379.
Raccoon Grape, 3487.
Radicula Armoracia, 36×, 2981×; Nasturtium-aquaticum, 36×, 2981×.
Radix Anatheri, 3456; Galangæ minoris, 265×; Vetiveriæ, 3456.
Raffia Palm, 2910×.
Ragan, Reuben, 1592; W. H., 1592.
Ragged Orchis, 1424×; Robin, 1929; Sailor, 711×.
Rag Gourd, 1921; -weed, 271×; -wort, Golden, 3151×; -wort, Purple, 3150×; -wort, Tansy, 3152.
Raimannia, 2330×.
Rainbow Cactus, 1095; Moss, 3138.
Rain Tree, 3066×.
Raisin Tree, Japanese, 1611×.
Rais Colorada, 3037.
Rambutan, 2131.
Ramero, 3377.
Ramo de oro, 1312.
Ramona, 430.
Ramontchi, 1241.
Rampion, Horned, 2612.
Ram's Foot, 2909×.
Rand, E. S., 1592×.
Rangoon Creeper, 2894×.
Ranunculaceæ, 32.
Ranunculus sceleratus, 32×; Thora, 32×.
Rapanea guyanensis, 2095×.
Rape, 2910.
Raphanistrum, 2910.
Raphanus Raphanistrum, 36×; sativus, 36×.
Raphidophora, 2925×.
Rapunculus verus, 643×.
Raspberries, history, 1515×.
Raspberry, European, 3028; Fire, 3024×; Flowering, 3024×; Purple-Cane, 3028×; Red, 3028; Rocky Mountain Flowering, 3024×.
Rata, 2044×; Mountain, 2045.
Ratibida columnaris, 1840×; pinnata, 1841.
Rat-stripper, 2424×; -tail Cactus, 312×.
Rattan, 16×.
Rattle-box, 901×, 1920.
Rattlesnake Master, 1138; Plant, 623; Plantain, 1357; Root, 2781×; Weed, 1491.
Ravenala madagascariensis, 21×.
Ravenea Hildebrandtii, 2905.
Ravenna-Grass, 1129.
Rawson, W. W., 1593.
Razoumofskya, 2595.
Reana luxurians, 1161×.
Reasoner, P. F., 1593.
Rectæ (Clematis), 795; (Stachys), 3220×.
Red Ash, 1275×; Baneberry, 212×; Bay, 2556; -berried Elder, 3068; -berry, 2924×; Birch, 497×; -bird Cactus, 2524×; Box, 1152×; Buckeye, 228; -Bud, 720; Campion, 1928; Cedar, 1728×; Chokeberry, 396×; Clover, Common, 3379×; Cluster Pepper, 659; Currant, 2960; Currant, Northern, 2960; Currant, Swamp, 2959×; Elm, 3410×; Fescue, 1228×; Fir, 174×, 2847; Grape, 3486×; Gum, 1158; -hot Cat-tail, 191; -hot-poker Plant, 1751×; Ironbark, 1153, 1159; Ironwood, 2922×; Jamaica Banana, 2078×; Kowhai, 802×; Mahogany, 1156; Maids, 618; Maple, 202×; Mulberry, Native, 2071; -Osier Dogwood, 852×; Passion-Vine, 2486; Pepper, 658×; Pine, 2640; Pine, Japanese, 2640; Puccoon, 3069×; Raspberry, 3028; Robin, 1331; -Root, 269×, 1893×; Sandal-wood Tree, 215; Spanish Banana, 2078×; Spruce, 2619; Valerian, 713×; -White-and-Blue Flower, 914; -wood, 3163×.
Reed, 403×; Bur-, 3200×; Canary-Grass, 2573×; Common, 2601×; Giant, 403×; Mace, 3405×; Meadow-Grass, 1351×; Paper-, 2472×; Sea Sand-, 274×; Spire-, 2601×.
Refrigeration, 3245×.
Regelia (Iris), 1673.
Reidia glaucescens, 2606×.
Rein Orchis, 1423.
Rescue-Grass, 579.
Reseda, 1831; Luteola, 37; odorata, 37.
Resedaceæ, 37.
Resin, Dammar, 12×, 230×; Kauri, 12×; Myrrh, 45×; Sandarac, 12×.
Rest-Harrow, 2353.
Resurrection Fern, 2744×; Plant, 3140.
Retama monosperma, 1322.
Retinospora, 1440×; dubia, 3335×; ericoides, 730×, 3335×; filifera, 731×; juniperoides, 3337; leptoclada, 730×, 732; obtusa, 731; obtusa aurea, 731; pisifera, 731×; plumosa, 731×; plumosa aurea, 732; Sanderi, 731; squarrosa, 732. See also 3603.
Rhamnaceæ, 51.
Rhamnus cathartica, 51, 1440×; Paliurus, 2436×.
Rhaphanus, 2910.
Rhapidophyllum, 2445×.
Rhapiolepis, 2911.
Rhapis, 2445×.
Rhapontic Roots, 61.
Rheumatism-root, 1720×.
Rheum officinale, 28×; Rhaponticum, 28×.
Rhineberry, 2924.
Rhinopetalum, 1280.
Rhipidodendron dichotomum, 260×; distichum, 260×; plicatile, 260×.
Rhipsalis cereiformis, 2566; ianthothele, 2566; salicornioides, 1433.
Rhizophoraceæ, 59×.
Rhizopus nigricans, 5×.
Rhodanthe alba, 1453×; atrosanguinea, 1453×; maculata, 1453×; Manglesii, 1453; varius, 1453×.
Rhodea, 2974×.
Rhode Island, 2162.
Rhodes Grass, 750×.
Rhodiola rosea, 3129×.
Rhodochlamys, 2079.
Rhodocistus Berthelotianus, 778.
Rhododendron amœna, 1439×; arbutifolium, 3571; austrinum, 3571; Chamæcistus, 2949×; lætevirens, 3571; oleifolium, 3571; various new combinations, 3574; Wilsonianum, 3571; Wilsonii, 3571.
Rhodophyceæ, 5.
Rhodora canadensis, 2943.
Rhoicissus capensis, 3482×.
Rhopala, 3020×.
Rhopalostylæ (Potentilla), 2773.
Rhubarb, Guatemala, 1720.
Rhus Coriaria, 48; cotinoides, 865; Cotinus, 864×; rhodanthema, 2949; succedanea, 48.
Rhynchospermum jasminoides, 3361×.
Rhynchospora, 3041×.
Rhytidophyllum floribundum, 1333×.
Ribbon-Grass, 2574; Tree, 2655; -wood, 2655×.
Ribes, 39; Cul'verwellii var. wollense, 3571; new combinations, 3574.
Ribwort, 2656×.
Ricciales, 6×.
Rice, 2411; Bean, 2575×; Field Water-Lily, 2313×; -Flower, 2624; Indian, 3546×; Mountain, 2411; Paper, 1204; -root Lily, 1281×; Wild, 3546×.
Richardia Adlamii, 3536×; æthiopica, 3536×; africana, 3536×; albo-maculata, 3536; angustiloba, 3536×; aurata, 3536×; cantabrigiensis, 3536×; devoniensis, 3536×; Elliottiana, 3536; hastata, 3536×; intermedia, 3536×; Lathamiana, 3536×; Lutwychei, 3536×; macrocarpa, 3536×; melanoleuca, 3536; melanoleuca var. tropicalis, 3536; nana compacta, 3536×; Pentlandii, 3536×; Rehmannii, 3536; Sprengeri, 3536; suffusa, 3536×; Taylori, 3536×.
Ricinella, 214×.
Ricinus communis, 46×.
Riddellia tagetina, 2849.
Rissoa ceylonica, 426×.
Rivea tiliæfolia, 391.
Riverbank Grape, 3486; Birch, 497×; Poison, 1189.
Rivina peruviana, 3377.
Robertsonia (Saxifraga), 3096.
Robin-run-away, 2130×.
Roccardia corymbiflora, 1453×; Humboldtiana, 1453×; Manglesii, 1453; Manglesii var. maculata, 1453×; rosea, 1453×.
Rocella tinctoria, 6.
Rochea falcata, 878.
Rock Beauty, 1068×; -Brake, 903×; Chestnut Oak, 2886×; -Cress, 343; -Cress, Purple, 429; Elm, 3410; Grape, 3485; Jasmine, 282×; Maple, 203; Melon, 908×; Rose, 776×; -Rose Family, 55.
Rocket, 1479; Candytuft, 1635×; -Salad, 1137×; Yellow, 454.
Rock, John, 1593.
Rocky Mountain Bee-Plant, 799; Flowering Raspberry, 3024×.
Rodetia Amherstiana, 526.
Roeding, F. C., 1593×.
Roettlera, 1005.
Roezlia bulbifera, 1305×; regia, 1305; regina, 1305.
Roffia Palm, 2910×.
Rogers, E. S., 1593×.
Rogiera amœna, 2980; cordata, 2980; gratissima, 2980; latifolia, 2980; versicolor, 2980.
Rollinia leptopetala, 2978; parviflora, 2978.
Roman Kale, 496×; Wormwood, 400.
Root Blossom, Scarlet, 229.
Ropala, 3020×.
Roripa Armoracia, 2895×; Nasturtium, 2895×.
Rosaceæ, 40.
Rosa damascena, 41; de Montana, 304×; gallica, 41; Mundi, 2989; rubiginosa, 1440×; rugosa, 1440×; various new combinations, 3574.
Rosanowia conspicua, 3170; ornata, 3170.
Roscheria, 2445×.
Roscœa gracilis, 695; lutea, 695.
Roscyna (Hypericum), 1630×.
Rose Acacia, 2967×; Anemone, 2997; -Apple, 1163; Ayrshire, 2987; Banks', 2988×; Bay, 2139; -Bay, East Indian, 3304; Bengal, 2988; Bourbon, 2988×; Bridal, 3029; Brier, 3029; -Bud Cherry, 2841; Burgundian, 2989×; Cabbage, 2989; California, 839; Calla, 3536; Campion,

Rose, continued. 1928; Champney, 2988; Cherokee, 2996×; China, 2988; Christmas, 1454×; Cinnamon, 2993; Confederate, 1488; Cotton-, 1335×, 1488; Crimson Chinese, 2988; Crimson Rambler, 2985; Damask, 2989×; Dawson, 2985; Dog, 2990×; Fairy, 2988; Family, 40; Fortune's Double Yellow, 2987×; Geranium, 2533; Green, 2988; Guelder, 3462×; Harison's Yellow, 2995×; Himalayan Musk, 2985×; Japanese, 1736×; Macartney, 2996×; -Mallow, 1483×; -Mallow, Crimson-Eye, 1486×; -Mallow, Swamp, 1486×; Memorial, 2986×; Moss, 2766, 2989; Mountain, 304×; Musk, 2986; Noisette, 2988; of Heaven, 1928; of Jericho, 2920; of Sharon, 1488×, 1630×; Persian Yellow, 2995×; Pompon, 2989×; Prairie, 2985×; Rock, 776×; Scotch, 2995; Seven Sisters, 2985; Sulphur, 2995×; Sun, 1444; Tea, 2987×; -water, 41; -wood, 42; -wood, Burmese, 2853×; York and Lancaster, 2989.
Roselle, 1485.
Rosemary, 70, 912, 3020; Victorian, 3512; Wild, 1833.
Rosenbergia Pringlei, 807; scandens, 806×; stipularis, 807.
Rosette Mullein, 2903×.
Rosin, 1417×; -weed, 3168×.
Rosmarinus officinalis, 70, 912.
Rosoglio, 38×.
Rosulati (Streptocarpus), 3273×.
Rottlera japonica, 1972×.
Rotundifoliæ (Cratægus), 883.
Rouge Plant, 2966.
Rough-stalked Meadow-Grass, 2723×.
Roulinia gracilis, 966; Karwinskiana, 2147×; serratifolia, 966.
Round Kumquat, 1270; -leaved Mint, 2035.
Roupellia grata, 3277×.
Rowan Tree, 3195×.
Roxburghia gloriosa, 3235; gloriosoides, 3235; viridiflora, 3235.
Royal Catchfly, 3167; Fern, 2413×; Jasmine, 1718×; Palm, 2405; Poinciana, 2727; Water-Lily, 3466×.
Roystonea Borinquena, 2405; floridana, 2405; oleracea, 2405; regia, 2405.
Rubacer, 3021; columbianum, 3024×; odoratum, 3024×; parviflorum, 3024×.
Rubber, Brazil, 1482×; Guayule, 2477×; Plant, 1229; Tree, Para, 1482×; Tree, South American, 1482×; Virgin, 3072×.
Rubia tinctoria, 74×.
Rubiaceæ, 74×.
Rubra (Acer), 202×.
Rubus Dalibarda, 961; odoratus albidus, 3574; procumbens var. roribaccus, 3574; rosæflorus, 3604.
Ruby-Grass, 3374×.
Rudbeckia purpurea var. serotina, 1088; serotina, 1088.
Rue, 912, 3041×; Anemone, 3296×; Family, 44×; Goat's 3321×; Meadow, 3326; Tall Meadow, 3327×.
Ruellia ciliosa, 73×; colorata, 1457×.
Ruizia fragrans, 2565×.
Rulac Negundo, 204×.
Rumex crispus, 28×.
Running Blackberry, 3032; Myrtle, 3471; -Pine, 1932.
Rupala, 3020×.
Rupture-wort, 1477×.
Ruscus androgynus, 3142×; racemosus, 961×.
Rush, 1724×; -Broom, Leafless, 3470×; Family, 19; Flowering, 601; Lily, 3171; Wood, 1924.
Russell River Lime, 2047×.
Russian Almond, 2832; fruits, 1297×; Mulberry, 2079×; Thistle, 3057; Vetch, 3466.
Rustica, 2143.
Rustic work, 2675.
Rutaceæ, 44×.
Ruta graveolens, 912.
Rutland Beauty, 839×.
Ruyschiana spicata, 1071.
Rydbergia grandiflora, 212×.
Rye, 3124; -Grass, 1902×, 3568; -Grass, Giant, 1111×; Wild-, 1111.

Sabal, 2445×; serrulata, 17.
Sabina, 1727×.
Sacaline, 2743.
Sacaton, 3217×.
Saccharina (Acer), 203.
Saccharomyces, 5×.
Saccharum officinarum, 15.
Sacci, 232×.
Saccolabium Blumei, 2955×; cœleste, 2956; giganteum, 3431×; guttatum, 2955×; Harrisonianum, 2956; præmorsum, 2955×; retusum, 2955×; Rheedii, 2955×; violaceum, 2955×.
Sacred Earflower of the Aztecs, 938.
Safflower, 675.
Saffron Crocus, 899×; False, 675; Meadow, 824×.
Sage, 912; Bethlehem, 2857; Brush, 399, 400; Jerusalem, 2585×; -leaved Pear, 2868; Scarlet, 3063; White, 400.
Sago Palm, 932×; Palm, 2045.
Sainfoin, 2353.
St. Agnes' Flower, 1849; Andrew's Cross, 405; Augustine Grass, 3237; Bernard's Lily, 300; Bruno's Lily, 2473; George's Herb, 3426×; John's Bread, 717×; John's Lily, 893; John's-Wort, 1629; John's-Wort Family, 54×; John's-Wort, Marsh, 1632×; Joseph's Lily, 1868×; Julien Plum, 2826; Lucia, 2356×; Lucie Cherry, 2835×; Lucie Grass, 939×; Mary's Guacima, 3526×; Mary's Thistle, 3169; Patrick's Cabbage, 3096; Paul's Speedwell, 3451; Peter's-wort, 405; Thomas Tree, 457×.
Saintfoin, 2353.
Salal, 1319.
Salamander Tree, 304.
Salep, 23.
Salicaceæ, 24.
Salisburia adiantifolia, 1338×.
Salix, 24; acutifolia, 3572×; alba var. cærulea, 3571×; alba var. calva, 3571×; ambigua, 3572; appendiculata, 3572; aurita, 3572; austriaca, 3572; bicolor, 3572×; bullata, 3571×; canescens, 3571×; cinerea, 3571×; cinerea var. angustifolia, 3571×; cinerea var. oleifolia, 3571×; cremensis, 3571×; daphnoides, 3572×; daphnoides var. acutifolia, 3572×; Erdingieri, 3571×; Erdingieri var. cremensis, 3571×, 3574; Forbyana, 3573; fragilis var. bullata, 3571×; fragilis var. decipiens, 3571×; glabra, 3572×; gracilistyla, 3573; grandifolia, 3572; hastata, 3572×; hexandra, 3571×; holosericea, 3572×; Læstadiana, 3571×; latifolia, 3571×; ludificans, 3572; myrsinifolia, 3572; neriifolia, 3572; nigricans, 3572; palustris, 3571×; phylicifolia, 3572×; Piperi, 3572×; Pontederana, 3572; purpurea var. amplexicaulis, 3573; purpurea var. Kecksii, 3573; purpurea var. Lambertiana, 3573; purpurea var. sericea, 3573; Reuteri, 3572×; rubens, 3571×; rubens var. palustris, 3571×; rubra, 3573; Russelliana, 3571×; sesquitertia, 3572; Sieboldiana, 3573×; sordida, 3572; spadicea, 3572; stipularis, 3572×; tetraptera, 3572×; Thunbergiana, 3573; viminalis var. Gmelinii, 3572×; viminalis var. songarica, 3572×; viridis, 3571×; Wimmeri, 3572×; Wimmeriana, 3571×.
Salmonberry, 3023×, 3026×.
Salpichroma rhomboideum, 3055×.
Salsify, 3365; Black, 3121.
Salt-Bush, 436; -Grass, 1061; Tree, 1429×.
Salvia Sclarea, 911×; officinalis, 70, 912.
Salviniaceæ, 10, 1209.
Saman, 3066×.
Sambucus canadensis, 75; japonica, 1176; nigra, 75.
Samphire, 896, 912; Marsh, 3050.
Sanctolina, 3071.
Sandalwood, 3071; Bastard, 2090×; False, 3525; Family, 27×; Red, 42; Tree, Red, 215.
Sandarac, 1417×; Resin, 12×.
Sandarach, 631.
Sand Blackberry, 3031×; -box Tree, 1615×; -Bur, 711; Cherry, 2833×; Clover, 303×; Grape, 3485; Lily, 1848×; Myrtle, 1835; Pear, 2869; Pine, 2644; Plum, 2829×; -Reed, Sea, 274×; Verbena, 175×; Vetch, 3466.
Sanguineæ (Cratægus), 886.
Sanguisorba obtusa, 2776×.
Sanicle, 3070.
San Miguelito, 304×.
Sanseverina rorida, 3070×.
Sansevieria fragrans, 1070.
Santa Domingo Apricot, 1975×.
Santalaceæ, 27×.
Santalum album, 27×.
Santonica, 399.
Santonin, 77.
Sapindaceæ, 50.
Sapindus chinensis, 1756; Saponaria, 50×.
Sapium sebiferum, 47, 2303×.
Sapodilla Family, 65.
Saponaria officinalis, 31×.
Saponin, 29, 31×, 3072.
Sapotaceæ, 65.
Sapote, 1919; Mamey, 1919.
Sapotillier, 3073×.
Saprolegnia, 5×.
Sapucaya Nut, 1832×.
Sararanga, 2449.
Sarcochilus Cecilæ, 3334; Hartmannii, 3334; lilacinus, 3334×; purpureus, 639×.
Sarcodes sanguinea, 64.
Sarcopodium, 2403.
Sarcostemma, 2583.
Sardonia, 32×.
Sargassum bacciferum, 5.
Sargent, H. W., 1594.
Sarothamnus scoparius, 948.
Sarracenia purpurea, 37×.
Sarraceniaceæ, 37×.
Sarsaparilla, 19×; Bristly, 344×; Wild, 344×.
Saskatchewan, 570×.
Sassafras, 35×; variifolium, 35×.
Satin-Bush African, 2724; Flower, 1921×, 3171; -Leaf, 767; Poppy, 2017×; -wood, 2076; -wood, Indian, 751×.
Satsuma Orange, 784×.
Satureia nortensis, 912; montana, 912.
Saul, John, 1594×.
Saunders, Wm., 1594×.
Saururaceæ, 23×.
Sausage-Tree, 1738.
Savastana odorata, 1491×.
Savin, 1728×.
Savory, 3082; Summer, 912, 3082×; Winter, 912, 3082×.
Sawara Cypress, 731×.
Saw-Brier, 3174×; -fly Orchis, 2356; Palmetto, 3156×.
Saxegothæa gracilis, 2725.
Saxifraga pyrolifolia, 1841×; Sullivantii, 3281.
Saxifragaceæ, 39.
Saxifrage Family, 39; Golden, 767×; Meadow, 3157×.
Scabiosa Pterocephala, 2854×; Succisa, 3280×.
Scabious, 3105×; Sheep, 1716×; Shepherd's, 1716×; Sweet, 3106.
Scammony, 68×.
Scarborough Lily, 3428.
Scarlet Bush, 1431×; Clover, 3379; -flowering Rose Geranium, 2533; Fritillary, 1281×; Lightning, 1927×; Maple, 202×; Oak, 2883×; Plume, 1169×; Root Blossom, 229; Runner Bean, 2576; Sage, 3063; Strawberry, 1272; Turk's-Cap Lily, 1874; Vetch, 3465×.
Schæfferia lateriflora, 1080.
Scheeria lanata, 208; mexicana, 208.
Schinus Limonia, 1219.
Schivereckia podolica, 269.
Schizæa pusilla, 9.
Schizæaceæ, 9, 1208×.
Schizonotus, 1498.
Schizophragma hydrangeoides, 1623.
Schmaltzia aromatica, 2953; copallina, 2954; crenata, 2953; glabra, 2954×; hirta, 2954×; Michauxii, 2954×; trilobata, 2953.
Schœnocaulon officinalis, 19×.
Schomburgkia, 2403.
Schrader's Brome-Grass, 579; Schubertia disticha, 3314×; graveolens, 2610.
Sciadocalyx, 1705×.
Sciadophyllum acuminatum, 3108×; Brownii, 3108×; conicum, 3108×.
Scillopsis, 1764×.
Scindapsus pertusus, 2925×.
Scirpus lacustris, 16.
Sclarea (Salvia), 3060.
Scleroderma vulgare, 2088×.
Sclerostylis buxifolia, 3158×; Hindsii, 1270; spinosa, 2038×.
Scoke, 2614.
Scolopendrium officinarum, 2607; vulgare, 2607.
Scolymus hispanicus, 77×.
Scoparia dulcis, 71.
Scopolia carniolica, 70×.
Scorodonia (Teucrium), 3325.
Scorodosma fœtidum, 1228.
Scorpion Grass, 2091; Senna, 855×.
Scorzonera, Creole, 871×; hispanica, 77×.
Scotanthus tubiflorus, 1420×.
Scotch Broom, 948; Crocus, 898×; Elm, 3410×; Laburnum, 1763×; Pine, 2640×; Pink, 998×; Rose, 2995; Thistle, 2354.
Screen-planting, 2681×.
Screw-Bean, 2811; -Pine, 2449; -Pine Family, 13.
Scrophulariaceæ, 71.
Scrophularia nodosa, 71.
Scrub Oak, 2884×; Palmetto, 3045; Pine, 2644.
Scurfy Pea, 2849.
Scurvy Grass, 454, 809.
Scutch Cane, 446.
Scutellaria lateriflora, 70.
Scutellatæ (Veronica), 3452×.
Scytalia chinensis, 1891×.
Scythian Lamb, 768×.
Sea Buckthorn, 1494×; -Daffodil, 1626; -Grape, 807×; -Holly, 1137×; -Kale Beet, 496×, 734; Lavender, 3229×; Lyme-Grass, 1111×; Oats, 3414×; -Onion, 3118×, 3417; Pea, 1826; Pink, 395, 3228; Poppy, 1346×; Purslane, 427×; Sand-Reed, 274×; Urchin, 1428; -Urchin Cactus, 1097.
Seaforthia elegans, 385; Kuhlii, 2626; robusta, 2950.
Seaside Balsam, 902; Laurel, 2606×; Pea, 1826; Planting, 2670×; Plum, 3525; Vine, 776×.
Seaweeds, Brown, 5; Red, 5.
Sedangan, 1896.
Sedge, 662, 3119; Broom, 282×; Family, 15×.
Sedum Cotyledon, 871; ebracteatum, 3125; edule, 869×; Telephium, 38×.

Seed-box, 1920; business, history, 1516×.
Sego Lily, 635.
Selaginella, 11, 1215×; Family, 10×; lepidophylla, 2920×.
Selaginellaceæ, 10×.
Selenipedium Ainsworthii, 2604; albopurpureum, 2604; Boissierianum, 2603×; caricinum, 2603; caudatum, 2603×; caudatum var. Warscewiczii, 2603×; Hartwegii, 2603×; Klotzschianum, 2603; Lindleyanum, 2603; Roezlii, 2603×; Sargentianum, 2603; Schlimii, 2602×; Schomburgkianum, 2603; vittatum, 2603; Wallisii, 2603×.
Self-Heal, 581.
Semecarpus Anacardium, 2304.
Sempervivum tectorum, 38×; tenuifolium, 3127×.
Sencuya, 292×.
Seneca-Grass, 1491×; Snakeroot, 2738.
Senecio japonicus, 1859; Kaempferi, 1858×; Ledebourii, 1859; Ligularia, 1859; longipes, 2291; sagittatus, 1112; sibiricus, 1859; sonchifolius, 1112.
Senegal Gum, 1417.
Seni, 1915.
Senna, 680; Bladder, 834; Scorpion, 855×.
Sensitive Brier, 3115; -Fern, 2353; Pea, 680×; Plant, 2053×.
Serapias, 1357×.
Serapiastrum, 3156.
Serenoa, 2445×.
Sericeæ (Rosa), 2996.
Sericobonia, 1714.
Sericographis Ghiesbreghtiana, 1715; Mohintli, 1715; pauciflora, 1715.
Sericotheca Boursieri, 1498×; discolor, 1498×.
Seringa, 1483.
Seringueira, 1482×.
Serjania lethalis, 50×.
Serpentaria, 28×.
Serpent Gourd, 3376; -head Orchid, 3223.
Serradella, 2409×.
Serratula tinctoria, 77×.
Serrulatæ (Furcræa), 1305.
Service-berry, 272, 273×; Tree, 3196; Tree, Wild, 3196×.
Sesame-Grass, 3383×.
Sesamum indicum, 72.
Seven Sisters Rose, 2985.
Seville Orange, 782×.
Shad-bush, 272.
Shagbark, False, 677.
Shaggy Hawkweed, 1491.
Shallon, 1319.
Shamrock-Pea, 2475×.
Sharp, F. P., 1595×.
Shaw, Henry, 1595×.
Shea Butter, 65×.
She Balsam, 174; -Oak, 683×.
Sheep-Berry, 3459×; -Laurel, 1734×; Scabious, 1716×; Sorrel, 3037×.
Sheep's-bit, 1716×; Fescue, 1228×.
Shellac, 26×.
Shellbark-Hickory, 678.
Shell-Flower, 265×, 2059×, 3344×.
Shepherdia argentea, 59.
Shepherd, R. W., 1596; Mrs. T. B., 1596×.
Shepherd's Scabious, 1716×.
Sherwoodia galacifolia, 3160; unifora, 3160×.
Shifting, 2778.
Shingle Oak, 2885; Plant, 2064×.
Shining Sumac, 2954.
Shin Leaf, 2864; Family, 63×.
Shinn, James, 1596×.
Shirley Poppy, 2457×.
Shirt-button Plant, 1974×.
Shittim Wood, 179.
Shoeblack Plant, 1488.
Shooting-Star, 1063.
Shore-Grape, 807×; Plum, 2831.
Shortia californica, 213×.
Show Geranium, 2532×.
Showy Lily, 1870×; Orchis, 1311×; Sedum, 3131×; Sunflower, 1449×; Wild Pea, 1826.
Shrubby Althea, 1488×.
Shrub Yellow-Root, 3537.
Siberian Apricot, 2824×; Crab, 2871×; Cranesbill, 1332; Millet, 3158×; Rye-Grass, 3568; Squill, 3118×.
Sibthorpia europæa, 1624×.
Sicilian Beet, 496×.
Sida integerrima, 178×.
Side-Saddle Plant, 3078×.
Sierra Leone Copal, 1417.
Sieva Bean, 2577.
Sieversia ciliata, 1335; Peckii, 1334×.
Silene Cœli-rosa, 1928.
Silk-Cotton, 700; Cotton Tree, 521; -Grass, 1306×; Oak, 1412; -Vine, 2553×; -weed, 404.
Silky Prairie Clover, 2561×; Willow, 3054; Wisteria, 3518.
Silver Beard-Grass, 282×; -Bell, 1428×; -berry, 1106×; -Bract, 870; Chickweed, 2476; Fir, 173; -head, 2476; -leaved Cranesbill, 1331; -leaved Ironbark, 1152×; Maple, 202×, 2756; -Palm, 808; Thistle, 2354; -Tree, 1847×; Vine, 213; Wattle, 188×; Weed, 391, 2775×; Whitlowwort, 2476.
Silvery-leaved Sunflower, 1447×.
Simarubaceæ, 44×.
Simaruba Cedron, 45.
Simbulata, 280×.
Simon Plum, 2827.
Simplicifoliæ (Rosa), 2984×.
Sinapis arvensis, 544×.
Sinapistrum arvense, 544×.
Sinenses (Primula), 2791×.
Singhara-Nut, 3372.
Sing-kwa, 1921.
Sinningia barbata, 3310×; Carolinæ, 3310×; speciosa, 1350.
Siphonantha (Limonium), 3232×.
Siphonanthus indica, 801; splendens, 800.
Siphonia Cahuchu, 1483; elastica, 1483.
Siris Tree, 243×.
Sisal, False, 232×; Hemp, 232×.
Sisson Plum, 2827.
Sissoo Tree, 960×.
Sisymbrium indicum, 2981×; Nasturtium-aquaticum, 2895×, 2981×; pinnatifidum, 545×.
Sisyrinchium cyaneum, 2410×.
Sitka Spruce, 2620; Willow, 3055.
Skeleton-leaved Mulberry, 2070×.
Skullcap, 3121×.
Skunk-Bush, 2953; Cabbage, 3295; Currant, 2959; Grape, 3490×.
Slash Pine, 2643.
Slender Rock-Brake, 903×.
Slime Molds, 4×.
Slipper Plant, 2524×; Spurge, 2524×.
Slippery Elm, 1279, 3410×.
Sloanea dentata, 52.
Sloe, Black, 2830×.
Slough-Grass, 3201.
Small Cane, 446; Cranberry, 3425×; -flowered Leaf-Cup, 2744; -leaved Linden, 3347; Pignut, 677; Snapdragon, 304×; Spikenard, 344×.
Smaller Bitter-wood, 3526×.
Smartweed, 2740.
Smilacina racemosa, 19×.
Smith, A. M., 1596×; W. R., 1597.
Smithiantha achimenoides, 2097; amabilis, 2097×; cinnabarina, 2097; Geroltiana, 2097×; zebrina, 2097.
Smoke-Tree, 864×.
Smooth Alder, 253; Azalea, 2942; -barked Cottonwood, 2763; -leaved Elm, 3412; Sumac, 2954×.
Smyrnium nudicaule, 1903×; Olusatrum, 245×.
Snail-Flower, 2574×.
Snails, 2019×.
Snake Cactus, 2525; Cucumber, 908; Gourd, 1774×, 3375×; -Grass, 1126; Melon, 908; Palm, 276×; -weed, 2742.
Snakeroot, Black, 3070; Button, 1138, 1852×; Canada, 404; Seneca, 2738; Virginia, 393; White, 1167; Wild, 2130×.
Snake's-Head, 1280; Iris, 1477.
Snapdragon, 304×; Large, 304×; Small, 304×.
Sneeze Weed, 1442×; -wood, 2850×; -wort, 206.
Snowball, 3462×; -ball, Chinese, 3460; -ball Japanese, 3461; -berry, 748, 3292×; -bush, 2606; -Creeper, 2765; -drop, 1308; -drop Anemone, Double, 286; -drop-Tree, 1428×; -flake, 1848×; -flake, Water, 2316×; -in-Summer, 717; -on-the-Mountain, 1169; Pear, 2868; -Plant, 3077×; Wreath, 2139×.
Snuff, Mountain, 396.
Soap-Bark Tree, 2891×; -berry, 3072; -berry Family, 50; -bush, 2148; -Plant, 751; -wort, 3074×; -wort Gentian, 1326×.
Sobralia, 2403.
Society publications, 1553.
Socotrine Aloes, 255×.
Soirea, Blue, 679.
Soja Bean, 1352; max, 1352.
Solanaceæ, 70×.
Solanum carolinense, 70×; Dulcamara, 71; fragrans, 943; giganteum, 3573×; Lycopersicum, 1931; Melongena, 71; nigrum, 71; racemiflorum, 1932.
Soldanelloideæ (Primula), 2799.
Solea concolor, 1618.
Soledad Pine, 2645×.
Solena, 2033×.
Solenantha, 1626.
Solidago arborescens, 3152×.
Solomon's Lily, 402×; Seal, 2739; Seal, False, 3172×.
Soncoya, 292×.
Sophora japonica, 42; monosperma, 2407; platycarpa, 785×; tomentosa, 42.
Sophronitis, 2403.
Sorbaria Millefolium, 729×.
Sorbopyrus auricularis, 2868.
Sorbus arbutifolia, 396×; arbutifolia var. atropurpurea, 396×; glabra, 2596×; melanocarpa, 396×; terminalis, 2596.
Sorghum, 1497; halepense, 1497; vulgare, 1497.
Sorgo, 1497.
Sorrel, 3036×; Common Field, 3037×; French, 3037×; Garden, 3037×; Jamaica, 1485; Sheep, 3037×; -Tree, 2419×.
Souari-Nut, 678×.
Soulard Crab, 2871.
Sour Cherry, 2836×; Guisaro, 2848; Gum, 2316×; -sop, 292; sop-, Mountain, 292×; -top, 3423×; -Wood, 2419×.
South American Rubber Tree, 1482×.
South Carolina, 2223.
South Dakota, 2202.
Southern California Grape, 3488×; Cottonwood, 2759; Dewberry, 3032; Fox Grape, 3484; Gooseberry, 3422×; Pine, 2643; Red Lily, 1876; Swamp Lily, 1871×; -wood, 912.
Spanish Broom, 3201×; Fir, 174×; Grape, 3487; Heath, 1131; Iris, 1681; Jacinth, 3117×; Jasmine, 1718×; Lime, 2025×; Moss, 3350×; Oak, 2884; Oak, Swamp, 2884×; Oyster Plant, 3120×; Plum, 3217.
Sparkleberry, 3422.
Spartianthus junceus, 3201×.
Spartium multiflorum, 942; scoparium, 948; virgatum, 1323.
Spartocytisus filipes, 948.
Spartothamnus, 948.
Spathiphyllum pictum, 2949.
Spathyema fœtida, 3295×.
Spatlum, 1851×.
Spatter-Dock, 2291×.
Spatularia bryophora, 3092×; petioularis, 3092.
Spatulum, 1851×.
Spear-Lily, 1067; -mint, 2035; -Wood, 1158×.
Spectabiles (Verbascum), 3442×.
Speedwell, 3448; Bastard, 3449×; Common, 3452×; Germander, 3452×; Mountain, 3452×; St. Paul's, 3451.
Spergula arvensis, 31×; pilifera, 3048×; subulata, 3048×.
Sphærogyne imperialis, 3352; latifolia, 3352.
Sphærostema propinquum, 3110×.
Sphærostigma, 2329×.
Sphagnales, 6×.
Sphenogyne speciosa, 3417.
Spicata (Acer), 200×.
Spice Bush, 487.
Spider Orchis, 2356; -Lily, 1626; Plant, 799; -web Houseleek, 3146; -wort, 3363; -wort Family, 18×.
Spignel, 2045×.
Spike, 70; -Grass, 991, 3414×; -Grass, Marsh, 1061.
Spiked Loosestrife, 1937×.
Spikenard, 344×; Small, 344×.
Spinach Beet, 496×; New Zealand, 3323.
Spinage, 3206×; Dock, 3036×.
Spindle Tree, 1185×.
Spinovitis Davidii, 3845.
Spiræa amurensis, 2610×; angustifolia, 1239×, 3194; arborea, 3194; ariæfolia, 1498×; Aruncus, 403; Aruncus var. astilboides, 403×, 423; astilboides, 423; Boursieri, 1498×; cæspitosa, 2563×; camtschatica, 1239; capitata, 2611; digitata, 1239; discolor, 1498×; dumosa, 1498×; Filipendula, 1239; gigantea, 1239; grandiflora, 3194; japonica, 423; Kirilowii, 3194; lævigata, 3160×; Lindleyana, 3193×; lobata, 1239; Millefolium, 729×; monogyna, 2611; opulifolia, 2610×; opulifolia var. mollis, 2611; palmata, 1239; pauciflora, 2611; pectinata, 1921; sorbifolia, 3193×; sorbifolia alpina, 3194; spp., 1441; Ulmaria, 1239×; vestita, 1239×.
Spiral Flag, 864.
Spiranthes, 1636×, 2403×; autumnalis, 23; colorata, 3236×; diuretica, 23.
Spiraria, 3213×.
Spire-Reed, 2601×.
Spirodela, 1837.
Split-Thorn Acacia, 599.
Spondias dulcis, 48×; purpurea, 48×.
Sponge, Vegetable, 1921.
Spoon-Thorn Acacia, 599.
Spotted Calla, 3536; Cranesbill, 1332; Gum, 1152×; Lily, 1876; Touch-me-not, 1642×.
Spreading Dog-bane, 311×.
Spring Adonis, 221; Beauty, 786×; Bitter Vetch, 1827; Snowflake, 1849; Squill, 3118×; Star-Flower, 3384×.

Spruce, Black, 2619×; Colorado, 2620; Engelmann, 2620; Hemlock, 3390×; Norway, 2618; Pine, 2642×, 2644, 2645×; Red, 2619; Sitka, 2620; Tideland, 2620; White, 2619×.
Spurge, 1167; Caper, 1173; Cypress, 1173×; Family, 46×; Flowering, 1169; Indian Tree, 1170; Ipecac, 1169×; Melon, 1172×; Mountain, 2426×; Nettle, 1719×; Slipper, 2524×.
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Tutuila, 1699×.
Twayblade, 1888.
Tweedica floribunda, 2420×.
Twin-Berry, 2057×; -Flower, 1885×; -Flower, Mexican, 545; -leaf, 1720×.
Twining Cowitch, 3365.
Twisted Stalk, 3275×.
Two-flowered Pea, 1825×; -veined Hickory, 185×.
Tydæa amabilis, 1706; Cecilиæ, 1706×; picta, 1706.
Typhaceæ, 13.
Typocerasus, 2835×.
Ugni Guava, 2096×; Molinæ, 2096×.
Uhi-uhi, 2414×.
Uhuihi, 2045×.
Ulex europæus, 41×, 42.
Ulluco, 3408.
Ullucus tuberosus, 31.
Ulmaceæ, 25×.

Ulmaria angustifolia, 1239×; camtschatica, 1239; Filipendula, 1239; palmata, 1239; palustris, 1239×; pentapetala, 1239×; purpurea, 1239; rubra, 1239; vestita, 1239×.
Ulmus americana, 358×; fulva, 26; Keakii, 3540×; various combinations, 3574; Verschaffeltii, 3541.
Umbelliferæ, 62×.
Umbilicus Aizoon, 869; chrysanthus, 869; pendulinus, 869×; Sempervivum, 869×.
Umbrella-Leaf, 1016×; Palm, 941, 1442; Pine, 3115×; Plant, 941, 3102×; Tree, 1966×; Tree, Texas, 2024×.
Umbu, 2614×, 3217.
Una de Gato, 2652, 2653.
Unguis-cati, 2652.
Unicorn Plant, 2005.
Unifloræ (Cratægus), 885.
Unifoliati (Streptocarpus), 3274.
Unifolium canadense, 1971×, 3596.
United States, 2148.
Unona æthiopica, 3528; Brandisana, 653; carminativa, 3526×; cochinchinensis, 991×; Desmos, 991×; discolor, 991×; discreta, 991×, 3527; elegans, 991×; latifolia, 653; odorata, 652×; penduliflora, 938; tripetaloidea, 3527×; zeylanica, 991×.
Unonopsis, 291.
Unshiu Orange, 784×.
Upland Boneset, 1167; Cress, 454.
Upright Tomato, 1931×.
Uragoga Ipecacuanha, 74×,714.
Urbinia agavoides, 870.
Urd, 2575×.
Urena lobata, 52×.
Urginea maritima, 19×.
Urhur, 613×.
Uropedium Lindeni, 2603×.
Uropetalum, 1016.
Urtica cannabina, 26×; caracasana, 3416×; dioica, 26×.
Urticaceæ, 26×.
Urticastrum, 1821×.
Urvillea ferruginea, 3156×.
Usambara Violet, 3049×.
Usteria scandens, 2012×.
Utah, 2272×; Hybrid Cherry, 2834.
Uvadel Mar, 807×.
Uva-Grass, 1421×.
Uvaria brasiliensis, 938; odorata, 652×.
Uvularia sessilifolia, 2318.

Vaccaria vulgaris, 3074×.
Vaccinium album, 3293×; macrocarpon, 64; Myrtillus, 64; Oxycoccus, 64.
Vagnera racemosa, 3173; sessilifolia, 3173; stellata, 3173; trifolia, 3173.
Valdesia, 512×.
Valerian, African, 1204×; Cat's, 3426×; Common, 3426×; Family, 75; Greek, 2729×; Marsh, 3426×; Red, 713×.
Valerianaceæ, 75.
Valeriana Cornucopiæ, 1204×; officinalis, 75; sibirica, 2487×.
Valley Cottonwood, 2758×; Grape, 3488×; Oak, 2887×.
Vallisneria alternifolia, 14×.
Valoradia plumbaginoides, 719.
Vanda Batemannii, 3233×, 3432×; gigantea, 3432×; lissochiloides, 3233×; longifolia, 191×; Lowei, 2917.
Van Deman, H, E., 3554.
Vangueria edulis, 74×.
Vanilla, 2043×; Carolina, 3380×; -Grass, 1491×; planifolia, 23; Plant, 3380×.
Variegated Bamboo, 449; Laurel, 815×.
Various-leaved Fescue, 1228×.
Varnish, Copal, 42; Tree, 245×, 1756×, 2953×; Tree, Japanese, 3239.
Vasconcellea quercifolia, 664.
Vaux, Calvert, 1601.
Vavisa, 287×.
Vegetable Orange, 908; Oyster, 3365; Sponge, 1921; Tallow, 3073.
Veitchia Canterburyana, 1442×.
Velasquezia, 3383.
Veltheimia Uvaria, 1752×.
Velvet Bean, 3243; -Grass, 2290×, 3549; Groundsel, 3152×; -Leaf, 775, 3423×; Tree, 1422.
Venice Turpentine, 12×.
Venus Fly-trap, 1011×; Looking-glass, 3203×.
Vepris lanceolata, 3352×.
Veratrum, 19×.
Verbascum Thapsus, 71.
Verbena hastata, 69×; Lemon, 1707, 1888×; ligustrina, 1889; Moss, 3446; nodiflora, 1889; officinalis, 69×; Sand, 175×.
Verbenaceæ, 69×.
Verbesina alternifolia, 213×; helianthoides, 213×; sativa, 1416.
Verilimonium, 3230×.
Vermont, 2157×.
Vernales (Primula), 2797×.
Vernal Grass, Sweet, 301.
Veronica, 71.
Veronicastrum 3450.
Verschaffeltia, 2446; melanochætes, 2999.
Vervain Family, 69×.
Vesicaria gnaphalodes, 2611×.
Vespuccia Humboldtii, 1624×.
Vetch, 3464; American, 3465×; Bitter, 3466; Black Bitter, 1826×; Carolina, 3465×; Crown, 855×; French, 3464×; Hairy, 3466; Kidney, 303×; Milk, 424; Narbonne, 3464×; Purple, 3466; Russian, 3466; Sand, 3466; Scarlet, 3465×; Spring Bitter, 1827.
Vetchling, Prairie, 1826×.
Vetiveria zizanioides, 15.
Vetrix purpurea, 3054×.
Vi, 3216×.
Viburnums, 1441; Wrightii var. Hessei, 3574.
Vicia galegifolia, 3282×; Lens, 1839; sativa, 41×.
Vick, James, 1601×.
Victorian Box, 2654; Rosemary, 3512.
Vigna Catjang, 41×.
Villamilla peruviana, 3377; roseo-œnia, 3377.
Villarsia aquatica, 2316×; lacunosa, 2316×.
Villosæ (Syringa), 3300.
Vincetoxicum acuminatum, 938×; japonicum, 938×.
Vine, 3481×; -Cactus, 1271; Peach, 908.
Viola canina, 3609.
Violaceæ, 56.
Violet, African, 3049×; Australian, 3473; Bird-foot, 3474×; Confederate, 3473; Damask, 1479; Dame's, 1479; Family, 56; Horned, 3474; Labrador, 2632×; Prairie Clover, 2561×; Sweet, 3473; Usambara, 3049×; Water-, 1608.
Viorna (Clematis), 790×.
Viper's Bugloss, 1098×.
Virgilia lutea, 785.
Virginia, 2215×; Cowslip, 2039; Creeper, 2478×; Crownbeard, 3447; Snakeroot, 393.
Virginian Strawberry, 1272; Willow, 1707×.
Virgin Rubber, 3072×.
Virides (Cratægus), 883×.
Viscaria alpina, 1927×; oculata, 1928.
Viscum album, 27×; flavescens, 2594×.
Visiania, 1859.
Vitaceæ, 51.
Vitalba (Clematis), 795.
Vitex Negundo forma multifida, 3574.
Viticella (Clematis), 792×.
Vitis, 51×; bipinnata, 278; brevipedunculata, 278; cantoniensis, 278×; capreolata, 3324; Delavayana, 278; gongylodes, 776; Henryana, 2478×; heterophylla, 277×; heterophylla var. variegata, 278; inconstans, 2478×; inconstans var. Lowii, 2479; indivisa, 277×; leeoides, 278×, 3565×; megalophylla, 278×; oligocarpa, 775×; orientalis, 278×; pterophora, 776; quinquefolia, 2478×; repens, 277×; rubrifolia, 2479; serjaniæfolia, 278; Veitchii, 2479.
Vitis-Idæa (Vaccinium), 3425; Vitis-Idæa, 3425.
Vitivert, 3456.
Vittadinia triloba, 1133.
Vittaria lineata, 1215×.
Voandzeia Poissonii, 1737; subterranea, 41×.
Voa Vanga, 3433.
Volkameria fragrans, 800×; japonica, 800×.
Vriesia anceps, 3350×; glaucophylla, 3351; Lindenii, 3350×; musaica, 2010×.
Vulgaris (Syringa), 3300×.

Wafer Ash, 2851.
Wahlenbergia grandiflora, 2711.
Wahoo Elm, 3410.
Wake Robin, 403, 3380×.
Waldmeister, 411×.
Walker, Ernest, 3554.
Walking-Leaf Fern, 652; -Stick Palm, 441×.
Wall Fern, 2744×; -flower, Coast, 1140; -gardening, 2680×; Pepper, 3127.
Wallichia caryotoides, 2446; porphyrocarpa. 1006.
Walnut, 1721, 2296; Belgaum, 245×; Family, 25; Indian, 245×.
Walsura piscidia, 45×.
Wampi, 786.
Wandering Jew, 3363, 3540.
Wand-Flower, 3200.
Wappato, 14.
Waratah, 3320×.
Warder, J. A., 1602.
Waria zeylanica, 3527×.
Warratau, 3320×.
Warrea discolor, 3506×.
Washington 2278×; Plant, 608×; Thorn, 886.
Washingtonia, 2413, 2446.
Watches, 3078×.
Water Aloe, 3260; Arum, 627×; Ash, 1276; -Blinks, 2065; Caltrops, 3371×; Chestnut, 3371×; Chestnut Family, 61×; Chickweed, 2065; Chinkapin, 2117; -Corn, 3468; -Cress, 2895×; -Dock, Great, 3037; Dropwort, 2328×; -Elm, 2655×, 3409×; -Feather, 1608; -gardening, 2668; Hawthorn, 311×; -Hickory, 676×; Hyacinth, 1105; -Leaf, 1625; -Leaf Family, 68×; -Lemon, 2484; -Lettuce, 2650; -Lily, 2306; -Lily, Cape Blue, 2311×; -Lily, Cape Cod, 2313×; -Lily Family, 31×; -Lily, Rice Field, 2313×; -Lily, Royal, 3466×; -Lily, Sweet-scented, 2313; Lobelia, 1899; Locust, 1347; -melon, Chinese, 486×; Milfoil Family, 61×; -mold, 5×; Oak, 2884×; Oats, 3546×; Parsnip, 3171×; Pennywort, 1624×; -Plantain, 246×; -Plantain Family, 13×; -Poppy, 1624×; Purslane, 1920; -Shield, 539×; Snowflake, 2316×; Soldier, 3260; -Target, 539×; -Thyme, 1110×; -Violet, 1608; -Weed, 1110×; -Willow, 974, 997; -Yarrow, 1608.
Watsonia natalensis, 1345.
Wattle, Black, 188; Blue-leaved, 184×; Broad-leaved, 184×; Broom, 181×; Golden 184×; Green, 188; Hairy, 187×; Silver, 188×; Sydney Black, 188; Sydney Golden, 187×.
Waxberry, 3293×; Chinese White, 1274×; Gourd, 486×; Myrtle, 2092×; -Palm, 726, 1019×; -Plant, 1612×; -Tree, 2953×; -Work, 701.
Wayfaring Tree, 3460×; American, 3460×.
Waythorn, 2924.
Weather-Plant, 176.
Webbia (Hypericum), 1632.
Wedding Iris, 2066×.
Weeping Big Tree, 3154; Lantana, 1820; Myall, 185×; Oak, 2887×; White, Linden, 3348×; Willow, 3053.
Weigela, 1007×, 3510.
Wellhouse, Frederick, 1602×.
Welsh Onion, 248; Poppy, 2017×.
Western Cottonwood, 2758×; Mugwort, 400; Sand Cherry, 2833×.
West Indian Birch, 600×; Cedar, 698; Copal, 1417; Gherkin, 908×; Gooseberry, 2606×; Indigo, 1646×; Red Jasmine, 2723.
West Virginia, 2218.
Wharton, Silas, 1602×.
Wheat-Grass, 240; India-, 1201×.
Wheatley Elm, 3412×.
Wheel Lily, 1876.
Whin, 3407×.
Whirlwind, 286×.
White Adder's-Tongue, 1143; Alder, 801×; Alder Family, 63; Ash, 1275×; Bachelor's Button, 2907×; Baneberry, 212; -Bark Pine, 2639; Bay, 1967×; Beam-Tree, 3197; Bedstraw, 1312; Ben, 3165×; Birch, 498; Box, 1153×; Campion, 1928×; Cedar, 730×, 1854, 3335; Charlock, 2910; Clover, 3379; Columbine, Munstead's, 341×; -Cup, 2145; Daisy, 1832; Elm, 3409×; Fir, 173, 174; Fritillary, 1282; Gourd, 486×; Hawkweed, 1491; Heath Aster, 418×; Hellebore, American, 3440×; Hellebore, European, 3440×; Ironbark, 1153, 1159; Linden, 3348; Linden, Weeping, 3348×; Lotus, 2315; Lupine, 1923×; Mahogany Gum, 1155×; Mangrove, 436; Maple, 202×; Mint, 2035; Mountain Lily, 1848×; Mulberry, 2070; Oak, 2885×, 2887×; Oak, Mexican, 2890×; Oak, Swamp, 2886×; Pine, 2638; Pine, Mountain, 2638×; Popinac, 1848; Poplar, 2755×, 2756×; Prairie Clover, 2561; Sage, 400; Sapote, 680; Snakeroot, 1167; -spined Bull-Horn, 599; Spruce, 2619×; Swamp Honeysuckle, 2942; Upright Mignonette, 2918×; Walnut, 1722×; Watsonia, 3510; -weed, 758; Willow, 3052×; -wood, 34, 1080, 1890, 3345×; Wood Lily, 3380×.
White, W. N., 1602×.
Whitlavia, 2566×; alba, 2576; gloxinioides, 2567; grandiflora, 2566×.
Whitlow-Grass, 1068; -Wort, 2476; -Wort, Silver, 2476.
Whorl-Flower, 2067×; -leaved Acacia, 186×.
Whortleberry, 3424×.
Wicky, 1734×.
Wicopy, 1020×.
Widdringtonia Whytei, 631.
Widow Iris, 1477.
Wilder, M. P., 1603.
Willow, 2765; Arroyo, 3055; Bay-Leaf, 3052; Black, 3052; Brittle, 3052; Colorado, 3054×; Desert, 747×; Dwarf, 3054; Egyptian, 3053; Family, 24; Flowering, 747×; Goat, 3053×; Heart-leaved, 3054×; Hoary, 3054×; Kimarnock, 3053×; Laurel-Leaf, 3052; Napoleon's,

Willow, continued. 3052×; Oak, 2885; Osier, 3054; Peach-Leaf, 3052; Prairie, 3054 Primrose, 1730; Pussy, 3053×; Silky, 3054; Sitka, 3055; Thurlow's Weeping, 3053; Virginian, 1707×; Water-, 974, 997; White, 3952×; Wisconsin Weeping, 3053; Yellow, 3052×.
Wilugbæya, 2050.
Windmill Grass, 750×.
Windsor Bean, 3464×.
Wineberry, 3027; -berry, New Zealand, 395; -berry Shrub, 847; Grape, 3484×; -Palm, 679×, 2910×; -Plant, 2927×.
Winged Elm, 3410; Pea, 1917×.
Wing-stemmed Wild Pea, 1826.
Winter Aconite, 1127; -berry, 1640×; Cherry, 2608×; Cress, Common, 454; Cress, Early, 454; Grape, 3487; Grape, Sweet, 3487×; Heliotrope, 2562; Melon, 908; Purslane, 2065; Savory, 3082×; -Sweet, 209; Sweet Pea, 3283.
Wintera aromatica, 1077.
Wintergreen, 64, 1319, 2864; Chickweed-, 3378×; Flowering, 2738.
Wire-Grass, 939×, 1109×; Plant, 2074×.
Wisconsin, 2187×; Weeping Willow, 3053.
Wisteria, Evergreen, 2706×.
Witch-Grass, Old, 2452×; -hazel, 40, 1430; -hazel Family, 40.
Withania origanifolia, 3055×.
Withe-Rod, 3459×.
Wokowi, 1915.
Wolfberry, 3293×.
Wolffia, 1836.
Wolffiella, 1836.
Wolfsbane, 209; -milk, 1167; Pale Yellow, 210×.
Wollybutt, 1159×.
Woman's-Tongue Tree, 243×.
Wonga-Wonga Vine, 2452.
Wood Anemone, 286; Anemone, Yellow, 286×; -Apple, 1219; Betony, 2524×; -bine, 1913; -Fern, 1078×; Hair-Grass, 989; Lily, 1876; Lily, White, 3380×; Meadow-Grass, 2273×; -oil, 245; -oil Tree, China, 245×; -oil Tree, Japan, 245×; Rush, 1924.
Woodfordia floribunda, 59.
Woodruff, 411; Dyer's, 411×.
Woods, 2662.
Woodsia, 1217×.
Woodwardia angustifolia, 1218.
Woolly Woundwort, 3220.
Woolverton, C. E., 1603×.
Wormseed, 737.
Wormwood, 77; Beach, 399×; Roman, 400.
Woundwort, 303×, 3218; Woolly, 3220.
Wreath Goldenrod, 3188; Purple, 2563.
Wrightia tinctoria, 67×; tomentosa, 67×.
Wrinkled Bamboo, 449.
Wulfenia cordata, 3297×.
Wych Elm, 3410×; hazel, 1430×.
Wyoming, 2260×.

Xalxocotl, 2848.
Xanthantha, 2312×.
Xanthorhœa australis, 19×; hastilis, 19×.
Xanthosoma sagittifolium, 18.
Xeranthemum proliferum, 2569.
Xicori, 1915.
Xiloxochitl, 2423.
Ximenia americana, 28.
Xiphium (Iris), 1681; filifolium, 1681×; Histrio, 1682; junceum, 1681; Kolpakowskianum, 1682; planifolium, 1680; Sisyrinchium, 1682; tingitanum, 1681×.
Xochinacaztli, 938.
Xolisma ferruginea, 1935; fruticosa, 1935; ligustrina, 1935.
Xuxu, 3124×.
Xylon pentandrum, 700.
Xylophylla elongata, 2606×; latifolia, 2606×; montana, 2606×.
Xylopicrum, 3527.
Xylopleurum, 2331×.
Xylosteum, 1904; Solonis, 1907×.

Yam Bean, 2425×; Chinese, 1013; Family, 20×; Hawaiian Bitter, 1013×; Vine, Giant, 1013×.
Yampi, 1013×.
Yaquona, 2646×.
Yaray, 3044×.
Yard-Grass, 1109×.
Yarrow, 206; Water-, 1608.
Yas, 2556×.
Yate, Flat-topped, 1154×; Tree, 1154×.
Yaupon, 1640.
Yautia, 3523.
Yaw-Root, 3242×.
Yaxci, 232×.
Yellow Archangel, 1777; Bachelor's Button, 2909; -Bark Oak, 2884; Bedstraw, 1311×; -Bells, California, 1112; Berry, 3023×; Bignonia, 3317; Birch, 498; Box, 1158×; Calla, 3536×; Cedar, 730×; Chestnut Oak, 2886; Chinese Poppy, 2018×; Clover, 3379; Daisy, 3034×; Day Lily, 1455×; Dock, 3037; Elder, 3317; Everlasting, 1450; False Garlic, 2291; -flowered Rest-Harrow, 2353×; Fringed Orchis 1423×; Fox-tail, 3158; Locust, 2967; Loosestrife, 1936×; Lupine, 1923; Oak, 2883×; Oleander, 3332×; Pine, 2642×; Pond-Lily, 2291×; Poplar, 34, 1890; Rocket, 454; -Root, Shrub, 3537; Strawberry, 1080, 3496; Strawberry Guava, 2848×; Stringybark, 1155×; Suckling Clover, 3379; Trefoil, 2019×; Turk's-Cap Lily, 1874; Willow, 3052×; Wolfsbane, Pale, 210×; -Wood, 785, 2949; Wood Anemone, 286×.
Yerba Buena, 2048; de Mate, 1637×; Mansa, 287×.
Yew, 3315; Family, 11×.
Ylangylang, 652×; Climbing, 397.
York and Lancaster Rose, 2989.
Youth-and-Old-Age, 3544×.
Yucca acaulis, 1306; acrotricha, 966; argyræa, 1305; argyrophylla, 1305; -Barrancasecca, 2147×; Boscii, 238×; bulbifera, 1305×; californica, 1479×; funifera, 1478; gracilis, 966; graminifolia, 966, 1479×; histrix, 238×; longifolia, 2147×; nitida, 1479×; Ortgiesiana, 1479×; Parmentieri, 1305; parviflora, 1478; parvifolia, 1478; Pringlei, 1305×; serratifolia, 966; superba, 1306×; Toneliana, 1305; Whipplei, 1479×; Whipplei, violacea, 1479×.
Yuquilla, 1992.

Zalusania eminens, 2724.
Zaman, 3066×.
Zamia calocoma, 2047×; pungens, 1114.
Zanthoxylum Daniellii, 1185×; trifoliatum, 193.
Zanzibar Aloes, 255×; Copal, 1417.
Zapania nodiflora, 1889.
Zapote negro, 1016.
Zapupes, 232×.
Zebra Plant, 624; Wood, 2649×.
Zehneria scabra, 2033×.
Zembe, 3526.
Zephyr Flower, 3541×.
Zephyrites, 3543.
Zerumbet speciosum, 265×.
Zichya tricolor, 1735×; villosa, 1735×.
Zigzag Clover, 3379×.
Zingiber officinale, 22.
Zingiberaceæ, 21×.
Zit-kwa, 486×.
Zizia integerrima, 3304×.
Zizyphus Lotus, 51; Paliurus, 2436×; Spina-Christi, 51.
Zonal Geranium, 2531.
Zostera, 13×.
Zosterostylis, 904×.
Zuursaak, 292.
Zygia fastigiata, 244.
Zygomycetes, 5×.
Zygopetalum, 2403×; Burtii, 1615; cœleste, 519×; discolor, 3506×; Lalindei, 519×; meleagris, 1615; Patinii, 519×; violaceum, 519×; Wendlandii, 3506×; xanthinum, 2810×.
Zygophyllaceæ, 44.
Zygophyllum simplex, 44.